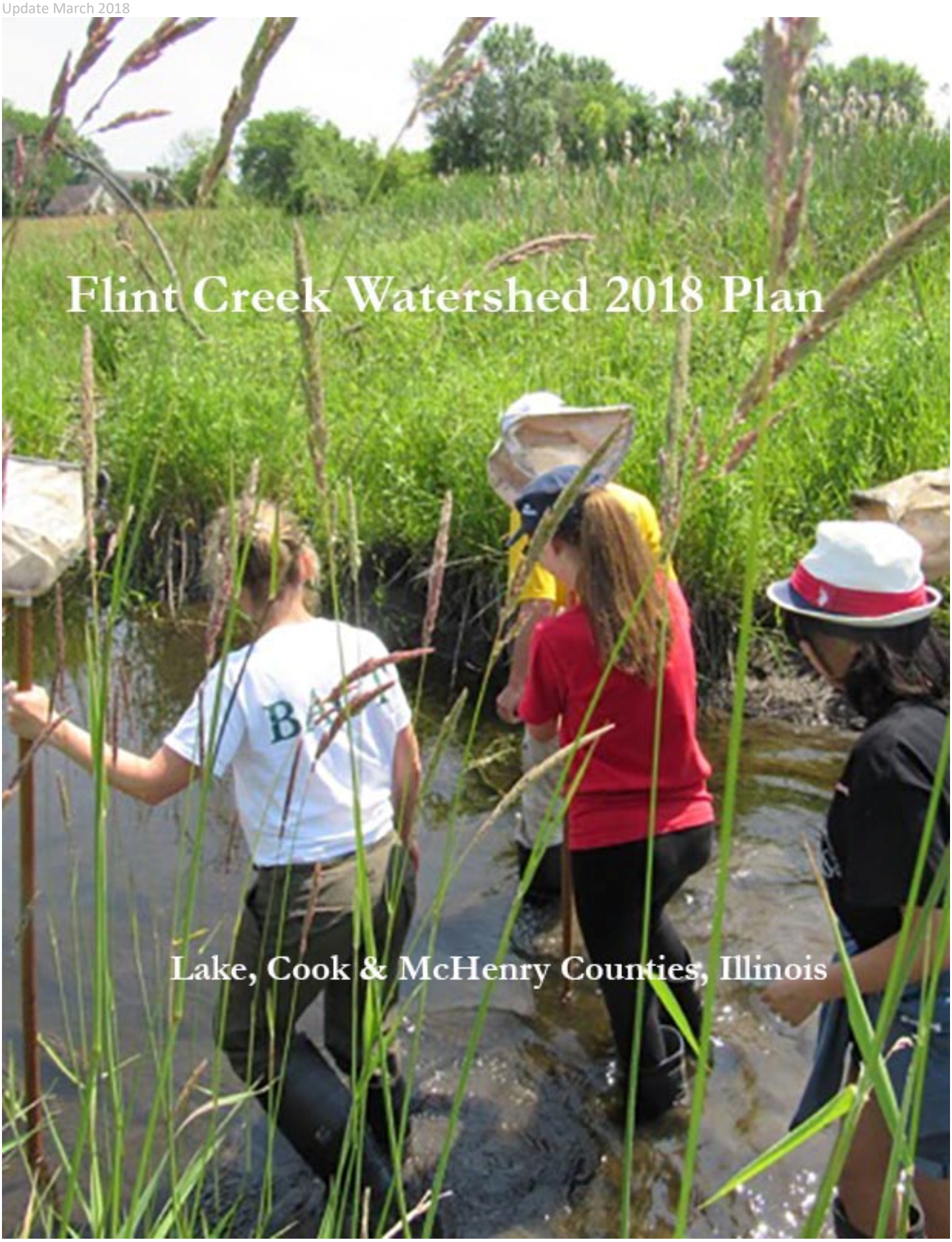

Flint Creek Watershed 2018 Plan

Lake, Cook & McHenry Counties, Illinois

Flint Creek Watershed Plan, 2018 Update

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1.0 INTRODUCTION

In Illinois, villages, townships and counties have been established using a variety of criteria, such as social, cultural, political, time frame of development, generally influenced by geography, but not determined by it. As a consequence, there is very little consistency across government agencies as it relates to how these units of government came into being. Watersheds, however, have an internal consistency, as it is the area of land where all of the water that falls on it and drains off of it goes to a common outlet or larger body of water. Since the late '80s, federal, state and local agencies have focused on watersheds as an effective framework for managing water resource quality and quantity within a specific area – the area that the watershed defines. Like most effective continuous improvement strategies, the watershed planning process works by using a series of collaborative, iterative steps and stages to define current conditions, identify and prioritize problems, define objectives, develop strategies, evaluate successes and failures, learn, adjust, and go through the process again. These processes are documented in what is known as the Watershed Plan.

A Watershed Plan brings together stakeholders with a common interest – the health and effectiveness of the watershed, whether those stakeholders are totally aware of extent of their common bond, or their part in it, or not. If they are not aware of their common interest, and the part their actions play, the Plan outlines ways to inform and educate. The goals are objective, supported by the best current science, and buttressed by assessments of the current and recent status of the Watershed, prioritized and measureable, as is appropriate in these times of limited resources.

The Flint Creek Watershed Plan is funded by its partners, along with donations of volunteer hours and a small grant for technical assistance provided by the Barrington Area Community Foundation. For more information, please visit www.barringtonareacommunityfoundation.org. Special thanks belongs to our partners: The Villages of Barrington, North Barrington, Lake Barrington, Deer Park, South Barrington, Barrington Township, Cuba Township and Lake Zurich, Fox Point Homeowners Association, Barrington Area Development Council, Barrington Area Council of Governments, Citizens for Conservation, our fiscal agent, and the Barrington Area Conservation Trust. Additional credit belongs to Casey Sebetto, our graduate student who provided exceptional assistance in accomplishing our updates. Special thanks and recognition as well to Mike Adam, and his team at the Lake County Health Department for their excellent studies of area lakes, and to Cecily Cunz of Applied Ecological Services (AES) for her services and consideration for our small budget.

Section 1.1 USEPA Watershed-Based Plan Requirements

The purpose of this project is to update the 2007 comprehensive watershed management plan for the Flint Creek watershed, and to change the format to conform to the Nine Point Watershed Planning Framework, specifically:

A.) Causes and sources of water pollution, and estimates of existing pollutant loads

B.) Water quality goals, load reduction targets, and expected load reductions

C.) Management measures to achieve load reduction targets

D.) Technical and financial assistance and relevant authorities

E.) Information and education component

F.) Schedule for implementing identified management issues

G.) Interim, measurable milestones

H.) Interim benchmarks to measure progress

I.) Monitoring component

This project updates information, recommendations, and projects found within the original Flint Creek plan; identifies additional projects and recommendations not in the original plan; and outlines work and projects that have been completed since the release of the 2007 Plan.

Section 1.2 Planning Process

The Flint Creek Watershed Partnership (FCWP) held regular, public meetings throughout the last half of 2016 and all of 2017 to guide the watershed planning process and to encourage participation of stakeholders in the projects.

Table 1. Flint Creek/Spring Creek Watershed Partnership meeting schedule:

Mtg #	Date	Agenda	Topic(s)
1	7/28/2016	Discussion of local projects	Discussion on updating the plan; Data Requirements
2	9/29/2016	Continued discussion of local projects	Discussion on FC Partnership and outreach to original stakeholders
3	11/16/2016	Call for completed projects	Partial Summary of Projects. Presentation on Projects for the Watersheds
4	1/10/2017	Status of priority projects	Map Work
5	3/14/2017	Ongoing call for completed projects	Filling in Charts instruction; Map Work
6	4/11/2017	Workbooks from Partners	Continued Work on Filling in Charts
7	5/9/2017	Filling in Charts Map Work	Impact of Municipal and Pvt. Raingardens; Worksheets from Partners
8	7/11/2017	Continued work on Completing Plan Charts	Intern Assistance Availability; Status of project reports
9	9/12/2017	Map Work: Filling in the Charts	Status of Partnership Reports
10	11/14/2017	Accomplishments and plan update and processes	Summary of progress to date; Working Session on Future Plans

11	2/13/2018	Status of Plan: Evaluation	Update; Review of evaluation process compared to 2007's 5 year update; More update plan additions
12	3/13/2018	Review of FSWP Goals & Objectives; Discussion of Target Reductions; Concerns or Consensus to Move Forward	Discussion of Goals, and Information and Education Components, and Expected Load Reductions

The primary goal of FCWP is to educate while building partnerships for projects to improve water quality, reduce flooding, and preserve and restore wetlands, prairies, and other natural features for future generations.

Section 1.3 Goals and Objectives

Six goals were established for the Flint Creek watershed to address the issues and opportunities raised by the FCWP. These goals include those listed in the 1994 Watershed Plan prepared by the Lake County Stormwater Management Commission (LCSMC) as well as additional goals discussed during the first watershed planning meetings. For the Plan Update, the goals are the same, although five objectives have been added

- **Goal A:** Protect surface and groundwater resources and enhance overall water quality in the lakes and streams of the watershed.
  Objectives:

  1) Lakes and streams shall at a minimum attain state water quality standards to fully support designated uses.
  2) Reduce sediment and nutrient accumulation in lakes and streams by restoring eroded streambanks and lake shorelines using bioengineering practices.
  3) Maintain and expand high quality native riparian buffers and restore native riparian buffers along those stream reaches identified as having poor buffer quality.
  4) Educate landowners on the environmental dysfunction caused by invasive buckthorn and support efforts for its eradication in the Flint Creek Watershed.
  5) Retrofit existing stormwater management structures and design new structures using BMP green infrastructure wherever feasible within developed areas to specifically reduce nutrient and sediment loading.
  6) Publicize the impacts of road salt usage on water quality and aquatic life and develop recommendations for education, alternatives, and use reduction.
  7) Identify open space parcels appropriate for implementation of best management practices (BMPs) to reduce pollutants originating from known pollutant loading hotspots.
  8) Reduce point source pollutant loading.
  9) Research best green infrastructure practices and work with government agencies to encourage best green management practices in ordinances and codes
  10) Educate the public about protecting shallow aquifer water quality, particularly in recharge areas.
  11) Implement stormwater BMPs throughout the watershed to improve water quality and reduce runoff.

12) Reduce phosphorus, nutrient & other pollution by educating land-owners and landscape contractors on the effectiveness of native buffers and porous pavements.
13) Continue to educate landowners and developers about the dangers of high Polycyclic Aromatic Hydrocarbon surface sealers, and their impact on water quality and aquatic life.
14) Work with the LCSMC, BACOG and local villages and government agencies to educate well and septic owners on best maintenance practices.

- **Goal B:** Identify and protect important natural areas/open space in the watershed and provide appropriate passive recreational benefits.
  Objectives:

  1) Permanently protect all sites with high quality natural areas or threatened and endangered species.
  2) Identify buffer parcels for potential acquisition, protection, and/or restoration adjacent to sites with high quality natural communities and/or threatened and endangered species.
  3) Adopt conservation design standards for all new development in designated high priority open space to maximize protection of natural areas and open space in new developments.
  4) Identify and protect open space that provides important green infrastructure (conservation) corridor connections and provide passive recreation opportunities.

- **Goal C:** Reduce existing flood damage in the watershed and prevent flooding from worsening downstream.
  Objectives:

  1) Inventory undeveloped floodplain that is not currently protected from development and protect it as open space.
  2) Mitigate for existing flood damage at all flood damage sites by identifying open space parcels suitable for wetland restoration or stormwater storage basins.
  3) Reconnect ditched stream reaches to historic floodplain where feasible.
  4) Implement multi-objective stormwater management best management practices (BMPs) within high priority open space and new developments that help reduce runoff and increased stream flows through infiltration of rainwater.

- **Goal D:** Improve aquatic and terrestrial habitat in the watershed.
  Objectives:

  1) Identify opportunities for habitat improvement on identified open space; improve habitat in degraded stream reaches using natural stream design approaches and improve habitat in degraded terrestrial communities by removing non-native plants and replacing with native plant communities.
  2) Develop and implement short and long-term management and monitoring plans for all natural areas.
  3) Encourage the development of lake management plans among stakeholders and HOAs.
  4) Encourage native plantings in stakeholder landscapes.

- **Goal E:** Increase communication and coordination among municipal decision-makers and other stakeholders within the watershed.
  Objectives:

1) Ensure that municipalities adopt updated Flint Creek Watershed-Based Plan.
2) Encourage municipalities and stakeholders to participate in Flint Creek Watershed Partnership.
3) Encourage adoption of municipal comprehensive plans, codes and ordinances supportive of watershed plan goals and objectives and climate change adaptation
4) Develop a planning, funding, and implementation mechanism to provide stream channel maintenance across multiple jurisdictions using environmentally friendly practices.
5) Encourage collaboration for water quality testing resources, locations and protocols

- **Goal F:** Foster appreciation and stewardship of the watershed through education.
  Objectives:

1) Provide watershed stakeholders with an education plan that promotes the knowledge, skills, and motivation needed to take action on implementing the watershed plan.
2) Encourage Volunteer Scientist Programs, such as RiverWatch and the Volunteer Lake Monitoring Program.
3) Educate the public on the benefits and goals of native plants and natural area restoration.
4) Identify open space parcels adjacent to public facilities such as schools that would be appropriate for outdoor education, butterfly gardens or rain gardens, and so on.
5) Implement environmental interpretation/education signage throughout greenway (conservation) corridors.
6) Educate the public on the value of ecosystem services provided by healthy natural systems.

Section 1.4 Using This Plan

Watershed Plans are largely useless without watershed stakeholders who are committed to managing and improving the watershed. The context of "watershed" is important, as it demonstrates clearly that our individual actions impact collectively the experience of all who live in the watershed, as well as downstream on the Fox River. While municipal and county agencies along with elected officials may be responsible for using the information in this document to help manage the watershed, each community member can play a part. Not only can each community member influence the actions of their elected officials, but their individual actions – e.g. use of fertilizers, water use, careful disposal of pollutants, buffer plantings, and so on – impact the health of their watershed.

We are all connected, and so are our water systems. There are three components to our water service infrastructure: drinking – from either our own wells or municipal wells (in our area), wastewater – to septics or sewers, and stormwater. These systems are ultimately interconnected, and looking at water through the lens of a watershed helps us understand.

This Watershed Plan should provide:

- a common basis for area residents to understand the challenges our Watershed currently faces;
- opportunities to become more involved and gain more knowledge;
- appreciation and support for the importance of protecting our water systems for our own enjoyment, economic growth and the ongoing vitality of the natural areas that attracted so many to our towns.

Given our current social landscape, in which municipal and governmental agency budgets are stretched, the prospects are for fewer, large projects publicly funded. Given the importance of developing more climate resiliency, the probabilities are that developing effective detention areas and mitigating floods will increase in priority. At the same time, given potential future water quality and quantity challenges, and the extent to which rivers and lakes are located on private properties, it will become more and more critical to invite our citizenry to step up, engage, and help protect and restore this invaluable common resource. This plan should help our communities understand the current state of our watershed and the positive and very impactful steps they can take with their neighbors.

Section 1.5 Completed Projects

A number of watershed Best Management Practices (BMPs) have been completed in the Flint Creek Watershed by many of the member jurisdictions and conservation groups. A list of projects completed from 2007 is listed below:

Table 2. Projects Completed Since 2007.

Location	Original Map Figure	Project Type	Original Page #	BMP #
Barrington				
Whitney Dr., Garlands completed in 2008	Figure 65	Detention Basins	211	139
Public Safety Basin maintenance	Figure 65	Detention Basins	211	140
Dam repairs south of Baker's Lake	Figure 65	Detention Basins	211	200, 201
Flooding on Elm Road, Work on Rte 14 at CN	Figure 66	Flood Mitigation	213	#9-19
Storm sewer replacement to reduce flooding	Figure 66	Flood Mitigation	213	FPA 6
Russel/Summit/Lincoln/Miller	Figure 66	Flood Mitigation	213	FPA 7
Flooding on Elm Road, Work on Rte 14 at CN	Figure 68	Regional storage	217	#9-19
Working on Dreamway project	Figure 70	Stream Reaches	221	FC 10
Hart Rd, improvements and underpass	Figure 70	Stream Reaches	221	FC09
Adopted SMC ordinance	Table 52	Programmatic Action Item	191	Goal A, Item 8
Installed rain garden at Barrington Area Library	Table 52	Programmatic Action Item	194	Goal C, Item 6
Barrington Hills				
Veterans Bridge repair	Figure 71	Stream reach	223	FC06

Location	Original Map Figure	Project Type	Original Page #	BMP #
Paganica Stabilization project on basin	Figure 69	Detention Basins	211	197
Adopted SMC ordinance	Table 52	Programmatic Action Item	191	Goal A, Item 8
Barrington Township				
Installed rain garden at Barrington Township Hall	Table 52	Programmatic Action Item	194	Goal C, Item 6
College Streets flood zone working on grants	Figure 66	Flood Mitigation	213	3
Cuba Township				
Highland Road	Figure 66	Flood Mitigation; Detention Basin	213	158, 159, 160, 161
See Figure 66	Figure 66	Flood Mitigation	213	FPA 9.04
Salt trucks computer controlled; also use Liquid Thermal Point R, applied to salt as released, reducing salt usage by 25%	Table 52	Programmatic Action Item	190	Goal A, Item 5
Prestwick Drive area	Figure 66	Flood Mitigation	213	FPA 8
Deer Park				
Squires Park study of options	Figure 65	Detention Basins	211	127
BMP for ponds in the community 2017	Table 52	Programmatic Action item	190	Goal A, 2, 4, 5
Ela Township				
Salt trucks computer controlled, reducing salt usage	Table 52	Programmatic Action Item	190	Goal A, Item 5
Fox Point HOA				
Improvement with 319 grants of channels into Lake Louise	Figure 70, 71	Stream Reaches	221, 223	FC 13, 14, 15
Lake Louise Shoreline and Dredging Study	Table 52	Programmatic Action Item	190	Goal A, Item 5
Lake Barrington				
Village Hall Detention Basin retrofit	Figure 65	Detention Basins	211	15

Onion Pub Pepper Road shoreline retrofit on old Quarry	Figure 65	Detention Basins	211	20
Low impact development	Figure 68	Regional Storage	217	35
Stonehenge Golf course partnership	Figure 68	Regional Storage	217	38
Flint Creek Savanna/woodland restoration	Figure 68	Regional Storage	217	40
Freier Farm acquisition, restoration, recreation	Figure 68	Regional Storage	217	41
Grassy Lake Preserve restoration	Figure 68	Regional Storage	217	42
Partnership with LCFPD restoration. Trails	Figure 68	Regional Storage	217	43
Partnership with LCFPD restoration. Trails	Figure 68	Regional Storage	217	44
Freier Farm improvements	Figure 69	Wetland Restoration	219	2
Partnership with LCFPD restoration. Trails	Figure 69	Wetland Restoration	219	4
Gibbs Acquisition	Figure 69	Wetland Restoration	219	14
Stream reach restoration with Hurd Farm, trails, restoration	Figure 70	Stream Reaches	221	FC01
Septic Maintenance Ordinances passed	Table 52	Programmatic Action Item	191	Goal A, Item 10
Lake Zurich				
Amherst Oaks	Figure 65	Detention Basins	211	47
Miller Road improvements	Figure 66	Flood Mitigation	213	#9-12
Stabilization of Lake Zurich shoreline	Figure 67	Lake Shoreline Restoration	215	Lake
Replaced damaged outlet with post 1992 release restrictor	Figure 65	Detention Basin Retrofit	250	64
Whitney Rd: Planted natives on side slope and detention bottom to promote water quality; repaired disconnected pipes; removed shopping carts	Figure 65	Detention Basin Retrofit	250	30
Pleasant Rd: Removed turf grass and rip-rap slopes and replaced with native vegetation	Figure 65	Detention Basin Retrofit	250	32
Rand Rd (Park); Vista Rd; Interlaken Drive replaced turf grass with native vegetation	Figure 65	Detention Basin Retrofit	250	35, 39

Lorie Ln. Replace turf grass slopes with native vegetation	Figure 65	Detention Basin Retrofit	250	43, 44, 45
Lions Drive: Converted to wet bottom detention basin planted with native vegetation	Figure 65	Detention Basin Retrofit	250	47
Rand/Ela Rd. Repair bare soils using native vegetation; control invasives and non-natives; located w/in pollutant loading hotspot SMU	Figure 65	Detention Basin Retrofit	250	77, 78
Berkshire Ln; Yorkshire Ln: Replaced turf grass buffers with native vegetation; controlling invasive and non-native species. (located w/in pollutant loading hotspot SMU	Figure 65	Detention Basin Retrofit	251	79, 80
Memory Ln; Replaced turf grass buffers with native vegetation	Figure 65	Detention Basin Retrofit	251	79, 80
Rosehall Dr. (Mews): Maintain newly contructed basin by controlling invasives and non-natives.	Figure 65	Detention Basin Retrofit	251	98, 99
Rand/Ela Rd: Replace turf grass buffers with native vegetation (also located in pollutant loading hotspot SMU	Figure 65	Detention Basin Retrofit	251	121
Echo Lake shoreline stabilization of 587 linear feet of severely eroded shoreline on SW parcels, including minor regrading and installation of native plants	Figure 67	Lake Shoreline Restoration	252	Lake
Rugby Ln to Rt. 12; 4,400 ft. 1) Increase native plant buffer width along residential areas and remove other non -native species; 2) construct artificial pools and riffles to combat effects of channelization and improve habitat; 3) install rootwads, boulders, and logs to improve habitat; Installing structure to increase flow velocity and transport moderate sediment; repair problematic hydraulic structures & discharge points Multi-year phased project beginning in 2018	Figure 71 & 71	Stream channel maintenance and monitoring	252	FC26
Lake Zurich permit structure for shoreline	Figure 67	Lake Shoreline Restoration	215	Lake
North Barrington				
Overall study and summary of detention basins in community	Figure 65	Detention Basins	211	
Improvements at Wynstone HOA private	Figure 65	Detention Basins	211	113

Miller Road improvements/removal of Oxford Rd	Figure 66	Flood Mitigation	213	#9-17
Signal Hill pipe improvements	Figure 66	Flood mitigation	213	#9-22
Wynstone HOA work private	Figure 67	Lake Restoration	215	Dogbone
Miller Road improvements/removal of Oxford Rd	Figure 68	Regional Storage	217	#9-17
Eton Park improvements/restoration	Figure 69	Wetland Restoration	219	18
Grassmere Farms improvements restoration	Figure 69	Wetland Restoration	219	20
Stream restoration 1700 feet	Figure 70	Stream reaches	221	FC25
Working on debris jams through entire reaches	Figure 70	Stream reaches	221	
Stream restoration 1700 feet	Figure 71	Stream reach restoration	223	FC25
Coal Tar Sealant ban passed 2016	Table 52	Programmatic Action Item	198	Goal E, Item 5
BMP manual for residents	Table 52	Programmatic Action Item	190	Goal A, Items 2,4,5
Macro-invertebrate assessment, Flint Creek Water Quality Monitoring	Table 52	Programmatic Action Item	196	Goal A, Item 7, Goal B Item 2 & Goal D, Item 6
Implement regular clearing of debris jams in streams	Table 52	Programmatic Action	194	Item 5
Septic Maintenance Ordinances passed 2010	Table 52	Programmatic Action Item	191	Goal A, Item 10
Drainage Program to assess and rank Village stormwater systems	Table 52	Programmatic Action Item	195	Goal C, Item 9, 11
Conservation Partners				
Barrington Area Conservation Trust				
Pederson Preserve, Lake Cook/Hart Rd; also assisting Pepsico restore floodplain	Figure 69	Wetland Restoration	219	not on map

Far Field Preserve, prairie installation	Figure 69	Wetland Restoration	219	not on map
Partnership with High School students & Curriculum	Table 52	Programmatic Action Item	190	Goal A, Item 4
36 Monarch gardens (100 sqft each) planted around communities in 2017	Table 50	Programmatic Action Item	196	Goal D Item 12
Citizens for Conservation				
Cuba Marsh Restoration project	Figure 69	Wetland Restoration	219	17
CFC has adult and youth education programs on the natural world, and annual native plant sales; 3 Community Education programs every spring, plus annual meeting program and seasonal youth programs annually; CFC elementary curriculum	Table 52	Programmatic Action Item	190 & 201	Goal A, Item 4; Goal F, Item 2
CFC provides homeowner visits to encourage native landscaping	Table 50	Programmatic Action Item	196	Goal D Item 12
Hurd Farm, Wetland work with LCFPD	Figure 69	Wetland Restoration	219	15
CFC headquarters	Figure 69	Wetland Restoration	219	20
CFC Flint Creek Savanna	Figure 69	Wetland Restoration	219	16
Bird Walks, Spring Summer, Fall in partnership with Audubon	Table 52	Programmatic Action Item	190	Goal A, Item 4
Bakers Lake Work	Figure 70	Stream reaches	221	FC 16
Lake County Forest Preserve				
Grassy Lake Preserve	Figure 69	Wetland Restoration	219	18
Cuba Marsh Restoration project	Figure 69	Wetland Restoration	219	17
Education Components Relating to Watershed Goals				
Ancient Oaks Foundation				
Monthly Outdoor Education Programs, via the Parks Dept., Ela Library, and the Garden Club of Lake Zurich ("Buckthorn Busters") and as Ancient Oaks.	Table 52	Programmatic Action items	200	Goal F, Items 2, 4, 6
Habitat restoration at the Oak Ridge Marsh Nature Park, 500 Lions Drive, LZ. Various Eagle projects have occurred at this site as well: a butterfly garden, bridge, boardwalk over wet area, announcement board.	Table 52	Programmatic Action Item	200	Goal F, Items 2, 4

Habitat restoration at an unnamed oak woodland parcel across from the Nature Park,. The address is 351 Lions Drive. Secured a ComEd Openlands grant to clear this area and the Foundation is now planting native seeds. weeding etc.	Table 51	Programmatic Action Item	193	Goal B, Item 2
Wetland restoration at the Community Services building (formerly Public Works) at 505 Telser Road. Included removal of phragmites, buckthorn and reseeding with native wetland species. Installation of bird boxes and informational signage(Eagle project).	Table 51	Programmatic Action Item	191	Goal A, Item 14
Manor Park, Miller Rd. entrance is a detention pond that had been planted with a grant years ago but had been neglected. We just started clearing phragmites and replanting this last fall but have not added it to our website yet. We run a wetland exploration program there in summer.	Table 51	Programmatic Action Item	200	Goal F, Items 2, 4
"Prairie Patch" at Breezewald Park, 125 N. Old Rand Rd. This small site had been planted with natives about 15 years ago but had been neglected so we cleared it, and replanted with pollinator friendly species.	Table 51	Programmatic Action Item	197	Goal D, Item 12
Barrington Area Council of Governments				
Groundwater education and resource information; Groundwater curriculum module for elementaries.	Table 52	Programmatic Action items	191	Goal A, item 4
Monitoring wells installed and operational for several municipalities	Table 52	Programmatic Action items	191	Goal A, item 6
Salt reduction initiatives implemented throughout communities	Table 52	Programmatic Action items	190	Goal A, Item 2
Coal Tar and/or high PAH ordinances passed in multiple communities	Table 52	Programmatic Action items	198	Goal E, Item 5
Flint Creek/Spring Creek Watersheds Partnership				
Plan approval adopted by partners	Table 52	Programmatic Action items	198	Goal E, Item 1
Six public rain gardens in Barrington, Barrington Township and Lake Zurich and 16 FCWP-sponsored private rain gardens that received free plants	Table 50	Programmatic Action Item	196	Goal D Item 12
Form a partnership to support grant proposals	Table 52	Programmatic Action items	198	Goal E, Item 2

Continue to recruit partners to participate in the plan	Table 52	Programmatic Action items	198	Goal E, Item 3
Implement a watershed wide water monitoring program	Table 52	Programmatic Action items	191	Goal A, Item 7
Assemble a team for a watershed council	Table 52	Programmatic Action items	198	Goal E, Item 4
Incorporate watershed goals in local planning	Table 52	Programmatic Action items	198	Goal E, Item 5
Multiple Jurisdictions share in the cost of watershed planning	Table 52	Programmatic Action items	198	Goal E, Item 7
Hire a watershed implementation coordinator	Table 52	Programmatic Action items	199	Goal E, Item 8
Provide training and watershed education for local government	Table 52	Programmatic Action items	199	Goal E, Item 10

2.0 Flint Creek Watershed Planning Area

2.1 Flint Creek Watershed Size

The Flint Creek watershed drains approximately 36.5 square miles (23,374 acres) of land in Lake, Cook, and McHenry Counties, Illinois. The watershed is a sub-unit of the larger Upper Fox River Basin that drains large portions of Jefferson, Kenosha, Racine, Walworth, and Waukesha counties in Wisconsin and McHenry, Lake, Kane, and Cook Counties in Illinois. The Lower Fox River Basin extends south and west through DeKalb, DuPage, Grundy, Kendall, LaSalle, Lee, and Will Counties. The Fox River joins the Illinois River in Ottawa, Illinois. The Illinois River flows southwest across the heart of Illinois before joining the Mississippi River just north of St. Louis, Missouri.

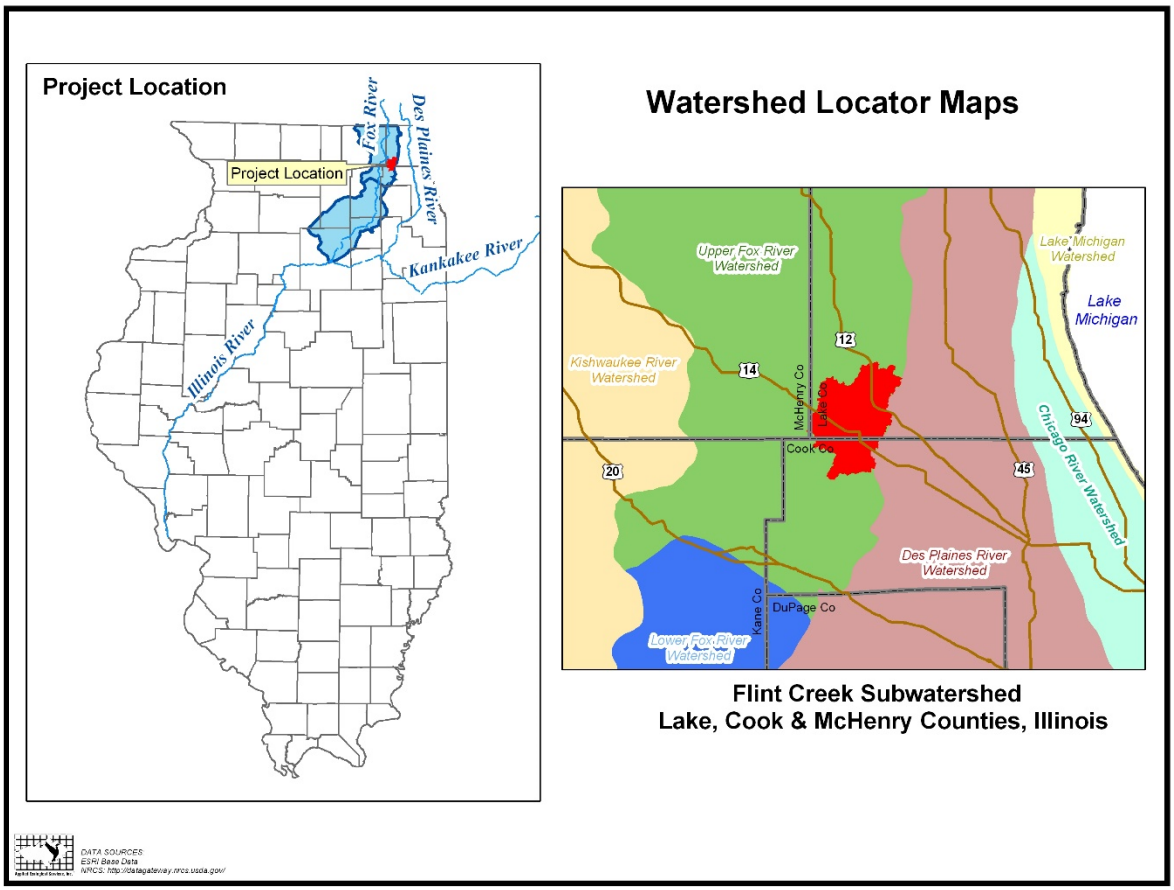


Figure 1: The Flint Creek Watershed lies in southwest Lake County, northwest Cook Count, and a small portion of southeast McHenry County in northeastern Illinois

Three primary tributaries drain the Flint Creek watershed (Figure 2). The north tributary is known locally as North Flint Creek and flows west for 15.8 miles across the northern half of the watershed draining approximately 10.7 square miles. The second and largest tributary is the main stem of Flint Creek which generally flows northwest for 18.6 miles draining 17.3 square miles of the western and southern portions of the watershed. The third tributary is the east branch of Flint Creek that flows for 10.8 miles and drains 8.5 square miles in the southeastern portion of the watershed before it joins the main stem of Flint Creek northwest of Barrington. The main stem of Flint Creek and north branch converge in the northwest part of the watershed at Flint Lake before flowing another 1.7 miles north to the Fox River. In addition to the major stream branches, the watershed is also comprised of many lakes and wetland resources (Figure 2). Available data indicates over 1,300 acres of open water and nearly 4,400 acres of wetlands are present.

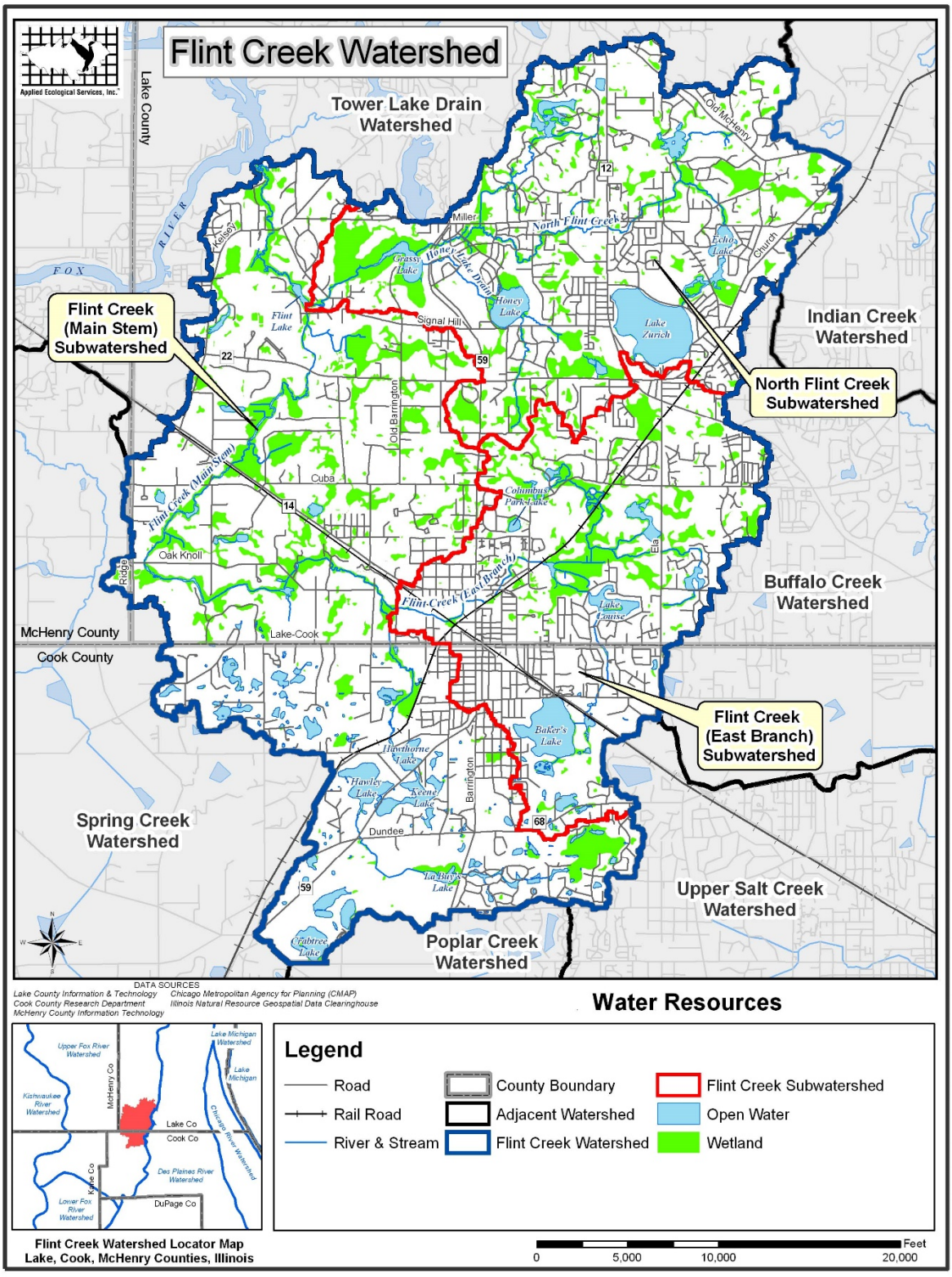


Figure 2: Water Resources

The main watershed use is residential development, large lot single family, village lot single family, and multi-family. There are also commercial zones, generally clustered around the major thoroughfares, and industrial areas. Other uses include park districts, forest preserves, conservation lands, golf courses, and a hospital.

2.2 Topography and Geology

For the Flint Creek Watershed, available 2-foot topography data was input into a GIS model (Arc Hydro) that generated a Digital Elevation Model (DEM) used to delineate watershed, subwatershed, and Subwatershed Management Unit (SMU) boundaries. Discrepancies in the model's delineation were altered to more accurately depict hydrologic boundaries. Most of these discrepancies occurred in areas divided by roads or drained by known features that were not accounted for in the model. Figure 3 depicts the DEM and outer boundary of the Flint Creek watershed.

The DEM forms the backbone for many of the watershed analysis features included in this report. Specifically, elevation data was used to develop a pollutant loading analysis, flood mitigation recommendations, delineation of SMU's, and examination of potential wetland/regional storage locations.

The terrain of the area was formed by repeated glaciation. The most recent glacial event was known as the Wisconsin Episode and ended about 14,000 years ago. As the Earth's temperature warmed and the ice retreated, it left behind moraines and glacial ridges (Hansel, 2005). A tundra-like environment covered by spruce forest was the first ecological community to colonize after the glaciers retreated. As temperatures continued to rise, tundra was replaced by cool moist deciduous forests and eventually by Oak-hickory forests, Oak savannas, marshes, fens, seeps and prairies.

The Lake Michigan lobe of the last Wisconsin glaciation and the deposits left by the lobe shaped much of the landscape found in the watershed. The landform created by these conditions is called a moraine. Common topographic features left on moraine landscapes include knobby hills, ridges, and kettle holes (wetlands, ponds, and lakes)

The composition of the soils in the watersheds is also a remnant of the ancient ice and movement. Above the bedrock lies a layer of deposits left behind from the glaciers, consisting of unconsolidated materials such as clay, silt, sand, gravel and limestone cobbles. Groundwater, within these deposits, is the main source of water for the residents of the Barrington area.

The Flint Creek watershed generally drains northwest to the Fox River. The highest point (916 feet above sea level) is located in the southernmost tip of the watershed near Crabtree Lake. The lowest point in the watershed (731 feet above sea level) is Flint Creek's confluence with the Fox River. The difference in the highest and lowest points reflects a 185-foot change in elevation. The watershed's eastern boundary is formed by a ridgeline separating the watershed from adjacent watersheds to the east (Indian Creek, Buffalo Creek, and Upper Salt Creek) that drain to the Des Plaines River. Glacial deposits also determine sediment deposition and composition of stream channels. A stream inventory conducted by the Lake County Stormwater Management Commission (LCSMC) indicates the streambanks of Flint Creek and its tributaries are largely comprised of fine-grained cohesive sediments such as clays and silts while the bottom of the channels are a combination of silts, clays, sands, and gravels.

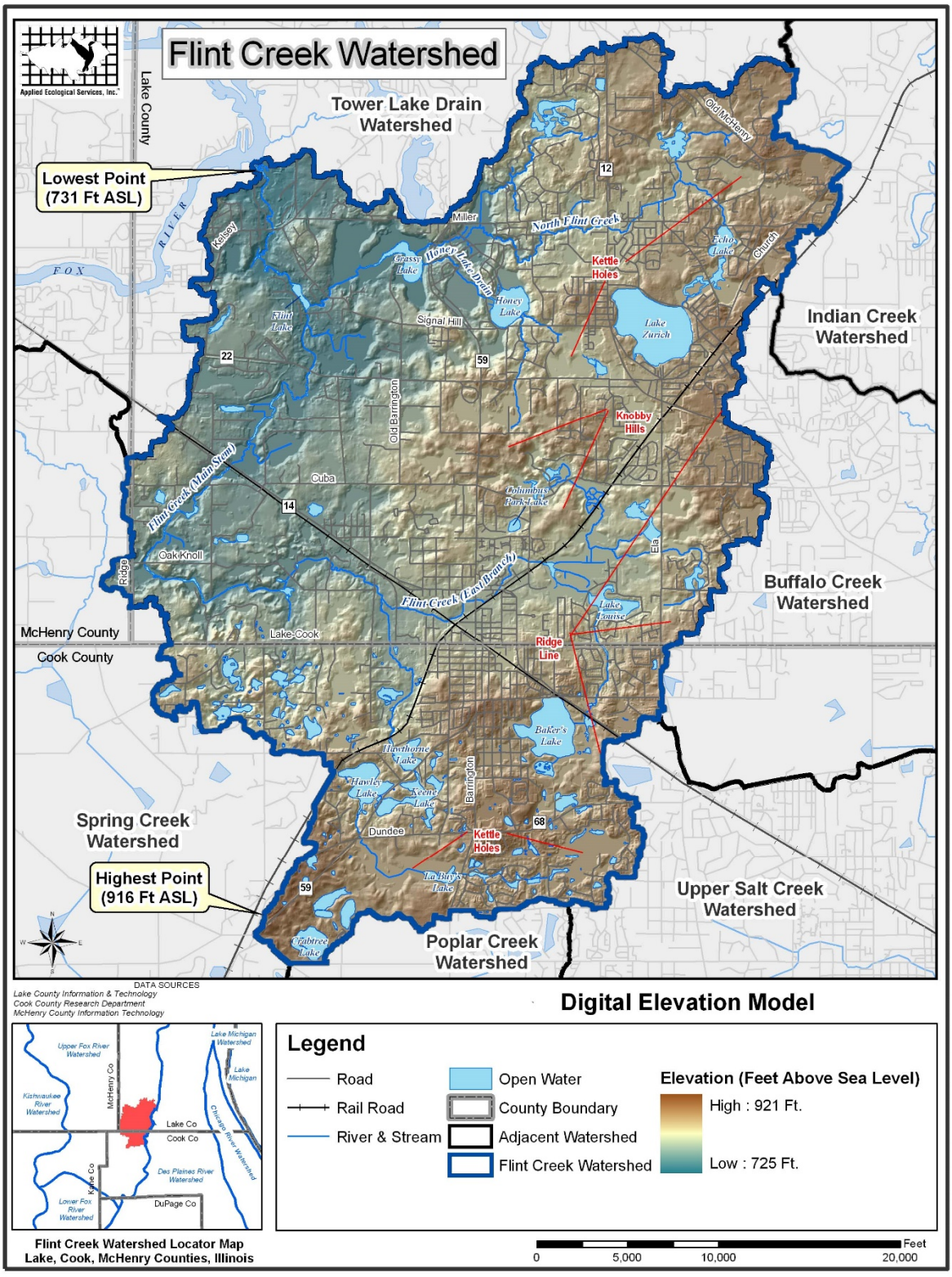


Figure 3: Digital Elevation Model

2.3 Soils

Deposits left by glaciers that covered the Flint Creek watershed approximately 14,000 years ago are the raw materials of present soil types. These raw materials, also known as drift, include till (debris) and outwash. A combination of physical, biological, and chemical variables such as topography, drainage patterns, climate, and vegetation, have interacted over centuries to form the complex variety of soils found in the watershed. Most soils formed under wetland, forest, and prairie vegetation communities.

Soil properties are a key component to consider when designing and implementing Best Management Practices (BMPs) in watersheds. Some soils that are saturated for extended periods throughout the year become what are called hydric soils because they generally hold water or infiltrate water very slowly. These soils provide the key to wetland restoration potential. Often, drain tiles are found in areas that exhibit hydric soil but because the water is diverted, wetlands that were once present no longer exist. By breaking these tiles, wetland hydrology can often be restored and a high quality wetland created with additional planting with native species. Soils also exhibit differences in erodibility depending on their composition (i.e. clay vs. silt) and slope. Erodibility of soils is especially important on construction sites where improper installation or maintenance of erosion control devices can lead to detrimental amounts of turbid water entering a waterway. Soils exhibit different infiltration capabilities. Knowing how a soil will hold water ultimately affects the type and location of infiltration BMPs such as wetland restorations and detention basins. The 2005 Lake County, 2004 McHenry County, and DRAFT 2007 Cook County Natural Resources Conservation Services' (NRCS) soil surveys were used to conduct a soil analysis for the Flint Creek watershed. The data was used to map the extent of hydric soils, soil susceptibility to erosion, and the infiltration capacity.

Hydric Soils

Hydric soils are important because they indicate the presence of existing or drained wetlands and are an extremely useful indicator of depressional areas and potential wetland restoration sites.. Historically, wetland soils formed over poorly drained clay material associated with wet prairies and other wetlands and accumulated organic matter from decomposing surface vegetation. Table 3 and Figure 4 list acreages and map the location of hydric and non-hydric soils in the watershed respectively. Hydric soils comprise 5,738 acres or 25% of the watershed and are comparable with other adjacent watersheds. 16,342 acres (70%) of upland soils comprise the remainder of the watershed. Approximately 1,282 acres of land are not classified (water & urban land).

Table 3. Percent coverage of hydric soils and non-hydric soils within the watershed.

Soil	Total Area (acres)	Percentage of Watershed
Hydric Soil	5,738	25%
Non-Hydric Soil	16,342	70%
Not Classified (Water & Urban Land)	1,282	5%
Totals	***23,362**	**100%**

* 0.05% of watershed (12 acres) is missing data (slivers) between 2,500 soil polygons

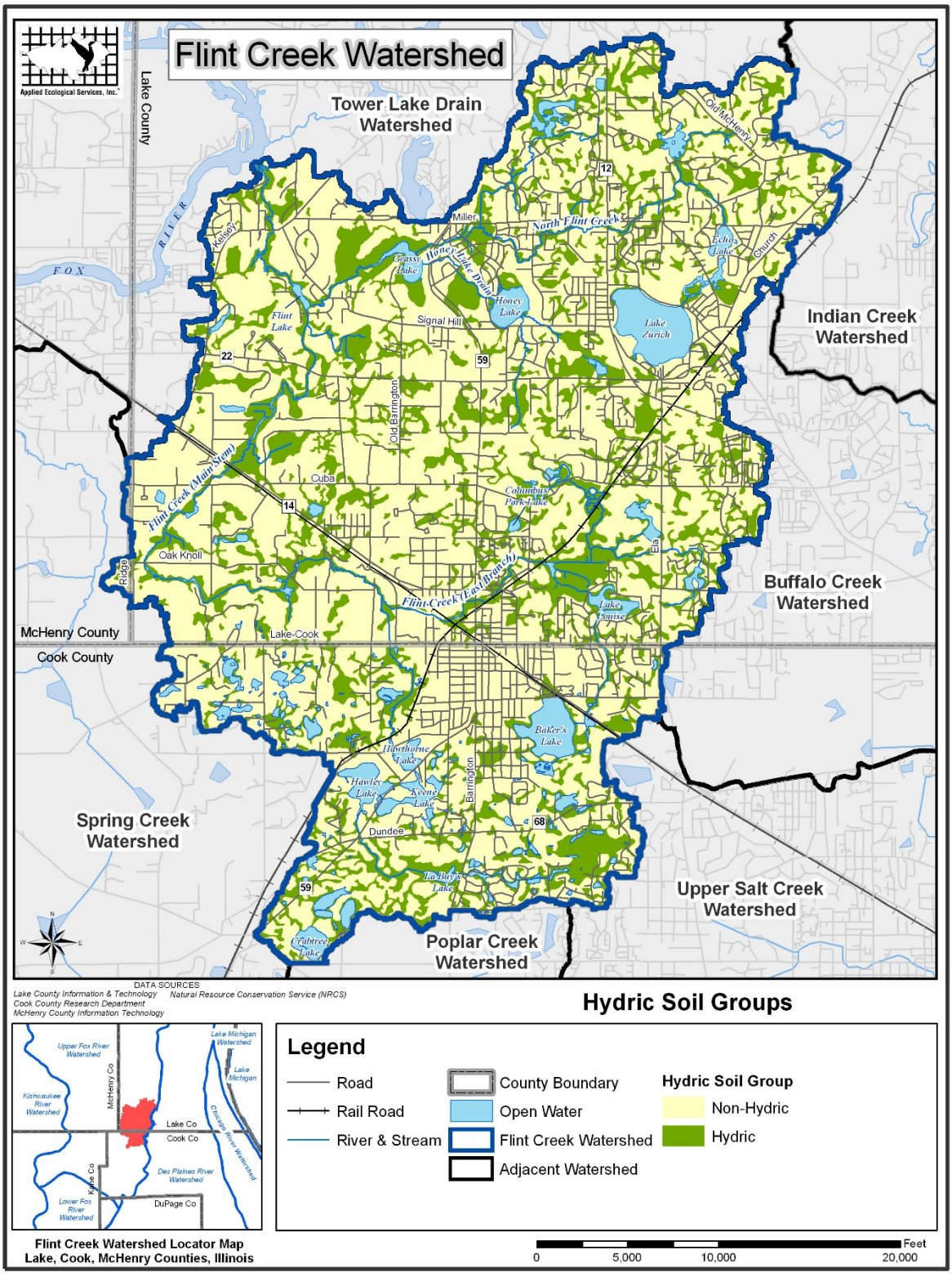


Figure 4: Hydric Soil Groups

Soil Erodibility

Soil erosion and sedimentation can have drastic effects on water quality. Soil erosion is the process whereby soil is removed from its original location by flowing water, wave action, wind, and other factors. Sedimentation is the process that deposits eroded soils on other ground surfaces or in bodies of water such as streams and lakes. Soil erosion and sedimentation reduces water quality by increasing total suspended solids (TSS) in the water column and by carrying attached pollutants such as phosphorus, nitrogen, and hydrocarbons. When soils settle in streams and lakes they often blanket rock, cobble, and sandy substrates needed by fish and macroinvertebrates for habitat, food, and reproduction.

A highly erodible soils map was created by selecting soils with particular attributes such as soil type and the percent slope on which a soil is located. These attributes were provided by the Lake, McHenry, and Cook County NRCS offices. It is important to map highly erodible soils because they represent areas that have the highest potential to degrade water quality. Based on the mapping, 4,951 acres (21% of watershed) exhibit highly erodible soils (Figure 5). A good percentage of these are located in the southern and eastern portions of the watershed where the topography exhibits more sand and gravel ridges and knobby hills typical of glacial areas. Streambank and lake shoreline erosion are not chronic problems in the watershed based on studies completed by the Lake County Stormwater Management Commission (LCSMC) and Lake County Health Department- Lakes Management Unit (LCHD-LMU) and agricultural land is still not a significant land use in the watershed. For these reasons, soil erosion and sediment control practices should be emphasized on new development sites. Acute problem areas of streambank/shoreline erosion should be identified in the site-specific action plan and targeted for restoration/stabilization.

National Pollution Discharge Elimination System (NPDES) Phase II Stormwater Regulations were implemented by the Illinois Environmental Protection Agency (IEPA) in 2003 to address potential erosion on all construction sites in the state that disturb greater than one acre. The regulations specifically require developers to issue a Notice of Intent (NOI) to begin construction, create a Stormwater Pollution Prevention Plan (SWPPP) to control erosion during construction, and submit a Notice of Termination (NOT) when the site is stabilized. NPDES regulations and the Lake County Watershed Development Ordinance (WDO) require that a Designated Erosion Control Inspector (DECI) conduct site visits on a weekly basis and after every 0.5-inch or greater rain event to monitor the construction site and work with the developer to implement erosion controls.

Lake County and McHenry County have taken additional steps to control erosion on construction sites. Both counties adopted stormwater management ordinances that address erosion and sedimentation as part of the overall stormwater management plan for a site. Cook County finally has a watershed ordinance. The Lake and McHenry County ordinances specify standards, methods, maintenance, inspections, and notification procedures that shall be used within their jurisdiction. Lake County takes the seriousness of erosion and sedimentation to another level. Any community that adopts a separate "Stormwater Quality Runoff Ordinance" may set turbidity or Total Suspended Solid limits for any construction site that discharges to wetlands, streams, and lakes. When this type of limit is established, the DECI is responsible for collecting water samples at the outlet point of the construction site to test turbidity of TSS. When limits are exceeded a violation and fine follows until the problem is addressed.

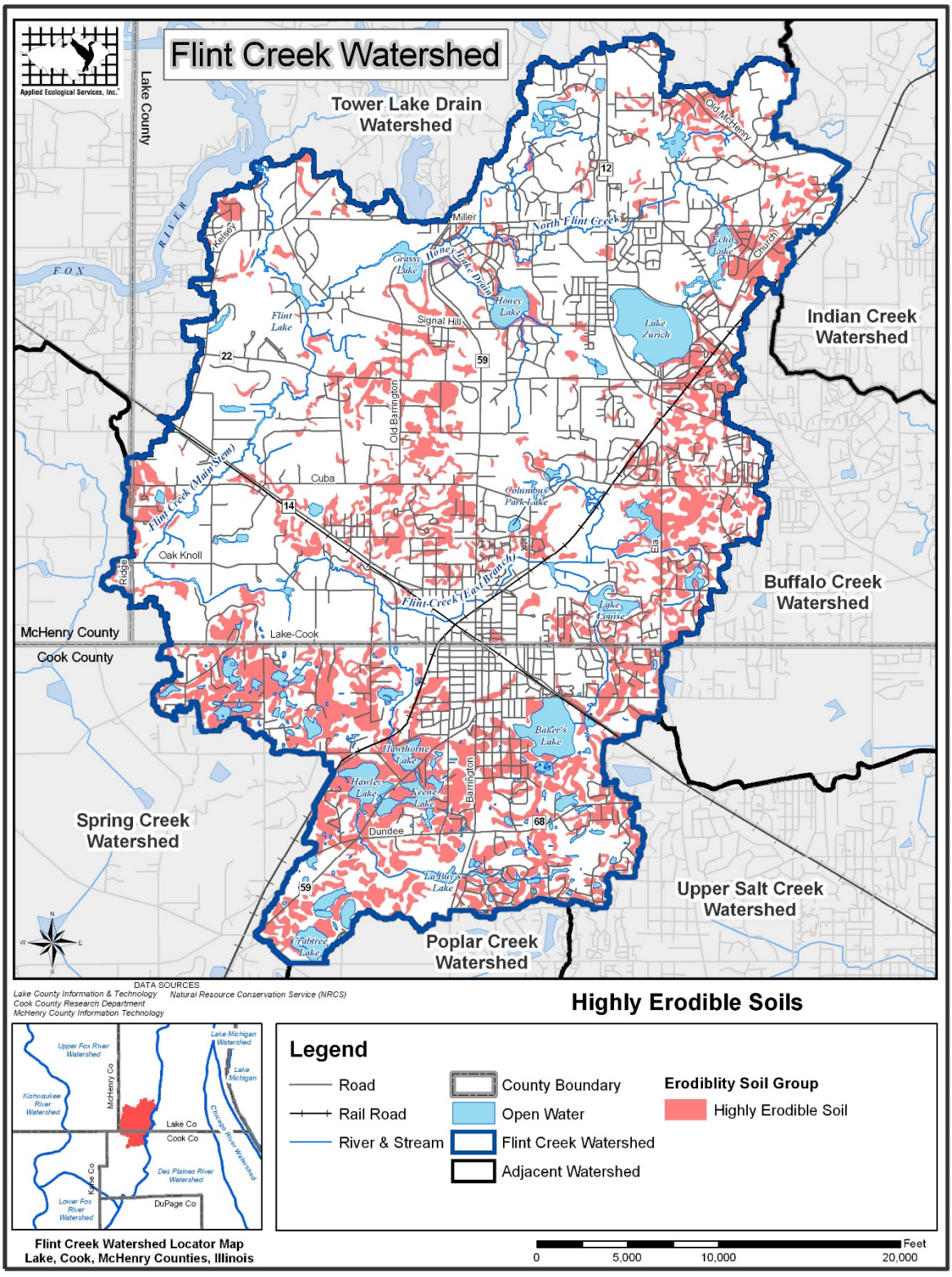


Figure 5: Highly Erodible Soils

Hydrologic Soil Groups

Hydrologic Soil Groups (HSGs) are based on a soil's infiltration and transmission (permeability) rates and are used primarily by engineers to estimate runoff potential related to how development sites should be designed and constructed to control stormwater runoff. HSG's are classified into four primary categories; A, B, C, and D, and three dual classes, A/D, B/D, and C/D.

- Group A is composed of the most permeable soil types and have the lowest runoff potential. These soils consist of mainly deep, well drained to excessively drained sands or gravelly sands. Group A soils have a high rate of water transmission.
- Group B soils have moderate infiltration rates and are moderately deep, moderately well drained, or well drained with fine texture to moderately course texture (silt and sand). Transmission rate for these soils is moderate.
- Group C soils exhibit slow infiltration rates because of a fine texture soil layer comprised of silt and clay that impedes downward movement of water. Transmission rate is slow for Group C soils.
- Group D soils have the slowest infiltration rate (high runoff potential). These soils are typically clays and exhibit very slow rates of transmission.
- Dual hydrologic groups (A/D, B/D, or C/D) are classified differently. The first letter is for artificially drained areas and the second is for undrained areas. Only soils that are rated D in their natural condition are assigned to dual classes.

Best Management Practices (BMPs) are often recommended based on infiltration and permeability rates of a particular HSG. The HSG categories and their corresponding soil texture, drainage description, runoff potential, infiltration rate, and transmission rate are shown in Table 4. Figure 6 depicts the location of each HSG found in the watershed while Table 5 summarizes the acreage and percent of watershed for each HSG. Poorly drained areas (Group A/D, B/D, C/D and D) account for about 23% of the watershed. Excessively and moderately drained (Group B and C) areas make up an additional 69% of the watershed. Urban areas and open water comprise the remaining 8% of the watershed.

Table 4. Hydrologic Soil Groups and their corresponding attributes.

HSG	Soil Texture	Drainage Description	Runoff Potential	Infiltration Rate	Transmission Rate
A	Sand, Loamy Sand, or Sandy Loam	Well to Excessibly Drained	Low	High	High
B	Silt Loam or Loam	Moderately Well to Well Drained	Moderate	Moderate	Moderate
C	Sandy Clay Loam	Somewhat Poorly Drained	High	Low	Low
D	Clay Loam, Silty Clay Loam, Sandy Clay Loam, Silty Clay, or Clay	Poorly Drained	High	Very Low	Very Low

Table 5. Hydrologic Soil Groups including acreage

Hydrologic Soil Group	Total Acreage	Percent of Watershed
A	0.0	0%
A/D	1,151	5%
B	3,182	14%
B/D	1,452	6%
C	12,886	55%
C/D	1,892	8%
D	964	4%
Open Water & Urban Land	1,835	8%
Totals	***23,362**	**100%**

* 0.05% of watershed (12 acres) is missing data (slivers) between 2,500 soil polygons

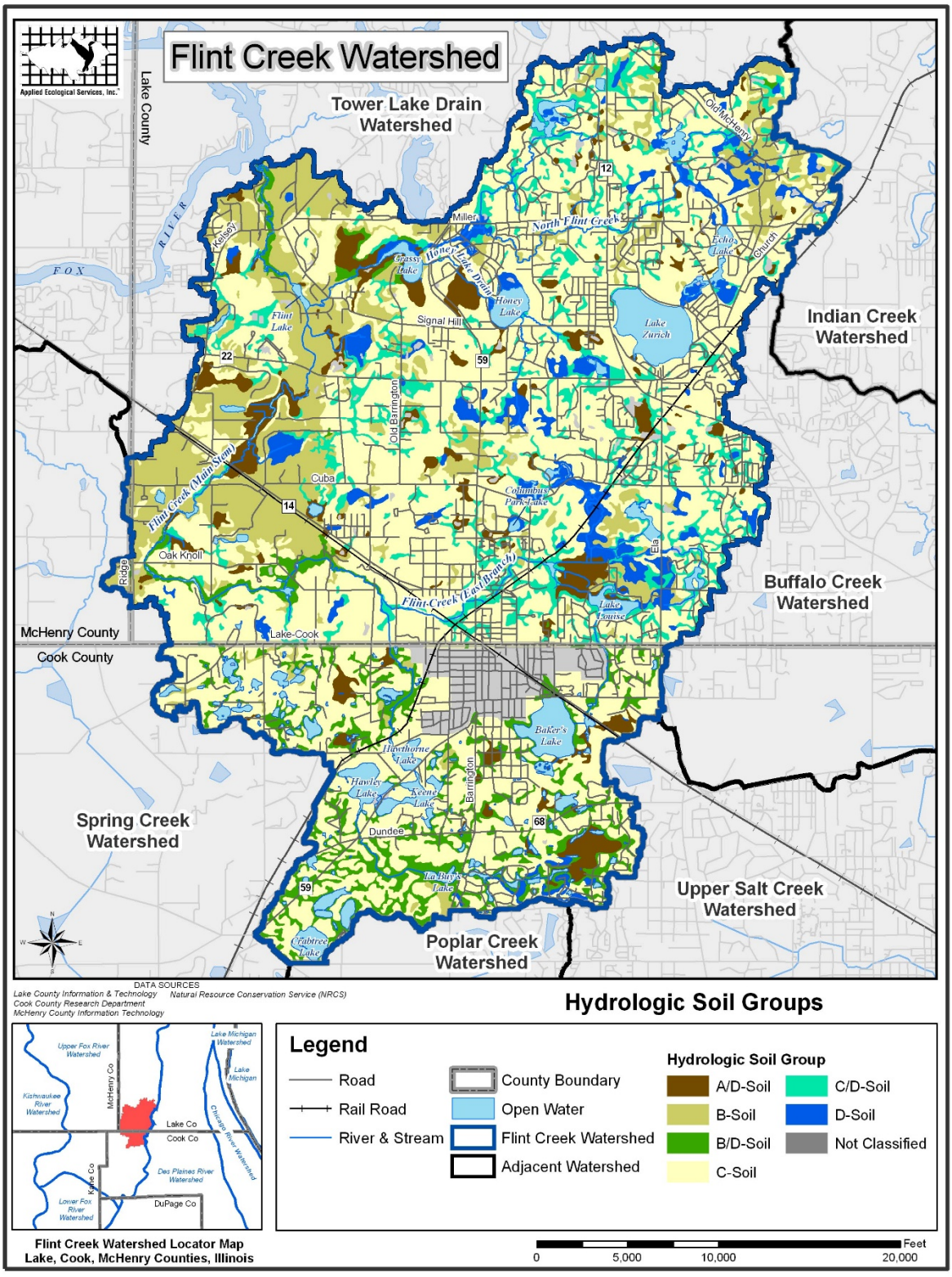


Figure 6: Hydrologic Soil Groups

2.4 Climate

"The region's present-day climate is typically continental with cold winters, warm summers, and frequent short fluctuations in temperature, humidity, cloudiness, and wind direction. Four factors control the climate of northeastern Illinois: 1) the sun, 2) weather systems, 3) urban areas, and 4) Lake Michigan. The first two are the most significant. The sun, which is the primary energy source for virtually all weather phenomena, in large part, determines air temperatures and seasonal variations. Solar energy is three to four times greater in early summer than in early winter at Chicago's mid-latitude location, which results in warm summers and cold winters. The second major factor is weather systems, which result from varying air masses and passing storm systems. The polar jet stream, which is the focal point for the creation and movement of low-pressure systems that bring clouds, winds, and precipitation, is often located near or over Illinois.

"The other two controls are of lesser significance but they influence local climate conditions….

"Lake Michigan influences the climate of northeastern Illinois. The large thermal mass of the lake tends to moderate temperatures, causing cooler summers and warmer winters. The lake also tends to increase cloudiness in the area and suppress summer precipitation. In the winter, precipitation is enhanced by lake-effect snows that occur when winds blow from the north or northeast."
(http://www.cmap.illinois.gov/documents/10180/14193/Appendix+A+-+Primary+Impacts+of+Climate+Change+in+the+Chicago+Region.pdf/2a85b021-f3bd-4b98-81d1-f64890adc5a7, pp. 2, downloaded 2/21/2018)

The scientific consensus is that global climate change is occurring, and that a review of the results of recent years show that changes have occurred in some variables, such as temperature and rainfall, over the last few decades in our region. Climate projections suggest further changes are in store.

The major trends are that it is very likely that:

- Annual temperatures will increase by mid-century or later
- There will be higher overnight minimum temperatures, especially in the summer
- The region will experience higher dew points in the future, leading hot days feeling even hotter due to higher humidity
- The region will experience fewer days with a minimum temperature below 32° F
- There is an increasing trend in annual precipitation with seasonal differences expected, although some models project that there could be a decrease
- The intensity of precipitation events is expected to continue to increase in the future
- Both floods and droughts will increase in frequency in the Midwest, with a possibility of longer periods of dry conditions in between wet precipitation events
- As winter temperatures increase, more winter precipitation is likely to fall as rain instead of snow, and there appears to be a steady upward trend in the intensity of snowfall events
- Plant Hardiness Zones will move northward as regional temperatures warm
- There is a greater potential for a decline in Lake Michigan-Huron levels due to increased evaporation and less ice with higher average temperatures

(Source: http://www.cmap.illinois.gov/documents/10180/14193/Appendix+A+-+Primary+Impacts+of+Climate+Change+in+the+Chicago+Region.pdf/2a85b021-f3bd-4b98-81d1-f64890adc5a7)

The climate within the Flint Creek watershed is suited for human comfort and activities. The Weather Channel and WorldClimate provide excellent summaries of climate statistics including monthly averages and records for most locations in Illinois. Data for Barrington represents the climate and weather patterns experienced in the Flint Creek Watershed. The average summer temperatures in July range from 63° F to 82° F while winter temperatures in January range from 13° F to 28° F. This depicts slightly cooler winter lows and summers that are hotter with bigger range between highs and lows. Both the highest recorded temperature and the lowest were unchanged since the 2007 plan was written with the highest being 103° F while the lowest temperature was -26° F (The Weather Channel 2017).

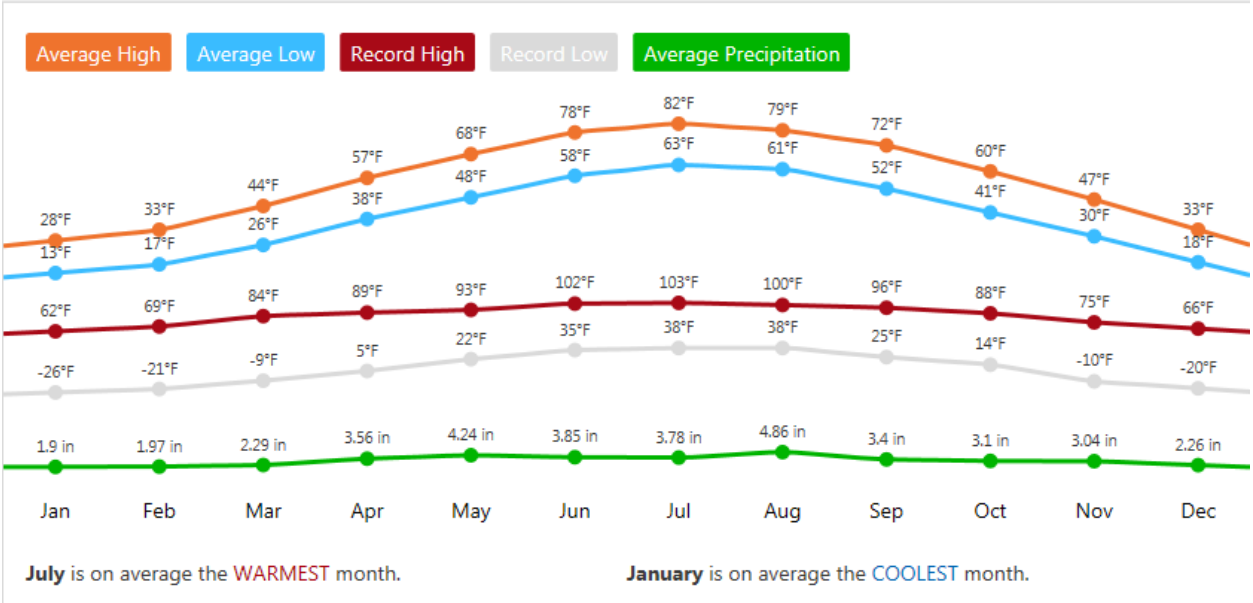


Figure 7. Monthly average temperatures and precipitation for Barrington, IL.

Fairly typical for the Midwest, the current climate of the watershed consists of an average precipitation around 38.1 inches annually (WorldClimate 2017). According to data collected in Barrington, the most precipitation on average occurs in August (4.86 inches) while January receives the least amount of precipitation with 1.9 inches on average (The Weather Channel 2017). Since the plan was first written in 2007, the average annual precipitation has shown an increase of over 3 inches.

Climate ultimately affects terrestrial and aquatic animal and plant populations more than any other factor. Conditions such as moisture, wind, and slope orientation determine which plants will comprise an ecosystem. Temperature and wind strongly influence bird migration patterns, emergence of hibernating reptiles, and bloom times for spring ephemeral flowers. Aquatic systems are affected by climate more than any other environment. Seasonal warming and cooling trends cause mixing and layering of water in deeper lakes. This annual process serves to mix nutrients and oxygen throughout the water column. In addition, thick ice and snow cover during winter months or extreme heat during summer months reduces photosynthesis by aquatic plants causing depletion of oxygen and fish kills.

2.5 Wetlands

Historical Hydrology

Prior to the late 1830's, many small prairie streams of the Midwest did not have conspicuous channels and were not as readily identifiable as they are today. In fact, smaller streams were identified as vegetated swales, wetlands, wet prairies, and swamps in the original land survey records of the U.S. General Land Office. European settlement land use changes resulted in clearing, tilling, draining, and development that altered the overland flow of surface water following rain events. The historic slow overland flows that promoted infiltration changed to concentrated flows where water is rushed to receiving streams and lakes. The result is increased runoff that increases sediment loads and other pollutant loading.

Typical historic stream channel and wide buffer

Typical altered stream channel and narrow buffer

Stream data collected in the Flint Creek watershed suggests that significant changes in hydrology have occurred since European settlement. Historical landscapes in the watershed and surrounding area "managed" stormwater very differently than humans manage stormwater today. Historical data for many watersheds indicates that a relatively small percentage of the precipitation in a healthy natural community actually results in measurable runoff and water leaving the watershed because precipitation that falls on the land is used by plants and animals or infiltrated into groundwater aquifers. Present-day stormwater management strategies involve collecting, concentrating, and managing the release of water via curb/gutters, stormdrains, and ditches to streams, lakes, and wetlands to improve drainage.

The natural drainage system in the Flint Creek watershed began to experience changes as community expansion resulted in more residential, commercial, and industrial land uses. With increased impervious surface and extensive stormsewer networks, flash hydrology is now common. Flashy stream conditions result when a rapid increase in the stream water level occurs followed by a rapid decrease after a significant rain event. As a result, streambank and streambed erosion and pollutant loading occurs. Degradation to streams results in degraded aquatic habitat vital to the health of a stream ecosystem. Increased impervious surfaces also decrease groundwater recharge, decreasing water tables, and ultimately reducing base flow to streams. This condition causes baseflow levels that are below predevelopment conditions. Additional changes in the natural hydrology occurred as portions of major stream branches were dammed to create lakes, ponds, and

other impoundments. Figure 8 below depicts the effects of reduced groundwater recharge on streamflow. In addition to building dams, some lakes were created from wetland areas to create in-channel impoundments. Hawley, Hawthorn, Keene Lakes, Crabtree, LeBuy and some other small lakes south of Rt. 14 were created to accommodate the EJ&E Railroad (now owned by the CN Railway). Honey Lake is also an in-channel impoundment.

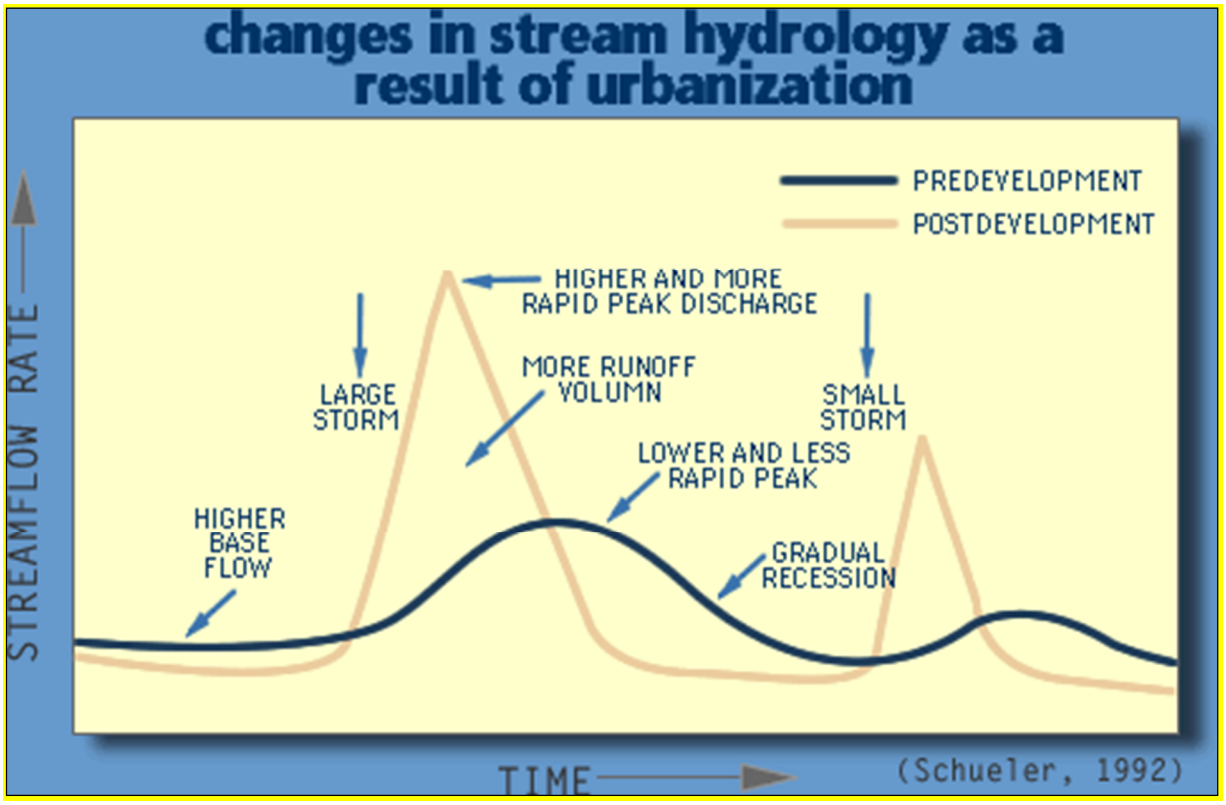


Figure 8. The effect of reduced groundwater recharge on streamflow

Baker's Lake was a peat wetland drained for farming. When the peat caught fire in the early 20th century, creating substantial air pollution in the Village of Barrington, the then owner, a Mr. Baker, paid men to locate the drainage tiles and fill them with concrete to stop the drainage, create the lake, and quench the fire.

Ecologically Significant Areas

High quality wetlands (ADID wetlands), Illinois Natural Area Inventory (INAI) sites, nature preserves, forest preserves, and private natural land are all considered ecologically significant areas in the Flint Creek watershed because they provide habitat for threatened & endangered (T & E) species and often contain high quality natural communities. These areas also provide large greenway corridors that *interconnect land and waterways, support native species, maintain natural ecological processes, sustain air and water resources, and contribute to the health and quality of life for communities and people.* Several ecologically significant areas are located in the watershed including 10 ADID wetlands, portions of 4 INAI sites, 1 village preserve, 4 forest preserves that include a nature preserve, 4 private preserves owned by Citizens for Conservation, and 2 private preserves owned by the Barrington Area Conservation Trust (Figure 9, below).

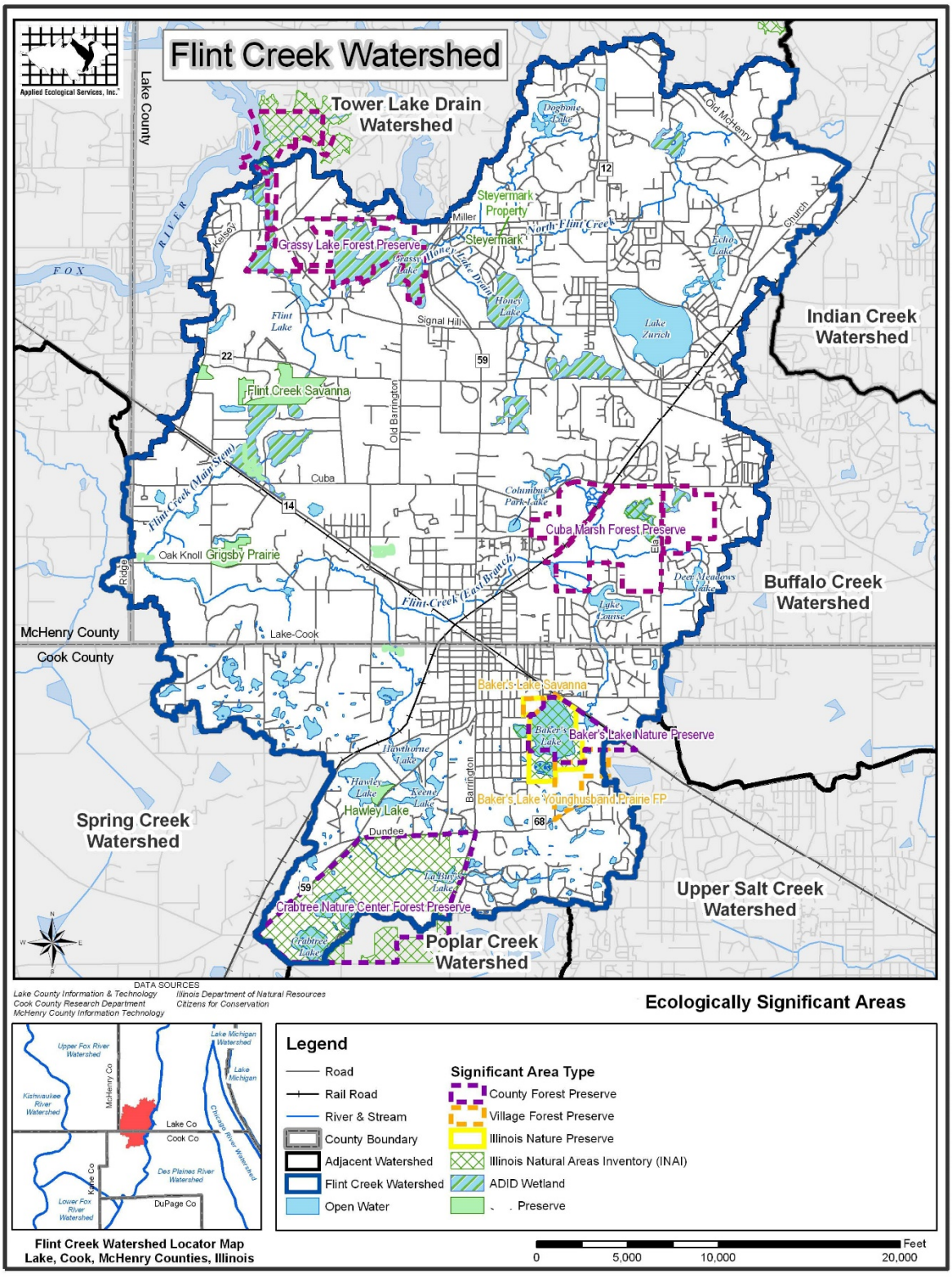


Figure 9: Ecologically Significant Areas

ADID Wetlands

The Advanced Identification (ADID) process involves collecting information on the values and functions of wetlands identifying those of high value based on their habitat, water quality, and stormwater storage functions. The EPA conducts the process in cooperation with the U.S. Army Corps of Engineers (USACE). Designation as an ADID wetland results in a more rigorous permitting review when drainage or filling alteration is proposed. Alteration of ADID wetlands is strongly discouraged as a result. Local communities can use the ADID inventory to help them better understand the values and functions of wetlands under their jurisdiction and to help permit applicants know in advance if a wetland can or cannot be filled. The ten ADID wetlands located in the watershed are mapped on Figure 27. A separate map of these wetlands and more detailed description of their ecological significance are found in Section 3.9 (Wetlands Inventory).

INAI Sites

Illinois Natural Areas Inventory (INAI) sites is a designation established in the 1970's by the Illinois Nature Preserves Commission (INPC) to identify "high quality" areas of the natural features found in Illinois. Included in the INAI inventory was a system to classify natural communities based on a grading scale related to the quality of natural areas. Portions of 4 INAI sites are located in the watershed. These include areas in Cuba Marsh Forest Preserve, Grassy Lake Forest Preserve, Crabtree Nature Center, and Baker's Lake Nature Preserve .These INAI sites are home to the majority of the T&E species and natural communities in the watershed.

Open and Partially Open Space Relative to Hydric Soils and Wetlands

Greater than 75% of the original wetlands in the Flint Creek watershed are still present according to the wetland inventory and analysis of drained hydric soils. The watershed has an extensive network of existing wetlands and areas of drained wetlands that now remain only as hydric soils. Figure 10 maps these areas in relation to open and partially open parcels. As expected, nearly all the existing wetlands and hydric soils are directly associated with open or partially open parcels, especially along stream corridors.

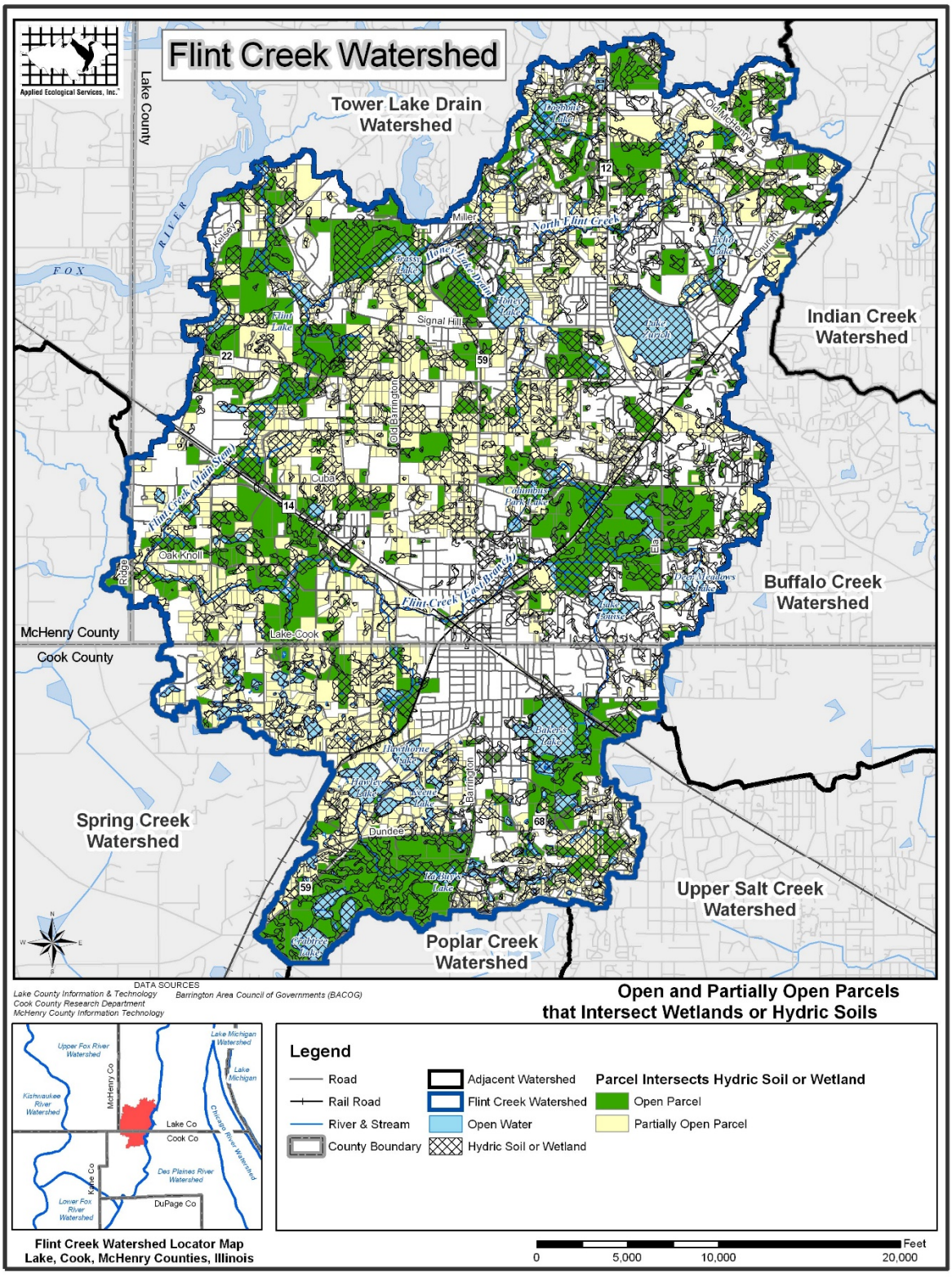


Figure 10: Open and Partially Open Parcels Intersecting Wetlands or Hydric Soils

2.6 Watershed Demographics

Population Projections

Municipal comprehensive plans are available for the Village of Barrington (2010), Village of Barrington Hills (2008), Village of Deer Park (2017), Village of Hawthorn Woods (2014), Village of Lake Barrington (2012), Village of Lake Zurich (2003), and Village of North Barrington (2015).

2015 Chicago Metropolitan Area Planning (CMAP) studies show demographics in Barrington and Cuba Township ageing. (Cuba and Barrington Townships with 16 to 27.3% of the population aged 65 and over). Cook County has seen a shift of its population out to the collar counties. Lake County has seen a 4% increase in the area's total population since 1980, whereas Cook County has seen a 12% decrease in its share. The CMAP (Chicago Metropolitan Area) as a whole has seen an 18% increase. Many of the new populations range in diversity. These changes are due to international immigration, especially Asian and Hispanic. These changes in population and demographics present different demands on development patterns, transportation and public services infrastructure.

According to CMAP's GO TO 2040 forecasts of population, number of households, and employment opportunities, all three counties (Lake, Cook, and McHenry) are expected to experience varying levels of growth (Tables 6 and 7). A closer look at the county-level data indicates most growth will occur in the outlying counties of McHenry and Lake as well as western portions of Cook. Growth in McHenry County will likely not influence the watershed because of its small size contribution within the watershed. Growth in Lake County and Cook County however, will likely impact watershed conditions primarily through changes in land uses associated with housing developments.

For general observations, the area population shows an increase in average age, and there are a number of multifamily developments in village central business districts (Barrington and Lake Zurich). There have been a significant number of teardowns and rebuilding. In all probability, the economic meltdown of 2007-2008 negatively affected development, with areas only recently recovering.

Table 6. CMAP GO TO 2040 projection data for Lake, Cook, and McHenry Counties (2014).

County	Population		Households		Employment	
	2010	**2040**	**2010**	**2040**	**2010**	**2040**
Lake	682,753	896,341	241,712	318,170	314,717	401,748
Cook	5,104,393	5,960,242	1,966,356	2,304,045	2,379,923	2,814,972
McHenry	307,113	201,805	109,199	179,215	88,947	153,389

Source: Chicago Metropolitan Agency for Planning *2040 Forecast of Population, Households and Employment* (CMAP 2014)

Table 7 includes CMAP's population, households, and employment forecast changes between 2010 and 2040 for the Flint Creek watershed area only. The data is generated by Township, Range, and quarter Section and is depicted on Figures 11-13. The combined population of the watershed is expected to increase from 44,934 in 2010 to 50,866 by 2040 with most of this growth occurring in the eastern half of the watershed. A detailed look at Figures 11 and 12 indicates that the heaviest population and household changes will occur in Barrington, Inverness, and the Lake Zurich area.

Projected employment is expected to increase by 4,166 jobs (Table 6, Figure 12). Most of this change is likely to occur in areas already developed as commercial and/or retail along major arterial roads such as Route 68, Lake-Cook Road, and Route 12. **Note: AES used GIS to overlay the Flint Creek Watershed Boundary onto CMAP's quarter section data for population, households, and employment. If any part of a quarter section fell inside the watershed boundary, the statistics for the entire quarter section were included in the analysis. Therefore, the numbers in Table 6 are overstated.**

Table 7. CMAP GO TO 2040 projection data for the Flint Creek watershed (2014).

Data Category	2010	2040	Change (2010-2040)
Population	44,934	50,866	5,932
Households	16,357	18,613	2,256
Employment	22,969	27,135	4,166

Source: Chicago Metropolitan Agency for Planning *2040 Forecast of Population, Households and Employment* (CMAP 2014)

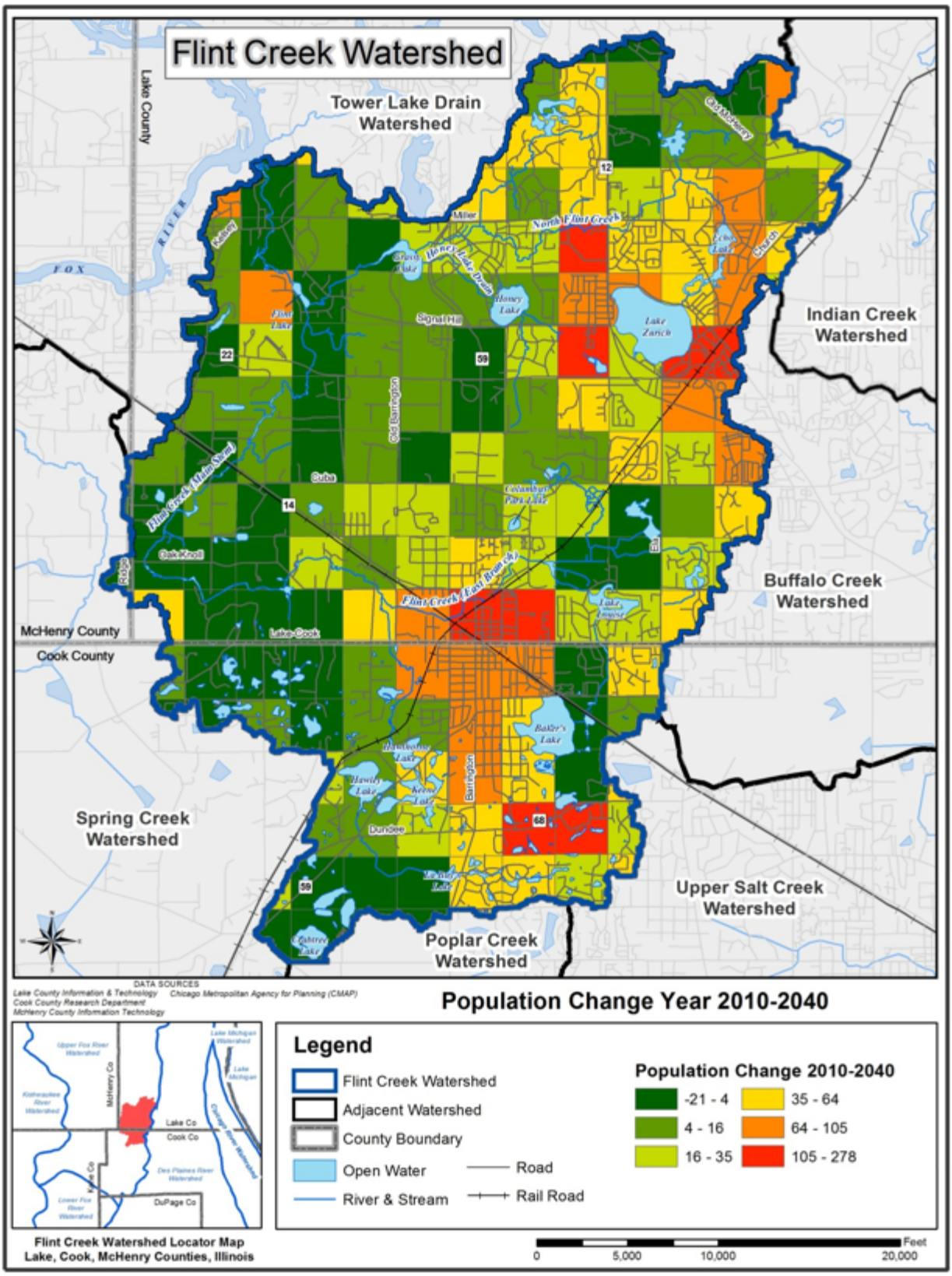


Figure 11: Population Change Year 2010-2040

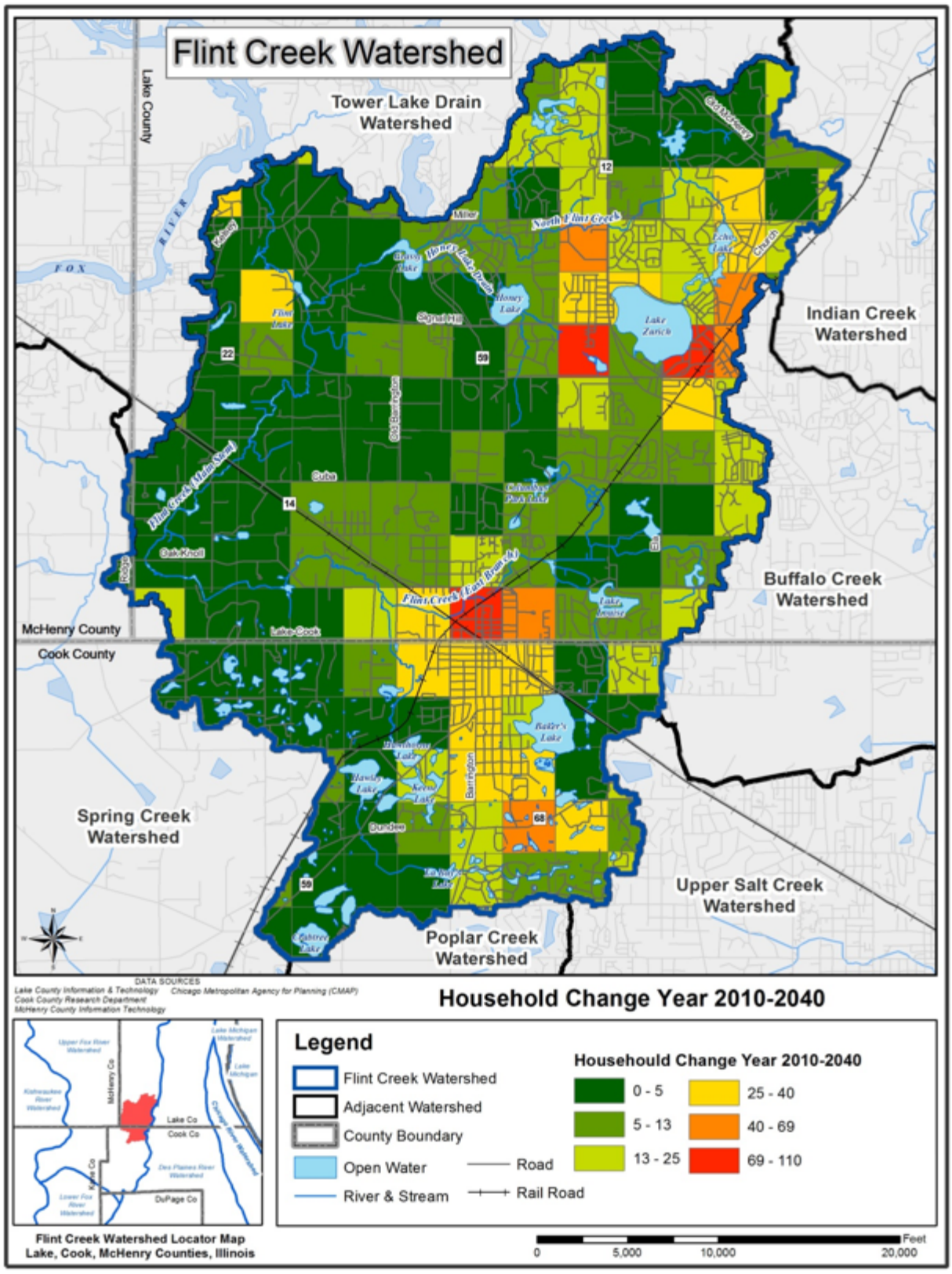


Figure 12: Household Change Year 2010-2040

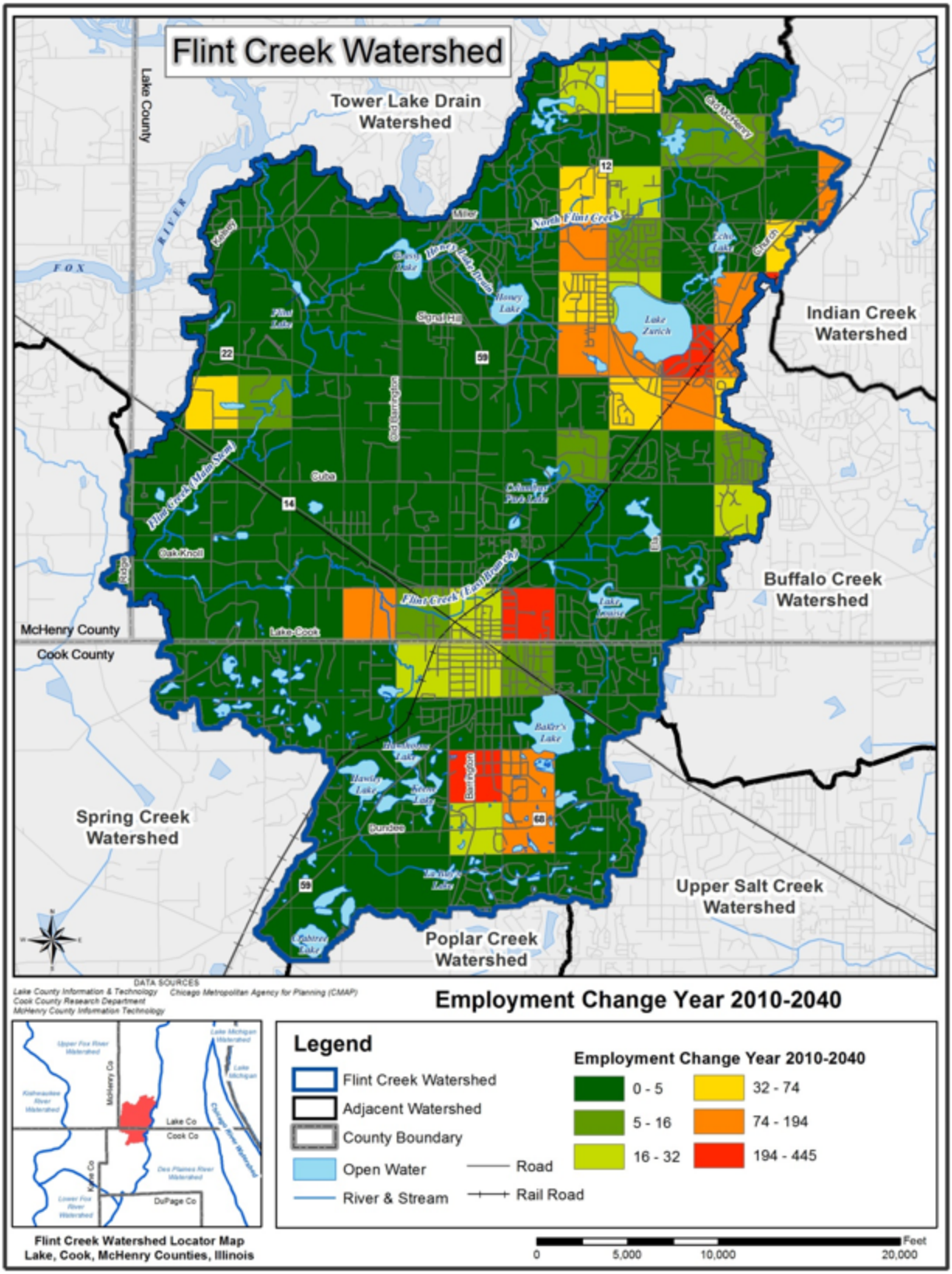


Figure 13: Employment Change Year 2010-2040

2.7 Watershed Jurisdictions

Portions of 3 counties, 10 municipalities, and 5 townships comprise the Flint Creek watershed (Table 5, Figure 11). The majority (17,364 acres/74%) of the watershed is located in Lake County. Approximately 5,952 acres (25%) is located in Cook County. A small portion (58 acres) is located in McHenry County. The municipalities that occupy the largest portions of the watershed are Barrington Hills (4,428 acres/19%), Barrington (2,919 acres/12%), North Barrington (2,825 acres/12%), and Lake Zurich (2,479 acres/11%). Fox River Grove and Tower Lakes occupy only 3 acres each. All remaining land in the watershed (3,756 acres) is Unincorporated and under the jurisdiction of Cuba and Ela Townships in Lake County, Barrington and Palatine Townships in Cook County and Algonquin Township in McHenry County. Additional entities with jurisdiction in the watershed include Lake and Cook County Forest Preserve Districts.

Table 8. County, municipal, and township jurisdictions in the Flint Creek watershed.

Jurisdiction	Acres	Percent of Watershed
Counties	**23,374**	**100%**
Cook	5,952	25%
Lake	17,364	74%
McHenry	58	0%
Municipalities	**17,231**	**73%**
Barrington	2,919	12%
Barrington Hills	4,428	19%
Deer Park	1,177	5%
Fox River Grove	3	0%
Hawthorn Woods	604	3%
Inverness	897	4%
Lake Barrington	1,896	7%
Lake Zurich	2,479	11%
North Barrington	2,825	12%
Tower Lakes	3	0%
Unincorporated Areas	**6,143**	**17%**
Townships	**23,374**	**100%**
Algonquin Township	58	0%
Barrington Township	4,773	20%
Cuba Township	10,450	45%
Ela Township	6,895	30%
Palatine Township	1,198	5%

Source: Lake County Department of Information and Technology, Cook County Research Department, and McHenry County Information Technology

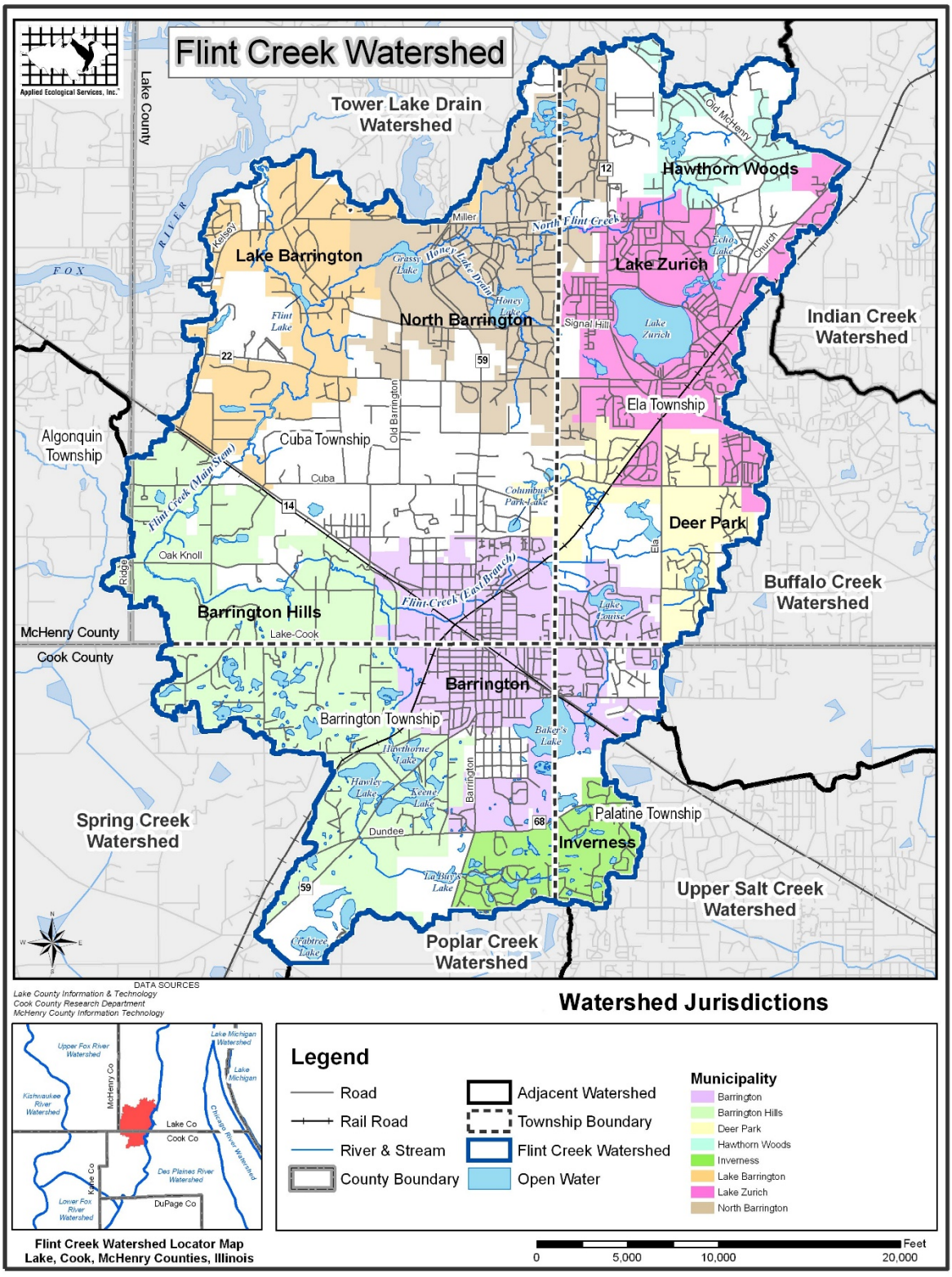


Figure 14: Watershed Jurisdictions

Many types of natural resources throughout the United States are protected to some degree under federal, state, and/or local law. In the Chicagoland region, the U.S. Army Corps of Engineers (USACE) and surrounding counties regulate wetlands through Section 404 of the Clean Water Act and county Stormwater Ordinances respectively. The U.S. Fish and Wildlife Service (USFWS),

Illinois Department of Natural Resources (IDNR), Illinois Nature Preserves Commission (INPC), and Forest Preserve Districts protect natural areas and threatened and endangered species. Local municipalities also have ordinances that address other natural resource issues. The Illinois EPA Bureau of Water regulates wastewater and stormwater discharges to streams and lakes. Watershed protection in Lake, Cook and McHenry Counties is primarily the responsibility of county and municipal level government.

Land development affecting water resources (rivers, streams, lakes, wetlands, and floodplains) is regulated by the USACE when "Waters of the U.S." are involved. These types of waters include any wetland or stream/river that is hydrologically connected to navigable waters. The USACE primarily regulates filling activities and requires buffers or wetland mitigation for developments that impact jurisdictional wetlands.

Development that affects water resources (rivers, streams, lakes, isolated wetlands, and floodplains) in the Lake County Portion of the Flint Creek watershed and the Barrington area within Cook County is regulated by the Lake County Watershed Development Ordinance (WDO) and enforced either by the LCSMC or Certified Communities. The WDO applies to projects that create a wetland impact within Waters of the United States (WOUS), Isolated Waters of Lake County (IWLC) or occur in buffer areas adjoining those waters. WOUS are those water bodies and wetland areas that are under USACE jurisdiction as determined by a jurisdictional determination. IWLC are all waters such as lakes, ponds, streams (including intermittent streams), farmed wetlands, and wetlands that are not under USACE jurisdiction.

In October 2013 the Metropolitan Water Reclamation District of Greater Chicago (MWRD) adopted the Cook County Watershed Management Ordinance. Ordinances are enforced by county agencies or by "Certified Communities" or "Authorized Municipalities."

Watershed development within the McHenry County portion of the watershed is regulated by the McHenry County Stormwater Management Ordinance and enforced either by the McHenry County or Certified Communities. As of 2015, Barrington Hills is partially certified under the Ordinance.

With the exception of Barrington Hills, all other Lake County municipalities in the Flint Creek watershed (Barrington, Deer Park, Hawthorn Woods, Lake Barrington, Lake Zurich, and North Barrington) are "Certified" by LCSMC to administer portions of the Lake County Watershed Development Ordinance. Barrington Hills is located in the southwest portion of the watershed and is divided by Lake and Cook Counties. Barrington Hills also occupies all of the 58 acres located in McHenry County but is not currently a Certified Community in either county. Instead, Barrington Hills administers its own village code with ordinances related to stormwater management and restoration/landscaping and is partially certified in Lake and McHenry. Inverness is the only jurisdiction located entirely with the Cook County portion of the watershed. Like Barrington Hills,

Inverness administers its own ordinance related to stormwater management and landscape restoration. In the near future, Inverness will likely become a Certified Community and will administer the Cook County Watershed Management Ordinance when that ordinance is completed. While the Village of Barrington is divided in two by the Cook/Lake County line along Lake-Cook Road, the Village is a Certified Community of Lake County and administers the Lake County Watershed Development Ordinance for all areas within its jurisdiction.

Other governments and private entities with watershed jurisdictional or technical advisory roles include the USFWS and IDNR, County Board Districts, and the Lake, North Cook and McHenry County Soil and Water Conservation Districts (SWCD). The USFWS and IDNR play a critical role in natural resource protection, particularly for rare or high quality habitat and threatened and endangered species. They protect and manage land that often contains wetlands, lakes, ponds, and streams. County Boards oversee decisions made by respective county governments and therefore have the power to override or alter policies and regulations. The SWCDs provide technical assistance to the public and other regulatory agencies. Although the SWCDs have no regulatory authority, they influence watershed protection through soil and sediment control and pre and post-development site inspections

Water resources on unincorporated land within Lake, Cook, and McHenry Counties are ultimately regulated by the Lake County Planning, Building and Development Office, Cook County Department of Building and Zoning, and McHenry County Department of Planning and Development respectively. Unincorporated areas include portions of Cuba, Ela, Barrington, and Palatine Townships. Development affecting water resources in these townships must be reviewed by the agencies listed above. For Lake and McHenry Counties, wetland and other water related issues may be coordinated with LCSMC, MCSC, or MWRD.

Other governments and private entities with watershed jurisdictional or technical advisory roles include the Lake and Cook County Forest Preserve Districts (FPD), County Board Districts, and the Lake, Cook, and McHenry County Soil and Water Conservation Districts (SWCD). The Forest Preserve Districts play a critical role in natural resource protection, particularly for rare or high quality habitat and threatened and endangered species. They protect and manage land that often contains wetlands, lakes, ponds, streams, and detention facilities. The County Board oversees decisions made by county governments and therefore has the power to override or alter policies and regulations. The SWCD provides technical resource assistance to the public and other regulatory agencies. Although the SWCD has no regulatory authority, it influences watershed protection through soil and sediment control and pre-development site inspections.

Municipalities in the watershed may or may not provide additional watershed protection above and beyond existing watershed ordinances under local Village Codes. Most Village Codes provide ordinances covering businesses regulations, building regulations, zoning regulations, new subdivision regulations, stormwater management, streets, utilities, landscaping/restoration, tree removal, etc.

NPDES Phase II Stormwater Permit Program

The Illinois EPA Bureau of Water regulates wastewater and stormwater discharges to streams and lakes by setting effluent limits, and monitoring/reporting on results. The Bureau oversees the National Pollutant Discharge Elimination System (NPDES) program. The NPDES program was

initiated under the federal Clean Water Act to reduce pollutants to the nation's waters. This program requires permits for discharge of: 1) treated municipal effluent; 2) treated industrial effluent; and 3) stormwater from municipal separate stormsewer systems (MS4's) and construction sites.

The Illinois EPA's NPDES Phase I Stormwater Program began in 1990 and applies only to large and medium-sized municipal separate stormsewer systems (MS4's), several industrial categories, and construction sites hydrologically disturbing 5 acres of land or more. The NPDES Phase II program began in 2003 and differs from Phase I by including additional MS4 categories, additional industrial coverage, and construction sites hydrologically disturbing greater than 1 acre of land. More detailed descriptions can be viewed on the Illinois EPA's web site.

Under NPDES Phase II, all municipalities with small, medium, and large MS4's are required to complete a series of Best Management Practices (BMPs) and measure goals for six minimum control measures:

1) Public education and outreach
2) Public participation and involvement
3) Illicit discharge detention and elimination
4) Construction site runoff control
5) Post-construction runoff control
6) Pollution prevention and good housekeeping

The Phase II Program also covers all construction sites over 1 acre in size. For these sites the developer or owner must comply with all requirements such as completing and submitting a Notice of Intent (NOI) before construction occurs, developing a Stormwater Pollution Prevention Plan (SWPPP) that shows how the site will be protected to control erosion and sedimentation, completing final stabilization of the site, and filing a Notice of Termination (NOT) after the construction site is stabilized.

Existing Policies and Ordinance Review

Protection of natural resources and green infrastructure during future urban growth will be important for the future health of Flint Creek watershed. To assess how future growth might further impact the watershed, an assessment of local municipal ordinances was performed to determine how development currently occurs in each municipality. In this way, potential improvements to local ordinances can be identified. As part of the assessment, municipal governments were asked to compare their local ordinances against model policies outlined by the Center for Watershed Protection (CWP) in a publication entitled "*Better Site Design: A Handbook for Changing Development Rules in Your Community*. (CWP, 1998)"

Each municipality in the watershed was invited to complete a self-assessment of their community's ordinances. Barrington and Lake Barrington provided completed worksheets while Barrington Hills, Deer Park, Hawthorn Woods, Inverness, Lake Zurich, and North Barrington, did not. The results of the review for each municipality can be found in Appendix M.

CWP's recommended ordinance review process involves assessments of three general categories including "Residential Streets & Parking Lots," "Lot Development," and "Conservation of Natural Areas." Various questions with point totals are examined under each category. The maximum score is 100. CWP also provides general rules based on scores. Scores between 60 and 80 suggest that it may be advisable to reform local development ordinances. Scores less than 60 generally mean that local ordinances are not environmentally friendly and serious reform may be needed. Municipal scores ranged from 47 to 53 (Figure 15). Lake Barrington scored the highest with 53 points followed by Barrington with 47 points, while the remaining municipalities did not return completed worksheets. Although scores are generally low, it should be noted that this assessment is meant to be a tool to local communities to help guide development of future ordinances. Various policy recommendations are included in the Action Plan section of the report to address general ordinance deficiencies.

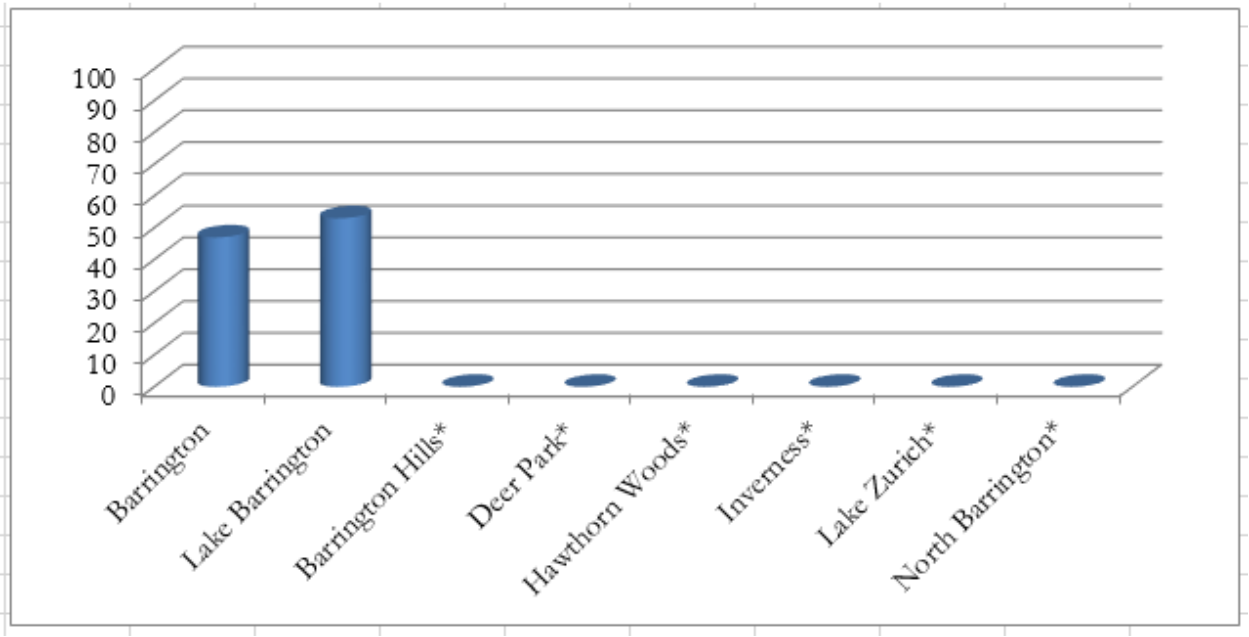
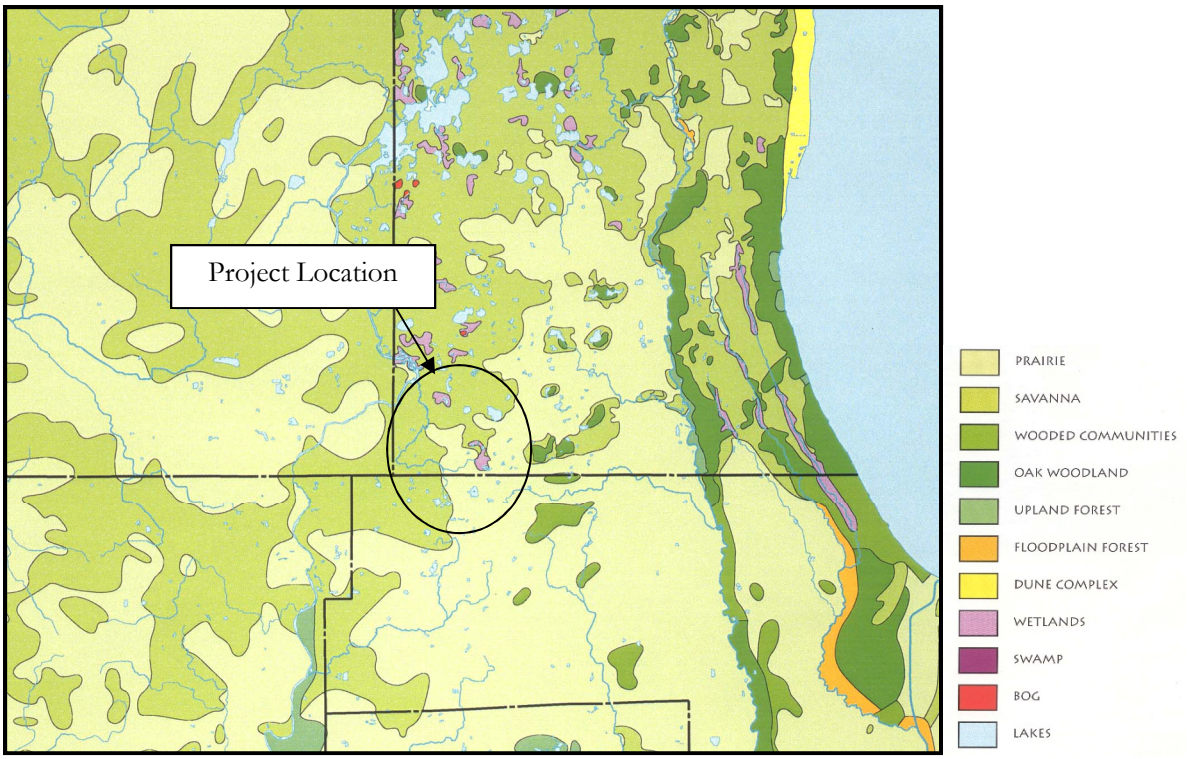


Figure 15. Center for Watershed Protection ordinance review results for local municipalities.

2.8 Land Use/Land Cover

Land Use/Land Cover

Prior to European settlement in the 1830's, the Flint Creek watershed contained a complex interaction between many natural communities including prairies, savannas, and wetlands (Figure 16). The Flint Creek watershed was comprised mostly of savanna and upland prairie communities. Wetlands communities such as marsh, sedge meadows, and wet prairies were present around lake and stream corridors.



Source: Chicago Wilderness: An Atlas of Biodiversity

Figure 16: Pre-settlement natural communities of northeast Illinois.

Today, the land cover is very different due to human induced land use changes. European settlement resulted in large tracts of savanna being cleared, prairies tilled for farmland or developed, wetlands drain-tiled and drained, and streams straightened for agricultural purposes. Many natural areas still exist but many have become degraded as natural processes such as fire are lost and invasive species such as buckthorn and reed canary grass displace native species.

The 2007 land use/land cover is depicted on Figure 16 with acreages for each land use/land cover displayed in Table 8. While there have been changes, especially the conversion of farmland into large lot single family, the financial crisis of 2008/9 slowed the progress of large developments. There has been infill, growth near village centers of multifamily units, and tear-downs and upgrades within the existing residential footprint. Hence, the determination is that Figure 16 is still useful and relevant.

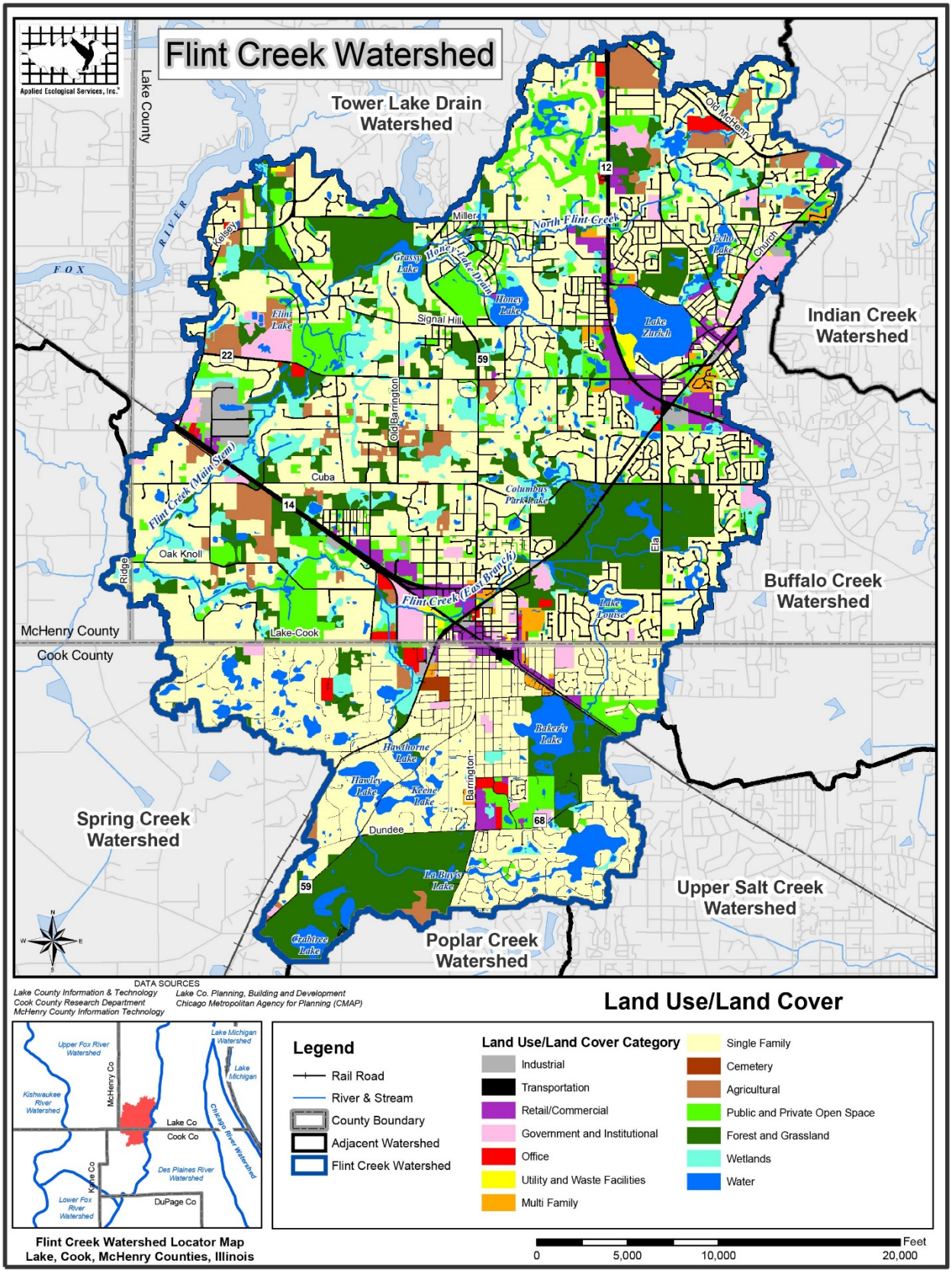


Figure 17: 2007 Land Use/Land Cover

Table 9. Land use/land cover classifications and acreage for the Flint Creek watershed

Land Use	Area (acres)	Percent of Watershed
Agricultural	756	3
Cemetery	33	0
Forest and Grassland	3,298	14
Government and Institutional	570	2
Industrial	206	1
Multifamily Residential	149	1
Single Family Residential	10,820	46
Office Space	171	1
Public and Private Open Space	1,759	7
Retail/Commercial	505	2
Transportation	1,965	8
Utility/Waste Facilities	53	0
Water	1,507	6
Wetlands	1,582	7
Total	**23,374**	**100%**

Single family residential development dominates the watershed at 46% of the total acreage, followed by forest and grassland (14%), and transportation (8%). Other important land uses include public/private open space (7%), wetlands (7%), and water (6%). Total open space including agricultural lands, water resources, forest/grassland, and public/private open space comprise approximately 8,902 acres or 38% of the watershed. Total developed land including residential, commercial, industrial, government/institutional, office space, cemetery, utility, and transportation accounts for approximately 14,505 acres or 62% of the watershed. The GIS land use/cover data used for the analysis attributed no data to the remaining 12 acres of the watershed. These areas showed up as small slivers of unclassified use located among the known data.

2020-2030 Future Land Use/Land Cover Projections

Information on future built out land use for the Lake County portion of the watershed was obtained from the Lake County Planning and Building Department. Additional information was obtained from each municipality's comprehensive plan where available: Village of North Barrington 2004, Village of Barrington Hills 2005, Lake Barrington 2006, Lake Zurich 2003, Barrington 2010, Deer Park 2001, and Hawthorn Woods 2004. No comprehensive plan was available from the Village of Inverness in the Cook County portion of the watershed. The data was analyzed and GIS used to map the land use/land cover based on 20-30 year projections (Figure 17).

Table 10 compares existing land use/land cover to future land use/land cover projections. The most obvious change occurs with open space land cover types (Agriculture, Forest & Grassland, and Public/Private Open Space). These land cover types are projected to decrease by approximately 1,527 acres; Agriculture: 725 acres, Forest and Grassland: 580 acres, and Public/Private Open Space: 222 acres. These decreases are the result of development including Single Family Residential (additional 899 acres), transportation (additional 393 acres) Government & Institutional (additional 132 acres), and Retail/Commercial (additional 107 acres). While some of the development change is

projected to occur in the western half of the watershed where primarily large lot single family residential development will replace existing agriculture and other private or public open space, there is also significant infill redevelopment within the main villages.

Land Use/Land Cover	Current Area (acres)	Current % of Watershed	Projected Area (acres)	Projected % of Watershed	Change (acres)	Change (%)
Agriculture	755	3	30	0	-725	-3
Cemetery	33	0	33	0	0	0
Forest and Grassland	3,298	14	2,718	12	-580	-2
Government & Institutional	570	2	702	3	+132	+1
Industrial	206	1	150	1	-56	0
Multifamily Residential	149	1	151	1	+2	0
Single Family Residential	10,820	46	11,720	50	+899	+4
Office Space	171	1	219	1	+48	0
Public and Private Open Space	1,759	7	1,537	7	-222	0
Retail/Commercial	505	2	612	3	+107	+1
Transportation	1,965	8	2,358	10	+393	+2
Utility/Waste Facilities	53	0	59	0	+6	0
Water	1,507	6	1506	6	-1	0
Wetlands	1,582	7	1579	7	-3	0

Table 10. 20-30-year projected land use/land cover, including percent change for each land use/land cover category (not updated)

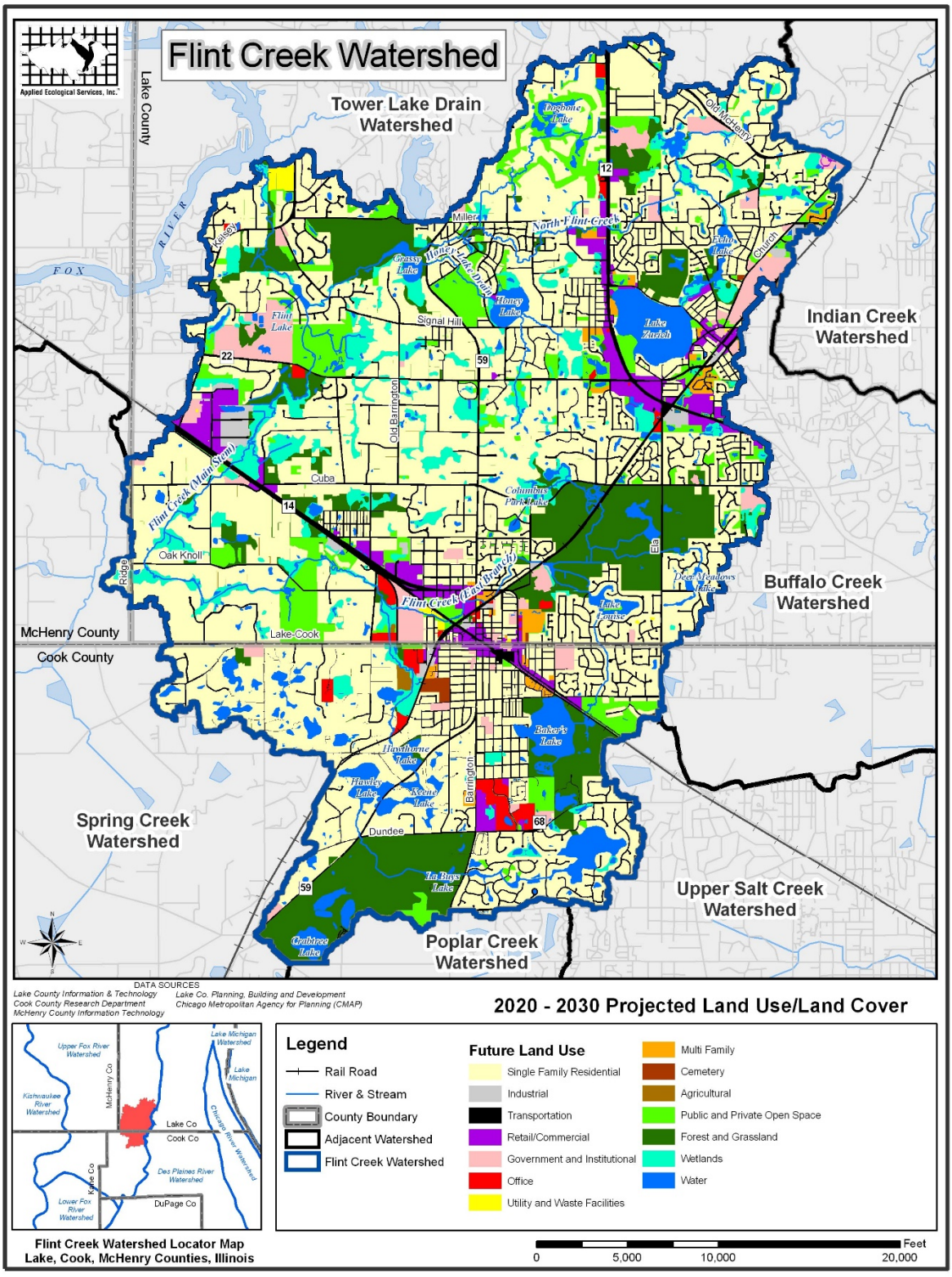


Figure 18: 2020 – 2030 Projected Land Use/Land Cover

Land Use Impacts on Watershed

Land use by humans generally increases the amount of impervious cover for a given area and reduces the amount of open space for infiltrating and storing precipitation. Imperviousness is an excellent indicator used to measure the impacts of urban land uses on aquatic systems. Specifically, increases in imperviousness have negative implications on the natural functions of streams including water quality, hydrology and flows, flooding and depressional storage, and habitat. The following paragraphs describe the implications of increased imperviousness on natural stream functions.

Water Quality

Imperviousness affects water quality in streams and lakes by increasing pollutant loads and water temperature. Impervious surfaces accumulate pollutants from the atmosphere, vehicles, roof surfaces, lawns and other diverse sources. During a storm event, pollutants such as excess nutrients (nitrogen and phosphorus), metals, oil and grease, and bacteria are delivered to streams and lakes. According to monitoring and modeling studies, increased imperviousness is directly related to increased urban pollutant loads (Schueler 1994). Furthermore, impervious surfaces can increase stormwater runoff temperature as much as 12 degrees compared to vegetated areas (Galli, 1990). According to the Illinois Pollution Control Board (IPCB), water temperatures exceeding 90°F (32.2°C) can be lethal to aquatic fauna. During summer months heated runoff could cause water temperatures to exceed lethal levels**.**

Hydrology and Flows

Hydrology and flows are severely altered by the amount of impervious cover in a watershed. More impervious cover generally translates to more water entering drainage systems such as streams, greater runoff volumes, and if unmitigated, will result in higher floodplain elevations (Schueler 1994). In fact, studies have shown that even relatively low percentages of imperviousness (5% to 10%) can cause peak discharge rates to increase by a factor of 5 to 10, even for small storm events. Impervious areas come in two forms: disconnected and directly connected. Disconnected impervious areas are represented primarily by rooftops, so long as the rooftop runoff does not get funneled to impervious driveways or the stormsewer system. Significant portions of runoff from disconnected surfaces usually infiltrate into soils more readily than directly connected impervious areas that typically end up as stormwater runoff directed to a stormsewer system that discharges directly to a waterbody.

Flooding and Depressional Storage

Flooding is an obvious consequence of increased flows resulting from high impervious cover. As stated under *Hydrology and Flows*, increased impervious cover leads to higher water levels, greater runoff volumes, and high floodplain elevations. Higher floodplain elevations usually result in more flood problem areas. Furthermore, as development increases, wetlands and other open space decrease. A loss of these areas increases flows because wetlands and open space typically soak up and capture rainfall and release it slowly to streams and lakes. Detention basins can and do minimize flooding in highly impervious areas by regulating the discharge rate of stormwater runoff, but detention basins do not reduce the overall increase in runoff volume.

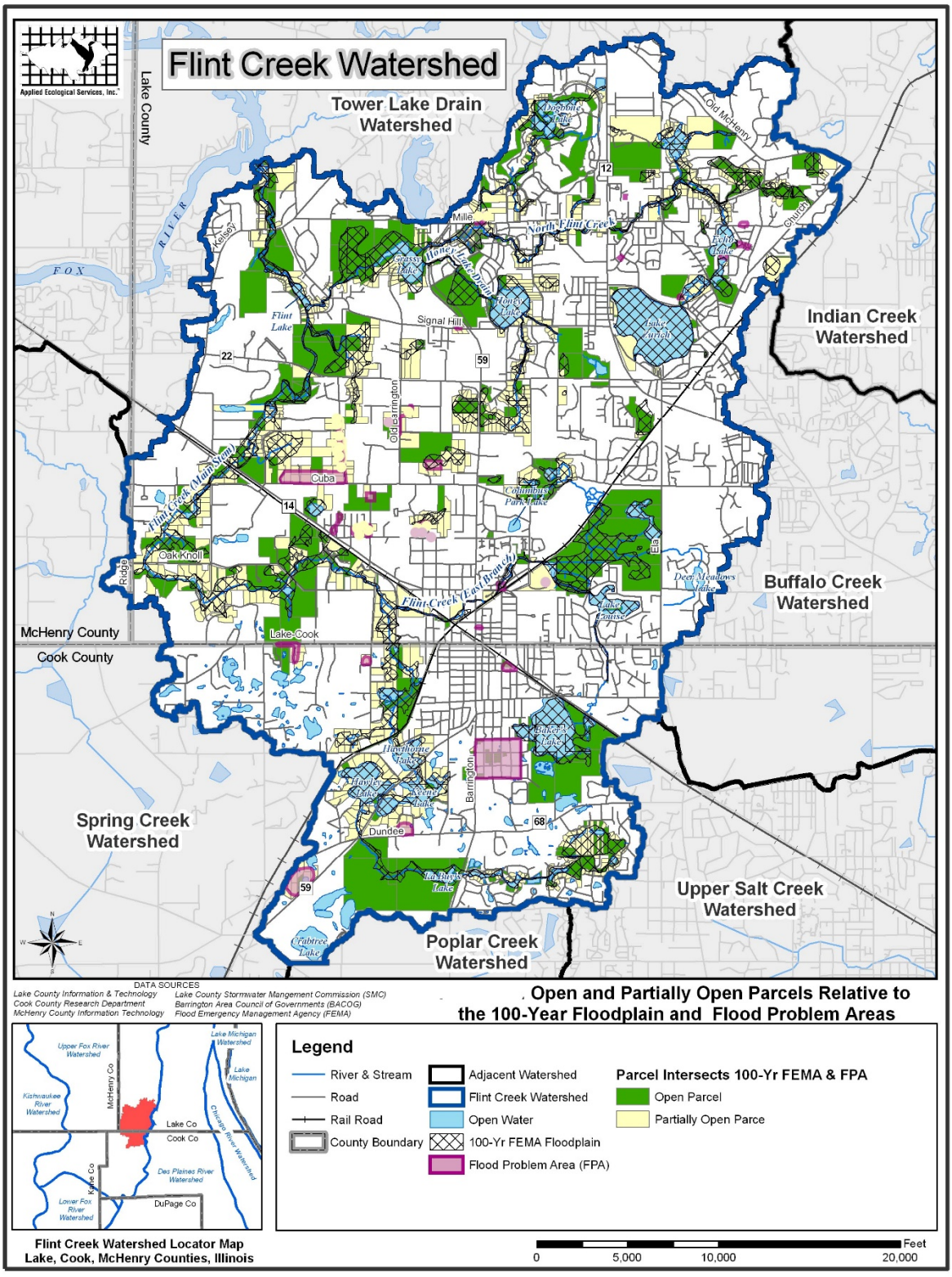


Figure 19: Open Partially Open 100 Year Flood Plain

Habitat

Increased impervious cover negatively impacts stream habitat and its associated biological communities. When a stream receives more severe and frequent runoff volumes compared to historical conditions, channel dimensions often respond through the process of erosion by widening, downcutting, or both, thereby, enlarging the channel to handle the increased flow. Channel instability leads to a cycle of streambank erosion and sedimentation resulting in physical habitat degradation (Schueler 1994). Streambank erosion is one of the leading causes of sediment suspension and deposition in streams. Sediment suspension causes turbid conditions that may result in undesirable changes to aquatic life (Waters 1995). Sediment deposition alters habitat for aquatic plants and animals by filling interstitial spaces in substrates important to macroinvertebrates and some fish species. Physical habitat degradation also occurs when high and frequent flows result in loss of riffle-pool complexes, loss of overhead cover, and decreased in-stream structures. Booth and Reinelt (1993) found that a threshold in habitat quality exists at approximately 10% to 15% imperviousness.

Impervious Cover Estimate

Imperviousness is generally defined as the sum of roads, parking lots, sidewalks, rooftops, and other surfaces of an urban landscape that prevent infiltration of precipitation (Scheuler 1994). Imperviousness is an indicator used to measure the impacts of urban land uses on water quality, hydrology and flows, flooding and depressional storage, and habitat related to streams. Studies from several geographic areas yield a similar result: streams begin to degrade when the watershed reaches approximately 10% impervious cover. As a result of increased impervious surface, runoff increases and groundwater recharge decreases. Stream channel shape responds to increased runoff by widening, downcutting, and losing riffle-pool sequences. Runoff over impervious surfaces also collects pollutants and warms the water before it enters a stream. As a result, biological communities shift from sensitive species to ones that are more tolerant of pollution and hydrologic stress.

Calculating the 2007 and projected (2020) impervious cover in the watershed began with an analysis of each individual land use/land cover shown on Figure 17. Existing (2007) impervious cover is calculated by assigning an impervious cover percentage for each land use/land cover category based upon the Environmental Protection Agency (EPA) TR55 paper (Table 11). The TR55 paper provides estimates of impervious cover based on land use categories. GIS analysis is used to estimate the percent impervious cover for various areas in the watershed using the 2007 and 2020 land use/land cover maps. We also note that Lake County updated and strengthened its Watershed Development Ordinance in 2013, and all of the Flint Creek Watershed municipalities are certified or partially certified communities.

Based on several studies and other background data, Scheuler (1994) and the Center for Watershed Protection (CWP) developed an Impervious Cover Model used to classify streams in subwatersheds into three stream quality categories based on percent of impervious cover. These categories are Sensitive, Impacted, and Non-Supporting (Table 12). In general, Sensitive subwatersheds have less than 10% impervious cover, stable channels, good habitat, good water quality, and diverse biological communities whereas streams in Non-Supporting subwatersheds generally have greater than 25% impervious cover, highly degraded channels, degraded habitat, poor water quality, and poor-quality biological communities.

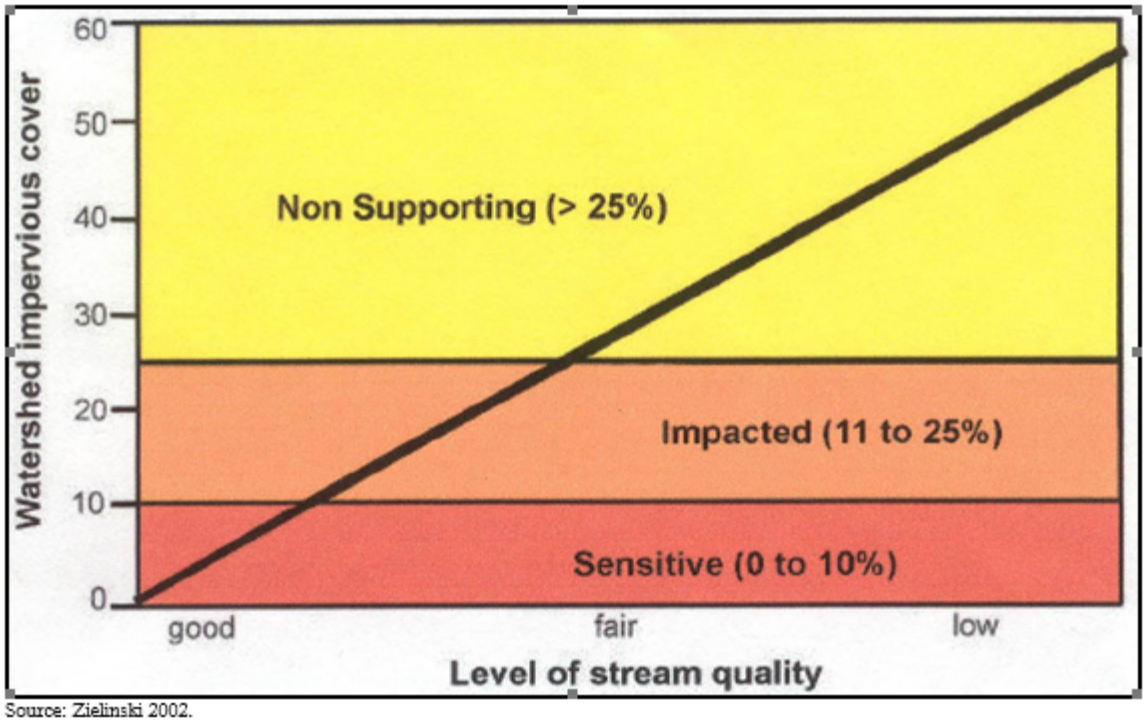
Table 11. Summary of EPA's TR55 land uses and associated imperviousness.

Land Use/Projected Land Use Classification	Percent Impervious
Agriculture	0
Cemeteries	20
Commercial	85
Government	72
Industrial	72
Institutional	72
Office Campus	72
Open Space	0
Residential	
<1/8 acre lot size or less	65
1/4 acre lot size	38
1/3 acre lot size	30
1/2 acre lot size	25
1 acre lot size	20
2 acre lot size	12
> 2 acre lot size	5
Transportation (includes ROW)	75
Utilities	10
Vacant Forest Grassland	0
Water	*100
Wetland	0

Table 12. Impervious categories and descriptions based on the CWP's Impervious Cover Model.

Category	% Impervious Cover	Description
Sensitive	10% or less	Subwatershed generally exhibits very little impervious cover (≤10%), stable stream channels, excellent habitat, good water quality, and diverse biological communities.
Impacted	Greater than 10% and less than 25%	Subwatershed generally possesses moderate impervious cover (11-25%), and somewhat degraded stream channels, altered habitat, decreasing water quality, and fair-quality biological
Non-Supporting	Greater than 25%	Subwatershed generally has high impervious cover (>25%), and highly degraded stream channels, degraded habitat, poor water quality, and poor-quality biological communities.

Source: (Zielinski 2002)



Source: Zielinski 2002.

Figure 20: Impervious cover relationship to levels of stream quality

According to the 2007 existing impervious cover analysis, the entire Flint Creek watershed is estimated to have approximately 21% impervious cover or has stream channels considered "Impacted" by surrounding land uses.

2.9 High Quality Natural Resources and Green Infrastructure

Natural Resources

Important natural resources and threatened & endangered species locations in the Flint Creek watershed were gathered from several sources. Illinois Natural Areas Inventory (INAI) database, Illinois Nature Preserves, and some information from the Illinois Natural Heritage Database (INHD). The Flint Creek Watershed is fortunate to have as much protected lands as it does, although there are some additional significant wetlands areas that are attractive targets for protection.

Portions of 4 INAI sites are located in the watershed: areas in Cuba Marsh Forest Preserve and Grassy Lake Forest Preserve (Lake County Forest Preserves), Crabtree Nature Center and Baker's Lake Nature Preserve (Cook County Forest Preserve). T&E bird sightings include those reported on Cornell's Lab of Ornithology's eBird application.

<u>Baker's Lake Nature Preserve</u>

The Baker's Lake Nature Preserve was designated in 1984 and is the only nature preserve in the watershed. It is part of the Forest Preserve District of Cook County's 330-acre Baker's Lake Younghusband Prairie Preserve. The nature preserve includes a 112-acre lake with a small island that supports a rookery with black-crowned night-heron, great egret, great blue heron and double-crested cormorant nests. Other rare birds such as common moorhen, yellow-headed blackbird, and black

tern have also been observed nesting in and around the lake. Baker's Lake Savanna, a 17-acre restored savanna that supports nearly 100 native plant species is located adjacent to the nature preserve. This restored savanna is owned by the Village of Barrington and managed by Citizens for Conservation.

Cuba Marsh Forest Preserve

Cuba Marsh Forest Preserve is one of two forest preserves in the Lake County portion of the watershed. This site includes nearly 800 acres of marsh, prairie, woodland, and savanna that was preserved in the in the 1970's when a group of local residents banded together to encourage the Lake County Forest Preserve District to preserve the land. Like other preserves in the watershed, Cuba Marsh supports several T&E species, such as black-crowned night-heron, osprey, American Bittern, black-billed Cuckoo, northern harrier, Forster's tern, cerulean warbler, black tern, and king rail.

Grassy Lake Forest Preserve

Grassy Lake Forest Preserve is one of two forest preserves in the Lake County portion of the watershed. It is located in the northwest corner of the watershed and extends outside the watershed to the north along the Fox River. The preserve includes over 550 acres of rolling hills, oak woodlands, marshes, and fens. A long reach of Flint Creek downstream of Flint Lake and the reach between Flint Lake and Grassy Lake flow through the preserve. Grassy Lake is also part of the preserve and harbors several T&E bird species.

Crabtree Nature Center

A large portion of Crabtree Nature Center is located in the southern tip of the Flint Creek watershed and is owned by the Forest Preserve District of Cook County. The once highly agricultural land was purchased by the forest preserve in the 1960's. Since that time natural processes and management have resulted in a slow return of nearly 1,000 acres of land to a more natural state. The site now contains expanses of wetlands, wet prairies, small lakes, and a large headwater reach of Flint Creek's main stem. Black-crowned night-heron, black tern, Forster's tern, the black-billed cuckoo, cerulean warbler, American bittern, least bittern, yellow-headed blackbird, and osprey have been seen there.

Citizens for Conservation Preserves

Citizens for Conservation (CFC) formed in 1970 when a group of concerned Barrington area residents met to discuss the negative impacts of suburban growth on the natural resources of the area. In 1971, CFC was incorporated as a non-profit organization whose mission is "Saving Living Space for Living Things"- through protection, restoration, and stewardship of land, conservation of natural resources, and education. Since the 1970's, CFC has promoted conservation efforts in the Barrington area through education and volunteer work. Additional information about CFC can be obtained by viewing their website: www.citizensforconservation.org/. Some of CFC's many achievements include:

- Protecting over 2,000 acres of public land;
- Owning 12 preserves, 7 of which are located in the Flint Creek Watershed (Figure 27);
- Stewardship and education for local villages, forest preserves, and schools;
- Nature watching and monitoring events;
- Native seed collection and restoration of natural areas.

Grigsby Prairie

Grigsby Prairie was once part of the historical Grigsby Estate. Beginning in the mid 1980's, CFC began restoring native prairie to a 38-acre fallow farm field located near Oak Knoll and Buckley Roads donated by a private resident (Figure 27). Today, the prairie restoration extends beyond the preserve and includes almost 50 acres with more than 150 native plant species. This prairie was restored by volunteers who collected native seed from nearby prairie remnants. The rich prairie habitat is now home to many forms of wildlife, especially declining grassland birds such as bobolinks, grasshopper sparrows, Henslow's sparrows, and meadowlarks.

Hawley Lake Marsh

In 1974, a private land owner donated approximately 17 areas of marsh adjacent to Hawley Lake in the Village of Barrington Hills to CFC (Figure 27). The wetland area is kept in its natural state.

Steyermark

The 1-acre Steyermark property was donated by a private resident in 1986 and includes a forested ravine and floodplain on the north branch of Flint Creek (Figure 27). The ravine exhibits a diverse display of spring woodland wildflowers. CFC actively removes garlic mustard, brush, and logjams, and also conducts annual stream monitoring for RiverWatch there since 1996.

Flint Creek Savanna

Citizens for Conservation purchased a portion of the property now known as Flint Creek Savanna in 1988. At that time, the site consisted of eroded banks along Flint Creek, degraded streamside woodlands, and adjacent agricultural land. The site was purchased primarily because of its potential to restore several interacting ecosystems to pre-settlement condition, creating habitat that harbors a variety of native plant and animal species. Recent additional land purchases create a preserve that now totals over 100 acres with nearly a mile of Flint Creek, four oak/hickory woodlands, several acres of wetlands, and prairie. Flint Creek Savanna is ultimately a place preserved as open space for wildlife but also as a place for adults and children to learn about biological diversity and the benefits of preserving and restoring open space. An additional small parcel was recently donated, such that the preserve now extends across R. 22. Restoration is actively proceeding.

In 2009, the Lake Barrington purchased 30 acres commonly known as the Gibbs parcel for $1,100,000, and rezoned it from Manufacturing to Conservation. They then entered into a Purchase Option Agreement with Citizens for Conservation for a 20 year period that gives CFC the right to purchase portions of the site, which they are restoring, and which also contains significant wetlands. This land lies along Flint Creek South. Thus far, CFC has purchased several acres, and plans to purchase more 2018. CFC is restoring the acreage they purchase, as well as working on the Lake Barrington parcels. Restoration activities are active, removing reed canary grass and planning wetland sedges, as well as clearing buckthorn. Nearby is the formerly Abbate property, 13.3 acres, donated to CFC by Barrington Bank. Near term efforts mirror that of the Gibbs property.

CFC is also restoring recently donated property west of Hart and south of Cuba, the 22 acres Craftsbury Preserves. It is also wetland, and still in raw shape. CFC is removing significant buckthorn and reseeding with native plants.

Citizens for Conservation continues restoration of the Barrington Bog, which is a graminoid or grassy bog, acidic with a peat base on the west side of Rt. 59. This is also a quaking bog. Maintenance is a consistent challenge, as the bog is difficult to access and the weather not always cooperative.

The Stewards of Grassy Lake, along Miller Road and Kelsey, and Rt. 59, have cleared over 70 acres of buckthorn over the last 7 years. That Fen is called by many as not only a rare fen, but one of the best in the whole of Lake County. This property is part of the Lake County Forest Preserves, and is noted here due to the substantial removal of buckthorn, a persistent invasive. Restoration continues.

CFC continues restoration of the other properties they have acquired over the years, such as the fine Grigsby Prairie and ongoing work with the Lake County Forest Preserves in Cuba Marsh and the Hurd property.

This year, Citizens for Conservation announced a **Barrington Greenway Initiative** (BGI) to restore and expand existing greenways and to encourage contiguous landowners to restore parts of their properties to more natural conditions to provide more natural pathways for wildlife and plants. In addition to volunteers working on restoration, there will be a significant community education outreach focusing on the value of ecosystem services. Partners in this endeavor include Citizens for Conservation, Lake County Forest Preserves, Audubon Great Lakes, the Forest Preserves of Cook County, Friends of the Forest Preserve and the Bobolink Foundation. This effort is in alignment with FCSCWP goals and objectives.

Indeed, this is an important element in FCWP's consideration of "green infrastructure." Green infrastructure not only publicly protected lands (e.g. Forest Preserves), conservation lands (e.g. lands administered by groups such as Barrington Area Conservation Trust and Citizens for Conservation, but also privately owned lands whose owners invest not only in rain gardens and monarch gardens, but also invest in significant buffers to protect strategic and sensitive lands, stream banks, lakes, flood plains, wetlands,. The objective is to construct protected wildlife and biotic corridors.

Green infrastructure is best defined as an interconnected network of natural areas and other open space that conserves natural ecosystem values and functions, sustains clean air and water, and provides a wide array of benefits to people and wildlife (Benedict, 2006). Natural features such as stream corridors, wetlands, floodplain, woodlands, and grassland are the primary components of green infrastructure. Working lands such as mini-estates, hayfields, organic farms, horse farms, other agricultural fields and so on, and partially developed areas including any school grounds, golf courses, detention basins, parks, ball fields, large residential parcels, and developed lots that include a stream corridor are also considered components of a Green Infrastructure Network. It is important to note that since parts of the Flint Creek Watershed are highly developed, existing green infrastructure is somewhat fragmented. (See Figure 75, p. 192).

Barrington Area Conservation Trust Preserves

The Barrington Area Conservation Trust (BACT) has added 144 acres since 2007 in both the Spring Creek and the Flint Creek Watersheds, that are permanently protected through both donations and conservation easements. They curate 11.7 acres in the Flint Creek Watershed (Pederson and

Thomas) through which significant sections of Flint Creek runs, thereby providing water retention capacity and natural wetland filtration.

BACT has three easements (Bradford-White, Bialas-Heiberg and Dworsky, totaling 12.9 acres which also provide water filtration and retention ecosystem services.

In December, 2016, BACT received 6.7 acres of wetlands at the corner of Oak Knoll and Ridge Roads in Barrington Hills. Named Katie's Marsh, and once used as a garden which included native plants and sedges, BACT will work to enhance its wetland functions to Flint Creek.

Other Open Space Additions

North Barrington recently purchased property needed for Haverton on the Pond to access Route 59, in order to restore and repair historic drainage tiles from Haverton East underneath 59, north to Honey Lake to West Flint Creek, which has seen regular flooding. This flooding regularly inundates Rt. 59, and had become a public safety hazard.

The Barrington Park District recently swapped part of their Miller Park with the Village of Barrington for land contiguous to the west and south sides of Miller Park, by Summit and Concord Streets, where there will be a new Park. The Village of Barrington is using the part of the old Miller Park that they acquired to construct a significant detention basin to reduce frequent flooding in the East Lincoln and South Summit Street area.

Many of the municipalities of Flint Creek are supportive of bike paths and routes. While many of these paths are space allocations on existing roads and shoulders, there are also bike paths that are shared with foot traffic. Cuba Marsh has delightful walking trails also suitable for biking, and the Villages of Barrington and Deer Park have designated roads marked to share with bicycle riders. This network is expected to expand over the next ten to fifteen years.

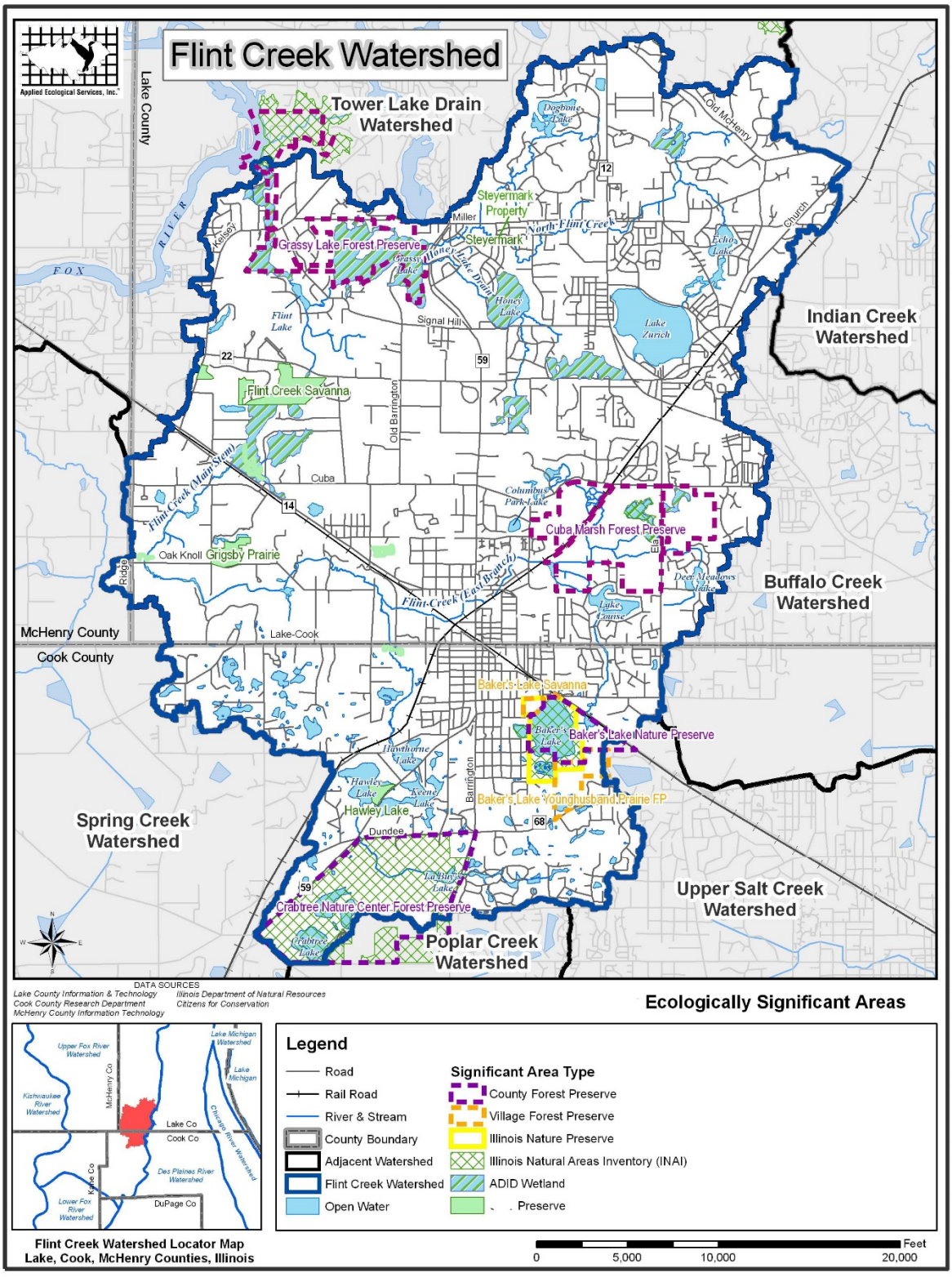


Figure 21: Ecological Significant Areas

Other Open Space Considerations

A key objective of the 2007 plan was to examine open space and determine how each parcel could best be utilized as part of a green infrastructure network to meet general watershed goals, including:

- water quality improvement
- natural resource protection and enhancement
- flood prevention and reduction

Prioritizing open space parcels for the green infrastructure network began by first identifying all open and partially open parcels in the watershed. Next, 14 prioritization criteria that address each of the three general watershed goals were applied. The 14 selected criteria are as follows:

- Open or partially open parcels that intersect with the 100-year FEMA floodplain.
- Open or partially open parcels located within 0.5 miles of any headwater stream.
- Open or partially open parcels that intersect with a wetland.
- Open or partially open parcels that contain a potential wetland restoration site identified in Section 3.9.4 (Wetlands Inventory).
- Open or partially open parcels located in a Subwatershed Management Unit (SMU) where less than 10% of the SMU is existing wetland.
- Open or partially open parcels within a 0.5 mile radius of a Flood Problem Area (FPA).
- Open or partially open parcels that are within 100 feet of a watercourse or lake.
- Open or partially open parcels that are adjacent to developed but undetained areas.
- Open or partially open parcels located within a non-point source pollutant loading SMU "hotspot" identified in Section 4.2 (Water Quality Problems).
- Open or partially open parcels located in a "Highly Vulnerable" Land Use/Land Cover SMU identified in Section 4.1 (Land Use Impacts).
- Open or partially open parcels within 100 feet of or including high quality (ADID) wetlands.
- Open and partially open parcels adjacent to or including Ecologically Significant Areas.
- Open or partially open parcels adjacent to or including Threatened & Endangered (T&E) species locations
- Open or partially open parcels that are adjacent to or contain a potential Regionally Significant Storage Location (RSSL) identified in Section 3.10 (Flooding and Flood Storage).
- Open or partially open parcels that are located in critical recharge areas for groundwater

Figure 22 shows the results. Parcels meeting 6 to 9 of the criteria are designated high priority for meeting project goals, while parcels meeting 4-5 criteria are designated medium priority. Parcels with a combined value of 1-3 are low priority. Parcels with a score of 0 are not a priority or were already developed.

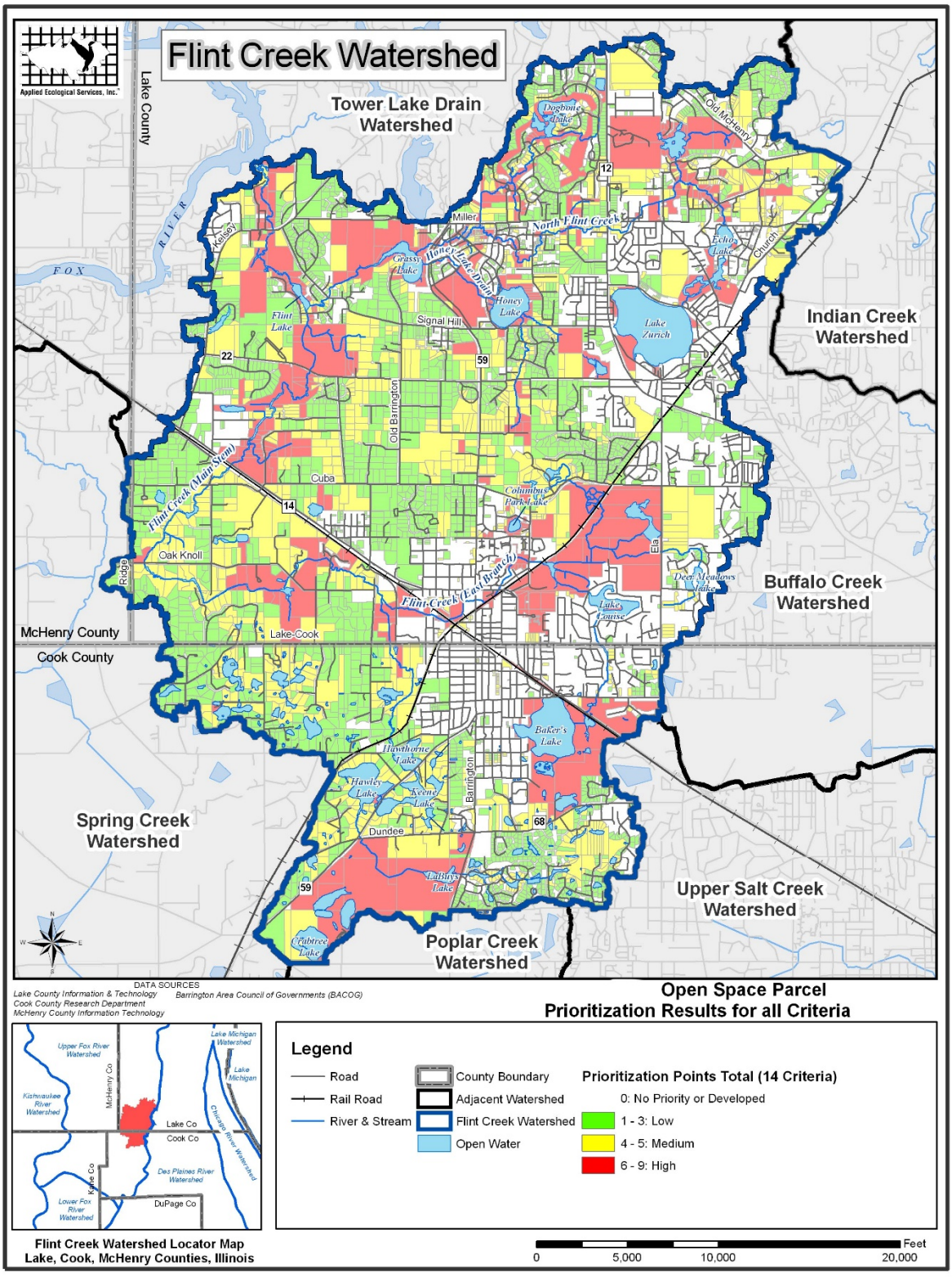


Figure 22: Open Space Prioritization Results for all Criteria

3.0 Watershed Issues

3.1 Detention Basins and Flood Plain Data

Existing 100-Year Floodplain

Floodplains along stream and river corridors perform a variety of benefits. Some of these benefits include aesthetic value, flood storage, water quality, and plant and wildlife habitat. The most important function however is the capacity of the floodplain to hold water during significant rain events to minimize flooding issues. The 100-year floodplain is defined as the area that would be inundated during a flood event (100-year flood) that has a one percent chance of occurring in any given year. However, 100-year floods can and do occur more frequently. The 100-year flood has become the accepted national standard for floodplain regulatory purposes and was developed in part to guide floodplain development to lessen the damaging effects of floods. The 100-year floodplain also includes the floodway. The floodway is the portion of the stream or river channel that comprises the adjacent land areas that must be reserved to discharge the 100-year flood without increasing the water surface. Figure 22 below depicts the 100-year floodplain and floodway in relation to the stream channel.

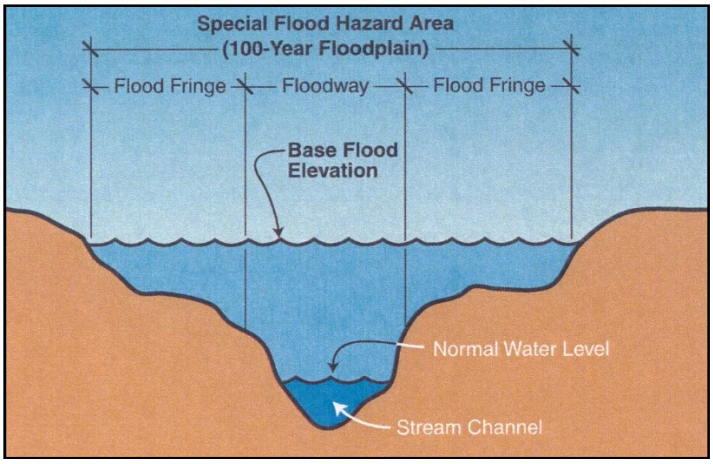


Figure 23: Depiction of 100-year floodplain and floodway.

Studies conducted by the Federal Emergency Management Agency (FEMA) to determine areas that have the highest probability for flooding are called Flood Insurance Studies (FIS). Flood Insurance Rate Maps (FIRM) are produced from the studies and used to determine the level of risk to people and structures in a certain area with respect to the dangers of flooding. FIRM maps are also used to determine the cost and requirements for the purchase of flood insurance.

Figure 23 includes a map of the existing 100-year floodplain. According to the mapping, the 100-year floodplain occupies 2,682 acres, or 12% of the watershed: 1,073 acres in North Flint Creek subwatershed, 1,083 acres in Flint Creek (main stem) subwatershed, and 526 acres in Flint Creek (east branch) subwatershed.

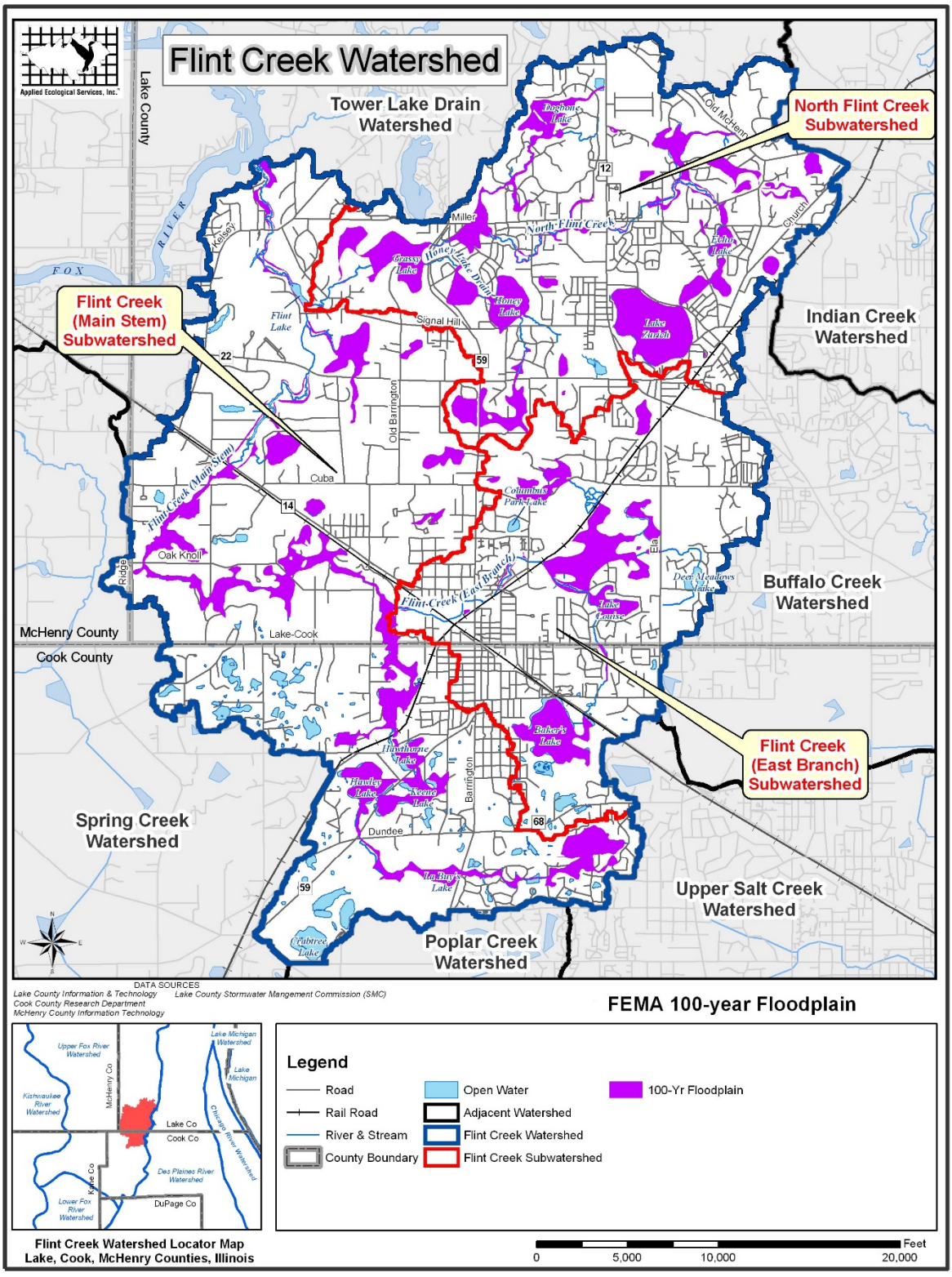


Figure 24: FEMA 100 Year Floodplain

Flood Problem Areas Inventory

In 2001, the Lake County Stormwater Management Commission (LCSMC) updated the original (1995-1996) Flood Problem Areas Inventory (FPAI) for all of Lake County (Table 13, Figure 25). A Flood Problem Area (FPA) is one or more structures that are damaged by flooding. The inventory was completed by conducting personal interviews with cities, villages, townships, homeowners associations, county agencies, county board members, and private organizations and individuals. Each identified FPA is categorized under one of the following; 1) overbank flooding, 2) local drainage problem, 3) depressional flooding, 4) sewer back-up, 5) septic problem, and/or 5) erosion problem. LCSMC identifies each FPA by using a watershed sequence number (Flint Creek watershed = 9) followed by a second identifier number (i.e. 9-01). Other FPAs were identified by contacting Village and Township staff, particularly for the Cook County portion of the watershed where little to no flood damage data was available. Personal contacts were also made to verify that some of the original LCSMC FPA's have been addressed. Information about addressed FPA's is not included in this report, except in the cases of FPA's that have been addressed since 2007. The Flood Problem Area inventory resulted in 20 areas exhibiting flooding problems. Information about each FPA and a map are included below. Detailed information for each LCSMC-identified FPA can be obtained by contacting the LCSMC and filing a FOIA request

Table 13. Flood Problem Areas identified during LCSMC's Flood Problem Areas Inventory and other known flood problem areas.

Flood Problem Area	Cause of Flooding	Location/Description	Known Mitigation Measures
LCSMC FPAs			
9-01	Depressional Flooding	Subdivision north of Route 14 in Cuba Township	Partial fix – Drainage replaced and revisited 2017
9-03	Local Drainage Problem	Harbor Rd. and Cuba Rd.	
9-04*	Local Drainage Problem	Corner of Old Barrington Rd. and N. Edgemond Rd.	Drainage fixed and Old Barrington Road Raised
9-10	Depressional Flooding	Areas near Lake Zurich and Echo Lake	None
9-11	Local Drainage Problem	Route 12 and Miller Rd.	Major work along Miller Road; fixed
9-12	Local Drainage Problem	Unincorporated subdivision east of Echo Lake	Minor work along N. Lakewood Ln.
9-14	Local Drainage Problem	Corner of Pine Tree Row and Golf View Rd.	None
9-17	Depressional Flooding	Miller Rd.	Fixed
9-19	Overbank Flooding	Elm Rd.	Partially addressed; part of planned CN related work
9-21	Depressional Flooding	N. Hart Road South of Cuba Rd.	Partial fix-culverts replaced
9-22	Local Drainage Problem	Signal Hill Rd.	None
Other FPAs			
1	Local Drainage Problem	Drainage problem on Lake-Cook Road between Brinker Rd. and Caesar Dr.	None
2	Depressional Flooding	Depressional flooding at northwest corner of Oakdene Road and Hart Hills Road.	None
3	Depressional Flooding	Depressional flooding in subdivision southwest of Baker's Lake	Proposed mitigation plan
4	Depressional Flooding	Depressional flooding at northwest corner of Route 68. and Lakeview Ln.	None
5	Depressional Flooding	Depressional flooding between Route 59/68 and Old Dundee Rd.	None
6	Local Drainage Problem	Flooding on Washington St. between Route 59 and N. Cook St.	Replacement of storm sewers
7	Local Drainage Problem	Flooding on E. Lincoln Ave., S. Summit St., E. Russell St., and Miller Park	Detention basin Construction 2017-18
8	Local Drainage Problem	Pond off Prestwick Dr. drains to road and approaches houses including on Merton	Partially fixed
9	Depressional Flooding	Several residential yards/basements in Fox Point Subdivision flooding during most rain events greater than 1 inch	None

Data Source: DRAFT 2001 Lake County Flood Hazard Mitigation Plan (LCSMC 2001).
* Flooding Hot Spot in DRAFT 2001 Lake County Flood Hazard Mitigation Plan

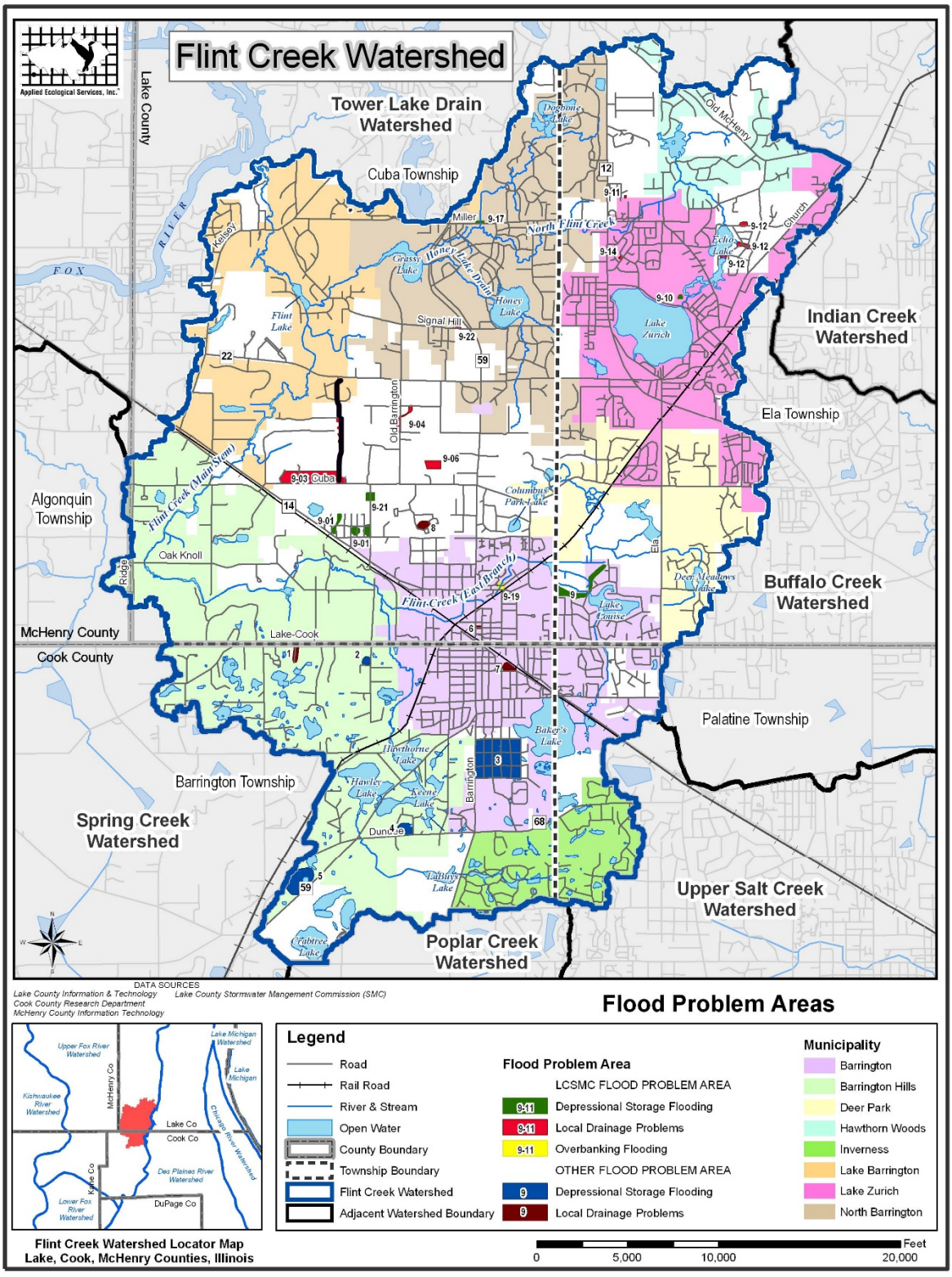


Figure 25: Flood Problem Areas

Table 14. Additional Flood Problem Areas identified in the Flint Creek Watershed

Flood Problem Area	Cause of Flooding	Location/Description	Known Mitigation Measures
10	Local Drainage Problem	In subdivision northwest of Ela and Cuba Rd – flooding along Hearthside Dr and Farthingdale Ct	None
11	Local Drainage Problem	Southwest of Rt 59 and 22 – flooding occurs along Haverton Way and along Route 59	None
12a	Local Drainage Problem	In subdivision south/southwest of Prestwick, In the Merton area with drainage to Rt.14	None
12b	Local Drainage Problem	In the area by the lake by Elizabeth Lane, sometimes blocking the road	None

Open and Partially Open Space Relative to the 100-Year Floodplain and Flood Problem Areas

The Federal Emergency Management Agency (FEMA) 100-year floodplain and known Flood Problem Areas (FPAs) were mapped relative to surrounding or intersecting open and partially open parcels on Figure 26. A clear open and partially open space parcel trend is noticeable along the majority of the Flint Creek (main stem), and western portion of North Flint Creek. Smaller partially open space parcels (generally larger residential lots), are located in the 100-year floodplain along North Flint Creek in Lake Zurich, Hawthorn Woods, and the eastern portion of North Barrington. Open or partially open space parcels are not common along Flint Creek (east branch) as it flows through Barrington. Open space is critical along streams/floodplains because it forms greenways for wildlife, flood storage during heavy rain events, is good for general ecological processes, and improves the quality of life for people. As human development encroaches on stream corridors, flood problems arise, corridors become smaller, and wildlife becomes less abundant.

Open and partially open parcels are also important when trying to mitigate for known flood problem areas (FPAs) because they provide open space that can potentially be used to create stormwater storage or other flood mitigation practices. A detailed discussion on FPAs can be found later. Figure 26 depicts the location of open and/or partially open parcels near or intersecting FPAs. Generally speaking, FPAs located in highly developed areas are not surrounded by open or partially open parcels. Flood mitigation on these parcels will likely occur onsite and include smaller scale BMPs such as rain gardens. FPAs located in rural areas are generally associated with open space. Larger scale flood mitigation such as creation of large storage areas/wetlands is more likely feasible for these sites. The Action Plan section of this report includes site-specific recommendations to mitigate for existing FPAs.

Open and Partially Open Space Relative to Hydric Soils and Wetlands

Greater than 75% of the original wetlands in the Flint Creek watershed are still present according to the wetland inventory and analysis of drained hydric soils. The watershed has an extensive network of existing wetlands and areas of drained wetlands that now remain only as hydric soils. Nearly all

the existing wetlands and hydric soils are directly associated with open or partially open parcels, especially along stream corridors.

Wetlands in the watershed exhibit a fair amount of protection against development through County and U.S. Army Corps of Engineers (USACE) regulations. Wetlands located in protected areas such as forest preserves are completely protected. Wetlands that are connected to stream systems are considered "Waters of the U.S." and are therefore regulated by the USACE. Effective January 1, 2005 developments are allowed to impact no more than 0.10-acre of USACE jurisdictional wetland without a permit and required mitigation.

Isolated wetlands, or wetlands that are not hydrologically connected to "Waters of the U.S.," are under the jurisdiction of the county in which they are located. McHenry County and Lake County each have Watershed Development Ordinances that require mitigation for wetland impacts greater than 0.1 acres to isolated wetlands that are high-quality and greater than 0.25 acres for isolated wetlands that are not considered high quality. Cook County now has an ordinance.

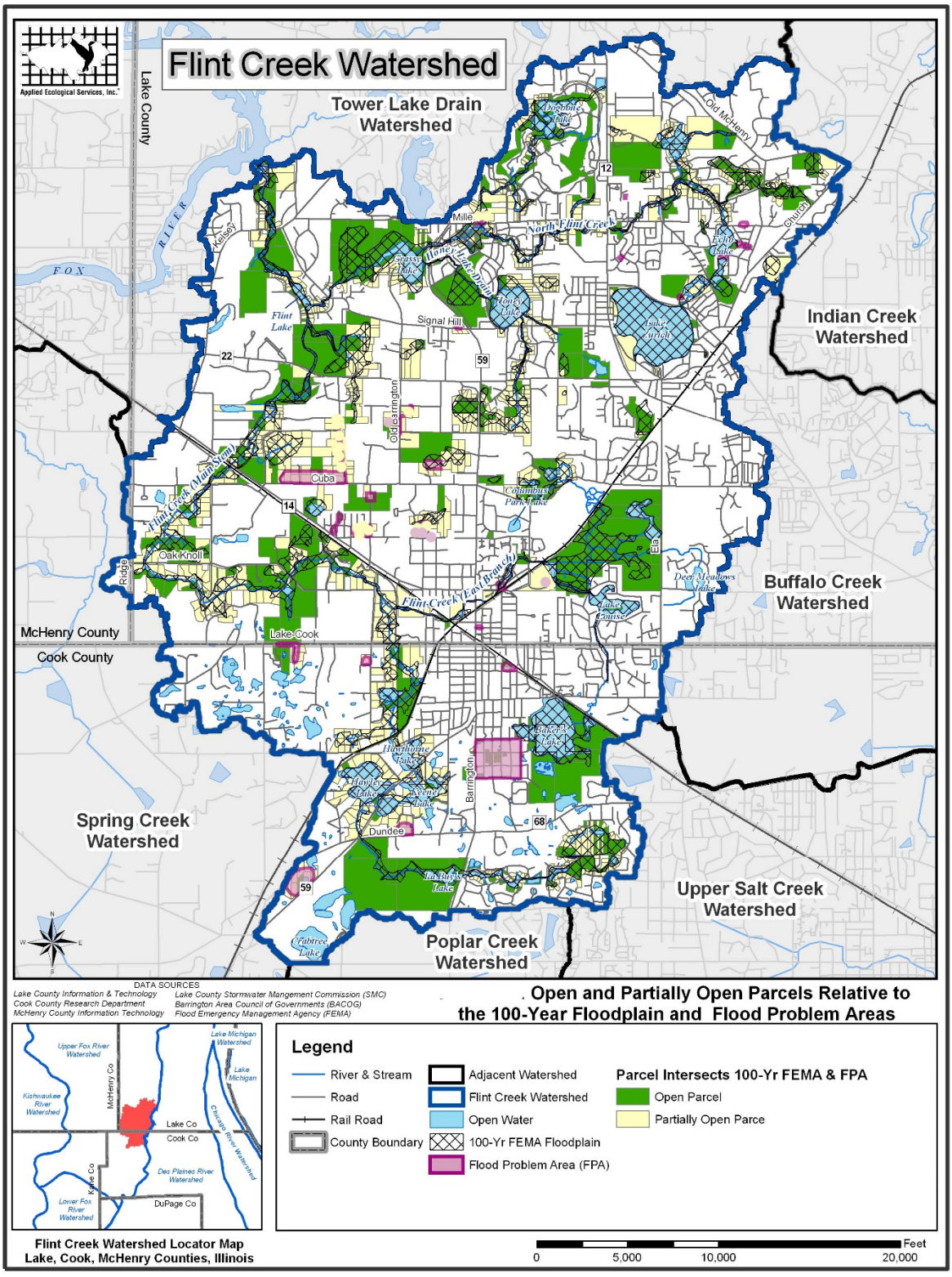


Figure 26: Open and Partially Open Parcels and Floodplain and Flood Problem Areas

Constructed Drainage System

The natural drainage system began to experience changes as residential, commercial, industrial, and transportation land uses increased. Early urban development was constructed without detention basins with stormwater directed to streams and lakes via ditches and stormsewer systems. The goal was to remove runoff from developed areas as quickly as possible. Without detaining stormwater originating from increased amounts of impervious surface and extensive stormsewer networks, flashy hydrology becomes common. Flashy hydrology results when the water level in streams rises quickly during a storm event and falls quickly following the storm event. This causes channel degradation such as downcutting and channel widening as well as flooding and unstable conditions that are not suitable to most fish and invertebrates. More recently, land planners and engineers have realized the benefits of storing stormwater runoff in detention basins that are designed to capture stormwater runoff from a surrounding development and release the water slowly over a given amount of time. If designed with native plants and other features, detention basins can also provide wildlife habitat and improve water quality.

Detention Basins

In 1992 (revised in 2015), Lake County adopted a comprehensive stormwater management ordinance (the Watershed Development Ordinance (WDO)) governing the entire County, which restricted stormwater release rates for all new development within the County.. The WDO limited release rates from the 2-year recurrence interval design storm to 0.04 cubic feet per second (cfs)/acre of development area and limited release rates from the 100-year recurrence interval design storm to 0.15 cfs per development acre. Limited release from the more frequent storms more closely approximated the bankfull capacity of stream channels in Lake County. In Lake County, detention basins constructed prior to 1992 and all detentions in Cook County with oversized outlets are often good candidates for retrofitting with restrictors that release stormwater more slowly. It should be noted that rainfall calculations are based on consistent rate patterns of precipitation, rather than the uneven rate patterns experienced during an average storm.

In 2007, the Lake County Stormwater Management Commission (LCSMC) conducted an inventory for all known detention basins in the entire Flint Creek watershed. Appendix F contains the results for 201 detention basins inventoried. Twenty four (24) of these basins are either located outside the watershed boundary and/or are not actually detention basins. The inventory includes observations and measurements of:

- basin size and drainage area characteristics;
- basin design features (type, vegetation, slopes, inlet/outlets, etc.);
- maintenance/design problems;
- potential retrofit opportunities.

The location of all detention basins within the watershed is shown on Figure 27. Several surveyed basins are not located in the watershed. These basins are not discussed in this plan. Site specific detention basin retrofit opportunities to improve water quality, improve wildlife habitat, and decrease flooding are identified in the Action Plan. These retrofits include:

- convert dry basins to wet or wetland basins;
- repair short-circuiting using berms or other measures;

- replace turf grass and rip rap with native vegetation for improved filtration and habitat;
- repair inlets/outlets and remove excess wood debris;
- clean up litter;
- treat excess algae.

Most newly constructed basins are designed to be wet bottom with side slopes and an emergent zone that is planted with native vegetation to help clean stormwater, promote infiltration, and improve habitat for wildlife. These types of basins are usually referred to as naturalized detention basins, and are significantly more effective at filtering runoff, when well designed and constructed with appropriate native plantings, than dry basins.

Stormsewers

In most cases, detention basins take on water from the surrounding stormsewer networks (stormsewersheds). The location of all known stormsewer networks were delineated by reviewing municipal and stormsewer maps where available. AES used 2006 aerial photography and available 2-foot contour topography data to map detention areas where existing data was not available. Figure 28 identifies:

- all areas in the watershed that are not developed (Lake, Cook, and McHenry County),
- areas developed and sewered/detained prior to 1992 (Lake County only),
- areas developed and sewered/detained after 1992 (Lake County only),
- areas that are developed and not sewered/detained (Lake, Cook, and McHenry County),
- all areas that are detained in Cook County.

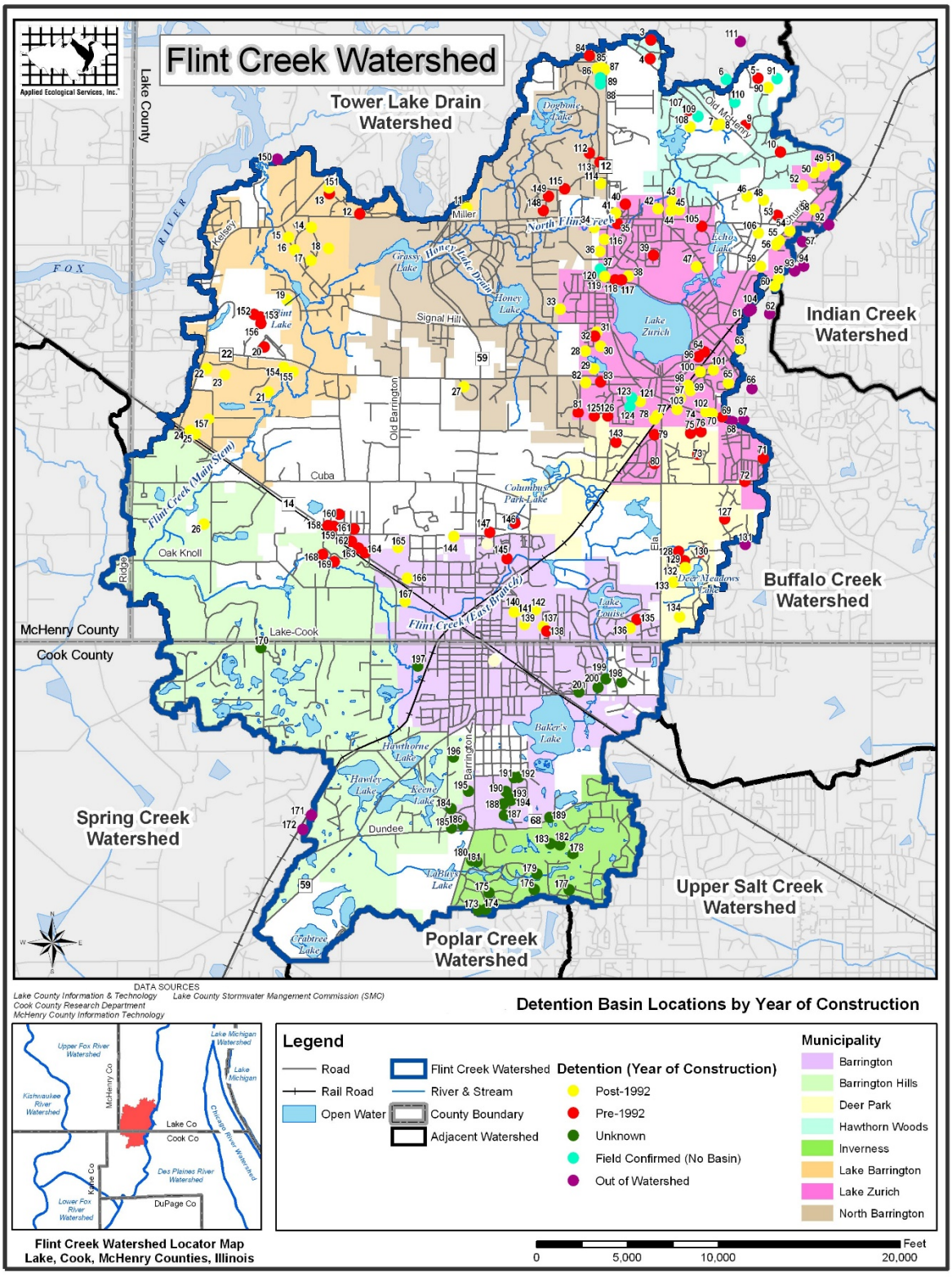


Figure 27: Detention Basin Location by Year of Construction

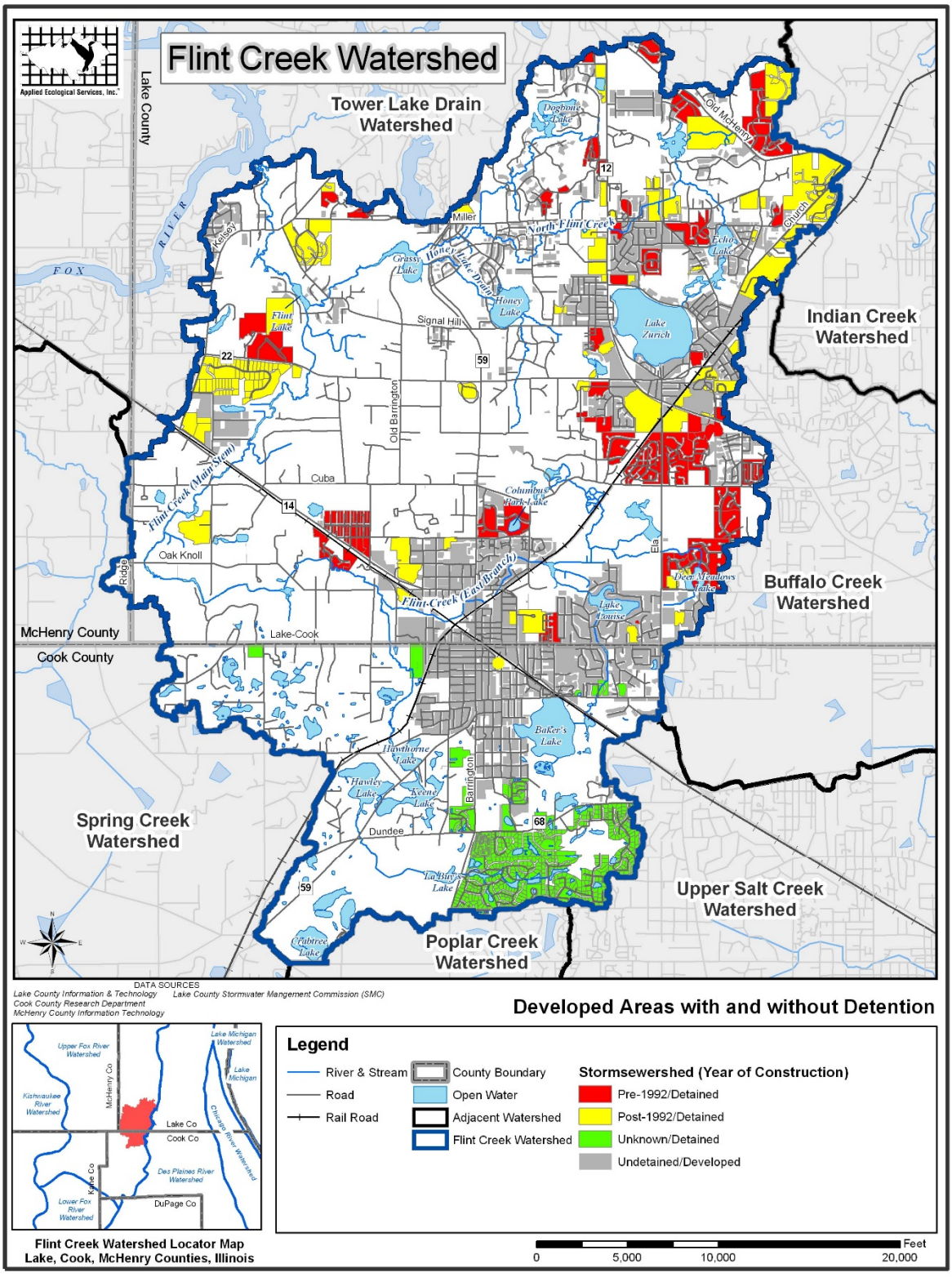


Figure 28: Developed Areas with and without Detention

Regionally Significant Storage Locations

Regionally Significant Storage Locations (RSSLs) are defined as existing or created depressional areas that are presently storing, or potentially could store, stormwater runoff to decrease flooding in the Flint Creek watershed. In many cases, potential storage locations coincide with potential wetland restoration sites and could be created to mitigate for wetland losses occurring via development. More importantly, existing and potential storage areas present opportunities to mitigate for Flood Problem Areas (FPAs). The criteria used to identify existing and potential storage locations in the watershed are summarized below.

Existing Storage Areas

- include all detention basins, 100-year floodplains, open water (streams and lakes), hydric soils, and wetlands;
- exclude parcels less than 1/3 acre, transportation, and building footprints;
- use 2-foot boundary elevation (assumes 2 feet of storage for each location and provides appropriate hemi-marsh wetland creation dimensions and water depths).

Potential Storage Areas

- include all areas with 1% slope or less and merge with hydric soils and 100-year floodplain;
- exclude transportation, building footprints, and existing storage locations;
- only include locations greater than 5 acres and assume 2 feet of storage for each location.

The location of each existing regional storage sites is shown on Figure 29. The larger storage areas are existing lakes, large wetland areas such as Cuba Marsh, and 100-year floodplain areas along Flint Creek. Note: FEMA has recently released updated Flood Maps. (https://hazards-fema.maps.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd)

Ninety-seven (97) initial potential storage locations were identified using the criteria listed above. However, the initial 97 sites were reduced to 50 following a rigorous review using a 2006 aerial to identify potentially feasible sites (Figure 30). The majority of the omitted sites were located in areas that are currently developed. The 50 potential sites could store an estimated 1,326 additional acre-feet of stormwater assuming each exhibits an average of 2 feet of storage volume. Two feet of storage can be created by constructing a 2-foot tall berm at the lowest elevation along each identified potential storage area. A 2-foot berm was selected because it can potentially hold back enough water to provide the optimum depth to support a functioning hemi-marsh-type wetland that has the potential to harbor various wetland plant and animal species as well as store significant amounts of stormwater. Water surface fluctuations greater or less than 2 feet in a hemi-marsh encourage growth of non-native/invasive species such as cattails in areas that are designed to be open water.

The largest potential storage locations are outlined in red, orange, and yellow on Figure 29 and Table 14. Smaller sites are shown in two shades of green. Generally speaking, potential sites located on open space or agricultural land are the most feasible and easiest to implement. Site 39 was the largest identified storage area but has limited feasibility because it is located on a golf course. The next three largest sites (4, 14, and 35) have high potential because they are largely located on open space or

agricultural land where opportunities are greater and easier to implement. With climate change, governmental agencies will need to re-examine their capabilities and options to retain floodwaters.

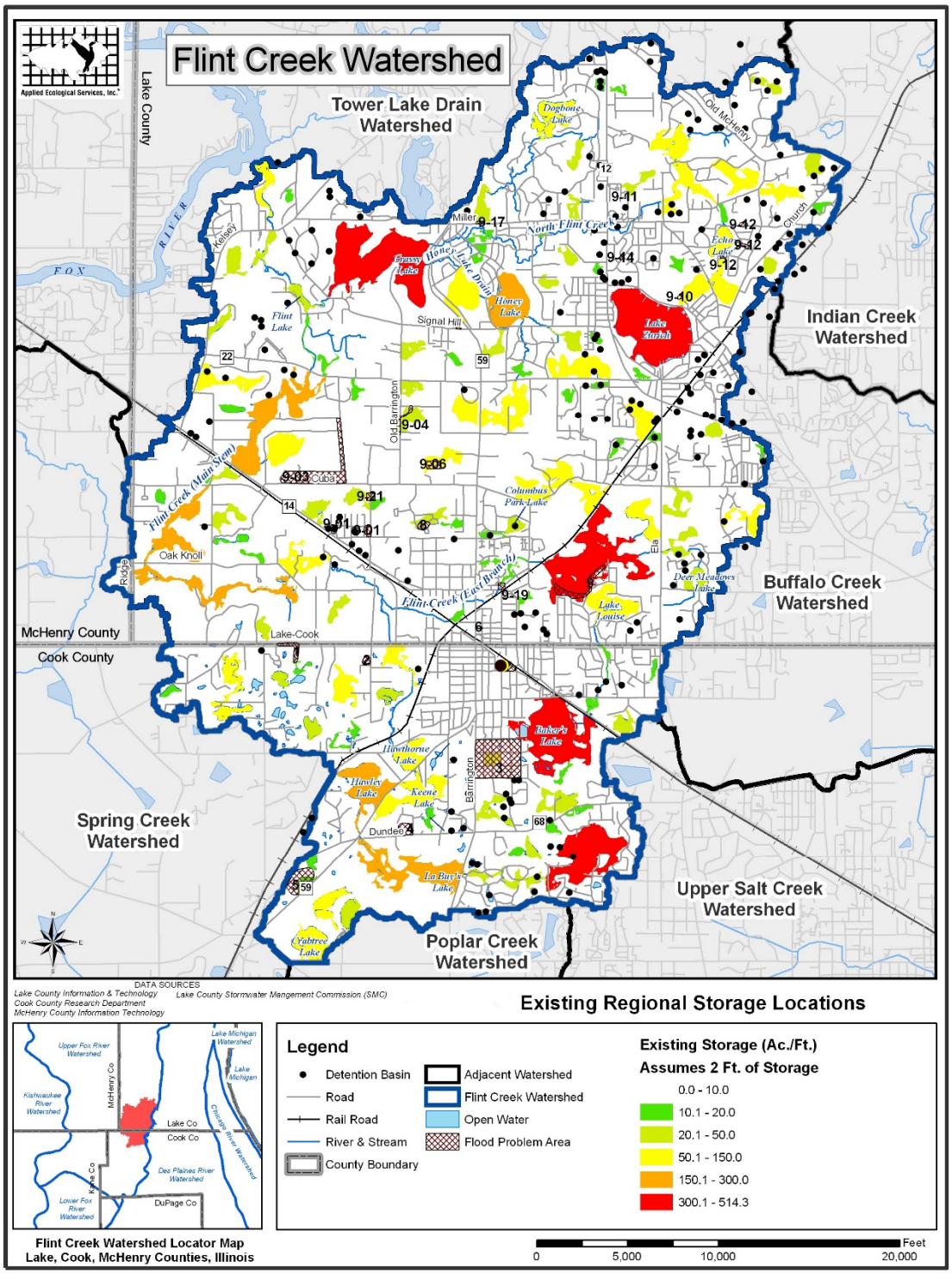


Figure 29: Existing Regional Storage Locations

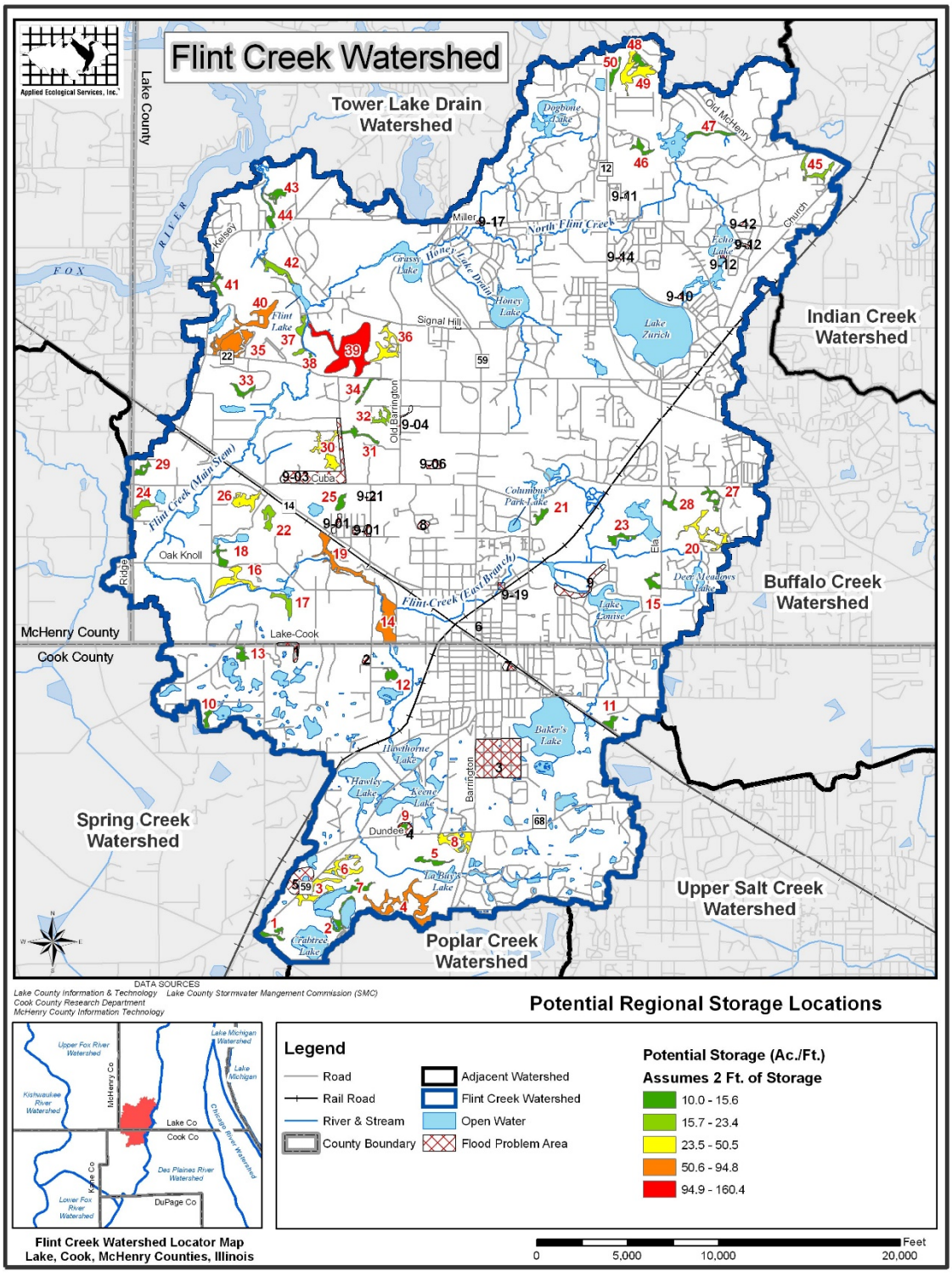


Figure 30: Potential Regional Storage Locations

Table 15. Ranking of potential significant storage locations by 2-foot depressional storage volume

Rank	Map ID	Acres	2-foot Depressional Volume (acre-feet)	Existing Feasibility
1	39	80.1	160.4	*Limited:* west half on golf course; existing wetland on east half
2	4	47.3	94.8	*Potential:* open space and agricultural land
*3	14	35.9	72.0	*Potential:* open space, existing wetland, stream/floodplain; development starting
4	35	31.6	63.4	*Potential:* agricultural land
5	40	27.9	56.0	*Limited:* treatment plant and agricultural land
6	19	27.4	54.9	*Limited:* online with stream/ wetland/ floodplain
7	49	25.2	50.5	*Potential:* agricultural land
8	30	19.8	39.6	*Limited:* large lot residential
9	36	18.5	37.0	*Limited:* existing wetland surrounded by residential
10	3	17.8	35.7	*Potential:* open space
11	16	17.6	35.3	*Limited:* large lot residential in close proximity
12	20	17.4	34.9	*Potential:* open space
13	8	17.1	34.2	*Potential:* open space
14	6	15.5	31.0	*Potential:* open space
15	26	14.9	29.9	*Potential:* agricultural land
16	42	11.7	23.4	*Limited:* online with stream/floodplain
17	45	10.5	21.0	*Limited:* surrounded by agriculture, residential, and commercial
18	22	9.9	19.9	*Potential:* agricultural land
19	32	9.7	19.5	*Potential:* open space and agricultural land
20	24	9.5	19.1	*Limited:* close proximity to large lot residential
21	17	8.8	17.7	*Limited:* existing golf course
22	37	8.6	17.2	*Limited:* existing golf course
23	2	7.8	15.6	*Potential:* open space
24	50	7.6	15.3	*Potential:* agricultural land
25	44	7.6	15.2	*Limited:* online with stream/floodplain
26	7	7.5	15.1	*Potential:* open space
27	27	7.4	14.8	*Limited:* partially developed
28	43	7.3	14.7	*Potential:* open space
29	31	7.3	14.6	*Limited:* close proximity to large lot development
30	23	7.2	14.5	*Potential:* open space
31	47	7.1	14.2	*Limited:* existing ditch between agricultural and commercial development

32	18	7.0	14.1	*Potential:* open space
33	5	6.8	13.7	*Potential:* open space
34	15	6.7	13.5	*Potential:* open space
35	1	6.5	13.1	*Potential:* open space
36	13	6.5	13.1	*Potential:* open space
37	46	6.3	12.7	*Potential:* agricultural and commercial open space
38	12	6.2	12.4	*Potential:* agricultural land
39	34	6.1	12.2	*Limited:* existing wetland surrounded by large lot residential
40	33	6.0	11.9	*Potential:* open space north of industrial area
41	48	5.8	11.6	*Potential:* agricultural land
42	25	5.7	11.5	*Potential:* open space
43	9	5.7	11.4	*Limited:* close proximity to large lot development
44	29	5.6	11.3	*Limited:* close proximity to large lot development
45	21	5.4	10.7	*Potential:* open space
46	41	5.2	10.4	*Potential:* open space
47	10	5.2	10.3	*Potential:* open space
48	11	5.2	10.3	*Limited:* existing golf course
49	28	5.1	10.3	*Limited:* existing wetland
50	38	5.0	10.0	*Limited:* existing golf course
		661.7	**1325.9**	

*Documented in LCSMC 1994 Flint Creek Watershed Management Plan

3.2 Condition of Sub Watersheds and Lakes

As noted earlier, the Flint Creek Watershed consists of three subwatersheds:

1. North Flint Creek subwatershed includes several major lakes: Lake Zurich, Echo Lake, Honey Lake, Grassy Lake, Dogbone Lake and Flint Lake. This entire area is located within Lake County. North Flint Creek is on-line with all of these lakes except Flint (which it feeds), Honey (on-line of a tributary), and Dogbone Lakes (on-line of a tributary), which are primarily fed by smaller drainage systems and surrounding watersheds. North Flint Creek subwatershed is 10.7 square miles.

2. Baker's Lake, Columbus Park Lake, Lake Louise, and Deer/Meadows Lake are located in the Flint Creek (east branch) subwatershed. Baker's Lake and Lake Louise are on-line with the creek in Cook County and Lake County respectively. Flint Creek (east branch) covers 8.5 square miles.

3. LaBuy's Lake, Hawley Lake, Keene Lake, and Hawthorne Lake are all located within Flint Creek (main stem) subwatershed and are on-line with the creek in Cook County. Crabtree Lake, Stephanie Lake, and Heather Lake are also located within Cook County but are hydrologically connected to Flint Creek's main stem via surface or tile drainage. This main stem of Flint Creek covers 17.3 square miles.

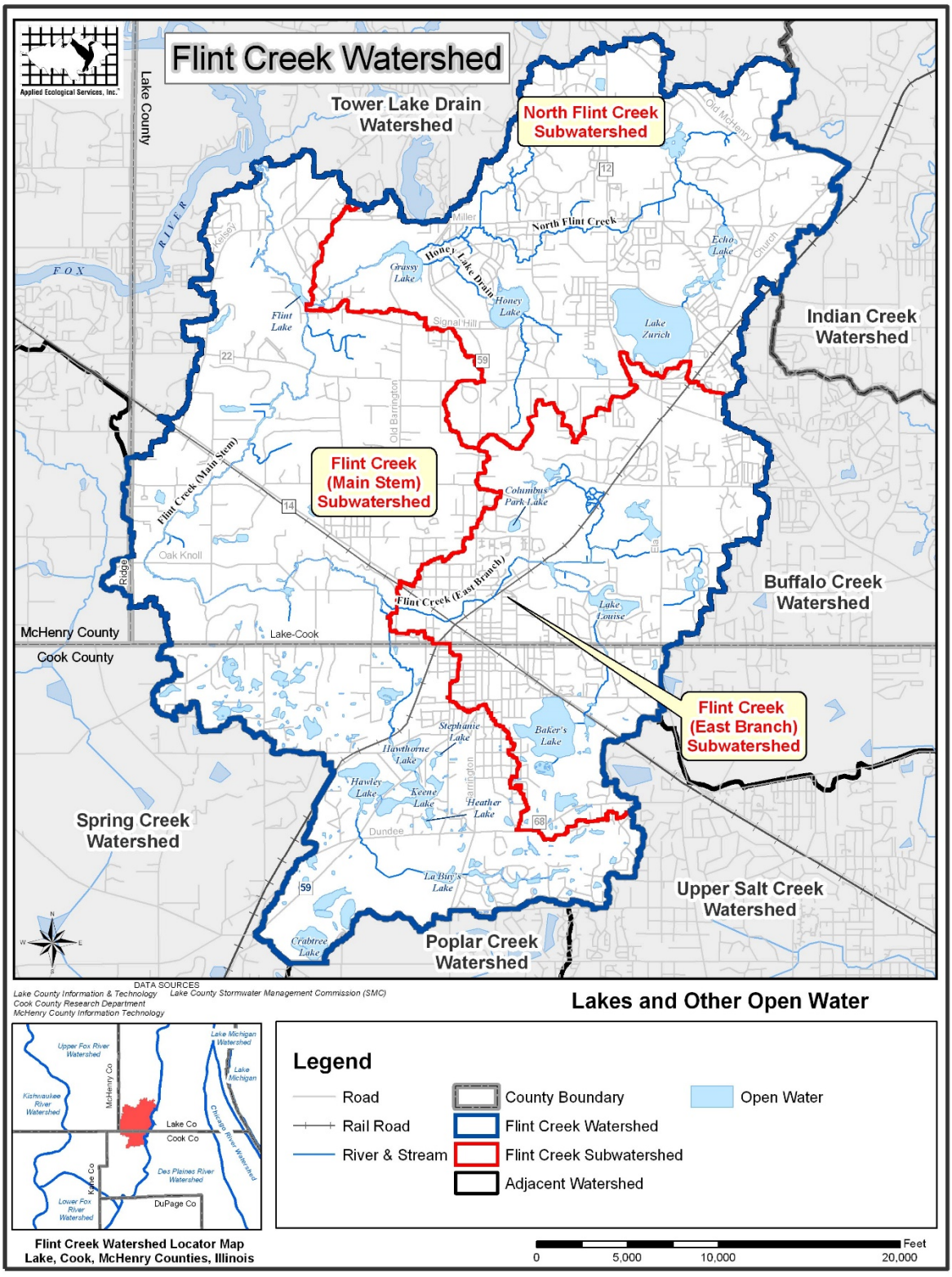


Figure 31: Lakes and Other Open Water

Flint Creek watershed contains 26 SMUs. According to the CWP, SMUs should generally fall between 0.05 and 0.5 square miles but can be larger depending on the location of small subwatershed divides. This size allows for detailed analysis and recommendations for site specific Best Management Practices (BMPs). Table 19 presents each SMU and acreage organized by each of the three subwatersheds. Figure 30 depicts the location of each subwatershed and SMU boundaries delineated within the larger Flint Creek watershed.

Table 16. Subwatershed Management Units and acreage organized by subwatershed.

Subwatershed	SMU #	Total Acres	Total Square Miles
Flint Creek Main Stem	FCM1	1,108	1.7
Flint Creek Main Stem	FCM2	1,203	1.8
Flint Creek Main Stem	FCM3	1,057	1.7
Flint Creek Main Stem	FCM4	1,653	2.6
Flint Creek Main Stem	FCM5	1,232	1.9
Flint Creek Main Stem	FCM6	830	1.3
Flint Creek Main Stem	FCM7	1,176	1.8
Flint Creek Main Stem	FCM8	917	1.4
Flint Creek Main Stem	FCM9	748	1.2
Flint Creek Main Stem	FCM10	1,146	1.8
Flint Creek Main Stem Subtotal		**11,070**	**17.3**
North Flint Creek	FCN1	675	1.1
North Flint Creek	FCN2	1,253	2.0
North Flint Creek	FCN3	1,408	2.2
North Flint Creek	FCN4	1,171	1.8
North Flint Creek	FCN5	710	1.1
North Flint Creek	FCN6	1,079	1.7
North Flint Creek	FCN7	568	0.9
North Flint Creek Subtotal		**6,864**	**10.7**
Flint Creek East Branch	FCE1	369	0.6
Flint Creek East Branch	FCE2	650	1.0
Flint Creek East Branch	FCE3	1,115	1.7
Flint Creek East Branch	FCE4	481	0.8
Flint Creek East Branch	FCE5	902	1.4
Flint Creek East Branch	FCE6	241	0.4
Flint Creek East Branch	FCE7	679	1.1
Flint Creek East Branch	FCE8	719	1.1
Flint Creek East Branch	FCE9	284	0.4
Flint Creek East Branch Subtotal		**5,440**	**8.5**
Watershed Total		**23,374**	**36.5**

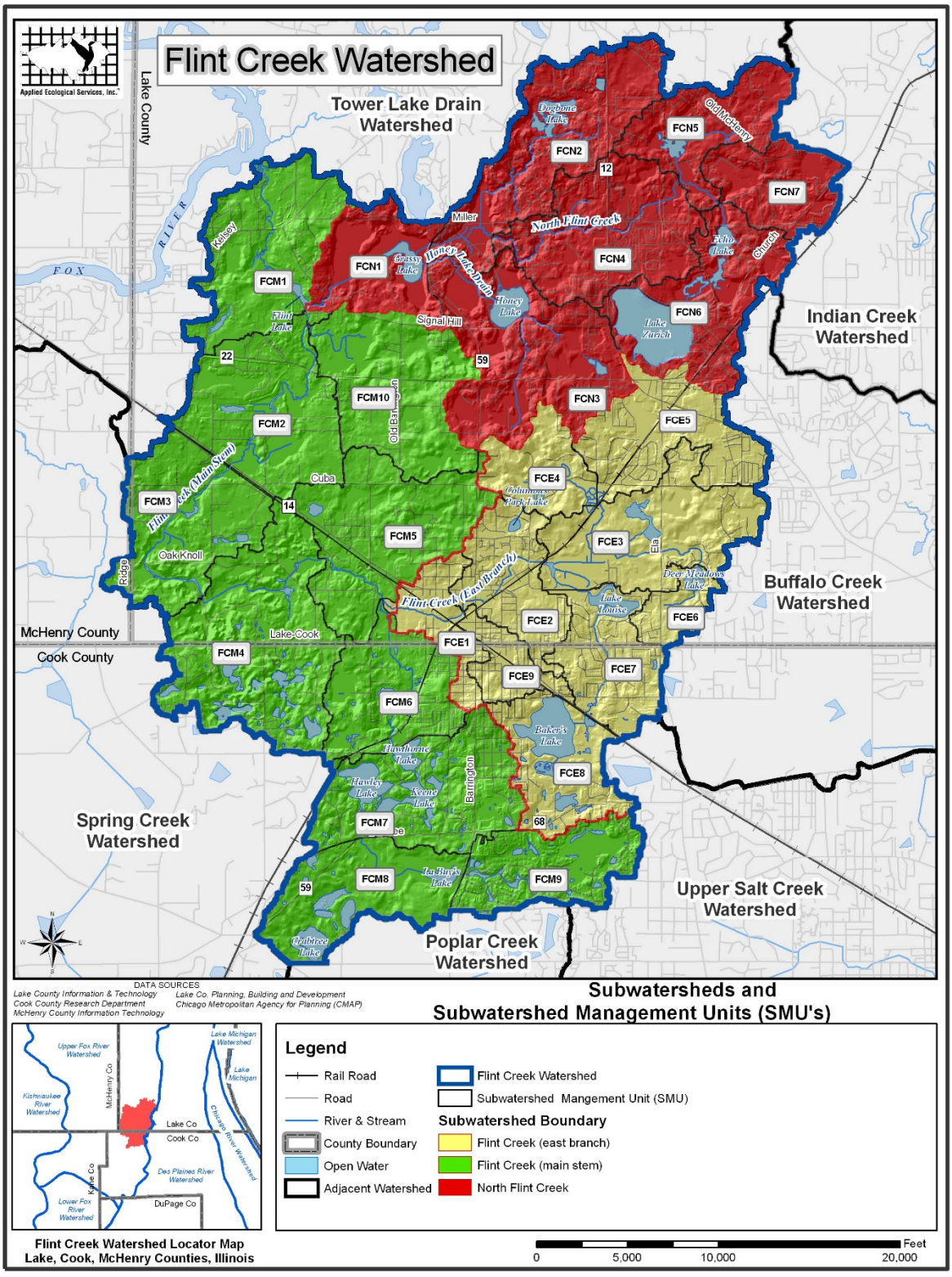


Figure 32: Subwatersheds and Subwatershed Management Units (SMU's)

The headwaters of Flint Creek (main stem) originate in Cook County in a series of detention ponds east of Barrington Road in the far southeast corner of the watershed. From here, a stream channel flows west under Barrington Road and into LaBuy's Lake located within the Crabtree Nature Preserve in the southern portion of the watershed (Figure 30). Water leaving the lake flows to the west before turning north and entering the Hawley, Keene, and Hawthorne Lake chain. Water exits this chain of lakes on the north side of Hawley Lake and flows north where it enters Lake County at Lake-Cook Road and eventually joins Flint Creek (east branch) just northwest of Barrington.

Flint Creek (east branch) originates at Baker's Lake in Cook County where it generally flows north across Lake-Cook Road into Lake Louise (Figure 30). The stream channel that exits Lake Louise flows through the southeast portion of Cuba Marsh where it joins several smaller tributaries that drain the marsh and Deer Lake/Meadows Lake east of Ela Road. At this point Flint Creek (east branch) turns to the west and flows through heavily developed areas in Barrington before joining Flint Creek (main stem).

After Flint Creek (main stem) and Flint Creek (east branch) converge, the main stem continues to the west through large lot residential areas before turning back to the north through additional large lot development and extensive wetland complexes managed by Citizens for Conservation (CFC) (Figure 30). The main stem eventually enters Flint Lake where it joins North Flint Creek and continues as the main stem of Flint Creek for approximately 1.7 miles to the Fox River. Much of this final 1.7 mile reach to the Fox is located within the Grassy Lake Forest Preserve.

The headwaters of North Flint Creek originate within the surrounding watershed to Lake Zurich (Figure 30). Water leaving Lake Zurich to the north flows for a short distance through wetland complexes before entering Echo Lake. From Echo Lake, the stream turns to the west where it flows for several miles through varying residential and open space land uses before entering Grassy Lake. Wynstone tributary enters North Flint Creek just upstream from Grassy Lake. It drains Dogbone Lake (formerly known as Sheree Lake) and its surrounding watershed within the Wynstone Golf Course. Another small tributary called Honey Lake Drain enters Grassy Lake from the east. Honey Lake Drain actually begins just southeast of Honey Lake as two small feeder streams to the lake. Water exiting Grassy Lake to the west again forms the North Flint Creek stream channel that flows west for another mile before entering Flint Lake where it joins Flint Creek (main stem).

In 1991, the Illinois Water Survey determined Flint Creek to be the most degraded of the Fox River's tributaries. The report also stated that Flint Creek possessed above average potential for restoration. At that time, Flint Creek's problems arose from a variety of causes. Residue from road and parking lot salts, fertilizers, pesticides and other chemicals had found their way into the creek. The deep rooted native plants which had originally stabilized the banks, had long been supplanted by shallow rooted, non-native species, such as reed canary grass. At many points, shallow rooted buckthorn, a very aggressive non-native, had shaded out ground vegetation, leaving banks open to further erosion and collapse. Silt had nearly filled Flint Lake. Restoration would be a long, necessarily persistent effort.

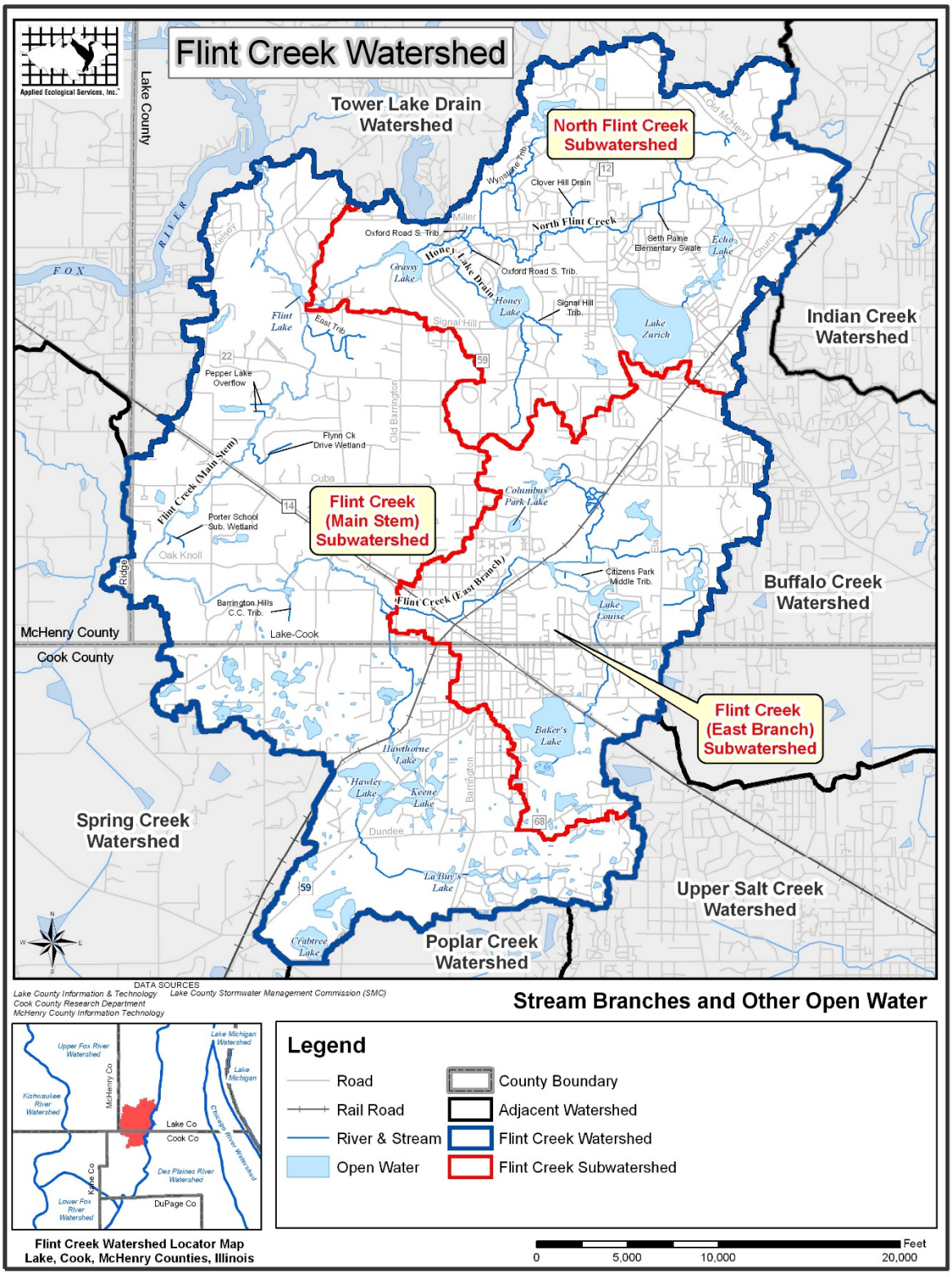


Figure 33: Stream Branches and Other Open Water

While huge strides have been made, there was still much to do. In the summer of 2006, the Lake County Stormwater Management Commission (LCSMC) completed a stream inventory for the Flint Creek watershed. Approximately 24 stream miles were assessed based on dividing major streams into 25 smaller stream reaches (Figure 32 on page 84). Stream reaches are defined as stream segments having fairly homogenous hydraulic, geomorphic, riparian cover, and land use characteristics. Approximately 8.5 miles and 11 reaches comprised of wetlands and lakes connecting stream reaches were not assessed in the stream inventory. Methodology included walking the stream reaches, collecting measurements, taking photos, and noting in-stream, streambank, and riparian corridor characteristics. A Global Positioning System (GPS) was used to locate points of interest to be included in a Geographical Information System (GIS) database. Appendix C contains a detailed summary report of stream reach characteristics in the watershed. Note: The LCSMC Stream Inventory Summary Report uses slightly different nomenclature related to major streams in the watershed as is used throughout this watershed report. First, this report refers to the stream that begins near Crabtree Nature Preserve and flows to the Fox River as Flint Creek (main stem). LCSMC refers to the 1.7 mile stretch between Flint Lake and the Fox River as the main stem. Also, this report refers to North Flint Creek as the entire reach of stream from Flint Lake to Lake Zurich. The LCSMC inventory refers to the reach between Grassy Lake and Flint Lake as the Grassy Lake Drain and the reach between Grassy Lake and Lake Zurich as North Flint Creek.

The major stream characteristics inventoried include:

- Channel conditions (physical size, streambank erosion, sediment accumulation, debris load, riffle-pool development, and hydraulic structures) and discharge points (channel and stormsewer outfall sizes and locations),
- Riparian corridor (land use and vegetated buffer width and composition),
- Aquatic habitat (substrate composition, in-stream fish cover, turbidity, and filamentous algae).

Streambank Erosion

Isolated streambank erosion along Reach FC02 between Kelsey Road and Flint Lake

Streambank erosion and its associated sediment accumulation and transportation downstream can cause significant water quality problems in any watershed. Degree of erosion usually depends on the amount of water **scouring a channel**, the steepness of the banks, and the vegetation that is holding the banks in place. A significant find in LCSMC's stream inventory is that although **some severe erosion can be found in isolated areas, no stream reach exhibits severe erosion along its entire length**. This is a surprising find in light of known flashy stream conditions that occur following significant rain events. According to the stream inventory, 15 of 25 (60%) reaches are

experiencing low erosion while 8 reaches (32%) are moderately eroded. Five of these moderately eroded reaches occur along North Flint Creek where **moderate channelization** is also observed. Reach FC21 between Hawley and LaBuy's Lakes appears to be experiencing moderate erosion, likely due in part to highly channelized banks. Two other moderately eroded reaches are found along Flint Creek's main stem (FC04 & FC08). All moderately eroded stream reaches provide excellent opportunities for streambank stabilization projects. The location and severity of streambank erosion in the watershed is summarized in Table 17 and depicted on Figure 34.

Table 17. Summary of streambank erosion in the streams of the Flint Creek Watershed.

Stream	Total Stream Length Assessed (ft)	Total Low or No Erosion (ft/%)		Total Moderate Erosion (ft/%)		Total High Erosion (ft/%)	
Flint Creek (main stem)	63,500	55,300	87%	8,200	13%	0	0%
Flint Creek (east branch)	17,700	17,700	100%	0	0%	0	0%
North Flint Creek & Honey Lake Drain	45,000	13,400	30%	31,600	70%	0	0%
Totals	**126,200**	**86,400**	**68%**	**39,800**	**32%**	**0**	**0%**

Source: LCSMC's Stream Inventory for Flint Creek watershed.

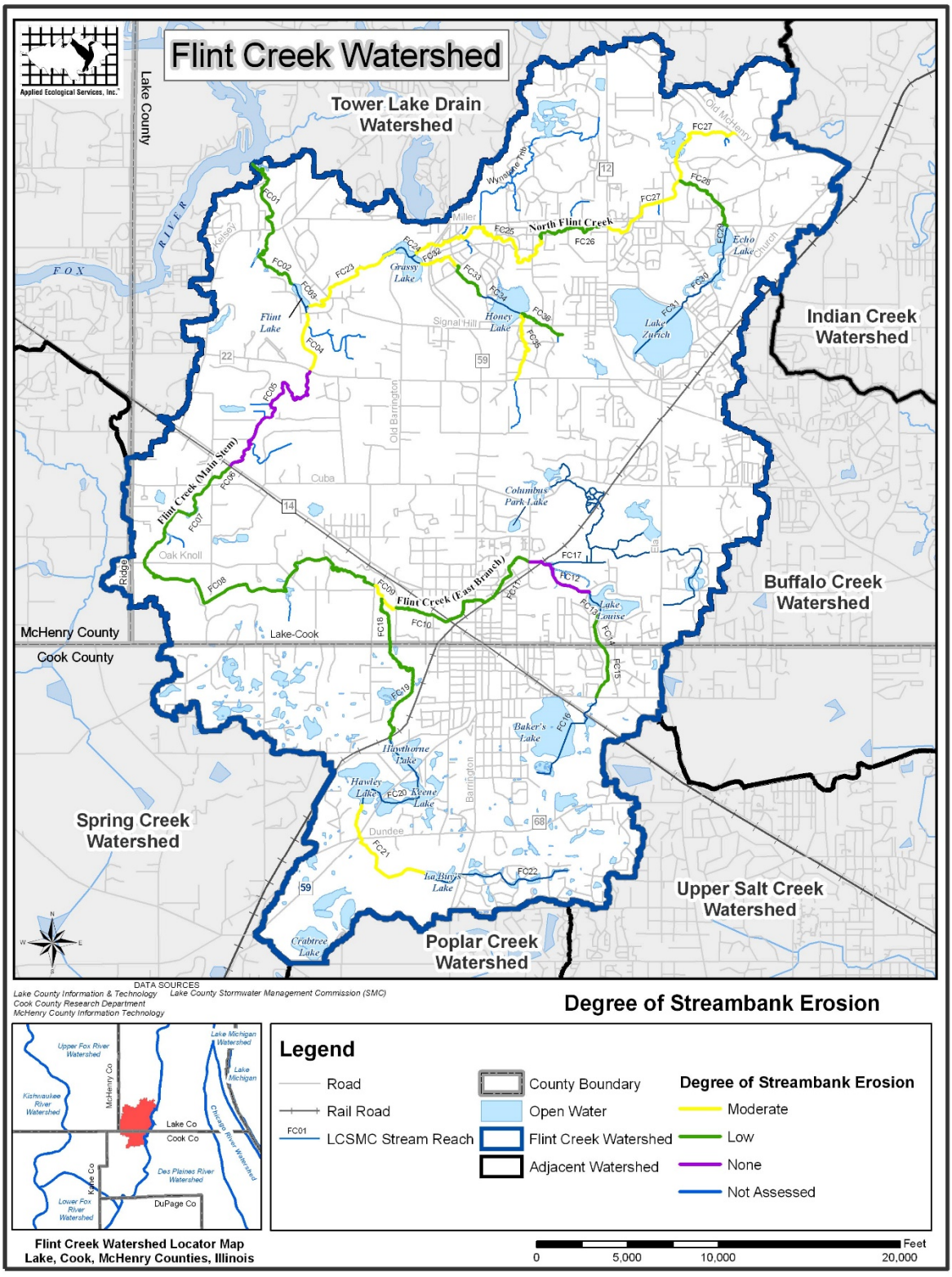


Figure 34: Degree of Streambank Erosion

Sediment Accumulation

Although sediment accumulation and transport is a naturally occurring process in meandering streams, the amount of deposition can be problematic as a result of human activity. In most cases, sediment accumulation in streams is associated with streambank erosion and gradient of the stream. Higher gradient streams tend to transport sediment more readily than lower gradient streams. However, other factors such as debris loads (blockages) and impoundments also cause sedimentation. Sedimentation negatively impacts streams because fine silty particles settle out of the water column and smother the natural gravel or cobble substrates thereby reducing habitat quality for fish and macroinvertebrates. According to LCSMC's stream inventory, all stream reaches in the watershed experience some degree of sediment accumulation. Eighty-four percent (21 of 25 reaches) have moderate or high degrees of accumulation (Figure 35). All of the high sediment accumulation is found on Flint Creek's main stem. FC21, which also is highly channelized and has moderate streambank erosion, exhibits high sediment accumulation. Table 18 below summarizes sediment accumulation in the streams of the watershed.

Table 18. Summary of sediment accumulation in the streams of the Flint Creek Watershed.

Stream	Total Stream Length Assessed (ft)	Total Low or No Sediment (ft/%)		Total Moderate Sediment (ft/%)		Total High Sediment (ft/%)	
Flint Creek (main stem)	63,500	4,600	7%	26,900	42%	32,000	50%
Flint Creek (east branch)	17,700	5,000	28%	12,700	72%	0	0%
North Flint Creek & Honey Lake Drain	45,000	4,100	9%	40,900	91%	0	0%
Totals	**126,200**	**13,700**	**11%**	**80,500**	**64%**	**32,000**	**25%**

Source: LCSMC's Stream Inventory for Flint Creek watershed.

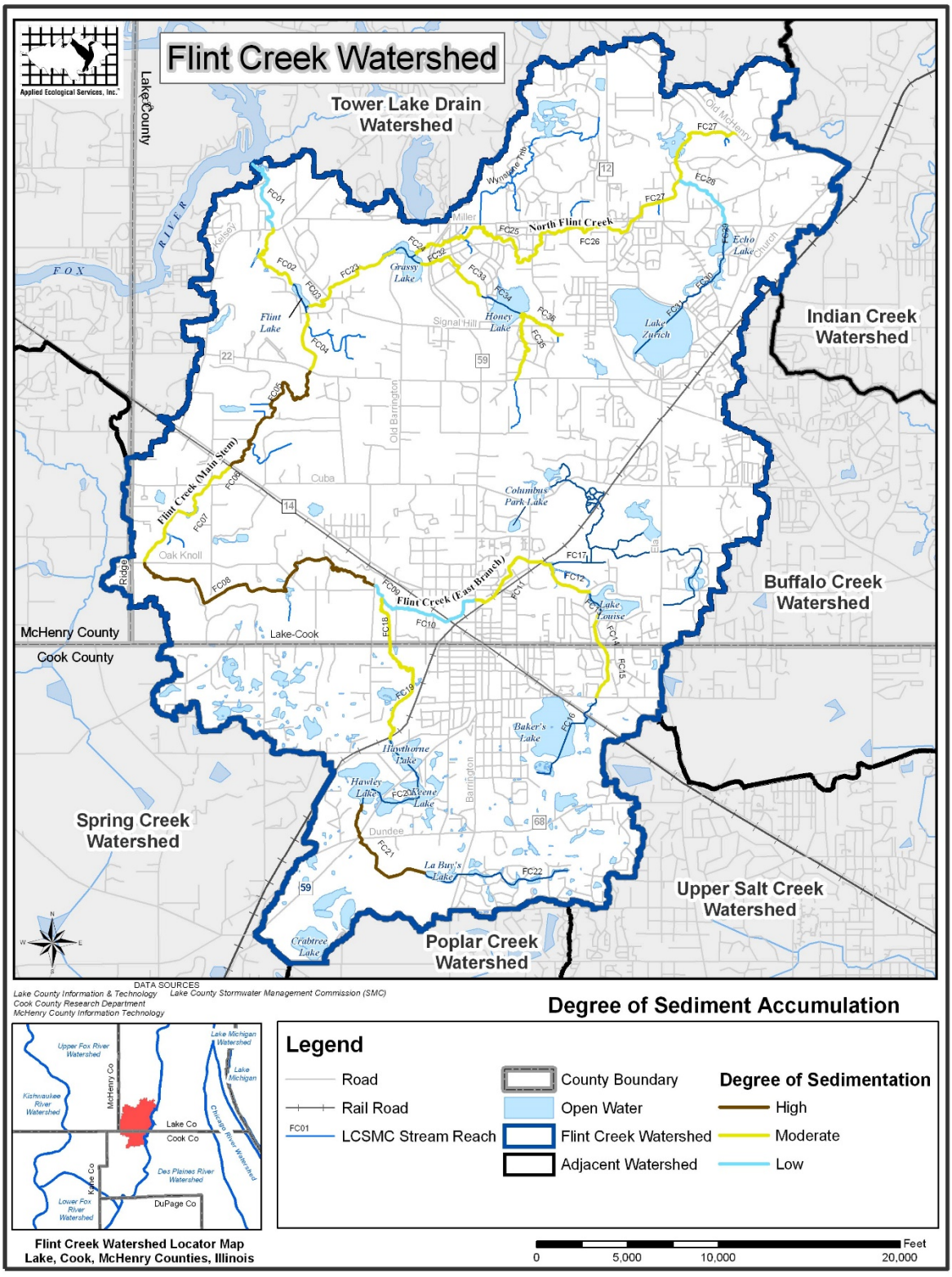


Figure 35: Degree of Sediment Accumulation

Debris Loads

Natural and human-made debris loads refer to debris accumulation and blockages, both in-stream and overbank, that can alter the natural flow regime in streams and contribute to streambank erosion, sediment accumulation, and backwater flooding. Reaches that failed the LCSMC's in-stream or overbank test were usually characterized as having large accumulations of lodged debris across the stream channel and over the banks. Problematic debris loading was identified in 14 of the 25 (56%) inventory reaches and appears to be scattered throughout the stream reaches in the watershed (Figure 35). Debris load removal is a relatively easy stream maintenance issue in which all jurisdictions in the watershed should participate and adopt a general maintenance program. Caution should be taken, however, when removing debris jams because not all are considered problematic. In fact, many provide excellent habitat for aquatic fauna. The American Fisheries Society published "*American Fisheries Society Obstruction Removal Guidelines*" (SRGC 1983) (Appendix D). These guidelines employ debris removal techniques based on the severity and type of obstruction. Additional stream maintenance/ monitoring guidelines are included in Appendix E of this report. Table 19 below summarizes debris loading in the watershed found in 2006. North Barrington has made clearing debris loads a major focus for some of their stream maintenance procedures, and it continues to be a major initiative in 2018.

Debris jam in Reach FC02 between Kelsey Road and Flint Lake

Table 19. Summary of debris loading in the streams of the Flint Creek Watershed.

Stream	Total Stream Length Assessed (ft)	Problematic Debris Loading Present (ft/%)		Problematic Debris Loading Not Present (ft/%)	
Flint Creek (main stem)	63,500	33,700	53%	29,800	47%
Flint Creek (east branch)	17,700	12,300	69%	5,400	31%
North Flint Creek & Honey Lake Drain	45,000	30,200	67%	14,800	33%
Totals	126,200	76,200	60%	50,000	40%

Source: LCSMC's Stream Inventory for Flint Creek watershed.

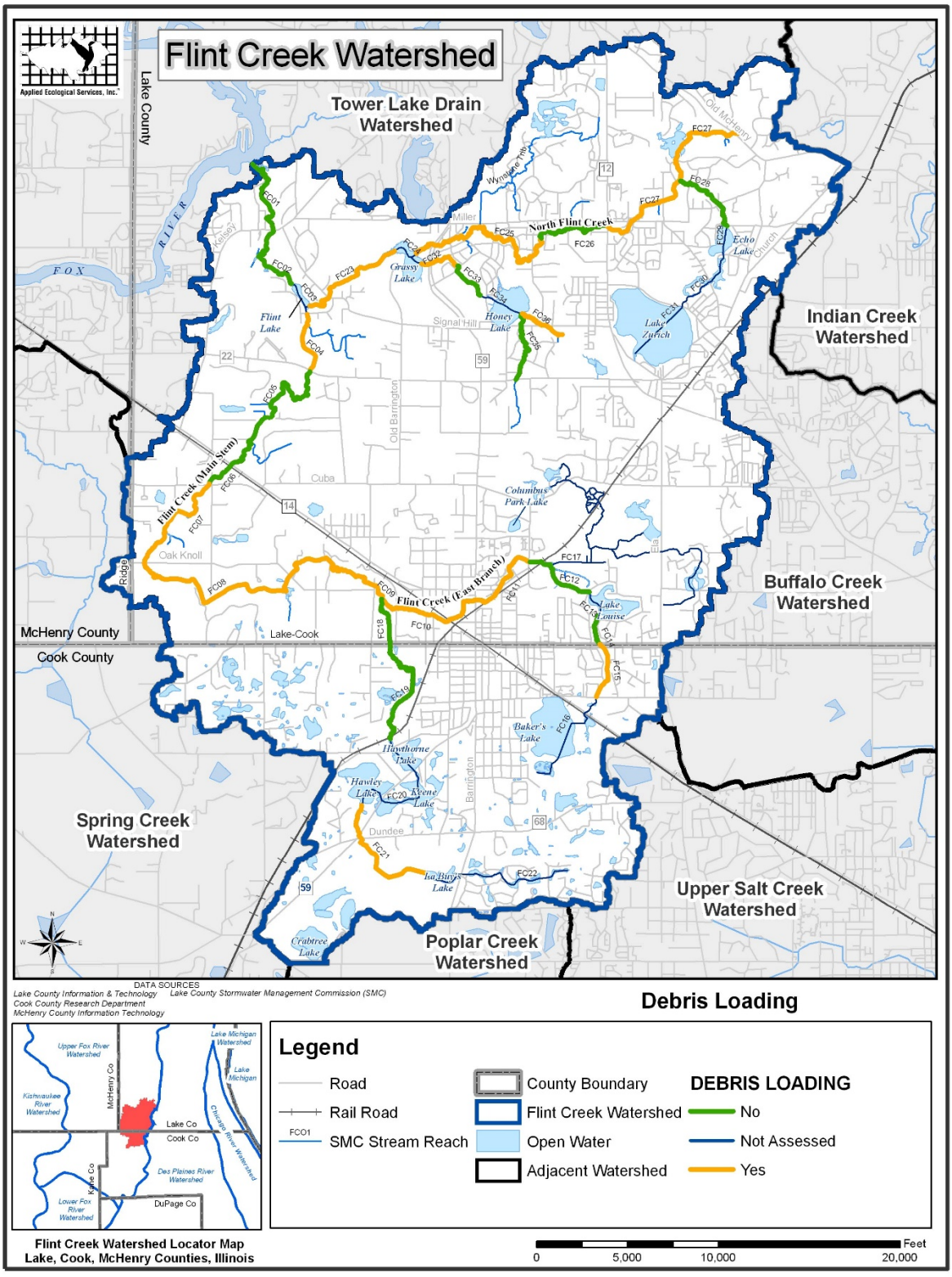


Figure 36: Debris Loading

Hydraulic Structures

Problematic hydraulic structure (bridge) crossing Reach FC35

Hydraulic structures are objects in the stream channel that alter the natural flow by constricting, diverting, redirecting, or damming. Hydraulic structures generally include all bridges, culverts, dams, weirs, and fences that span the channel. These structures may cause flooding, streambank erosion, and impede movement of fish and other aquatic fauna up or downstream. In some cases, poorly constructed hydraulic structures lead to debris jams that further restrict or inhibit flow. Dams can be extremely detrimental to the natural processes of streams. They impound water and act as migration impediments for aquatic fauna. LCSMC's stream inventory noted 136 hydraulic structures in the Flint Creek watershed including 89 bridges, 27 culverts, 12 dams, 2 weirs, 5 fences, and one "other" type (Table 20). Far more than half (65%) of the noted hydraulic structures are bridges. Of these, 43 are wooden foot bridges. LCSMC reports that a number of the wooden foot bridges do not appear to be in use and could be removed. Of the 136 structures documented by LCSMC, 11 are considered problematic hydraulic structures that are shown by stream reach on Figure 36 and addressed in the Action Plan section of this report. LCSMC did not GPS the location of each individual structure. However, plan implementers can contact the LCSMC for locations of these structures. The majority of the problematic hydraulic structures are located along Flint Creek's main stem between Lake-Cook Road and Flint Creek's junction with North Flint Creek.

Table 20. Hydraulic structures categorized by stream branch in the Flint Creek watershed.

Hydraulic Structures	Entire Flint Creek Watershed Totals	Flint Creek (main stem)	Flint Creek (east branch)	North Flint Creek
Bridges	89	31	18	40
Culverts	27	3	7	17
Dams	12	3	4	5
Weirs	2	0	1	1
Fence	5	1	2	2
Other	1	1	0	0
Total Hydraulic Structures	136	38	32	65
Problem Hydraulic Structures	11	4	2	5

Source: LCSMC's Stream Inventory for Flint Creek watershed.

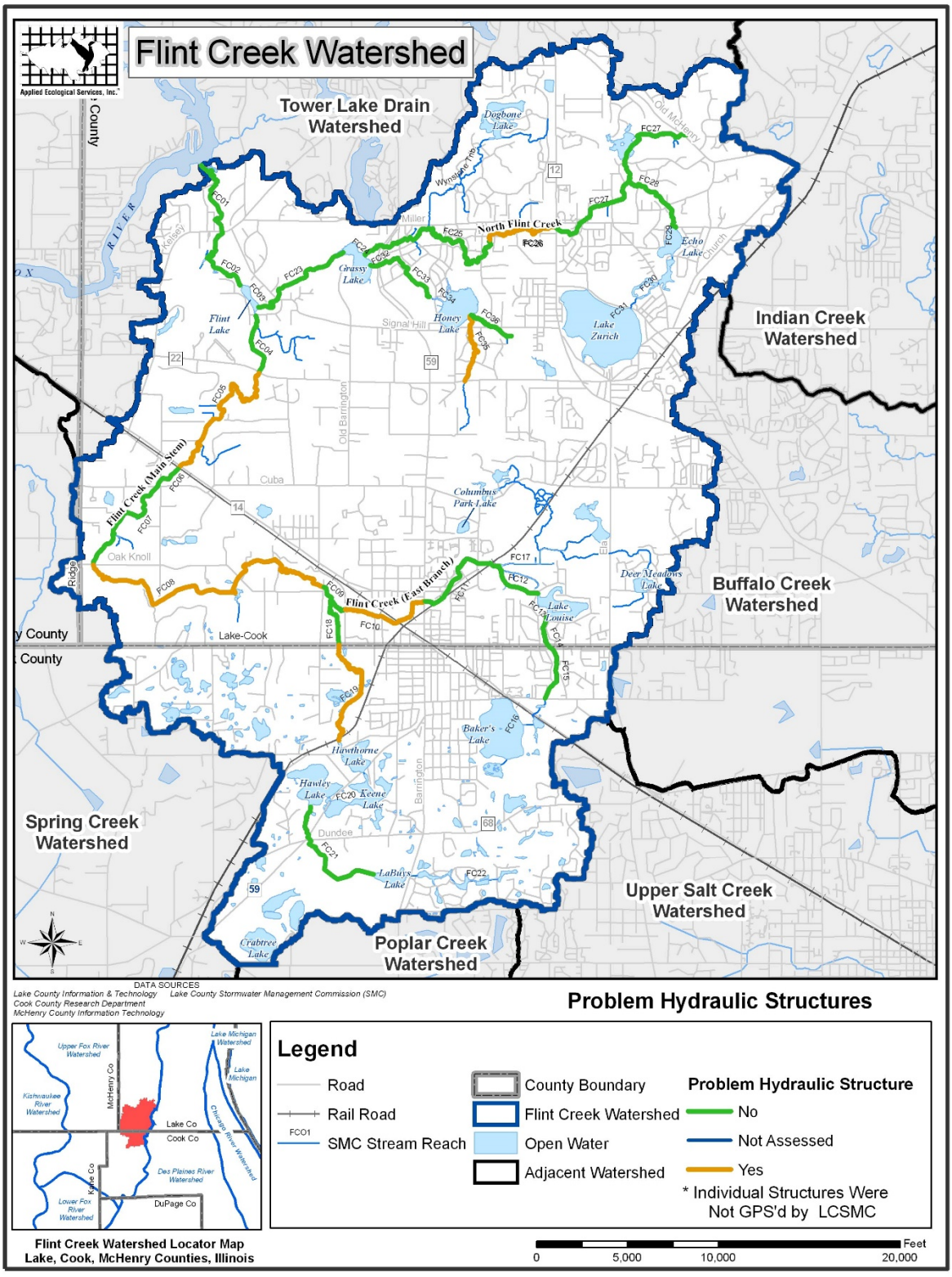


Figure 37: Problem Hydraulic Structures

Riparian Corridor (Buffers)

High quality riparian corridor along Reach FC05 north of Route 14

Riparian corridors buffer waterbodies by filtering pollutants from runoff and by providing beneficial wildlife habitat. Land use within 100 feet of either side of the stream channel was assessed during LCSMC's stream inventory by summarizing the percentage of land falling under six land use categories including residential, commercial/ industrial, recreational, agricultural, open space/vacant, and other. Much of the riparian corridor (approximately 50%) is open space and preserved in public ownership. About 40% is residential and an additional 12% is recreational (mostly golf courses). Vegetation along the streambanks is generally not diverse and dominated by a few species such as buckthorn and reed canary grass. Documentation records for each stream reach were assessed to identify areas needing buffer improvements (Figure 38). All reaches exhibiting no or small buffer widths according to LCSMC's inventory were categorized as high priority for buffer improvements. Reaches with moderate or high buffer widths were categorized as low or medium priority depending on the amount of impacts and the general condition of the vegetation community. Riparian buffer improvements are generally needed most along Flint Creek (east branch) through the Barrington Area and along North Flint Creek and Honey Lake Drain. These areas provide opportunities for improving buffer quality. Recommendations for improving buffer quality are located in the Action Plan section of this report. Table 21 below summarizes the need for riparian corridor improvements in the watershed.

Table 21. Summary of riparian corridor conditions (buffer) in the Flint Creek Watershed.

Stream	Total Stream Length Assessed (ft)	Low or No Need for Improvement (ft/%)		Medium Need for Improvement (ft/%)		High Need for Improvement (ft/%)	
Flint Creek (main stem)	63,500	49,500	78%	10,700	17%	3,300	5%
Flint Creek (east branch)	17,700	5,400	31%	4,300	24%	8,000	45%
North Flint Creek & Honey Lake Drain	45,000	6,000	13%	32,400	72%	6,600	15%
Totals	126,200	60,900	48%	47,400	38%	17,900	14%

Source: LCSMC's Stream Inventory for Flint Creek watershed.

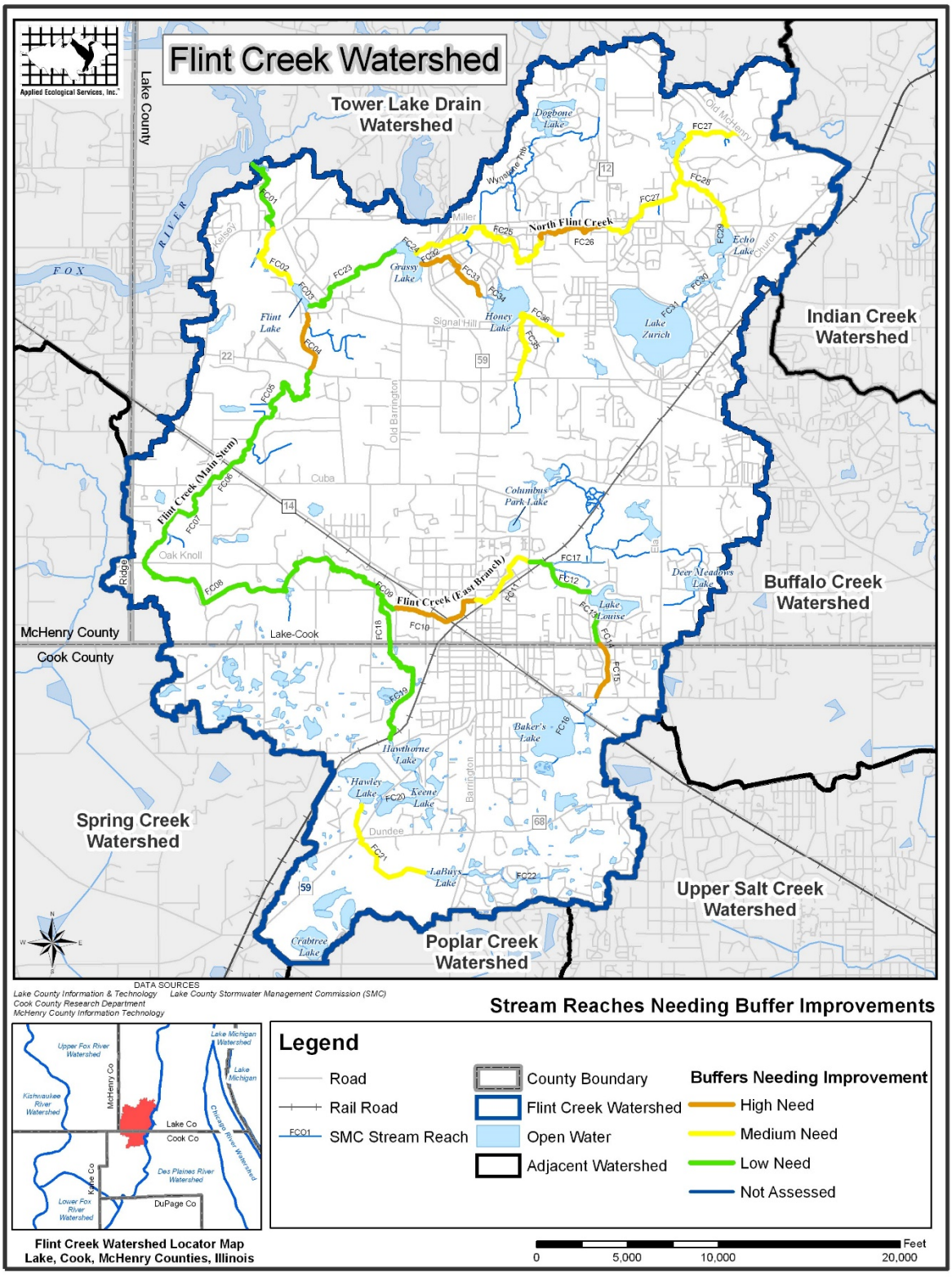


Figure 38: Stream Reaches Needing Buffer Improvements

Detail on Impervious Cover by SMU

In 2007, Impervious cover for each SMU was calculated based on existing land use/land cover classifications. Six SMUs are initially classified as Sensitive, 13 as Impacted, and 7 as Non-Supporting. The majority of the Sensitive SMUs are located in the western half of the watershed in the Villages of North Barrington, Lake Barrington, and Barrington Hills. These areas are primarily dominated by large lot residential and open space areas such as forest preserve and other protected land. Impacted SMUs are the most abundant and scattered throughout the watershed. A closer look at land use/land cover in these SMUs reveals mostly small and medium size residential lots with smaller areas of protected open space. All of the 7 Non-Supporting SMUs are located in highly developed areas associated with Barrington and Lake Zurich. These areas not only have dense small lot residential areas but also many retail, commercial, industrial, institutional/government, and office space.

Table 22. Existing impervious cover information for Subwatershed Management Units (SMUs).

Subwatershed	SMU #	Total Acres	Existing Impervious Percentage	Existing Impervious Classification
Flint Creek Main Stem	FCM1	1,108	14.1	Impacted
Flint Creek Main Stem	FCM2	1,203	23.7	Impacted
Flint Creek Main Stem	FCM3	1,057	7.7	Sensitive
Flint Creek Main Stem	FCM4	1,653	7.3	Sensitive
Flint Creek Main Stem	FCM5	1,232	19.4	Impacted
Flint Creek Main Stem	FCM6	830	19.7	Impacted
Flint Creek Main Stem	FCM7	1,176	17.3	Impacted
Flint Creek Main Stem	FCM8	917	2.3	Sensitive
Flint Creek Main Stem	FCM9	748	17.9	Impacted
Flint Creek Main Stem	FCM10	1,146	8.6	Sensitive
Flint Creek Main Stem Subtotal		**11,070**	**13.8**	**Impacted**
North Flint Creek	FCN1	675	7.3	Sensitive
North Flint Creek	FCN2	1,253	15	Impacted
North Flint Creek	FCN3	1,408	16.6	Impacted
North Flint Creek	FCN4	1,171	27.1	Non-Supporting
North Flint Creek	FCN5	710	19.6	Impacted
North Flint Creek	FCN6	1,079	29.5	Non-Supporting
North Flint Creek	FCN7	568	22.8	Impacted
North Flint Creek Subtotal		**6,864**	**19.7**	**Impacted**
Flint Creek East Branch	FCE1	369	48.4	Non-Supporting
Flint Creek East Branch	FCE2	650	34.8	Non-Supporting
Flint Creek East Branch	FCE3	1,115	11.5	Impacted
Flint Creek East Branch	FCE4	481	7.1	Sensitive
Flint Creek East Branch	FCE5	902	37.3	Non-Supporting
Flint Creek East Branch	FCE6	241	22.9	Impacted
Flint Creek East Branch	FCE7	679	27.3	Non-Supporting
Flint Creek East Branch	FCE8	719	12.0	Impacted
Flint Creek East Branch	FCE9	284	56.1	Non-Supporting
Flint Creek East Branch Subtotal		**5,440**	**28.6**	**Non-Supporting**
Watershed Total		**23,374**	**20.7**	**Impacted**

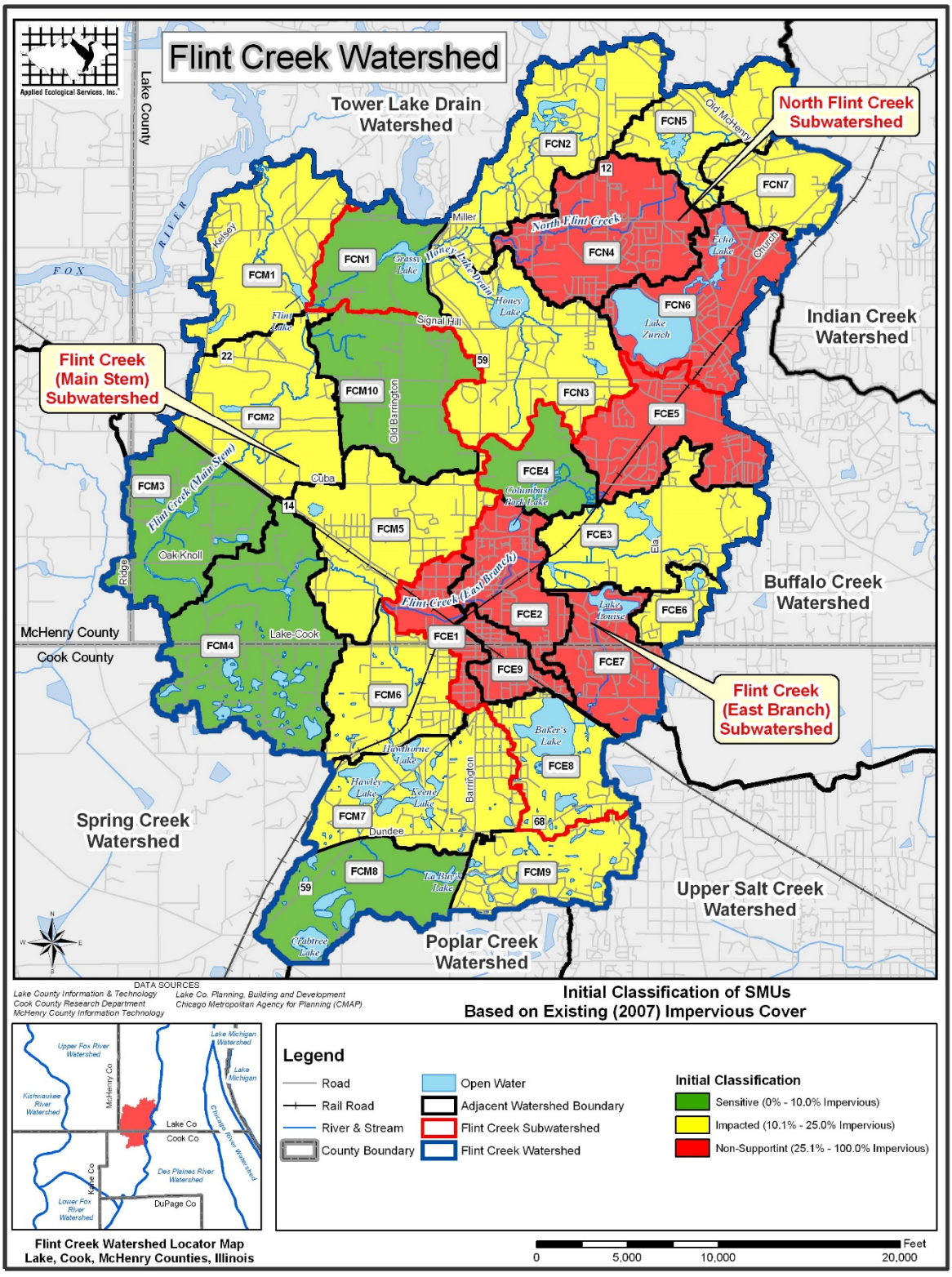


Table 39: Initial Classification on SMUs, Based on Existing Impervious Cover

Projected impervious cover was also evaluated, based on 20-30 year build outs based on comprehensive plans and parcel/zoning information. Similar to the initial classification, a projected classification of Sensitive, Impacted, or Non-Supporting is assigned to each SMU. This view of the future resulted in in 2 Sensitive SMUs, 14 Impacted SMUs, and 10 Non-Supporting SMUs (Table 23; Figure 40). The most significant changes occurred in the western portion of the watershed where four existing Sensitive SMUs are projected to change to Impacted SMUs. These SMUs include FCM3, FCM4, FCM10, and FCE4. This change is projected because the majority of remaining small open space and agricultural land in these watersheds will likely become developed to large lot residential. Also, FCM2, FCE6, and FCN7 are projected to change from impacted to Non-Supporting for many of the same reasons as discussed above. Figure 41 shows the percent change in impervious cover when comparing existing and future projects land use conditions.

Table 23. Projected impervious cover estimates for Subwatershed Management Units (SMUs).

Subwatershed	SMU #	Total Acres	Projected Impervious Percentage	% Change from Existing Impervious	Projected Impervious Classification
Flint Creek Main Stem	FCM1	1,108	22.6	+8.5	Impacted
Flint Creek Main Stem	FCM2	1,203	30.7	+7.0	*Non-Supporting
Flint Creek Main Stem	FCM3	1,057	13.7	+6.0	*Impacted
Flint Creek Main Stem	FCM4	1,653	12.7	+5.4	*Impacted
Flint Creek Main Stem	FCM5	1,232	24.5	+5.1	Impacted
Flint Creek Main Stem	FCM6	830	23.9	+4.3	Impacted
Flint Creek Main Stem	FCM7	1,176	23.1	+5.8	Impacted
Flint Creek Main Stem	FCM8	917	3.3	+1.0	Sensitive
Flint Creek Main Stem	FCM9	748	21.6	+3.7	Impacted
Flint Creek Main Stem	FCM10	1,146	14.4	+5.8	*Impacted
Flint Creek Main Stem Subtotal		**11,070**	**18.1**	**+4.3**	**Impacted**
North Flint Creek	FCN1	675	9.9	+2.6	Sensitive
North Flint Creek	FCN2	1,253	18.6	+3.5	Impacted
North Flint Creek	FCN3	1,408	20.8	+4.2	Impacted
North Flint Creek	FCN4	1,171	29.2	+2.1	Non-Supporting
North Flint Creek	FCN5	710	23.2	+3.6	Impacted
North Flint Creek	FCN6	1,079	29.5	0.0	Non-Supporting
North Flint Creek	FCN7	568	27.6	+4.9	*Non-Supporting
North Flint Creek Subtotal		**6,864**	**22.7**	**+3.0**	**Impacted**
Flint Creek East Branch	FCE1	369	47.9	-0.5	Non-Supporting
Flint Creek East Branch	FCE2	650	38.3	+3.5	Non-Supporting
Flint Creek East Branch	FCE3	1,115	12.5	+0.9	Impacted
Flint Creek East Branch	FCE4	481	12.5	+5.4	*Impacted
Flint Creek East Branch	FCE5	902	37.5	+0.2	Non-Supporting
Flint Creek East Branch	FCE6	241	26.4	+3.5	*Non-Supporting
Flint Creek East Branch	FCE7	679	27.8	+0.5	Non-Supporting
Flint Creek East Branch	FCE8	719	14.1	+2.1	Impacted
Flint Creek East Branch	FCE9	284	54.5	-1.6	Non-Supporting
Flint Creek East Branch Subtotal		**5,440**	**30.2**	**+1.6**	**Non-Supporting**
Watershed Total		**23,374**	**23.7**	**+3.0**	**Impacted**

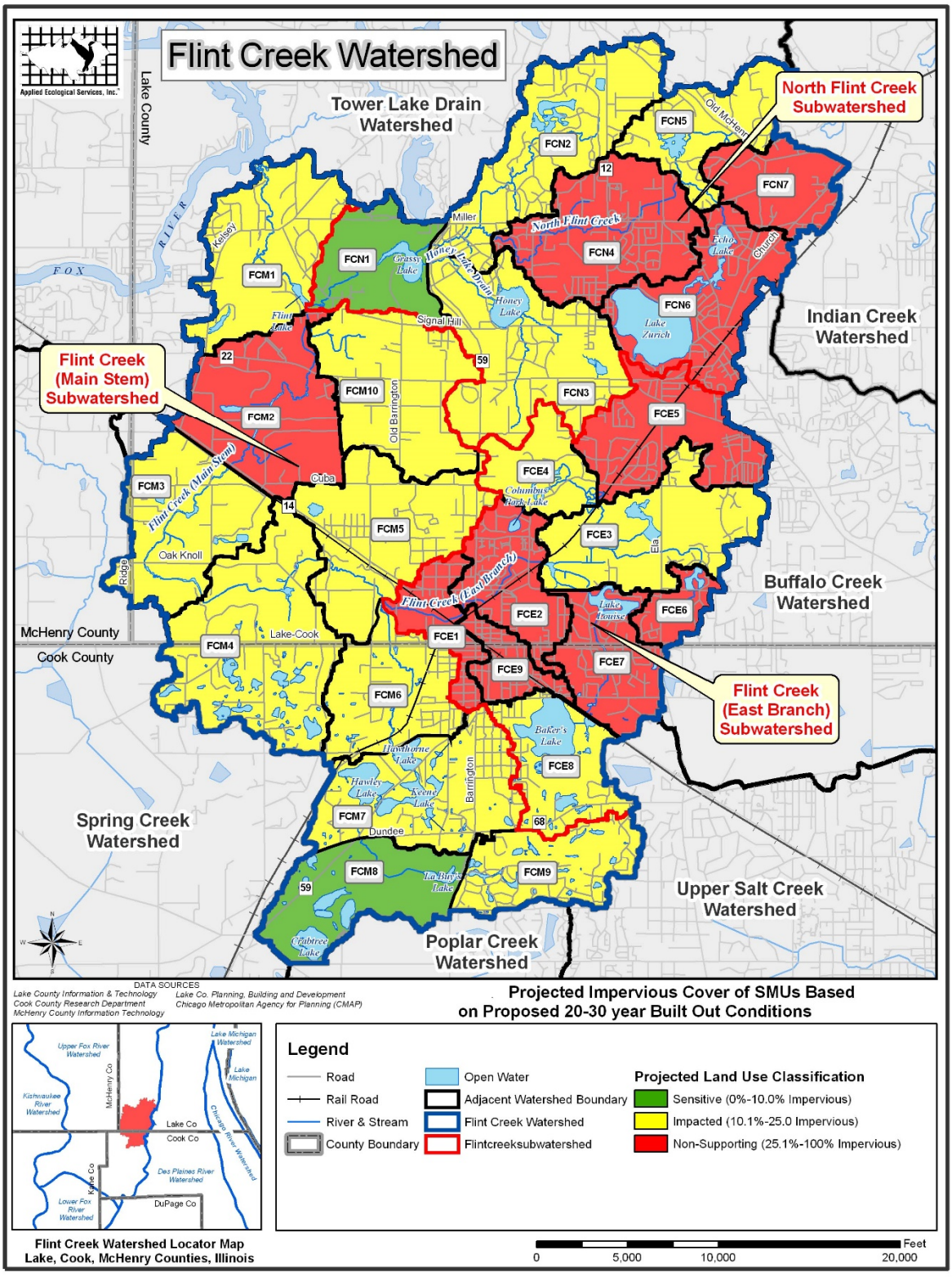


Figure 40: Projected Impervious Cover of SMUs Based on Proposed 20-30 Year Build Out

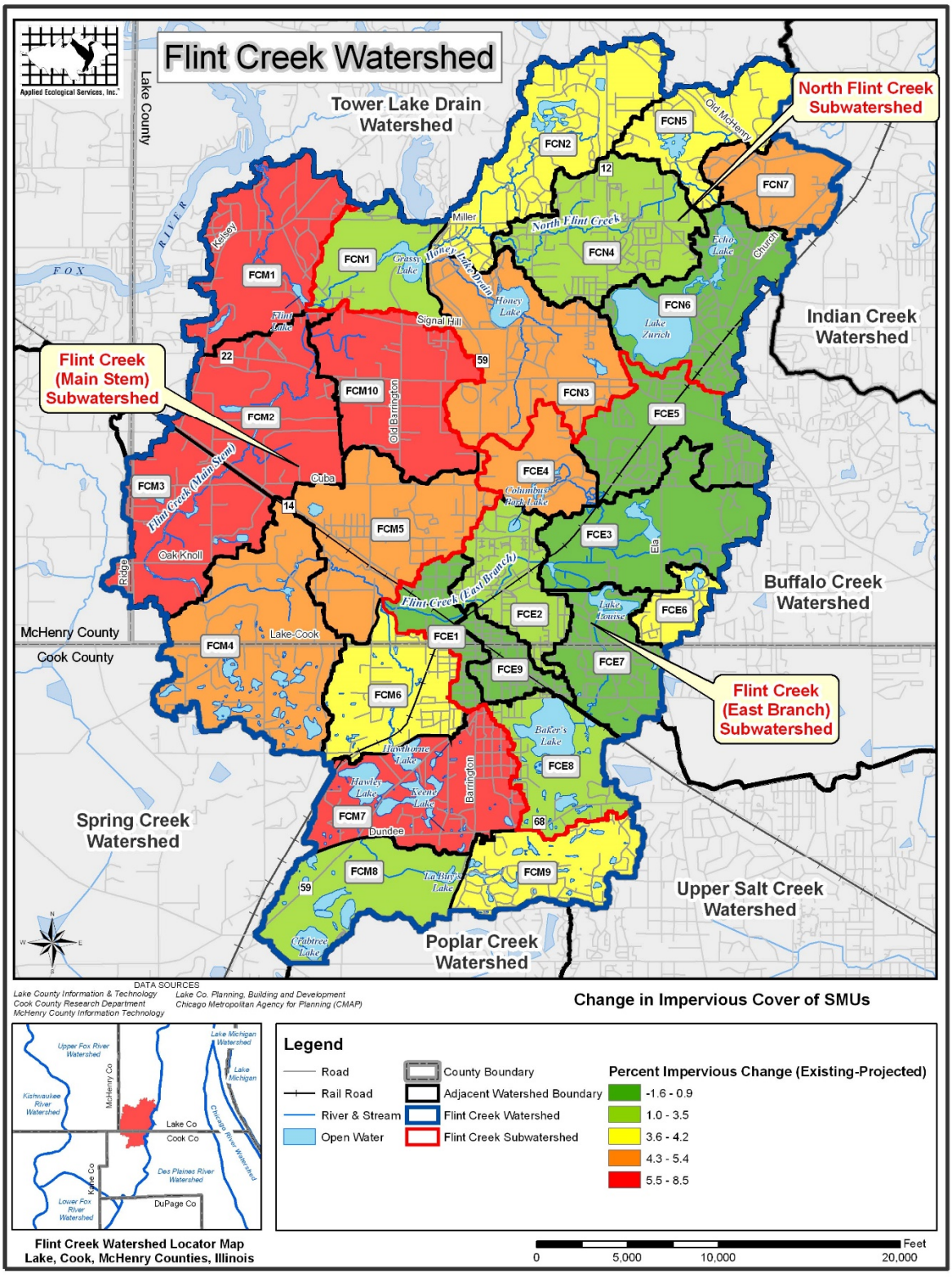


Figure 41: Change in Impervious Cover of SMUs

Aquatic Habitat

Aquatic habitat is the last of the three stream characteristics assessed during LCSMC's stream inventory. Stream substrate, in-stream fish cover, and water quality indicators were assessed to reflect the quality of habitat. Habitats with silt free substrates, good water quality indicators, and in-stream cover are important to macroinvertebrates and fish. The inventory found that the composition of fine sediments (silt, clay, & organic matter) is relatively the same as larger sediments (sand, gravel, and cobble). No substrate type dominates any one reach except for Reach FC01 at the mouth of the Fox River where cobble is the dominant substrate type.

Poor water quality and algal growth along Reach FC10 just west of Route 59

Water quality was assessed by visually inspecting and documenting turbidity, grease/oil in water column, and presence of filamentous algae. Problematic turbidity was noted in only three stream reaches (FC05, FC06, and FC23) during base flow conditions. Carp populations were noted in each of these three reaches and likely were the cause of turbidity. Grease and oil were observed in nearly half of the Flint Creek watershed stream reaches. Residential and commercial/industrial land uses drained directly by pipes to the stream are likely the cause. Filtering of these substances needs to occur prior to water entering the stream system via vegetated swales and naturalized detention areas. Algae is not a significant problem within the streams of the watershed but some areas such as golf courses, residential neighborhoods, and other urban areas were more problematic than others.

Lake County's stream inventory documents the presence or absence of 8 in-stream habitat types within each stream reach that are important to fish and communities. These include undercut banks, pools greater than 28 inches deep, macrophytes, logs, overhanging vegetation, rootwads, boulders, and backwaters. Available habitat types within each reach were used to develop a rating system for mapping good, moderate, and poor-quality habitat stream reaches within the Flint Creek watershed (Figure 39). Stream reaches exhibiting 4 or fewer habitat types are considered poor. Those reaches with between 5 and 6 habitat types are considered moderate, and reaches with 7 or 8 habitat types provide good habitat. Using these scoring criteria, 11 stream reaches in the watershed exhibit poor habitat quality and would benefit from fish habitat restoration. Habitat improvements are particularly needed along North Flint Creek upstream from Grassy Lake, along Honey Lake Drain, Flint Creek (east branch) and Flint Creek's main stem between Barrington Road and Hawley Lake. Recommendations for improving fish habitat are included in the Action Plan section of this report.

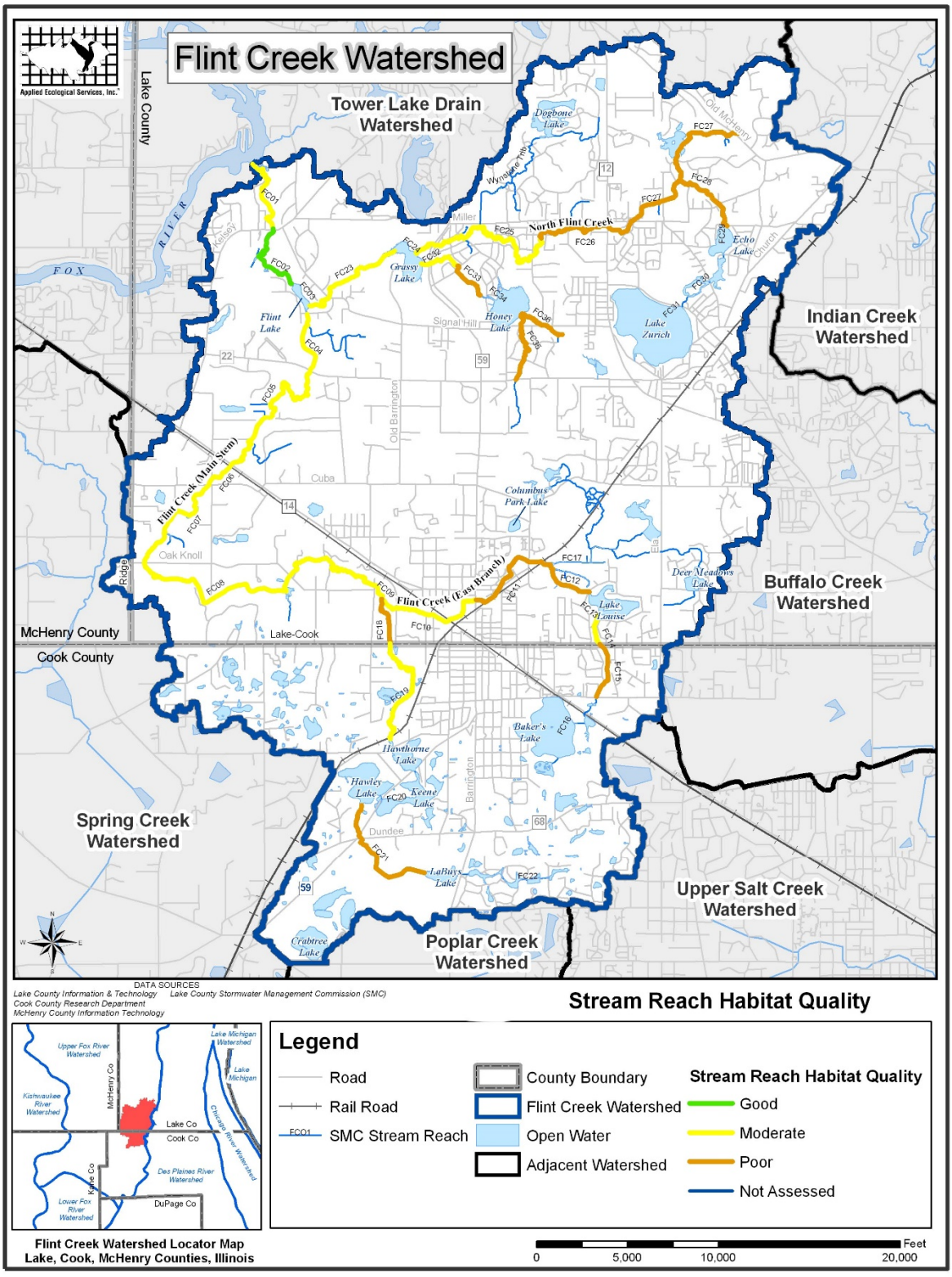


Figure 42: Stream Reach Habitat Quality

As part of the 2016 Baseline Water Quality Report, Stream Profiles featuring the elevation profiles and the water testing/water gage points from the 2016 Baseline Water Quality study (see Appendix H), and are featured here.

Shoreline erosion is common among the lakes in the watershed. Historically, shorelines were dominated with deep-rooted sedges and grasses limiting erosion. Since European settlement and development of shorelines, many land owners have decided to remove native vegetation and replaced it with shallow-rooted non-native vegetation such as turf grass or concrete seawalls. Erosion not only results in loss of shoreline, but also negatively influences the lake's overall water quality by contributing nutrients and sediments into the water. Adding riprap may limit erosion but reduces habitat, shade, and the cleansing functions of native plants. Table 24 documents the extent of lake erosion while the location of lake shoreline erosion is shown on individual aerial maps of each lake discussed below.

Table 24. Linear feet of slight, moderate, and severe erosion documented by LCHD-LMU for the major lakes in the Lake County portion of the watershed.

Lake	Year	Total Shore-line Assessed	No Erosion Shoreline Assessed (ft/%)		Total Slight Erosion (ft/%)		Total Moderate Erosion (ft/%)		Total Severe Erosion (ft/%)	
Lake Zurich	2015	14,877.7	9665.4	65%	3255.1	21.9	1106.6	7.4%	850.6	5.7%
Echo Lake	2015	5,098	2679	50.3	975	18.3	1326	24.9	348.5	6.5
Honey Lake	2015	10,880	7966	83%	1146	12%	439	5%	none	n/a
Grassy Lake	2000	8,643	8,643	100%	none	n/a	none	n/a	none	n/a
Flint Lake	2008	4,055	0	0	1,906	47%	973	24%	1,176	29%
Dogbone Lake	2004	15,906	10,503	66%	3325	20.9%	2,054	13%	244	1%
Columbus Park Lake	2000	2,048	1164.6	56.9	493.8	24.1%	107.2	5%	283.2	14%
Lake Louise	2015	11,260	9565	86%	1304	12%	252	2%	none	n/a
Deer/ Meadows Lake	2004	5,425	4451.3	82%	0	0%	973.7	17.9	none	n/a
*Baker's Lake	2007	n/a			n/a	n/a	n/a	n/a	1,000	n/a

Source: Lake County Health Department-Lake Management Reports
*Visual inspection of Baker's Lake in 2007 by FCWP

As humans remove native plant species from lake shorelines for development purposes, invasive, non-native species often move in and alter the original landscape. Most often, non-native, pioneer species such as buckthorn, purple loosestrife, and/or reed-canary grass are the first to occupy disturbed areas along lake shorelines. According to data obtained through LMU lake surveys, all lakes in the watershed have invasive species growing along the shoreline to some degree but it is not feasible to map these results in this report because of the variation and distribution of data. Non-native species do not perform the same environmental function as native species and are recommended to be removed. Lake and Homeowner associations should implement monitoring and maintenance programs to limit or remove invasive plant communities as needed.

North Flint Creek Subwatershed Lakes and Water Quality

Lake Zurich

Lake Zurich is a 232 acre glacial lake in southwestern Lake County, part of the Flint Lake drainage of the Fox River watershed. Situated at the top of the Flint Creek Watershed, it has relatively good quality. The lake is managed by the Lake Zurich Property Owners Association (LZPOA), which meets monthly, and has a Lake Management Committee.

The Lake County Health Department-Ecological Services (LCHD-ES) monitored Lake Zurich in 2015. Two water samples were collected once a month from May through September. Samples were from the deepest part of the lake, three feet below the surface, and 3 feet above the bottom. Samples were analyzed for nutrients, solid concentrations and other physical parameters; an aquatic plant survey and a shoreline assessment survey were also done.

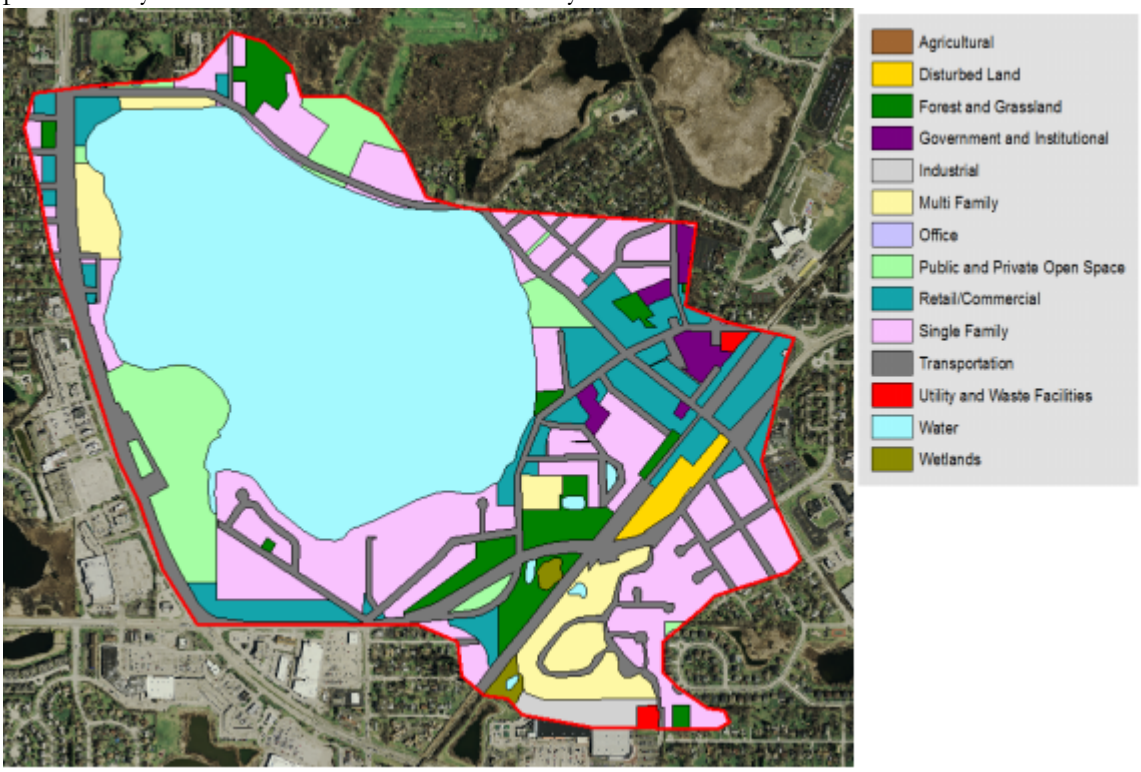


Figure 43: Land Use in the Lake Zurich Watershed (LCHD-ES)

Following are the summary highlights of the water quality sampling, shoreline survey and aquatic macrophyte surveys from the 2015 monitoring:

♦ Average water clarity based on Secchi depth in 2015 was 7.24 ft., which is a 30% decrease since 2008; yet remains well above the Lake County median Secchi depth of 2.96 ft.

♦ Water clarity is influenced by amount of particles in the water column; this is measured by total suspended solids. The average TSS concentrations on Lake Zurich was 3.0 mg/L in 2015, which is below the Lake County median of 8.2 mg/L and only a slight increase from 2.7 mg/L since 2008.

♦ Nutrient availability indicated that Lake Zurich was phosphorus limited with an average TN:TP ratio of 40:1.

♦ In 2015 the average total phosphorus concentration was 0.021 mg/L. This is below the Illinois Environmental Protection Agency (IEPA) water quality standard of 0.050 mg/L.

♦ Total phosphorus concentrations have increased since 2008 by 31% from 0.016 mg/ L to 0.021 mg/L.

♦ Trophic State index (TSIp) for Lake Zurich was 48; meaning Lake Zurich is considered mesotrophic.

♦ Lake Zurich thermally stratified throughout the monitoring season; May—August. ♦ Dissolved oxygen (DO) concentrations dropped below 5 mg/L during all June - September. DO dropped below 5 mg/L at depths greater than 20 ft. (June), 16 ft. (July), 18ft. (August), and 22 ft. (September).

♦ Dissolved oxygen concentrations reached anoxic conditions (<1mg/L) June-August

♦ The July aquatic macrophyte survey showed that 63% of all sampling sites had plant coverage. ♦ A total of 8 plant species and Chara (a macro-algae) were present, which is a decrease since previous monitoring years.

♦ The most dominant aquatic plant species in 2015 were Chara, a macro-algae, at 46.5% and large-leaf pondweed at 31.5% of the sampling sites.

♦ Eurasian watermilfoil and zebra mussels, two aquatic invasive species were present during the 2015 sampling season.

♦ 35% of the Lake Zurich shoreline was experiencing some degree of erosion. ♦ Based on the 2015 shoreline condition survey, 66% of Lake Zurich's lakeshore buffer condition was classified as poor.

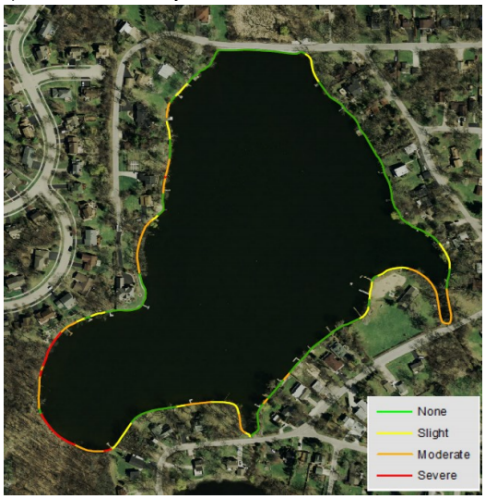
Figure 44: Lake Zurich Shoreline Erosion Condition, 2015

♦ Lake Zurich has three licensed beach including Oakwood Beach Club, Inc., Breezewald Park, and Henry J Paulus Park Beach. There was only one beach closures due to E.coli in 2015 which occurred at Henry J Paulus Park Beach from June 8th sampling, closing the beach on June 9th. Lake Zurich invested in shoreline restoration at Paulus Park Beach in 2016-2017.

In 2015, Lake Zurich was considered mesotrophic with a TSIp value of 48.2 Based on the TSIp, Lake Zurich ranked 18 out of 173 lakes studied by the LCHD-ES from 2000 –2015. This a decrease in ranking from 2008, when it ranked 4th out of 173 lakes in Lake County.

Echo Lake

Echo Lake (25 acres) is a private, man-made lake used for swimming, fishing, and non-motorized boating located just downstream from Lake Zurich (Figure 45). Historically, the lake was a natural wetland that was dammed to create a lake in the 1920s. The Echo Lake Community Corporation owns the majority of the lake. Two small parcels are owned by the Village of Lake Zurich and Lake County respectively. Echo Lake receives water from Lake Zurich and empties into Grassy Lake, eventually flowing into Flint Creek. In 2015, LCHD-ES monitored Echo Lake, following a similar protocol to that used in Lake Zurich.



A shoreline erosion study was assessed for Echo Lake in 2015. Echo lake was divided into reaches, and the shoreline evaluated for none, slight, moderate and severe erosion based on exposed soil and tree/plant roots, failing infrastructure, undercut banks, and other signs of erosion. Based on the 2015 data, 40.7% of Echo Lake's shoreline has some erosion; with 18% being slight erosion, 25% moderate erosion, and 7% severe erosion (FIGURE 43 above). It is recommended to fix areas with slight erosion as it is most economically beneficial. When erosion becomes severe, it is more costly and difficult to fix.

Following are the highlights of the study. While historically, Echo Lake has had below average water quality for Lake County, and while many water quality parameters remain below the Lake County median, water quality parameters have improved since the 2008 study, as summarized below:

♦ Average water clarity was 2.31 ft., which is a 9.5% increase since 2008, yet remains below the Lake County median of 2.96 ft.

♦ Water clarity is influenced by amount of particles in the water column; this is measured by total suspended solids. The average TSS concentrations on Echo Lake was 10.2 mg/L in 2015, which is greater than the Lake County median of 8.2 mg/L. However, TSS concentrations dropped by 24% since 2008.

♦ Nutrient availability indicated that Echo Lake had sufficient concentrations of nitrogen and phosphorus to support algae growth with an average TN:TP ratio of 14:1.

♦ Echo Lake is impaired for phosphorus with a 2015 average total phosphorus concentration of 0.079 mg/L. This exceeds the Illinois Environmental Protection Agency (IEPA) water quality standard of 0.050 mg/L.

♦ Despite having a phosphorus impairment, there was a significant decrease by 37% in total phosphorus levels since the 2008 sampling.

♦ Trophic State index (TSIp) for Echo Lake was 66.2; meaning Echo Lake is considered eutrophic.

♦ Dissolved oxygen (DO) concentrations remained above 5 mg/L in the upper water column only dropping below 5 mg/L at depths greater than 8 feet in June, July and August. When dissolved oxygen drops below 5 mg/L, aquatic life can become stressed.

♦ Dissolved oxygen concentrations never reached anoxic conditions (<1mg/L) in the lake

♦ The aquatic macrophyte survey showed that 85% of all sampling sites had plant coverage.

♦ A total of 3 plant species were present which include: Coontail, Sago Pondweed, and Southern Naiad.

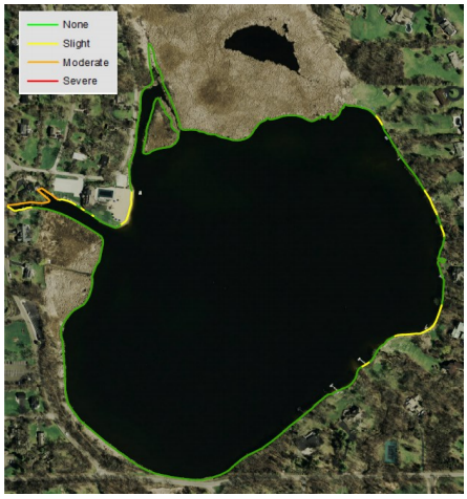
♦ The Floristic Quality Index (FQI) is 10.4, which is below the Lake County Median and ranks Echo Lake at 116/170 of the lakes in Lake County assessed for FQI.

♦ Echo Lake had 50.3% of its shoreline classified as no erosion, 18.3% as slight erosion, 24.9% as moderate erosion, and 6.5% as severe.

♦ Based on the 2015 shoreline condition survey, 61% of Echo's Lake lakeshore buffer condition was classified as poor.

♦ Echo Lake has an unlicensed beach on the south east end of the lake at the park. It is required by law that any beach servicing 5 or more households be licensed with the Illinois Department of Public Health.

Honey Lake



Honey Lake is a 66-acre glacial lake owned primarily by Biltmore Country Club and 11 private land owners (Figure 46). The lake is not on-line with North Flint Creek, but is fed by two small tributaries from the southeast. A spillway was constructed in 1950 to control water levels. Water flowing over the spillway drains west to Grassy Lake. The country club is the primary manager of Honey Lake. Honey Lake is listed as an ADID (advanced identification) wetland by the U.S. Environmental Protection Agency and an Illinois Natural Areas Inventory (INAI) by the state of Illinois. This indicates that the lake and surrounding natural environments have potential to have high quality aquatic resources based on water quality and hydrology values.

In 2015, LCHD-ES monitored Honey Lake, and followed similar protocols to that listed with the other lakes.

The water quality of Honey Lake has declined since the 2006 and 2008 samplings, although many parameters remain below the Lake County median values. Following is a summary of findings:

♦ Average water clarity based on secchi depth in 2015 was 3.11 ft., which is a 56% decrease since 2008; yet remains above the Lake County median secchi depth of 2.96 ft.

♦ Water clarity is influenced by amount of particles in the water column; this is measured by total suspended solids. The average TSS concentrations on Honey Lake was 6.6 mg/L in 2015, which is below the Lake County median of 8.2 mg/L but a 94% increase since 2008 sampling.

♦ Nutrient availability indicated that Honey Lake was phosphorus limited with an average TN:TP ratio of 25:1.

♦ In 2015 the average total phosphorus concentration was 0.059 mg/L. This is above the Illinois Environmental Protection Agency (IEPA) water quality standard of 0.050 mg/L; meaning Honey Lake is impaired for phosphorus.

♦ Total phosphorus concentrations have increased since 2008 by 73%.

♦ Trophic State index (TSIp) for Honey Lake was 59; meaning Honey Lake is considered eutrophic.

♦ Honey Lake thermally stratified throughout the monitoring season; May—September.

♦ Dissolved oxygen (DO) concentrations dropped below 5 mg/L during all sampling months. During June, July, and August DO dropped below 5 mg/L at depths greater than 3 ft., 4ft., and 5 ft., respectively.

♦ Dissolved oxygen concentrations reached anoxic conditions (<1mg/L) during all months during the sample season.

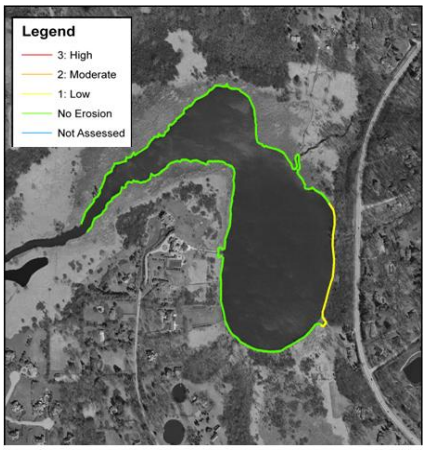
♦ The July aquatic macrophyte survey showed that 43% of all sampling sites had plant coverage. ♦ A total of 9 plant species and Chara (a macro-algae) were present with the most dominant species being Coontail and White Water Lily.

♦ Aquatic invasive plant species were not present during the 2015 sampling season.

♦ 17% of the Honey Lake shoreline was experiencing some degree of erosion.

♦ Based on the 2015 shoreline condition survey, 40% of Honey Lake's lakeshore buffer condition was classified as poor.

♦ Honey Lake has a licensed beach at the Biltmore Country Club. There were zero beach closures due to E.coli in 2015.



2006 Aerial Depiction of Grassy Lake and Degree of Shoreline Erosion

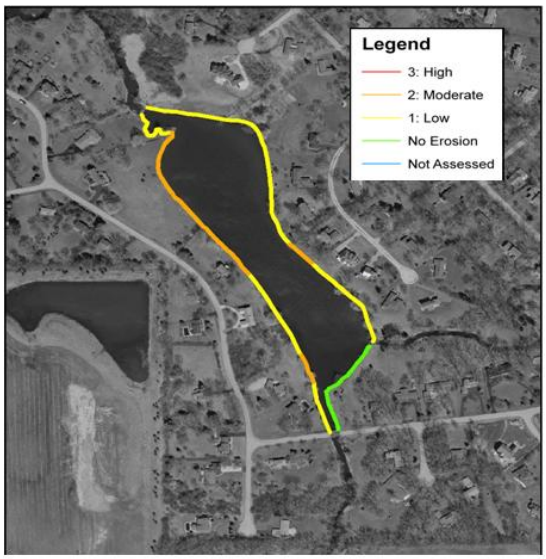
Grassy Lake

Grassy Lake is a 40-acre glacial slough owned by the Lake County Forest Preserve District that receives water from two primary sources: Honey Lake drain and North Flint Creek (Figure 47). The most recent study conducted by LMU in 2000 indicates poor water quality originating from several sources. High levels of phosphorus and suspended solids are of primary concern and are likely the result of bottom disturbance by large carp populations and additional nutrients entering the lake from adjacent land uses (Route 59) and three upstream wastewater treatment plants (Wynstone, North Barrington School, and Mt. St. Joseph). Shoreline erosion is not problematic but numerous stands of invasive purple loosestrife and buckthorn are present. Despite poor water quality, a Sandhill crane (State threatened) and Common tern (State endangered) were observed using the lake in 2000. In addition, few aquatic plants were observed by LMU in 2000. This is attributed to carp disturbance of bottom sediments and ongoing sediment deposition from upstream sources.

The July 2016 Flint Creek/Spring Creek Water Quality Baseline found Grassy Lake to have an average total Phosphorus (mg/L) of 0.161, and to be Hypereutrophic at 77.42. It ranks as 142 of 173 Lake County Lakes.

Flint Lake

Flint Lake is an 11-acre manmade lake in southwestern Lake County. Flint Lake receives water from two main inlets, the Grassy Lake Drain (north inlet) and Flint Creek (south inlet) and empties into Flint Creek which eventually flows into Fox River. Flint Lake residents use the lake for aesthetics. (Figure 48)



2006 Aerial Depiction of Flint Lake and Degree of Shoreline Erosion

Four sewage treatment plants are operating in the Flint Lake Watershed. The largest one is the Barrington Wastewater Treatment Plant that discharges effluent into Flint Creek. The Mount Saint Joseph and North Barrington Elementary plants discharge into Grassy Lake Drain.

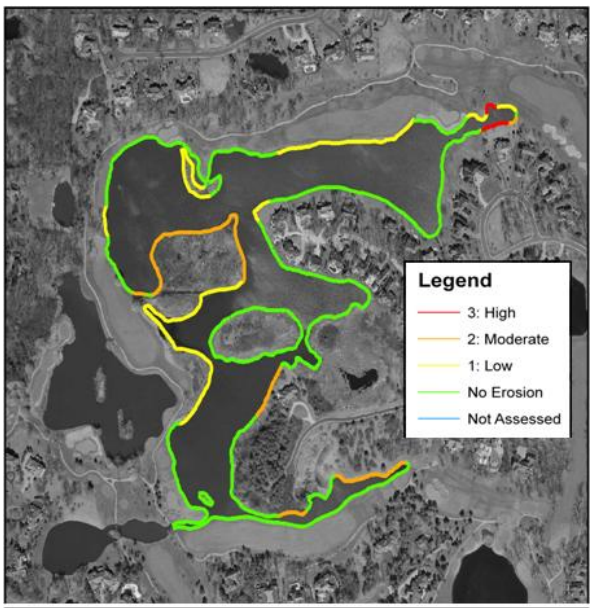
Based on a 2008 LCHD-ES study, Flint Lake is known for having some of poorest water quality of all lakes sampled in Lake County. Water quality in Flint Lake has not deteriorated since the 2003 study. The 2008 average TSS was 57.7 mg/L for the north inlet and 22.9 for the south inlet which is considerably higher than the county median of 8.2 mg/L. Alkalinity also had high values the north inlet 216 mg/L CaCO3 and 243 mg/L CaCO3 at the south inlet both are higher than the county median of 162 mg/L CaCO3. However 2008 values were reduced compared to the 2003 value of 330 mg/L CaCO3 that marked the highest alkalinity concentrations recorded in Lake County.

The Lake County median conductivity reading was 0.8195 milliSiemens/cm (mS/cm). During 2008, the average conductivity reading in Flint Lake for the north inlet was 1.0970 mS/cm and 1.2780 mS/cm for the south inlet. This was decrease from the 2003 average of 1.5818 mS/cm, likely due to rain events in 2008. Conductivity is positively correlated with chloride (Cl) concentrations. The average Cl concentration in Flint Lake was also greater than the Lake County median of 166 mg/L during 2008, with an average of 200 mg/L in the north inlet and 223 in the south inlet. The 2008 average total phosphorus (TP) concentration of 0.188 mg/L for the north inlet and 0.293 mg/L for the south was significantly above the county median of 0.065 mg/L. However the average TP concentration decreased by 48% from the 2003 survey when the average TP concentration was 0.564mg/L.

Aquatic plants were scarce in Flint Lake in 2003 and 2008. Only five species of aquatic plants; Sago Pondweed, Small Duckweed, Curlyleaf Pondweed, Coontail, and Elodea were present and located near the shoreline. Algal blooms and an over abundance of Duckweed occurred in Flint Lake during the season. The shoreline was reassessed in 2008 for significant changes in erosion since 2003. Based on the 2008 assessment, there was an increase in shoreline erosion with 100% of the shoreline having some degree of erosion. Overall, 47% of the shoreline had slight erosion, 24% had moderate erosion, and 29% had severe erosion. Flint Lake is located in a residential setting with the shoreline mainly developed. Although residential areas usually do not offer good wildlife habitat, the mature trees in the lots surrounding the lake offer some songbird habitat.

Dogbone Lake

Dogbone Lake was formerly known as Lake Sheree and is a 28.6 acre private lake located within the Wystone Golf Course community in the Village of North Barrington. The lake serves primarily as an aesthetic amenity for surrounding homes but is also used by local residents for fishing. According to LMU, neither the Wynstone Property Owner's Association nor golf course staff actively manages the lake. (Figure 49)



2006 Aerial Depiction of Dogbone Lake and Degree of Shoreline Erosion

Historically, the lake was a wetland complex that was excavated in 1970 to create the lake. The lake receives water primarily via runoff from its adjacent 700-acre watershed that is primarily golf course. Water exits the lake via the Wynstone tributary and enters North Flint Creek to the south. Wynstone Sewage Treatment Plant is located onsite to serve the surrounding homes and facilities within the golf course community.

This site is currently permitted by the IEPA. The overall water quality and condition of the lake is poor. Most notable reasons include shallow depth (5 feet maximum), low water clarity (0.94 feet), high total suspended solids (39.4 mg/l), high phosphorus (0.199 mg/l), abundant carp populations, stormwater and wastewater effluents. In addition, approximately 68% of the shoreline is developed;

33% of which is lawn or seawalls. These shoreline conditions are likely the cause of approximately 244 linear feet of severe erosion and 2,054 linear feet of moderate erosion. The aquatic plant assessment conducted in 2004 revealed little vegetation that is attributed to low water clarity and carp activity.

The Wynstone HOA has invested in some detention basin work and lake restoration with Dogbone Lake since 2007.

North Branch SubWatershed Elevations

Figure 50: Stream Profile – North Branch Flint Creek

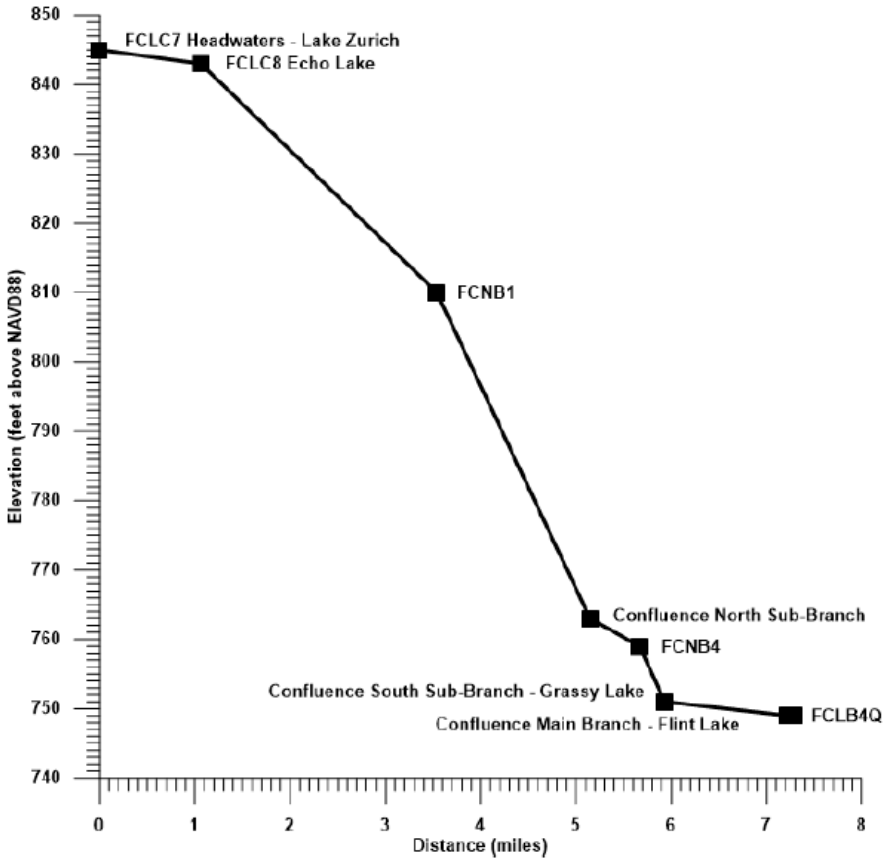


Figure 51: Stream Profile – North Sub-Branch North Branch Flint Creek

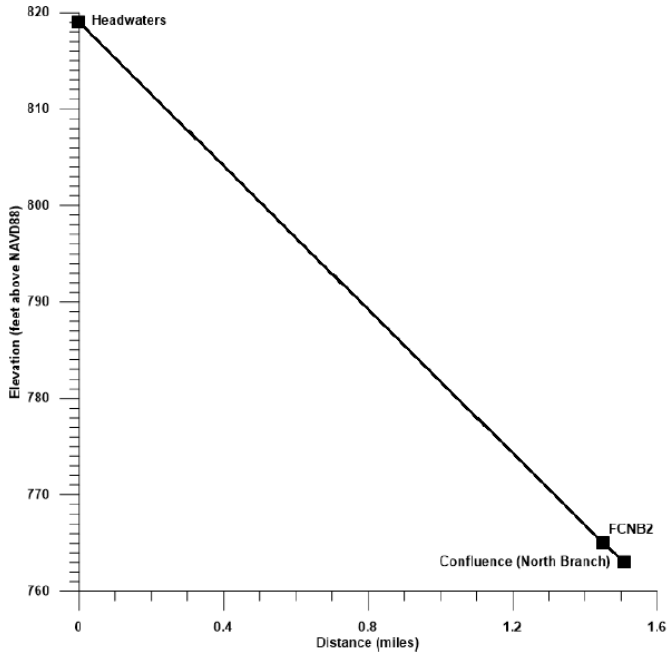
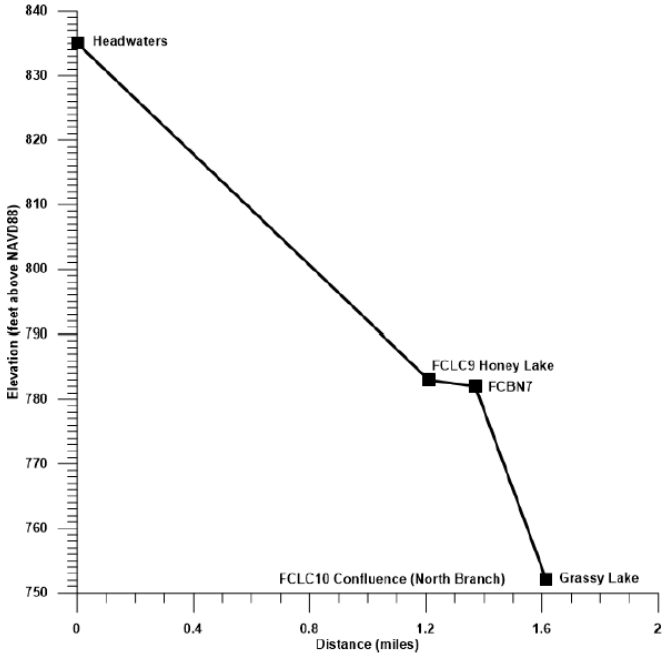
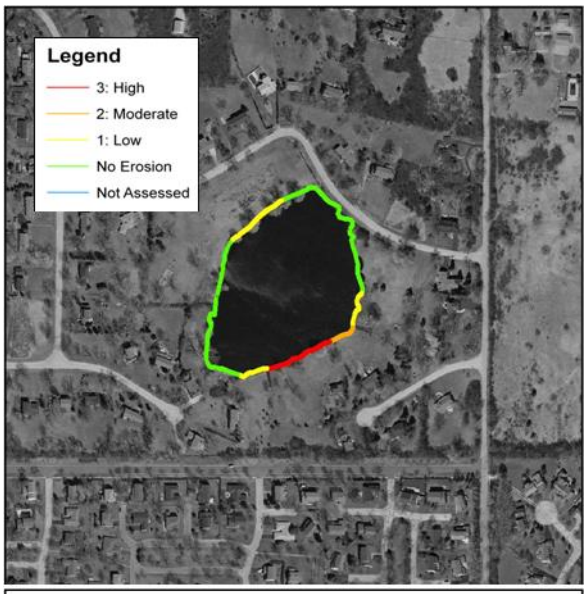


Figure 52: Stream Profile – South Sub-Branch North Branch Flint Creek



East Flint Creek Subwatershed Lakes and Water Quality



2006 Aerial Depiction of Columbus Lake and Degree of Shoreline Erosion

Columbus Park Lake

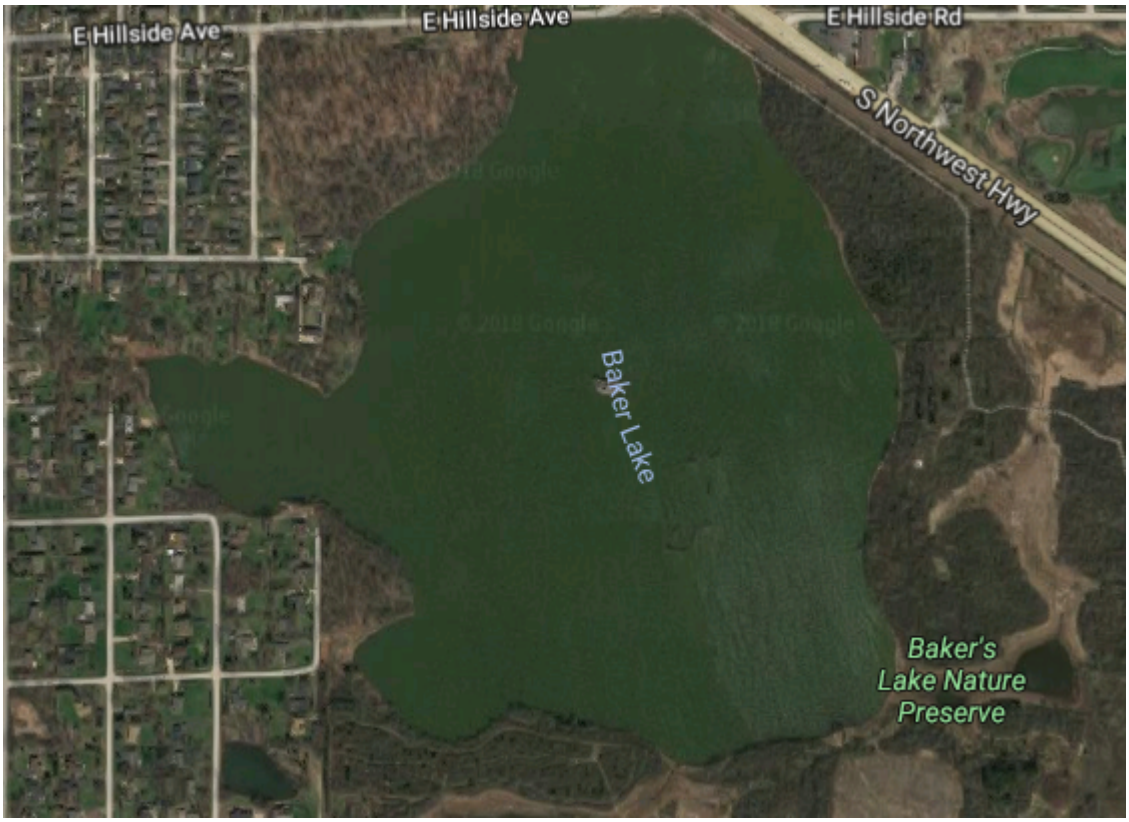
Columbus Park Lake is a small (6.6 acres), shallow, (6 foot deep) Barrington Park District-owned impoundment that serves simply as an aesthetic amenity to the adjacent park. No fishing, swimming, or boating is allowed. This small lake was created in 1962 in a surrounding residential development. Water that enters from the adjacent watershed outlets the lake into a stormwater system that eventually finds its way to Flint Creek (east branch). LMU's 2000 lake report documents poor water quality conditions. Nutrient levels and dissolved solids/conductivity are high. Phosphorus levels were found to be three times higher than the county average and road salts likely contribute to high dissolved solids. Developed areas comprise 88% of the shoreline leading to 110 linear feet of moderate erosion and 274 linear feet of severe erosion. Constant resident Canada goose populations are also known to occur in the adjacent park increasing nutrient loading. Columbus Park Lake is nearly devoid of vegetation apparently due to introduction of Grass Carp. Some work was done as an Eagle Scout project on native vegetation restoration. (Figure 53)

Baker's Lake

Baker's Lake and Lake Louise are the two primary lakes located online with Flint Creek's east branch. Baker's Lake is located in Cook County and Lake Louise in Lake County just north of Lake-Cook Road. Baker's Lake was not assessed by LMU, however some data is available from a 1981 Comprehensive Plan (Cook County Forest Preserve District, 1981) completed for Baker's Lake as well as miscellaneous other information including a visual inspection of the shoreline erosion by FCWP in 2007 and by AES in 2018. Detailed information regarding Lake Louise was available from Lake County's Lakes Management Unit.

Baker's Lake is part of an Illinois Nature Preserve owned by the Forest Preserve District of Cook County (FPDCC) and located just south of Route 14 on Barrington's southeast side (Figure 54 below). The nature preserve itself is over 200 acres while the lake is 112 acres. The majority of the water enters the lake via surface stormwater runoff from the adjacent watershed. Although the lake supports small fish populations, prolonged periods of winter freezing result in numerous fish kills. Wide varieties of birds feed and nest around the preserve including colonies of black-crowned night heron (state threatened), great egret, double-crested cormorant, and great blue heron. Other notable bird observations made near the lake include yellow-headed blackbird (state endangered), common moorhen (state threatened), black tern (state endangered), and pied-billed grebe. CFC also worked with the Village of Barrington to complete one of the most successful savanna restorations in the

Chicago region along the northwest portion of the lake. In addition, FCWP conducted a visual inspection of the shoreline conditions in 2007 and noted approximately 1,000 linear feet of severe erosion along Hillside Avenue which continues, as observed in 2018 by AES. Baker's Lake once supported a large heron rookery, which has now relocated to the Spring Creek Watershed.



Lake Louise

Lake Louise is a 38-acre privately owned (Fox Point Homeowners Association) water body located in the Village of Barrington just north of the Lake/Cook County line (Figure 55, below). The lake was constructed in 1967 during the development of the Fox Point Subdivision. A spillway was installed at the northwest portion of the lake to establish water levels.

Streambank stabilization projects have also been implemented in the Fox Point North subdivision to primarily decrease sediment loads to the lake from Flint Creek. In addition, 75% of the lake's shoreline is rip-rapped, while other areas contain invasive plants including buckthorn, honeysuckle, purple loosestrife, and multiflora rose. Of the 11,260 linear feet of shoreline assessed, only 204 feet is moderately eroded, and no severe erosion is present. Lastly, large numbers of Canada geese use the developed shoreline. Goose feces likely exacerbate nutrient levels within the lake. The Lake was monitored by LCHD-ES in 2015. Historically, Lake Louise has had a variety of lake quality issues dating back to the late 1950's. These problems include or have included excessive aquatic plants, unhealthy fishery, abundance of carp and geese, several algal blooms and nutrient enrichment. Many water quality parameters exceed the Lake County median. A summary follows:

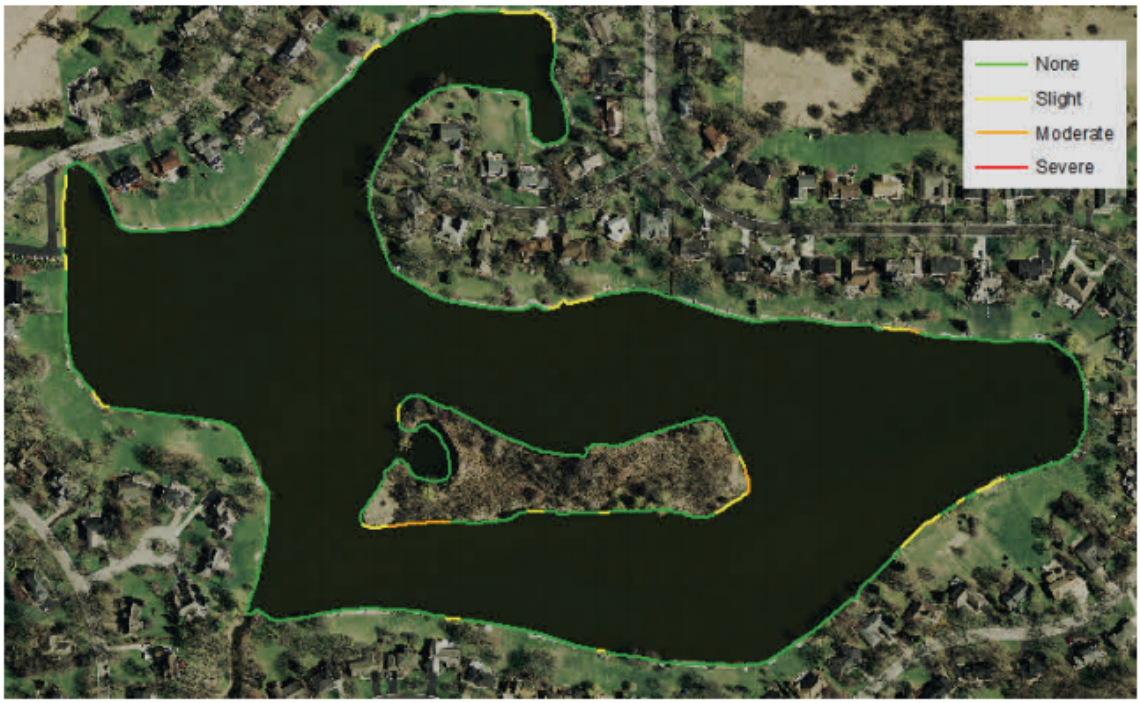


Figure 55: Streambank Erosion in Lake Louise in 2015

Figure 56: Shoreline Buffer Conditions

♦ Average water clarity was 1.04 ft., which is a 38% decrease since 2008, and 65% below the Lake County median Secchi depth of 2.96 ft.

♦ Water clarity is influenced by amount of particles in the water column; this is measured by total suspended solids. The average TSS concentrations on Lake Louise was 36.9 mg/ L in 2015, which is significantly greater than the Lake County median of 8.2 mg/L. TSS concentrations increased by 58% since 2008.

♦ Nutrient availability indicated that the average TN:TP ratio was 14:1 meaning that Lake Louise had adequate amounts of both nitrogen and phosphorus to support algal blooms. Most of the lakes in Lake County tend to be phosphorus limited, meaning addition of phosphorus to the lake ecosystem can affect change in the lake, such as increased algal populations.

♦ The 2015 average total phosphorus concentration was 0.181 mg/L, which exceeds the Illinois Environmental Protection Agency (IEPA) water quality standard of 0.050 mg/L. Lake Louise is impaired for phosphorus

♦ In addition to having a phosphorus impairment, there was an increase by 16% in total phosphorus levels since the 2008 sampling.

♦ Trophic State index (TSIp) for Lake Louise was 79; meaning Lake Louise is considered hypereutrophic.

♦ Dissolved oxygen (DO) concentrations remained above 5 mg/L in the water column from surface to lake bottom, except in July when it dropped below 5 mg/L at depths greater than 6ft. When dissolved oxygen drops below 5 mg/L, aquatic life can become stressed.

♦ Dissolved oxygen concentrations never reached anoxic conditions (<1 mg/L) in the Lake.

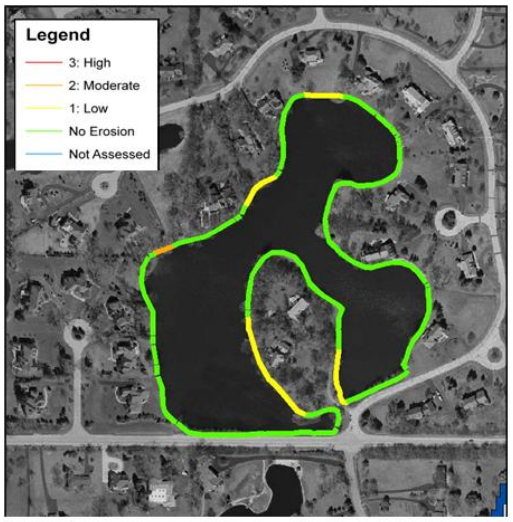
♦ The aquatic macrophyte survey showed that only 6.5% of all sampling sites had plant coverage.

♦ A total of 2 plant species were present which were: Giant Duckweed and Sago Pondweed.

♦ Lake Louise had 14% of its shoreline eroding with 12% classified as slight erosion and 2% as moderate erosion.

♦ Although minimal shoreline erosion was occurring, 76% of Lake Louise's lakeshore buffer condition was classified as poor based on the 2015 shoreline condition survey.

In 2015, Lake Louise was considered eutrophic with a TSIp value of 79 and on the verge of hypereutrophic. Based on the TSIp, Lake Louise ranked 145 out of 173 lakes studied by the LCHD-ES from 2000 –2015.



2006 Aerial Depiction of Deer/ Meadows Lake and Degree of Shoreline Erosion

Deer/Meadows Lake (Figure 57)

The LMU conducted its most recent assessment of Deer/Meadows Lake in 2004. The lake is actually a 13.6-acre detention basin with a maximum depth of about 4 feet that was created in the early 1980's to provide stormwater storage for approximately 20 homes in the surrounding subdivision. The lake is managed by private residents and currently, Environmental Aquatics treats the lake with algaecides as needed. The majority of the 38-acre watershed surrounding the lake is comprised of the residential subdivision. As a result, stormwater runoff to the lake results in poor water quality. The LMU reports phosphorus levels nearly twice the county average that may be caused by internal sources such as resuspended sediment caused by carp activity and decomposing algae. High total suspended solids (TSS) concentrations are also problematic and attributed to suspended sediments and algae. Another problem is high conductivity that results from road salts being washed into the system. Nearly 100% of the shoreline is developed and about 50% of this is comprised of turf grass; rip rap makes up an additional 31%, and buffer another 17%. Approximately 973 linear feet of the shoreline is moderately eroded.

Figure 58: Stream Profile – East Branch Flint Creek

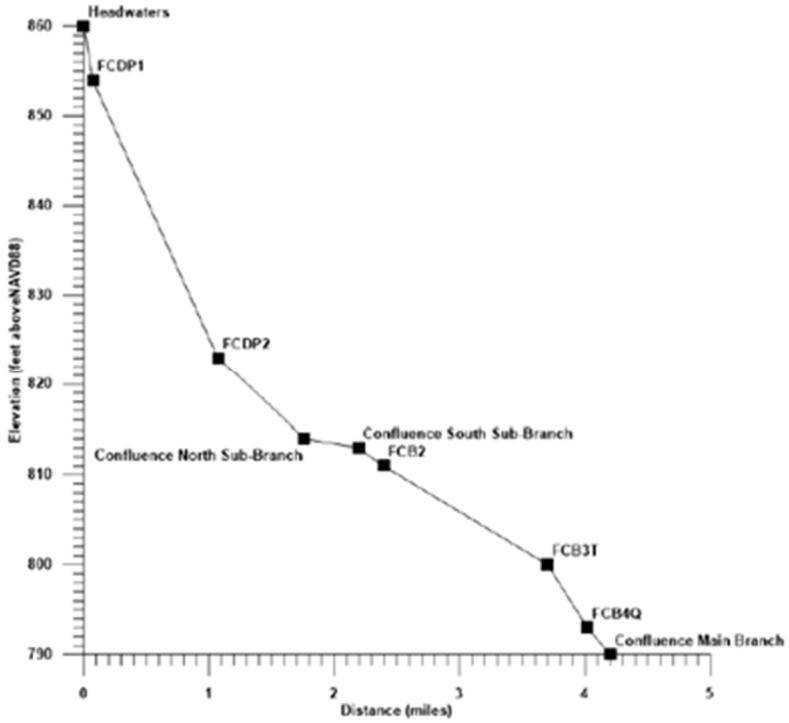


Figure 59: Stream Profile – South Sub-Branch East Branch Flint Creek

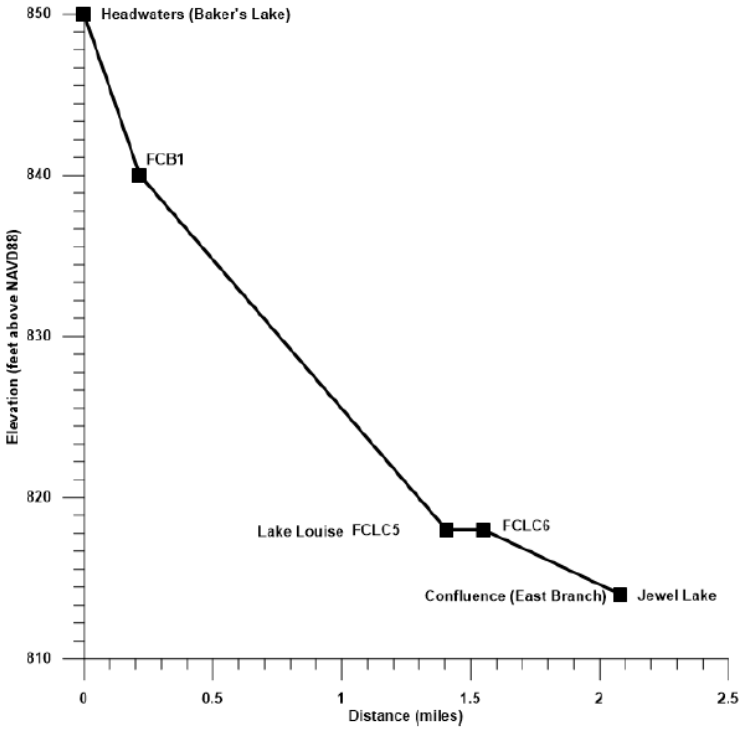
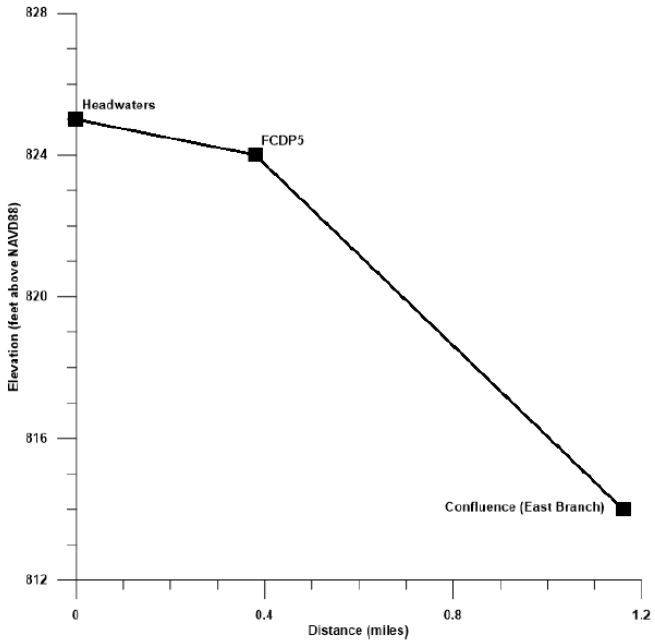


Figure 60: Stream Profile – North Sub-Branch East Branch Flint Creek



Main Stem Flint Creek Subwatershed Lakes and Water Quality

LaBuy's (16 acres), Hawley (67 acres), Keene (51 acres), and Hawthorne (31 acres) Lakes, (Figure 38) are located on-line with Flint Creek's main stem in the Cook County portion of the watershed. Stephanie, Heather, and Crabtree Lakes are also located in the Flint Creek (Main Stem) subwatershed but are hydrologically connected to Flint Creek primarily via smaller surface or tile drainages. None of these lakes were assessed by the LMU. However, some data from the early 1990's is available from IEPA's VLMP for Hawley, Keene, Stephanie, and Heather Lakes. An additional study of physical, chemical, and biological parameters for Heather, Keene, and Stephanie Lakes was conducted by Lake Management Services in 1988. No lake shoreline erosion data is available for any of the lakes located in Cook County except Baker's Lake.

LaBuy's and Crabtree Lakes

LaBuy's Lake (16 acres) and Crabtree Lake (46 acres) are both located in Cook County's Crabtree Nature Center Forest Preserve. These two lakes flow into Flint Creek's main stem within the preserve before flowing north and into a chain of three major lakes. Flint Creek first enters Hawley Lake from the south then exits over a spillway and flows east under Hawthorne Road (Route 59) into Keene Lake. From Keene Lake, Flint Creek flows north into Hawthorne Lake over a dam/spillway before exiting to the north and eventually into Lake County. Stephanie and Heather Lakes are smaller waterbodies that are hydrologically connected to Keene Lake to the south and north respectively.

Hawley Lake

Hawley Lake is a 67-acre private artificial impoundment created in 1938 with a maximum depth of 9 feet. Its water source is primarily from Flint Creek which enters the lake at the south end. According to the VLMP data collected in 1990, the water quality is fair. Phosphorus levels meet general standards and Total Suspended Solids readings are only slightly elevated. The VLMP reports the lake supports an excellent fishery.

Keene Lake

Keene Lake receives water from Hawley Lake under Hawthorne Road (Route 59) to the west. This 51-acre lake has a maximum depth of 11.5 feet and was constructed in 1944 by building a spillway at the north end. VLMP data collected in 1993 reports water clarity at about 3.5 feet. Additional data collected by Lake Management Services in 1988 reports sufficient nutrients to sustain plant and algal growth and varying degrees of water clarity linked to algae blooms, eroded shorelines, and carp. The study also reports an average fishery comprised primarily of largemouth bass and bluegill. Water exiting Keene Lake enters Hawthorne Lake to the north, the third and final lake in the chain. No data is available for Hawthorne Lake.

Stephanie Lake

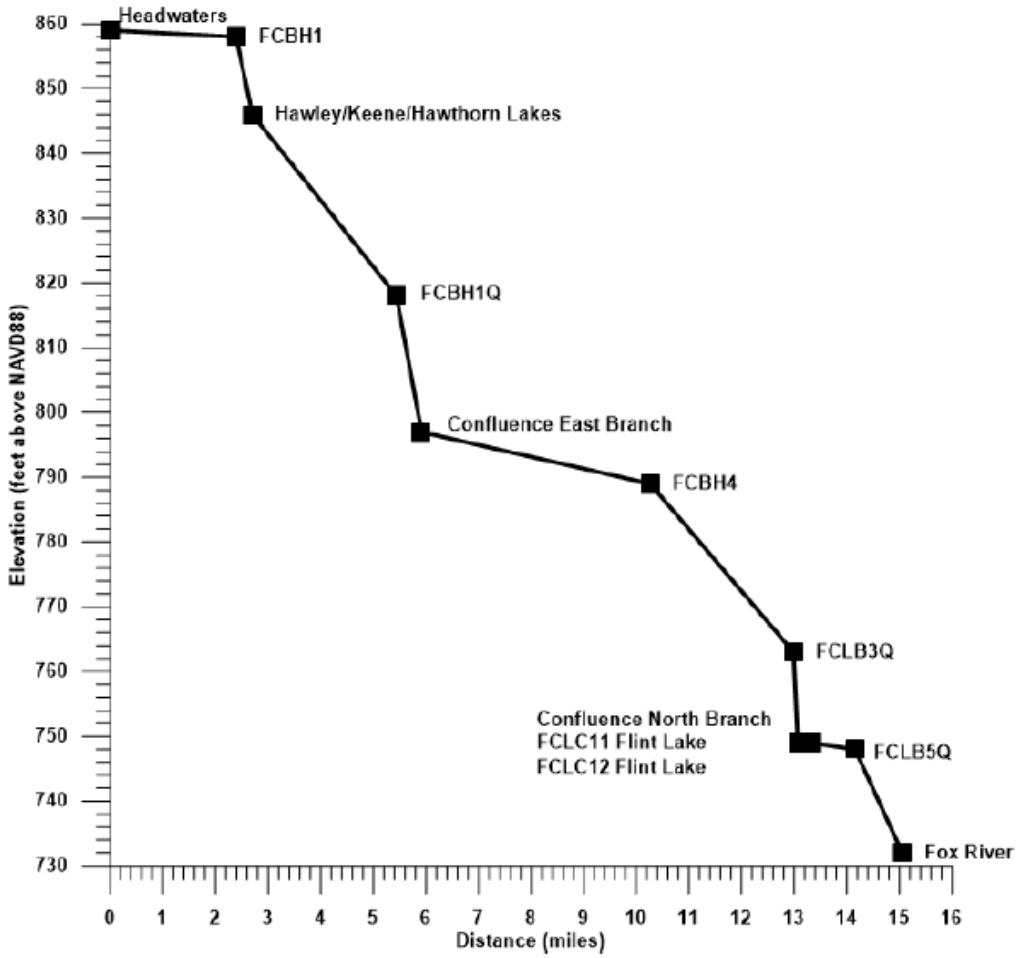
Stephanie Lake is hydrologically connected to Keene Lake to the south but is not on-line with Flint Creek's main stem. The small (4.8 acres) waterbody exhibits a maximum depth of 8 feet. VLMP data collected in 1993 indicates water clarity around 2.5 feet. Data collected by Lake Management Services in 1988 reports poor water clarity due to a summer algae bloom at the time of sampling. Phosphorus levels in 1988 were reported to be 0.26 mg/l, nearly 5 times higher than the general

standards. An examination of fish populations noted reduced numbers of largemouth bass, small bluegills, and an abundance of undesirable green sunfish.

Heather Lake

Heather Lake is a small (6.0 acres) impoundment located south of Keene Lake. Like Stephanie Lake, it is not on-line with Flint Creek's main stem but is hydrologically connected to Keene Lake. VLMP data collected in 1993 reports water clarity at about 2.5 feet. Supplemental data provided by Lake Management Services in 1988 indicates varying degrees of water clarity between 2.5 and 6 feet based on algae present in the water column. Phosphorus levels measured in 1988 were relatively high (0.14 mg/l) and were attributed to fertilizers, septic systems, and decomposing organic matter. The lake's fishery is moderate with varying sizes of largemouth bass and good populations of 7-8 inch bluegill.

Figure 61: Stream Profile – Flint Creek



Flint Lake (repeated from page 111, because of its location)
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The shoreline was reassessed in 2008 for significant changes in erosion since 2003. Based on the 2008 assessment, there was an increase in shoreline erosion with 100% of the shoreline having some degree of erosion. Overall, 47% of the shoreline had slight erosion, 24% had moderate erosion, and 29% had severe erosion.

Flint Lake is located in a residential setting with the shoreline mainly developed. Although residential areas usually do not offer good wildlife habitat, the mature trees in the lots surrounding the lake offer some songbird habitat. **(From the LCHDES 2008 study)**

3.3 Wetlands Inventory
In the 1830's European settlers in the Flint Creek watershed altered significant portions of the watershed's natural hydrology and wetland processes. Where it was feasible, settlers drained wet areas, channelized streams, and cleared forests in order to farm the rich soils. Based on hydric soils mapping provided by the McHenry, Lake, and Cook County Natural Resource Conservation

Services (NRCS), there were approximately 5,738 acres of wetlands in the watershed prior to European settlement. According to existing wetland inventories discussed below, 4,393 acres or 76% of the pre-settlement wetlands remain. This percentage of existing wetlands is much higher than in similar watersheds in Lake County, such as the Indian Creek and Bull Creek/Bull's Brook watersheds where only 45% and 56% remain, respectively.

Functional wetlands do more for water quality improvement and flood damage reduction than any other natural resource within a watershed. In addition, wetlands typically provide habitat for a wide variety of plant and animal species. They also provide groundwater recharge and discharge, filter sediments and nutrients in runoff, and help maintain water levels in streams during drought periods. Wetland information and mapping is available for the entire Flint Creek watershed area from several government agencies. Advanced wetland inventories and identification studies (ADID) are available for both Lake and McHenry Counties. The U.S. Fish & Wildlife Service's (USFWS) National Wetland Inventory (NWI) mapping is the only data available for wetlands in the Cook County portion of the watershed. The combination of wetland data was used to map and describe the existing wetlands in the watershed and to locate potential wetland restoration sites.

Lake and McHenry County Wetland Inventories

In 1998, the Lake County Wetlands Inventory (LCWI) was developed from USDA/Soil Conservation Service wetland inventory maps, National Wetland Inventory (NWI) maps, soil survey of Lake County, and other low altitude aerial photography. The inventory maps natural and artificial wetlands meeting definitions established by the federal agencies that work with the Lake County Geographic Information System. These agencies include the U.S. Environmental Protection Agency (USEPA), the USFWS, the U.S.D.A. Natural Resources Conservation Service (NRCS), and the U.S. Army Corps of Engineers (USACE). Because the LCWI wetland boundaries are based on off-site determination methods and not onsite delineation, the wetland boundaries are only good for general reference, planning, and initial screening purposes. Like Lake County, McHenry County also completed a wetland inventory and ADID study within its jurisdiction in 1998. Only two small non-ADID wetlands are located in the McHenry County portion of the watershed.

High Functionality (ADID) Wetlands

The ADID program is a USEPA and USACE guided program developed to shorten permit-processing time related to filling wetlands and to provide information to local governments. Three primary functions were used by the USEPA and USACE to evaluate wetlands during the ADID process including biological value (i.e. wildlife habitat and plant species diversity), hydrologic functional value (i.e. stormwater storage or bank stabilization), and water quality value (i.e. sediment, and nutrient removal). According to the identification process, 10 wetlands are identified as ADID (Figure 41). All of these wetlands are located within Lake County. Data for each ADID wetland is summarized in Table 23 below.

Some protection of ADID wetlands is provided in Lake County under existing regulatory programs including floodplain development restrictions, the Lake County Watershed Development Ordinance (WDO), and the USACE section 404 Clean Water Act permit program. The USACE will also generally require an individual permit for modifications to all ADID sites. ADID sites are generally considered unmitigatable and unsuitable for filling activities. In rare cases where mitigation is

allowed, a 3:1 mitigation ratio is required in Lake County. Additionally, Lake County requires a 100-foot buffer around all ADID wetlands located within developed areas.

Table 25. Lake County ADID wetlands and attributes.

ADID ID #	Name	Acres	ADID Attributes
147	Lyons Prairie & Tower Lake Fen Fox River Complex	41.8	**Biological**: State T&E species, INAI site, high quality plant community **Water Quality/Hydrology**: Stormwater storage, shoreline stabilization, sediment/toxicant retention, nutrient removal
173	Flint Creek	128.5	**Water Quality/Hydrology**: Shoreline stabilization, sediment/toxicant retention, nutrient removal
177	Flint Creek Tributary Wetland	51.2	**Biological**: High quality plant community (sedge meadow) **Water Quality/Hydrology**: Stormwater storage, sediment/toxicant retention, nutrient removal
166	Grassy Lake	252.4	**Biological**: High quality plant Community (sedge meadow) **Water Quality/Hydrology**: Shoreline stabilization, sediment/toxicant retention, nutrient removal
167	Honey Lake Complex	73.9	**Water Quality/Hydrology**: Shoreline stabilization, sediment/toxicant retention, nutrient removal
156	Headwaters of North Flint Creek	29.7	**Biological**: State T&E species **Water Quality/Hydrology**: sediment/toxicant retention, nutrient removal
174	Honey Lake Headwaters	38.3	**Water Quality/Hydrology**: Stormwater storage, sediment/toxicant retention, nutrient removal
175	Honey Lake Headwaters	76.1	**Biological**: State T&E species, sedge meadow **Water Quality/Hydrology**: Stormwater storage, sediment/toxicant retention
179	Deer Park Marsh	14.9	**Biological**: High quality wildlife habitat for State T&E species (hemi marsh) **Water Quality/Hydrology**: Stormwater storage, sediment/toxicant retention
178	Cuba Marsh	31.3	**Biological**: State T&E species, hemi marsh **Water Quality/Hydrology**: Stormwater storage, sediment/toxicant retention, nutrient removal

Source: Lake County Wetland Inventory (LCWI)

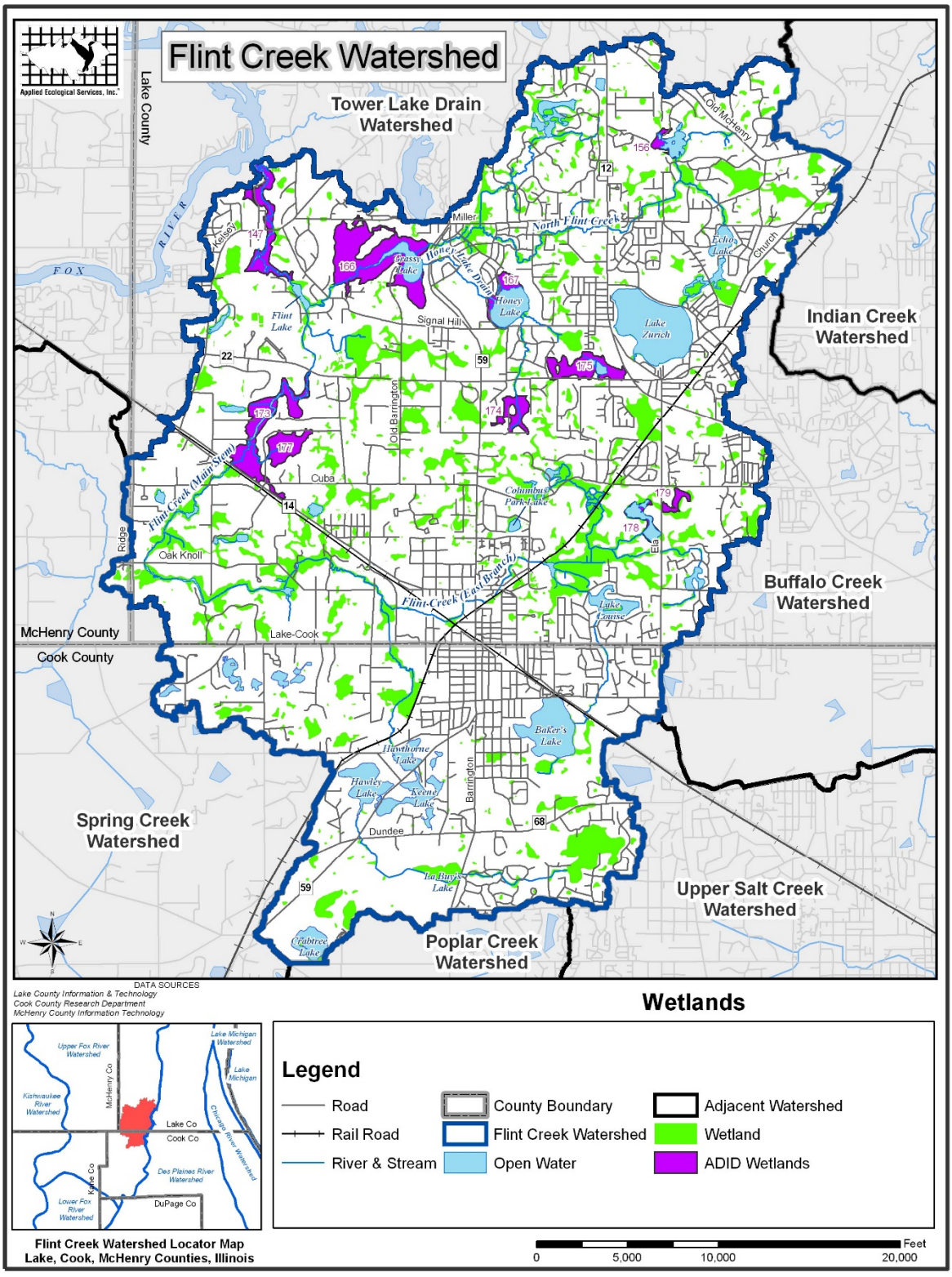


Figure 62: Wetlands

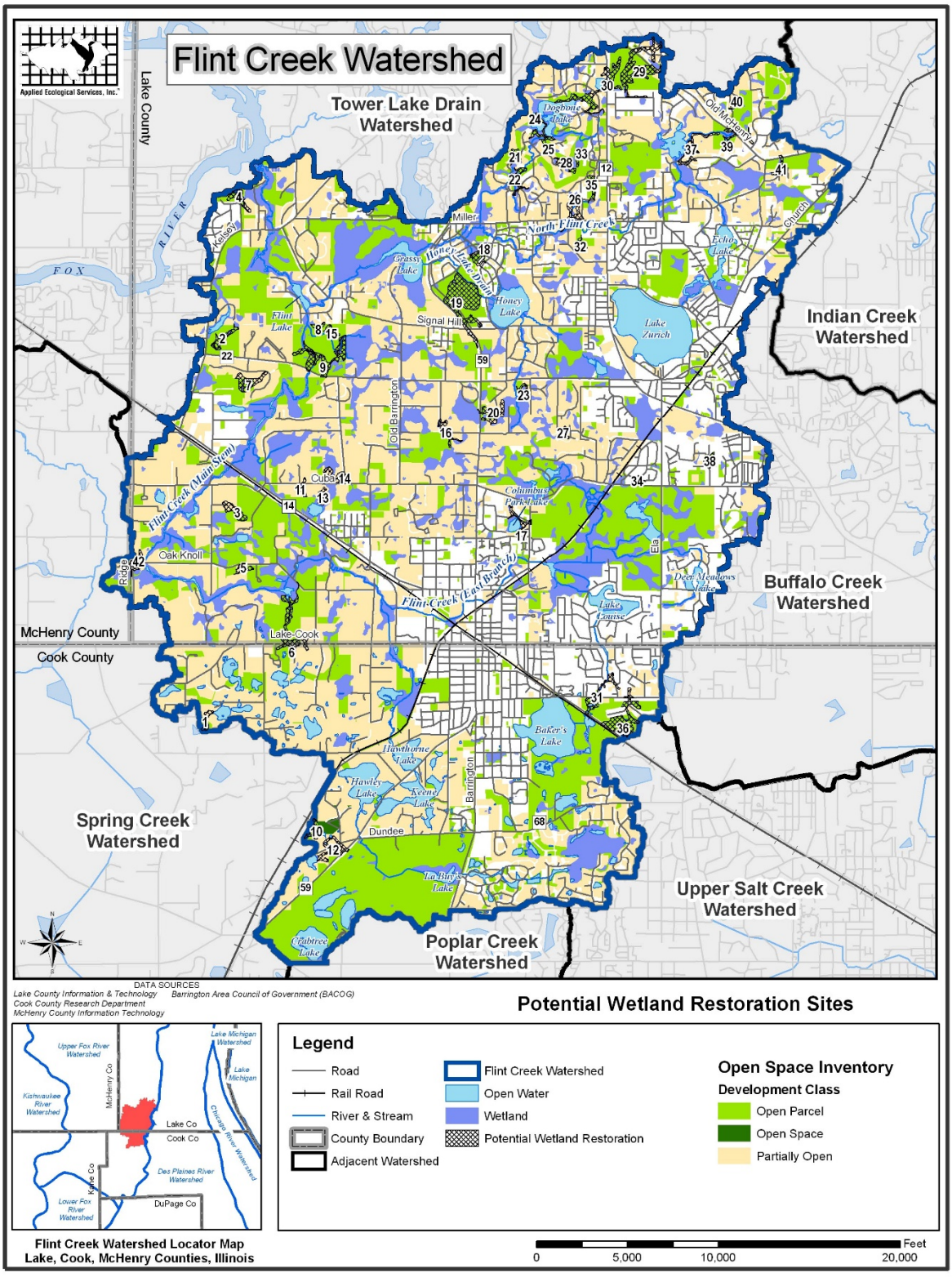


Figure 63: Potential Wetland Restoration Sites

3.4 Groundwater Protection

Groundwater is one the most important factors affecting the ecology of the watersheds. Groundwater is the base flow of streams and contributes water to many of the ponds lakes and wetlands of the watersheds. This water is supplied by the shallow groundwater system. The system consists of the limestone/dolomite bedrock underlying the watersheds plus the overlying unconsolidated materials left behind by the recession of the glaciers. The unconsolidated materials mainly consist of clay, silt, sand, gravel and the combinations thereof that are saturated with water. Groundwater is in storage in the void spaces between the particles of the unconsolidated materials. The coarser materials such as sand and gravel form units/formations called aquifers and are the primary source of water extracted for human consumption in the area.

All of this groundwater flow through, into, and out of the system balance out so that in a natural state, without human intervention, the amount of water in storage remains constant. This constant groundwater storage manifests itself in constant groundwater levels. When human influences are removed, the only change to groundwater levels is a result of climatic conditions. If there were a drought, the water levels go down and conversely, if there were an excess of precipitation, the groundwater levels would rise. Everyone has experienced drought conditions and seen stream water levels drop or disappear altogether. This is a result of groundwater levels dropping below the level of the streambed so that no groundwater discharge occurs to the stream.

Once human influence is added to the equation, it provides a stress that tends to reduce groundwater levels. There is a large volume of groundwater in the area that is *accessible* for consumption, accomplished through public and private well pumping for drinking water, lawn watering, agricultural irrigation, and industrial and other uses. Consumption of more than a few percent of that volume, however, can diminish community supply and reduce groundwater levels and discharge to streams to a point where the ecology of the watershed is substantially affected. The recharge process counters the reduction of groundwater levels by consumption, by allowing precipitation to infiltrate to the shallow aquifer system and increase the groundwater volume. Groundwater levels, especially trends in levels over long periods of time, reflect changes to the groundwater balance and the sustainability of the resource.

Recharge is the process by which precipitation reaches and re-supplies the groundwater aquifers. After precipitation reaches the ground a significant portion runs off and/or evaporates. Of the portion that infiltrates the surface soil, most eventually evaporates from the soil or is taken up and used (transpired) by plants. In areas near streams, rivers, ponds and lakes some of the portion that infiltrated the soil will travel through the near surface soils (upper few feet) and become delayed discharges to these water bodies within a few days of the precipitation event. In terms of annual precipitation, runoff and immediate evaporation accounts for approximately 26 and 5 percent of the precipitation respectively. About 69 percent of the precipitation enters the surface soil were 53 percent of the precipitation evaporates from the soil, is transpired by a plants is discharged by shallow subsurface flow. The remaining 16 percent travels downward through the underlying unconsolidated materials, reaches the groundwater and becomes groundwater recharge. Figure 5 shows the location of the recharge areas in the watersheds while Table 2 lists the acreage of each of the recharge characteristics in the watersheds.

Areas within the watershed that have conditions that favor rapid recharge are the main areas where the shallow system groundwater is replenished. Groundwater can be extracted from anywhere, but is mostly re-supplied through recharge areas. Therefore, recharge areas provide a fast conduit for precipitation to re-supply the groundwater and counter the effects of human consumption. On the other hand, the characteristics that encourage rapid refreshment of the groundwater are the same characteristics that favor the travel of contaminants from the surface to the groundwater and which can degrade the groundwater supply. Activities that use materials that might generate contaminants when released to the ground have the potential to cause these contaminants to migrate rapidly to the groundwater.

Research conducted through the Barrington Area Council of Governments (BACOG) has led to the classification of the watershed recharge areas. The classification is strictly based on analysis of the area's surface soil and underlying unconsolidated material characteristics. Classification is determined by the relative time of travel of water on the surface to reach the uppermost aquifer formation. It does not account for the variability in amount and the sequence of precipitation events nor does it include the effects of transpiration.

Data sources used in the classification and mapping include: Soil Survey for Lake County (USDA, 1970); stratigraphic (sequence of geologic soil types) information obtained from water-well logs (Illinois State Geological Survey [ISGS], 2001); and some techniques used by Berg (2001, ISGS).

The BACOG map (Figure 62) shows the distribution of recharge characteristics in the Flint Creek watershed. The watershed area contains approximately 4,100 acres of "moderate," 900 acres of "important," and 90 acres of "critical" recharge areas. These relatively good recharge areas are located along the western boundary of the watershed beginning with a small area of "moderate' to "important" recharge characteristics in Barrington Hills north of the headwaters of the main stem of Flint Creek. Portions of Lake Barrington and North Barrington also have significant portions of "moderate" to "important" recharge areas as does the western portion of Cuba Township that lies within the watershed boundary This portion of Cuba Township also contains a small area exhibiting "critical" recharge characteristics. The rest of the watershed has recharge characteristics that can be classified as "poor" to "very poor." The distribution of recharge depicted in Figure 62 is based on the best data available, but if recharge is an important consideration at a given site, more detailed site-specific recharge characteristics should be determined.

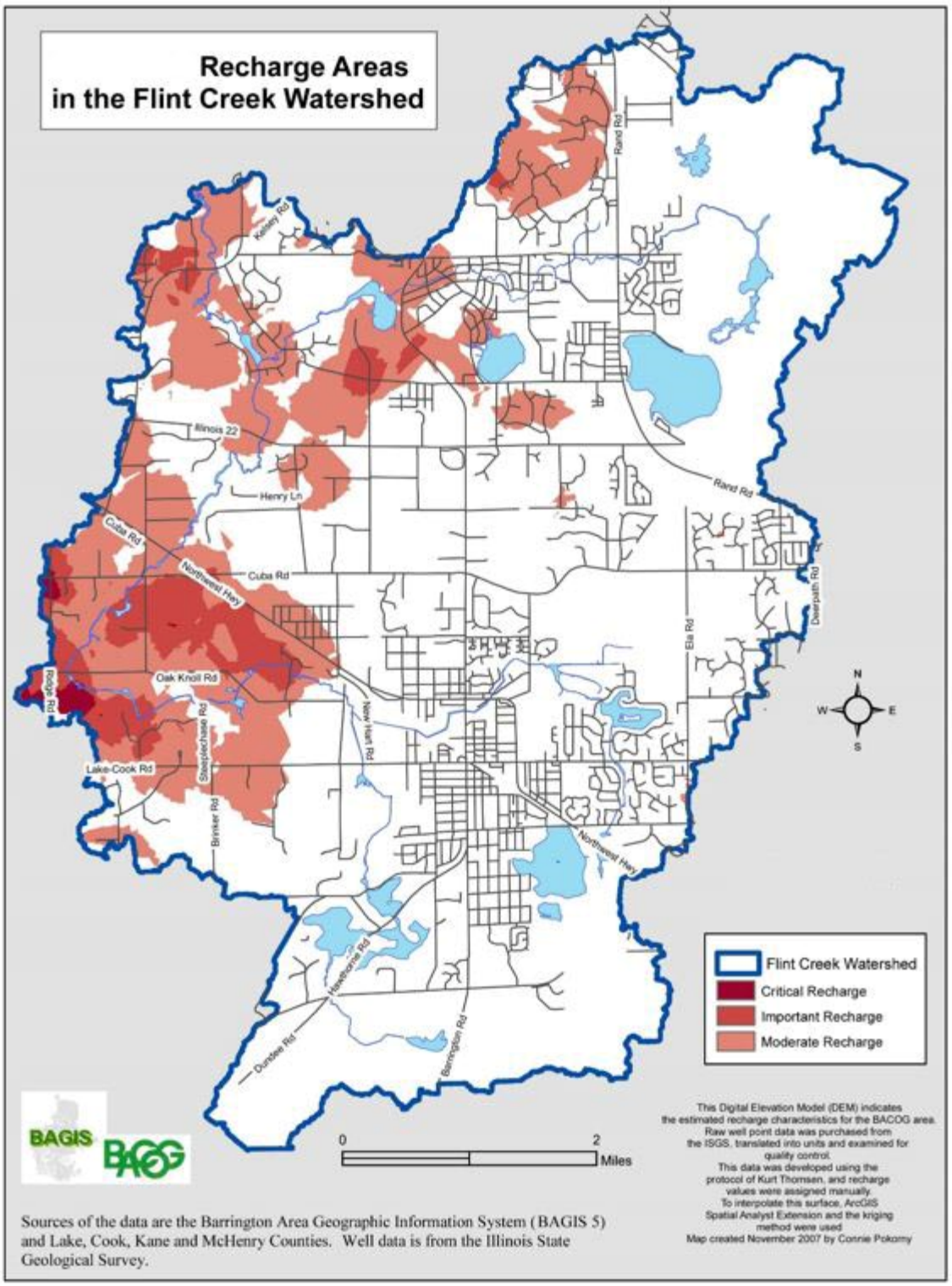


Figure 64: Recharge Areas in the Flint Creek Watershed

Interim Report Shallow Aquifer System Water Levels Monitoring Program, July 2016

(The following information is excerpted from the July, 2016 BACOG report, downloaded 2/26/2017 from http://bacog.org/wp-content/uploads/2017/06/2016-Interim-Summary-Report_FINAL-8-11-16.pdf The full report is included in the Appendix)

"Because the BACOG area is almost entirely reliant on the shallow aquifer system for all its water needs, there is growing concern about the sustainability of this resource. Water consumption due to growth and development has increased around and within the BACOG area and will continue. For the BACOG area, there is no alternate water supply. Lake Michigan water and river water are not available here, and even if another source of water supply were to become available, there is very little piped infrastructure to distribute such a supply. The cost to build distribution systems throughout nearly 90 square miles would be prohibitive.

"Most areas have individual residential private wells or subdivision wells; over 7,800 shallow aquifer system wells provide supply for a population of approximately 35,000. A significant drop in water levels could pose a huge financial impact as private well owners might need to drill deeper or relocate wells. A threat to water levels or water quality would be a threat to public health and safety as well.

"There are thousands of acres of natural areas locally, many of which are dependent on groundwater to feed them. A significant drop in water levels could also mean significant changes to those natural areas if groundwater discharge were no longer adequate to sustain rivers, streams and ponds and natural areas such as fens, woods and wetlands. If the natural areas that define the BACOG area and quality of life were to decline, property values could be negatively affected.

"State studies suggest there will be a downward trend in water levels in the coming decades – by 10 to 20 feet in some BACOG communities -- so monitoring those conditions has become more critical. To address this situation, the Executive Board unanimously approved RESOLUTION #13-04 "Supporting the Establishment and Funding of a Comprehensive Groundwater Monitoring Program under the Barrington Area Council of Governments" on November 19, 2013. Establishing a baseline and then trends in water levels in the shallow aquifer system is necessary information moving forward. Water level data can provide an indication of "what we need to do" in upcoming years to protect the aquifer system that is virtually the sole water supply for the region. Under Resolution #13-04, all BACOG governments share the costs of the program due to the regional nature of this initiative and benefit to all communities…."

While it is too early to establish trends, as "a courtesy to BACOG, two individuals from the ISGS and the USGS have provided comments on the data presented in the Interim Report.

"Comments provided by David R. Larson, Hydrogeologist (retired), Illinois State Geological Survey; former Section Head, Geologic Mapping and Hydrogeology Center:
Because the water-level record is so short and with little stage-level data for surface water, discussion of trends would be inappropriate. A discussion of possible indicators might include the overall similarity of the North Barrington and Deep Park hydrographs between the two periods. Another feature is the hydrographs of the first period show less fluctuation of water level than the hydrographs of the second period. A third feature is the different shape of the Lake Barrington hydrographs, but this would need a word of explanation as to why they are different. The

hydrographs show minor changes over time, and this may be all that is needed to be said. Adding a weather monitoring station (precipitation, temperature, etc.) within BACOG but some distance from the Barrington NOAA site would be beneficial. The data provided would enhance evaluating the trends in water-level fluctuations, for example. Cooperative programs, such as Mesonet, may help provide the resources to accomplish this, one of which involves schools.

"Comments provided by Amy M. Gahala, Hydrologist, U.S. Geological Survey, DeKalb Office: As previously noted, the required time period necessary to observe and evaluate trends in water levels is generally five years to a decade or more. For the 2019 BACOG report, the data available will include the historical ISGS measurements from 2007-12, which when evaluated together with all data collected through 2019, should provide an adequate time period to establish trends. With the exception of the LZUR05-02 monitoring well, all the other water level data are indicating a stable trend. The Lake Zurich quadrangle well, LZUR-05-02, has shown a 70 foot decrease in water levels from 2007 to 2016. Water levels have dropped consistently on a year-to-year basis, and this is not likely to be caused by natural fluctuations."

Fortunately, this last finding, according to Janet Agnoletti, BACOG Executive Director, was subsequently investigated and found to be a result of irregularities in the data and not a true water level decrease.

BACOG and the FCWP believe that a robust network of gages in monitoring wells and streams will aid in early identification of water supply trends. Such a network has been established. Currently there are 18 monitoring wells in the BACOG area (includes some in the Spring Creek Watershed). Three of these wells have transducers, providing a continuous read of water levels (http://bacog.org/groundwater-resources/program-overview/); the other 15 require manual readings, taken annually. In addition, there is also a network of stream gages, some of which can also measure conductivity. While the stream gages have yet to be calibrated for consistency, the gages and monitoring wells are building a picture of how our surface and groundwater resources are responding to our patterns of use, and climate variations. Adding gages in Spring Creek, adding monitoring wells, and/or equipping more of the monitoring wells would enhance the water level and water quality data needed for evaluating trends.

3.5 Water Quality

While the stream gages and well monitoring are focused on water levels, BACOG also hosts Level 1 private well water testing every fall. These tests are for nitrates and bacteria. Private well water samples found to have bacteria run between 10% and 13% annually. Well owners participating in this testing also may sign up for BACOG's Level 2 water testing, which measure natural water quality in the aquifer. BACOG maintains a GIS database of Level 2 test results, which is being used to characterize the region's natural water quality and which is shared with the State Surveys.

Many water quality studies have been completed by several agencies within the Flint Creek watershed. Water quality monitoring is conducted in both lakes and streams but differs depending on the parameters measured. Lake studies usually monitor for nutrients, suspended solids, water clarity, and dissolved oxygen. These parameters are also monitored in streams along with biological monitoring of macroinvertebrates. The data gathered is in a comprehensive report published in July, 2016, so that recommendations and management strategies could be based on the current and most

complete depiction of the present water quality conditions within the Flint Creek watershed. The full report is in the Appendices. This event was the implementation of the approved water quality plan (KOTECI, 2015a) and was conducted following the procedures detailed in the water quality plan and the approved quality assurance project plan (KOTECI, 2015b). While the collected data were used to characterize baseline conditions in both watersheds, only Flint's is reflected here. Data were collected from 25 locations in the Flint Creek watershed. A minimum of three data sets and preferably six data sets are required for any statistical analysis of the data to conduct comparisons and develop trends.

Chemical Monitoring for Water Quality

Chemical monitoring data is a major source of information for the IEPA Section 305 (b) water quality and Section 303 (d) List integrated report. The Clean Water Act defines pollution as the human-made or human-induced alteration of chemical, physical, biological, and radiological integrity of water (Hocutt 1981). Chemical pollution, as documented in Illinois' Section 303 (d) list is a threat to "Designated Uses" of streams and lakes in the Flint Creek watershed.

Limnologists evaluate the ecological health of a waterbody and probability of biological productivity by measuring a variety of water quality parameters. The overall objective of water quality sampling and monitoring is to assess existing conditions in an attempt to restore or maintain the chemical, physical, and biological integrity of the stream or lake. A list of typical chemical and physical monitoring parameters measured is listed below. General use standards are designed to protect the state's water for aquatic life, wildlife, agricultural uses, secondary contact, and most industrial uses. In other words, "General Use" standards are established to protect "Designated Uses".

Table 26. Typical physical and chemical monitoring parameters:

Temperature	Standards/Recommendations:	<32° C
pH	Standards/Recommendations:	6.5 - 9
Dissolved Oxygen (DO) mg/l	Standards/Recommendations:	>5
Total Suspended Solids (TSS)/Turbidity mg/l	Standards/Recommendations:	15
Water Clarity (ft)	Standards/Recommendations:	1.5
Total phosphorus mg/l	Standards/Recommendations:	0.050
Fecal coliform (colonies/100 ml)	Standards/Recommendations:	200
Conductivity	Standards/Recommendations:	N/A
TKN	Standards/Recommendations:	
Metals	Standards/Recommendations:	Varies

Table 27. Sampling Stations and Locations

	Sampling Stations	Latitude	Longitude
Barrington	FCB1	42.1449	-88.1153
	FCB2	42.1653	-88.1260
	FCB3T	42.1582	-88.1453
Barrington Hills	FCBH1	42.1276	-88.1574
	FCBH4	42.1762	-88.1854
Deer Park	FCDP1	42.1723	-88.0877
	FCDP2	42.1667	-88.1019
	FCDP5	42.1781	-88.1085
North Barrington	FCNB1	42.2112	-88.1190
	FCNB2	42.2120	-88.1357
	FCNB4	42.2092	-88.1440
	FCNB7	42.2018	-88.1344
Lake County	FCLC5	42.1599	-88.1131
	FCLC6	42.1611	-88.1152
	FCLC7	42.1955	-88.1000
	FCLC8	42.2100	-88.0903
	FCLC9	42.2004	-88.1301
	FCLC10	42.2053	-88.1472
	FCLC11	42.2007	-88.1672
	FCLC12	42.2037	-88.1703

Table 28. Stream Gage and Sampling Station Locations

Responsible Jurisdiction	Sampling/Stream Gaging Stations	Latitude	Longitude
Barrington Hills	FCBH2Q	42.1544	-88.1520
Barrington	FCB2Q	42.1591	-88.1512
Lake Barrington	FCLB3Q	42.1996	-88.1676
	FCLB4Q	42.2007	-88.1660
	FCLB5Q	42.2114	-88.1735

Table 29. Biological Sampling Station Locations

Responsible Jurisdiction	Biological Sampling Stations	Latitude	Longitude
Barrington Hills	FCBH2QB	42.1544	-88.1520
Barrington	FCB2QB	42.1591	-881510
Lake Barrington	FCLB3QB	42.1996	-88.1671
Lake Barrington	FCLB4QB	42.2007	-88.1660
	FCLB5QB	42.2114	-88.1735
Citizens for Conservation	FCCFC1B	42.1603	-88.1536
	FCCFC2B	42.1975	-88.1673
	FCCFC3B	42.2198	-88.1760
River Watch	FCRW3B	42.2097	-88.1319

Based on the 2016 Baseline Study, following is the Trophic State of some of the Lakes in the Flint Creek Watershed

Table 30. Location of Testing Sites and the Stream Branch and SMU

Stream Branch	Sampling Location	SMU
FCMB	FCBH1	FCM7
FCMB	FCBH2Q	FCM5
FCEB	FCDP2	FCE6
FCEBNSB	FCDPS	FCE3
FCEBSSB	FCB1	FCE3
FCEBSSB	FCLC5	FCE8
FCEBSSB	FCLC6	FCE7
FCEB	FCB2	FCE7
FCEB	FCB3T	FCE2
FCEB	FCB4Q	FCE3
FCMB	FCBH4	FCN1
FCMB	FCLB3Q	FCM3
FCNB	FCLC7	FCN1
FCNB	FCLC8	FCN6
FCNB	FCNB1	FCN6
FCNBNSB	FCNB2	FCN4
FCNB	FCNB4	FCN2
FCNBSSB	FCLC9	FCN1
FCNBSSB	FCLB7	FCN3
FCNBSSB	FCLC10	FCN3
FCNB	FCLB4Q	FCN1
FCMB	FCLC11	FCN1
FCMB	FCLC12	FCN1
FCMB	FCLB5Q	FCN1

The full report is Appendix H Detailed findings are presented later in this report.

Table 31. Specific 2016 303(d) information for assessed waterbodies in the Flint Creek watershed.

Waterbody	Priority	Causes of Impairment	Designated Use
Flint Creek	Medium	Fecal Coliform, Dissolved Oxygen Levels, Total Phosphorus	Aquatic Life and Recreation
Columbus Park Lake	Medium	Total Suspended Solids (TSS), Total Phosphorus (TP)	Aesthetic Quality
Echo Lake	Low	Total Suspended Solids (TSS), Total Phosphorus	Aesthetic Quality
Grassy Lake	Low	Total Suspended Solids (TSS), Total Phosphorus,	Aesthetic Quality
Honey Lake	Low	Fecal Coliform, Total Phosphorus (TP),	Aesthetic Quality
Lake Louise	Low	Total Suspended Solids (TSS), Total Phosphorus	Aesthetic Quality
Lake Zurich	Medium	Mercury	Fish Consumption

Source: IEPA (2016).
*Flint, Baker's, Hawthorne, Keene, Hawley, Heather, Stephanie, Dogbone, and Deer/Meadow Lakes were not assessed for potential inclusion into the 303d list.

Lake County Health Department Water Quality Data

The Lake County Health Department-Lakes Management Unit (LMU) has been collecting water quality data on Lake County lakes since the late 1960's. Detailed reports are written for each lake and include data analyses, a list of problems specific to each lake and recommendations on how to reduce or eliminate those problems (http://www.co.lake.il.us/health/ehs/lmureports.asp). The goal of the LMU is to monitor the quality of the county's surface water in order to:

- Maintain or improve water quality and alleviate nuisance conditions
- Promote healthy and safe lake conditions
- Protect and improve ecological diversity

The LMU collected the most recent water quality data for Lake County Lakes in the Flint Creek watershed from 2000 to 2016 for 9 lakes including Lake Zurich, Echo Lake, Honey Lake, Grassy Lake, Flint Lake, Columbus Park Lake, Deer/Meadows Lake, Dogbone Lake, and Lake Louise. Section 3.9.3 (Lakes Inventory) includes information regarding water quality, aquatic plants, life, and shoreline assessments. The LMU did not collect water quality studies for lakes in the Cook County portion of the watershed. However, the IEPA's Volunteer Lake Monitoring Program (VLMP) conducted basic water quality data sampling for Hawthorn Lake, although nothing since 2004. Keene Lake, Heather Lake, and Stephanie Lake are no longer monitored.

Trophic State Index, Water Clarity, and Total Dissolved Solids

Total phosphorus (TP) concentrations are important to a lake's productivity and health. The state of Illinois set the standard for TP at 0.05 mg/l.

Data from lakes in Lake County show average phosphorus levels at 0.056 mg/l. When TP levels exceed 0.05 mg/l lake wide algal blooms can occur and rooted vegetation can grow uncontrollably.

Increases in algal blooms lead to decreased water clarity, a decrease in light penetration, and increase in total suspended solids. In other words, the biological productivity of the lake increases. Biological productivity is measured by computing a Trophic State Index (TSI). The single index number derived from the TSI is then compared to numerical ranges for the four trophic states discussed below. The most common TSI used to assess Lakes is the phosphorus based TSIp which uses phosphorus levels as the primary indicator of the productivity of a lake. The TSIp categories include: oligotrophic (lacking biological productivity), mesotrophic (moderate biological productivity), eutrophic (high biological productivity), and hypereutrophic (overabundant biological productivity).

Determining the trophic state of a lake is important because it provides a base measure from which lake managers can choose effective strategies to meet the goals of a lake and set reasonable expectations regarding the waterbody's true biological, aesthetic, and recreational potential. For example, oligotrophic and mesotrophic lakes are better managed for swimming than eutrophic lakes because they are generally clearer and contain less biological productivity. Eutrophic lakes are better managed for fishing. Hypereutrophic lakes are typically unhealthy and managed as aesthetic amenities because fish consumption and swimming are generally not safe.

Table 32 below summarizes the most recently documented phosphorus concentrations, TSIp number, and TSIp Category for each assessed lake in the watershed. The water clarity (secchi depth) and Total Suspended Solids (TSS) is also shown in Table 32. Water clarity and TSS is directly related to phosphorus levels. The state of Illinois set the secchi depth standard at 4 feet for swimming and 1.5 feet for general water quality. Several lakes including Grassy, Flint, Dogbone, and Deer/Meadows Lakes do not meet the general water quality secchi depth standard. Lake Zurich and Honey Lake are the only lakes to meet IEPA standards for swimming.

Table 32. Secchi depths, phosphorus concentrations, and TSIp values/categories for assessed lakes in the Flint Creek watershed.

Lake	Year Assessed	Secchi Depth (ft)	Total Suspended Solids (mg/l)	Total Phosphorus (mg/l)	TSIp	TSI Category
Standard	**n/a**	***4 ft/1.5 ft**	***7.5 mg/1**	***0.05 mg/1**	**n/a**	**n/a**
Lake Zurich	2015	7.24	3.0	0.021	48.0	Mesotrophic
Echo Lake	2015	2.3	10.2	0.079	66.2	Eutrophic
Honey Lake	2015	3.11	6.6	0.059	59.0	Eutrophic
Flint Lake	2008	NA	23.3	0.241	93.8	Hypereutrophic
Dogbone Lake	2004	0.9	39.4	0.199	80.5	Hypereutrophic
Columbus Park Lake	2000	2.0	19.0	0.123	73.5	Hypereutrophic
Lake Louise	2015	1.04	36.9	0.181	79.0	Hypereutrophic
Baker's Lake	3/31/2017	n/a	37	0.01	n/a	Eutrophic
	6/15/2017	n/a	276	0.77	n/a	Hypereutrophic
	9/20/2017	n/a	258	0.89	n/a	Hypereutrophic
Hawley Lake	1990	2.5	12.0	0.061	64	Eutrophic
Deer/ Meadows Lake	2004	1.0	23.2	0.116	73	Hypereutrophic

Source: Lake County Health Department Lake Management Reports
* Secchi Depth Standard = 4 ft for swimming, 1.5 ft for water quality
* Total Suspended Solids = 7.5 mg/l standard for general water quality
* Total Phosphorus Standard = 0.05 mg/l standard for general water quality

Results of the TSIp classifications indicate that Echo Lake, Honey Lake, Baker's Lake, and Hawley Lake are all eutrophic (Table 30). A comprehensive study of Baker's Lake conducted by the Cook County Forest Preserve District in 1981 (Forest Preserve District, 1981) classifies the lake as eutrophic. Subsequent testing in 2012 to 2017 by the Village of Barrington would suggest a hypereutropic classification. Eutrophic lakes (TSIp 50-69) have high biological productivity. They possess high nutrient concentrations and are able to support extensive rooted plant populations. These lakes often lack oxygen in the bottom waters during summer stratification limiting the habitat potential of the system. Eutrophic lakes are common in the Midwest especially among human-created lakes and lakes surrounded by heavy development. Lake Zurich was also assessed by LMU in 1991 and 1998. At that time, the lake was classified as mesotrophic (TSIp 40-49); it was classified eutropic as 2007; in 2015, it is again mesotrophic.

Bakers Lake						Lake Zurich Rd						Hart Rd					
Date	Ammonia	Ph	BOD	Total Phos	TSS	Date	Ammonia	Ph	BOD	Total Phos	TSS	Date	Ammonia	Ph	BOD	Total Phos	TSS
Limit	15	6.5-9	< 8	0.05	15-30	Limit	15	6.5-9	< 8	0.05	15-30	Limit	15	6.5-9	< 8	0.05	15-30
2012	0.161	8.5	8	0.11	18	2012	0.01	8.0	1	0.47	5	2012	0.01	7.7	5	0.38	9
2013	0.04	9.8	8	0.18	77	2013	0.11	7.7	3	0.37	0	2013	0.04	8.0	3	4.16	1
2014	0.04	8.9	7	0.05	47	2014	0.12	7.9	5	0.15	2	2014	0.08	7.9	3	1.62	0
2016	0.03	10.2	14	0.67	170		0.17	8.0	7	0.56	12		0.07	8.0	6	1.68	5
3/31/2017	0.509	8.1	9	0.01	37	3/31/2017	0.051	7.7	3	0.02	19	3/31/2017	0.108	7.8	3	0.06	61
6/15/2017	0.022	9.1	11	0.77	276	6/15/2017	0.601	8.8	7	0.49	68	6/16/2017	0.176	7.9	5	0.59	33
9/20/2017	0.27	7.8	12	0.89	258	9/20/2017	0.64	7.7	11	0.64	5	9/20/2017	0.06	8.0	3	1.67	3

Table 33: Recent MS4 testing of Baker's Lake and Main Stem Flint Creek

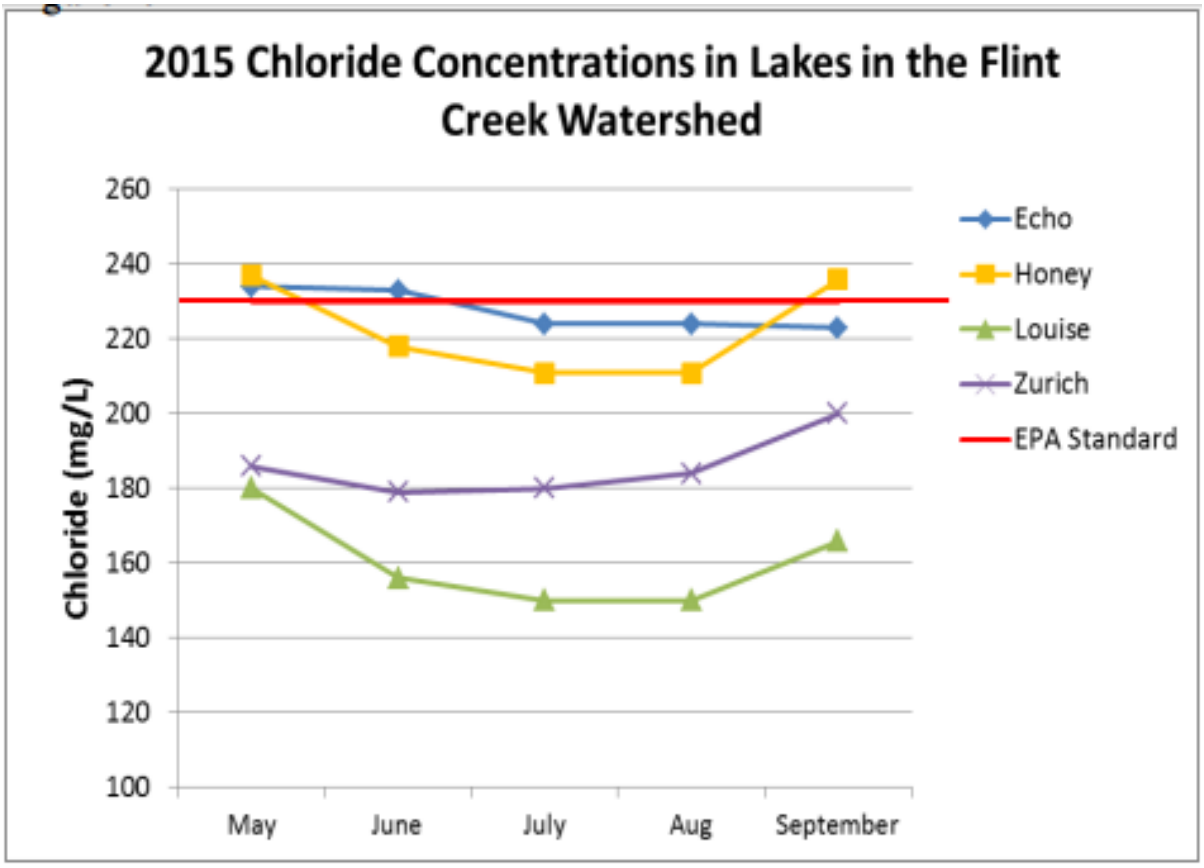
The other assessed lakes in the watershed - Grassy, Flint, Columbus Park, Louise, Dogbone, and Deer/Meadows - are all classified as hypereutrophic (TSIp >70) (Table 30). Hypereutrophic lakes have extremely high nutrient concentrations as well as extensive algal blooms and low water clarity. These problems can result in reduced uses of the waterbody and are often the focus of ongoing management efforts.

Total Suspended Solids (TSS) is a measure of the amount of suspended material in the water column. This can include but is not limited to algae and sediment. High TSS values typically correlate with poor water quality and this is no exception of the assessed lakes in the watershed. Increased turbidity caused by TSS can negatively affect aquatic organisms by decreasing sight for predatory species and decreasing light penetration necessary for aquatic plant growth. Aside from Lake Zurich and Honey Lake, the remaining studied lakes in the watershed far exceed the Lake County standard (7.5 mg/l) for TSS (Table 30).

Total Dissolved Solids (TDS) and correlating conductivity readings in the water column of many urban lakes has increased in recent years. TDS include a variety of dissolved solids such as those being flushed from stormsewers and from stream and lake shoreline erosion. One of the most common dissolved solids is salt applied to roads during winter road maintenance. Chloride ions associated with dissolved salt were found by the U.S. Environmental Protection Agency to be toxic to certain forms of aquatic life at a four-day average concentration of 230 mg/L. Some plant species at the base of the food chain can be impacted at low concentrations. Although high TDS levels can originate from many sources, the LMU identifies road salts as a primary source.

The Lake County median for Chloride concentration is 139 mg/L. Some plant species at the base of the food chain can be impacted at much lower concentrations. Many of the assessed lakes in the watershed show Chloride concentrations above toxic levels and above the county median Although high TDS levels can originate from many sources, the LMU identifies road salts as a primary source.

FIGURE 65: 2015 Chloride Concentrations in Lakes in the Flint Creek Watershed



Biological Monitoring for Water Quality

NGRREC RiverWatch volunteers conducted several macroinvertebrate and fish community surveys in the early 1980's, 1990's, and into 2007 to measure water quality within Flint Creek (Table 34). Biologists and volunteers utilized two biological indices including the Macroinvertebrate Biotic Index (MBI) (IEPA 1987) and the Index of Biotic Integrity (IBI) (Karr 1981; Karr et al.1986; IEPA unpublished) to evaluate the water quality and biological health of streams and to detect and understand change in biological systems that result from the actions of human society on water quality.

Table 34. Index of Macroinvertebrate Biotic Integrity, Flint Creek

Location	Date	Water Quality	Avg. Collected Macroinvertebrates	Avg. Taxa Richness	Avg. EPT Taxa Richness	MBI	Latitude/ years of data
NB Flint Creek Tr R0204301	6/19/14	Poor	118.1764706	8.058823529	1.705882353	6.006922258	42.2097 17 yrs
Flint Creek Petersen Preserve	6/13/2016	Fair	82.0	8.0	2.0	4.52	42.152831 1 year
Flint Creek Savannah R0204201	6/18/2014	Poor	116.7058824	8.705882353	1.705882353	5.720060364	42.1911 17 years
Flint Creek Tr #2; North of Baker's Lake R0213801	6/9/2002	Poor	103	8.71428514	0.4285714286	6.339954018	42.1419 7 years

The MBI is designed to rate water quality using the pollution tolerance of macroinvertebrates and human impacts as an estimate of the degree and extent of organic pollution and disturbance in streams and is a modification of the Hilsenhoff Biotic Index (HBI) (Hilsenhoff 1982) first used in Wisconsin streams. Following data collection, macroinvertebrates are identified and given a predetermined pollution tolerance rating. The MBI is calculated by taking an average of tolerance ratings weighted by the number of individuals in the sample. In 2004, IDNR revised the MBI scoring to better describe and reflect stream conditions in Illinois. Using the 2004 system, MBI scores less than 4.35 represent excellent water quality while scores greater than 6.26 indicate very poor water quality. Flint Creek has much room for improvement, as well as a need for an increase of volunteers with RiverWatch.

The MBI is a valuable monitoring tool because stream biota integrate cumulative effects of sediment/nutrient pollution and respond to habitat degradation (Ohio EPA 1999). Macroinvertebrate and stream fish community surveys are also a major source of information for Section 305 (b) and 303 (d) water quality reports.

Table 35. Water Quality Correlation to Macroinvertebrate Biotic Index Score 2004 Scale.

Macroinvertebrate Biotic Index	Water Quality Category
≤ 4.35	Excellent
≥4.36 to ≤5.0	Good
≥5.1 to ≤5.7	Fair
≥5.71 to ≤6.25	Poor
≥6.26	Very Poor

Note: Score also depends on taxa richness and EPT taxa richness (number of mayfly, stonefly and caddisfly species)

Lake County Health Department sampled area lakes for aquatic plants and invasives. In moderation, native aquatic plants are aesthetically pleasing and environmentally desirable. The diversity and extent of plant populations can be influenced by water clarity and depth. When the light level in the water column falls below 1% of surface light level, plants can no longer grow.

Table 36. Area Lake Macrophytes and Floristic Quality Profiles

Lake	Year Assessed	Macrophytes Sites - % w/ plants	Floristic Quality Index	Invasives	Algae	TSI Category
Lake Co. Median	**n/a**		**13.4**		**n/a**	**n/a**
Lake Zurich	2015	161 sites – 61% Only 8 plant species and Chara (macro-algae)	18.9	Eurasian watermilfoil, Zebra mussels,		Mesotrophic
Echo Lake	2015	23 sites – 85%	10.4	Common carp	treated	Eutrophic
Honey Lake	2015	31sites – 42.5%	20.0		Not in 2015	Eutrophic
Flint Lake	2008	Only 5 species near shore and scarce	11.0	Curlyleaf Pondweed	yes	Hypereutrophic
Dogbone Lake	2004	Only 5 species in just a few locations	15.7* *indicates the quality of the plants found only, and not the density.	Along shore: purple loosestrife, reed canary grass, buckthorn, multiflora rose	slight	Hypereutrophic
Columbus Park Lake	2000	Only 3 species and 1 microalgae found	N/A	Shoreline: purple loosestrife, reed canary grass, buckthorn. Grass carp in the lake	yes	Hypereutrophic
Lake Louise	2015	3 sites – 6.5% Only 2 species	8.3	Carp and gizzard shad	Yes, incl blue-green	Hypereutrophic
Baker's Lake	1981	n/a	n/a	n/a	n/a	Eutrophic
Hawley Lake	1990	n/a	n/a	n/a	n/a	Eutrophic
Deer/ Meadows Lake	2004	Few plants, small localized beds	5.2	Carp, curlyleaf pond-weed; shoreline has 8 invasive species	Yes, incl blue-green	Hypereutrophic

Table 37 presents Hite and Bertrands' (1989) Biological Stream Characterization (BSC) summary while MBI scores for each sampling event are given in Table 34. Class A streams are usually comparable to the best situations without human intervention. Comparatively, Class E streams usually contain very few fish and no sport fishery.

Table 37. Biological Stream Characterization (BSC) Summary

IBI	Class	BSC Category	Biotic Resource Quality Description
51-60	A	Unique Aquatic Resource	Excellent. Comparable to the best situations without human disturbance.
41-50	B	Highly Valued Aquatic Resource	Good. Good fishery for important game fish species; species richness may be somewhat below expectations for stream size or geographic region.
31-40	C	Moderate Aquatic Resource	Fair. Fishery consists predominantly of bullhead, sunfish, and carp. Species diversity and number of intolerant fish reduced. Trophic structure skewed with increased frequency of omnivores, green sunfish, or tolerant species.
21-30	D	Limited Aquatic Resource	Poor. Fishery predominantly for carp; fish community dominated by omnivores and tolerant forms. Species richness may be notably lower than expected for geographic area, stream size or available habitat.
≤20	E	Restricted Aquatic Resource	Very poor. Few fish of any species present; no sport fishery exists.

Source: (Hite and Bertrand 1989)

IBI scores calculated in 1996 and 2002 at Site BIO5 indicate that Flint Creek is a Class D (Limited Aquatic Resources) stream. The Biological Stream Characterization describes a Class D aquatic resource as poor because it is generally dominated by tolerant species, lacks species richness, and may lack suitable habitat for higher quality (intolerant) species. A closer look at the LCHD-ES data supports this assessment. The number of native species and proportion of species that represent particular feeding niches is below average and the number of tolerant species is above expected conditions.

Table 38. Stream Data for Analyte Values that are Above Water Quality Criteria

Location	Ortho-P (mg/L)	Total-P (mg/L)	O2 (mg/L)	BOD (mg/L)	Chloride (mg/L)	TDS (mg/L)	Iron (mg/L)	E. Coli (Col./100mL)	Branch
FCBH1`	0.08	0.16	0.53	3.97	202	0.22	1.5	517.2	Main
FCBH2Q	0.26	0.31	6.64	3.75	136	500	1.3	648.8	Branch
FCDP1	0.06	0.71	0.35	8.83	429	1133	11	435.2	
FCDP2	0.03	0.11	1.92	4.07	224	767	1.4	93.4	
FCDP5	0.01	0.06	5.7	5.37	261	600	0.49	307.6	
FCB1	0.24	0.33	2.40	7.95	658	3.52	1.5	1299.7	East
FCLC5		0.238	7.85	6.3	150	164	1.31		Branch
FCLC6		0.228	11.5	7.4	148	478	1.30		
FCB2	0.34	0.47	1.26	5.29	188	533	1.4	290.9	
FCB3T	2.89	3.03	8.45	2.11	462	1367	0.048	920.8	
FCB4Q	2.85	3	8.56	2.59	457	1367	0.13	980.4	
FCBH4	0.43	0.48	3.55	4.71	339	0.3	1	325.5	Main
FCLB3Q	0.25	0.32	7.68	4.85	257	767	0.62	547.5	Branch
FCLC7		0.021	8.57	3.7	184	472	0.07		
FCLC8		0.074	5.91	3.7	224	606	0.38		
FCNB1	0.11	0.14	6.35	2.19	337	867	0.71	360.9	
FCNB2	0.05	0.1	6.54	2.83	194	667	0.68	36.4	North
FCNB4	0.07	0.09	6.93	2.11	273	733	0.29	155.3	Branch
FCLC9		0.039	5.85	3.7	211	624	0.07		
FCNB7	0.01	0.02	4.46	4.71	228	633	0.037	50.4	
FCLC10		0.149	10.44	4.7	175	576	0.48		
FCLB4Q	0.08		6.31	0.04	0.07	0.11	5.3	21.64	
FCLC11		0.35	6.34	2	218	164	0.43		Main
FCLC12		0.478	5.41	2	223	770	1.91		Branch
FCLB5Q	0.2	0.29	9.40	4.77	245	800	0.49	488.4	
Criteria:	0.01	0.05	> 5.0	< 5.0	250	500	0.3	200	

Table 39. Flint Creek Stream Analyte Loading to the Fox River

Analyte	Loading (Pounds/Day)	Loading Goals (Pounds/Day)	Load Reduction To Meet Goals (%)
Flint Creek:			
Phosphorus	6.3	1.1	82.5
Orthophosphate	4.3	0.22	94.9
Chloride	5,300	5,410	0
Total Dissolved Solids	17,300	10,800	37.6
Iron	10.6	6.5	38.7

From the 2007 Report, following is the SMU analysis of pollutant loading in mg/L.

Table 40. 2007 Subwatershed analysis of pollutant loading, all pollutant loading units in mg/L.

Flint Creek (East Branch) Pollutant Loading Analysis									
SMU ID	Acres	TSS	TDS	BOD	COD	TOT N	TOT KN	DIS P	TOT P
FCE1	369	837.21 H	1688.68 H	36.36 H	330.64 H	9.16 L	6.31 M	0.323 H	1.052 H
FCE2	650	637.01 M	1415.09 M	26.93 H	261.74 H	7.11 L	5.31 M	0.246 H	0.871 H
FCE3	1,115	242.99 L	635.27 L	8.45 H	96.17 H	2.30 L	2.15 L	0.090 H	0.317 H
FCE4	481	176.69 L	490.74 L	6.62 H	74.59 H	1.86 L	1.68 L	0.071 H	0.255 H
FCE5	902	702.19 M	1663.00 H	30.61 H	295.74 H	7.95 L	5.56 M	0.265 H	0.875 H
FCE6	241	457.16 M	1034.86 M	18.27 H	189.65 H	4.98 L	4.10 L	0.168 H	0.667 H
FCE7	679	436.29 M	844.10 M	21.19 H	180.06 H	5.75 L	3.92 L	0.223 H	0.765 H
FCE8	719	477.59 M	1179.28 M	33.63 H	234.56 H	8.15 L	2.95 L	0.284 H	0.558 H
FCE9	284	951.85 H	2065.62 H	44.86 H	400.27 H	11.62 M	7.54 M	0.400 H	1.279 H
Flint Creek (Main Stem) Pollutant Loading Analysis									
FCM1	1,108	318.91 L	752.19 M	11.86 H	126.37 H	3.21 L	2.76 L	0.121 H	0.441 H
FCM2	1,203	462.97 M	885.22 M	16.87 H	154.70 H	4.44 L	3.09 L	0.196 H	0.545 H
FCM3	1,057	194.68 L	427.64 L	7.92 H	75.63 H	2.17 L	1.72 L	0.092 H	0.306 H
FCM4	1,653	158.63 L	358.48 L	7.65 H	67.11 H	2.13 L	1.51 L	0.089 H	0.298 H
FCM5	1,232	414.49 M	1001.89 M	16.40 H	170.27 H	4.34 L	3.43 L	0.150 H	0.531 H
FCM6	830	356.50 L	764.63 M	17.40 H	147.30 H	4.60 L	2.91 L	0.179 H	0.540 H
FCM7	1,176	283.14 L	633.57 L	15.55 H	127.13 H	4.18 L	2.53 L	0.159 H	0.502 H
FCM8	917	76.93 L	325.13 L	2.22 H	31.66 H	0.70 L	0.84 L	0.044 H	0.110 H
FCM9	748	276.33 L	519.86 L	15.34 H	120.64 H	4.28 L	2.69 L	0.168 H	0.560 H
FCM10	1,146	217.53 L	563.76 L	8.02 H	88.83 H	2.23 L	2.00 L	0.087 H	0.322 H
North Flint Creek Pollutant Loading Analysis									
FCN1	674	167.34 L	495.04 L	6.39 H	72.33 H	1.83 L	1.65 L	0.072 H	0.259 H
FCN2	1,253	357.75 L	783.53 M	16.05 H	147.86 H	4.40 L	3.25 L	0.173 H	0.606 H
FCN3	1,408	342.22 L	871.23 M	14.32 H	146.91 H	3.82 L	2.97 L	0.132 H	0.474 H
FCN4	1,171	513.37 M	1194.51 M	21.72 H	214.48 H	5.76 L	4.36 L	0.199 H	0.710 H
FCN5	710	708.95 M	1622.10 H	48.56 H	335.74 H	11.70 M	4.24 L	0.413 H	0.827 H
FCN6	1,079	539.74 M	1094.50 M	21.13 H	205.33 H	5.41 L	4.13 L	0.194 H	0.667 H
FCN7	568	476.45 M	1064.53 M	17.61 H	183.60 H	4.65 L	3.83 L	0.170 H	0.602 H

TSS=Total Suspended Solids; TDS=Total dissolved solids; BOD=Biological oxygen demand; COD=Chemical oxygen demand; Tot N=Total Nitrogen; Dis P=Dissolved Phosphorus; TOT P= Total Phosphorus;
(L)=Low; (M)=Medium; (H)=High compared to IEPA standard. According to the 2016 KOT Baseline Water Quality Report, metals, except for Fe, are inconsequential in Flint Creek waters, and are not reported here.

Water Quality Summary (quoted from the 2016 baseline report)

"The Illinois EPA lists Flint Creek as being impaired. The impairment of Flint Creek is caused by several factors including other flows into the Creek, low dissolved oxygen, high total phosphorous, and high aquatic algae content. The low dissolved oxygen levels are caused by the large amounts of aquatic algae in the creek causing increased eutrophication. The aquatic algae buildup is due in part to the interruption of flow due to the large number of dams in the creek and their resulting impoundments. Also, contributing to the aquatic algae buildup was the urban runoff and stormwater that increases the amount of phosphorus and other nutrients available in the creek. A review of the available water quality data indicated consistently high values of phosphorus, chloride and total suspended solids. Additionally, Flint Creek had consistently reported high values of biological oxygen demand and fecal coliform.

"A water quality monitoring event was conducted in the Flint watershed during the summer of 2015 and was supported by an Illinois EPA 319 grant. This event was the implementation of the approved water quality plan (KOTECI, 2015a) and was conducted following the procedures detailed in the water quality plan and the approved quality assurance project plan (KOTECI, 2015b). The collected data were used to characterize baseline conditions in both watersheds. Data were collected from 25 sampling locations. Very little data analysis could be conducted on this first set of data collected. Little more than presenting the data with descriptive statistics could be accomplished. A minimum of three data sets and preferably six data sets are required for any statistical analysis of the data to conduct comparisons and develop trends.

"Orthophosphate in both watersheds makes up a significant portion of the total phosphorus available. No orthophosphate values were measured in any of the lakes. The headwaters of the East Branch in Deer Park is the only location where the total phosphorus is significantly greater than the orthophosphate. At the Barrington POTW there is a large influx of phosphorus, mainly in the form of orthophosphate, which is carried on down to the confluence of the East Branch with the Main Branch of Flint Creek and is further assimilated/diluted as the water moves through Barrington Hills and into Lake Barrington at Flint Lake.

"In a stream system that is unaffected by urbanization, one would expect total phosphorus, orthophosphate, dissolved oxygen and BOD to be interrelated. In this situation orthophosphate would be expected to be low and the dissolved oxygen levels high with BOD having low values. In urbanized streams such as we have with the Flint Creek, this relationship is not always valid.

"Chloride in streams is primarily due to urban runoff. In the Flint Creek watershed chloride makes up about 32 percent of the TDS values. Local hardness values were estimated to be about 45 percent, therefore, chloride and hardness make up about 77 percent of the TDS in the creeks.

"Although most of the iron concentrations are above the criteria all of the concentrations are below two mg/L with the exception of two apparent outliers having concentrations of 11 and 5.3 mg/L respectively.

"A significant number of the E. coli values are above the 200 colonies/100 mL criteria. The outflow of Baker's Lake has an E. coli value of 1300 colonies/100 mL probably as a result of the heron rookery located in the Lake. A high value of E. coli was also recorded at the Barrington POTW and

at the sampling location prior to the confluence with the Main Branch of the Flint Creek. No E. coli values were recorded in the lakes.

"Analyte loadings to the Fox River were estimated for those analytes that did not meet water quality criteria. Review of the loading of these constituents to the Fox River provides insight to the overall health of the creeks. Loadings were estimated using discharge measurements and analyte values from the sampling station closest to the Fox River. The estimated loadings reflect the conditions present during this water quality monitoring effort and are likely to change during the course of the year.

"The analysis shows that total phosphorus and orthophosphate in the Flint Creek watershed are a problem. Total phosphorus and orthophosphate in the watershed need to be reduced by 82.5 and 94.9 percent respectively to meet water quality criteria loads calculated for conditions encountered during this water quality monitoring event.

"Chloride loading to the Fox River is the only analyte in the Flint Creek watershed that meets the estimated water quality criteria loading values. TDS and iron also are over the loadings estimated based on the water quality criteria and their loadings need to be reduced by less than 40 percent to meet the goals.

"The phosphorus loading estimates are an indicator of the degree of urbanization of the Flint Creek watershed. The fate of phosphorus in the watersheds includes uptake and release by vegetation, periphyton and microorganisms; sorption and exchange reactions with soils and sediments; chemical precipitation in the water column; and sedimentation and entrainment. These mechanisms exemplify the combined biological, physical, and chemical nature of phosphorus retention in the stream wetlands and stream itself. The estimated loads to the Fox River represent the amount of phosphorus that can't naturally be assimilated by the streams. Therefore, remedial actions need to be established that will increase the amount of phosphorus that can be assimilated by the watershed or removed from the system.

"The Barrington POTW is the only point source remedial action that removes phosphorus from the system. The POTW discharge averages about 2 million gallons per day (mgd). During the 11 low-flow period that was in effect during the water quality monitoring event, POTW discharge accounted for about three quarters of the Flint Creek flow into the Fox River. Influent total phosphorus levels range from 2 to 3 mg/L and the average total phosphorus discharge concentration was approximately 1.500 to 2.250 mg/L most of which is assimilated by the Flint Creek wetlands and the stream itself. The POTW is in the process of upgrading its treatment in order to meet the US EPA's new discharge criteria of 0.1 mg/L of total phosphorous, and should be online in late 2018. The proposed upgrade is expected to reduce the total phosphorus discharge level to as low as 0.010 mg/L.

"The Flint Creek watershed-based plan Partners each have a comprehensive list of remedial actions that can be undertaken. Each of these remedial actions address the removal of phosphorus, orthophosphate, TDS, and iron by improving the assimilation capacity of the watershed. Chloride is conservative and these actions will have a limited effect on assimilation of chloride. A number of these remedial actions include the maintenance of existing facilities such as detention basins, wetlands and other riparian areas. Private landowners and local environmental organizations are

involved in removing invasive species. The Citizens for Conservation and Barrington Area Conservation Trust has conducted and is conducting extensive prairie and savanna restoration. Most of these remedial actions are relatively inexpensive and are very effective in removing runoff pollutants. Clearly, citizen engagement and education is working and must be expanded.

Conclusions:

"Flint Creek is impaired, with significant channelization and eroded streambanks along its reaches. The current pollutants of concern are nutrients, especially phosphorus and orthophosphates, chlorides, total dissolved solids, and iron. Metals contamination were all well below EPA guidelines except for iron, which naturally occurring in the Flint Creek Watershed area.

"Some of the lakes have issues of high E.coli, as well as the aforementioned nutrients, chlorides and total dissolved solids. Details of the lakes with nutrient problems that have poor shorelines, with inadequate buffers, have been documented in the LCHD Lake Unit. Sources of E.coli may be wildlife, pet waste disposal or leaky septic systems. Carp is widespread within the watershed, which means lake bottoms are continually churned, with resulting low clarity. Much of the chloride contamination comes from runoff from streets, parking lots and sidewalks. Dissolved oxygen was low in almost all cases, except Lake Zurich, due to high BOD and COD."

Table 41. Pollutants and Identified and Potential Causes and Sources per EPA's 303(d) Report

Pollutant	Identified and Potential Causes and Sources Per EPA's 303(d) Reports on Impaired Waters	Designated Use Impairment
E.coli	*Causes*: Animal (esp. avian and canine) and human waste *Sources*: Public parks, streets, lawns, driveways, parking lots, problem septic systems, etc.	Primary and Secondary Contact
Salt	*Causes*: Excess dilution in stormwater runoff *Sources*: Deicing operations on streets, driveways, parking lots, and other impervious surfaces	Aquatic life, water supply
Total Suspended Solids (TSS)	*Causes:* Eroded soils and other loose debris; carp *Sources*: Streets, lawns, driveways, parking lots, soil erosion, elevated and highly varied stream flows, improper construction site management of sediment, agricultural practices (esp. equine) increasing land development without proper stormwater management practices	Aquatic life, water supply, primary contact
Total Dissolved Solids (TDS)	*Causes*: Dilution of substances in stormwater *Sources:* Streets, lawns, driveways, parking lots, construction activities, channel erosion	Aquatic life, water supply, primary contact
Biological Oxygen Demand (BOD)	*Causes:* Organics *Sources*: Poorly treated wastewater, blooms caused by high nutrient load; yard wastes contamination	Aquatic Life
Chemical Oxygen Demand (COD)	*Causes*: Organics	Aquatic Life

	Sources: Poorly treated wastewater, algal blooms caused by high nutrient load; yard wastes contamination	
Total Nitrogen	*Cause*: Excessive dilution in stormwater *Sources*: Applications of fertilizer, failing septic systems, sewage treatment plant discharges, livestock (e.g. horses), geese	Aquatic Life primary contact, water supply
Total Kjeldahl Nitrogen (TKN)	*Causes*: Excess dilution on stormwater *Sources*: Plant and animal decay, yard waste contamination	Aquatic Life primary contact, water supply
Dissolved Phosphorus (DIS P)	*Causes:* Excess dilution in stormwater *Sources:* Streets, residential lawns (lawn fertilizers, grass clippings, leaves), driveways, agricultural and golf course fertilizers, soil erosion, runoff from animal raising/stabling operations, untreated stormwater and wastewater, inadequate or failing septic systems, lake sediments, geese and other wildlife	Aquatic Life primary contact, water supply
Total Phosphorus (TOT P)	Causes: Excess dilution in stormwater Sources: Streets, residential lawns (fertilizers, grass clippings), driveways, agricultural and golf course fertilizers, soil erosion, runoff from animal raising operations, untreated stormwater and wastewater, inadequate or failing septic systems, lake sediments, wildlife, e.g. geese	Aquatic Life primary contact, water supply

4.0 Best Management Practices

For the Flint Creek Watershed-based Plan, BMPs have been separated into watershed-wide and site specific strategies. There are a variety of practices in the plan that address the issues of stormwater and residential modes of use in the watershed. BMPs are suggested based on a number of factors, including need, feasibility, and cost, including labor.

There are a number of golf courses in the area, as well as large lot land holdings, and something like **agricultural filter strips** or **riparian buffers** may be some of the best practices available. Both reduce sediment and nutrients by filtering the water that flows through it. Buffers are generally larger than agricultural filters, and they can reduce the flow of water more significantly. The type of vegetation can dramatically affect the effectiveness of the filter strip and turf grasses are not recommended. When installed, appropriately populated, And functioning correctly, the USEPA has documented that filter strips can reduce total suspended solids (sediment) by 73%, total phosphorus by 45%, and total nitrogen by 40%.

Bioswales may also be an option, depending on the layout of the land. Bioswales, or vegetated swales, are designed to convey water and also can be modified to capture and treat stormwater for watersheds. Bioswales act as filters for stormwater nutrients, and are effective in trapping sediment and other nutrients as they slow the water flow, especially if they are planted with native plants, and

the plants are salt-tolerant.. Depending on the "uphill" area for the practice, bioswales can be very effective for reducing total suspended solids. Again, according to the USEPA, vegetated swales reduce total suspended solids by 65%, total phosphorus by 25%, and total nitrogen by 10%.

One longer term mediation strategy – which may be effective to reduce chloride run off - may be working with municipalities to change the cultural attitude toward having turf roadsides, even in suburban neighborhoods, and instead have **swales or vegetated strips with low growing native plants, such as sedges, or other plants that have a high salt tolerance**. Many neighborhoods have drainage ditches that lead to Flint Creek, which are covered with turf grass. If there were sedges or other (native) grassed ditches and roadsides, the impact on the rate of phosphorus and chloride pollution of Flint Creek could be substantial. The task of changing the prevailing culture, ordinances and expectations of what a front lawn should look like is a very long term proposition.

Similarly for owners of lakeside or creekside properties, **riparian buffers, filter strips, raingardens, bioswales** are all viable Best Management Practices options, depending on the property. In many cases, there are Lake Management organizations or Home Owner Associations which would be the required coordinating bodies to encourage homeowner cooperation.

Larger projects required by severe streambank or lakeshore erosion could require cooperation of municipal agencies as well as county or state agency assistance with funding.

Debris removal and programs of regular stream maintenance are an ongoing concern. Depending on the river flow, some blockages can alter the stream channel and cause erosion of the streambank. Major blockages can exacerbate flooding. Ongoing vigilance and maintenance of stream flow is important for the health of streams. At the same time, some tree falls or brush can be beneficial for river life, giving cover, so understanding of the situation is important.

Shoreline and streambank stabilization mitigation can be an important BMP. Various reaches of Flint Creek and shorelines of area lakes have moderate to severe erosion and require stabilization of shorelines and streambanks to reduce the progress of erosion and prevent future occurrences. Stabilization can reduce nutrient loads from runoff as well as sediment loads.

Flint Creek has a number of hydraulic structures throughout its length, which should be regularly reviewed for their utility, condition and effects, in coordination with the Watershed Partnership and landowners, and reflecting a systemic approach to understand upstream and downstream impacts.

There are six probable wetland locations and thirty-five detention basin retrofits located within pollutant loading "hotspot" SMUs that are recommended for water quality retrofits. Three basins are recommended to be changed from dry bottom basins to wet bottom basins. These are shown in Figure 66. Figure 67 shows recommended stream and lake restoration projects within pollutant loading "hotspots" – where land uses have higher pollutant loading rates compared to other SMUs.

Wetlands are essential for water quality improvement and flood reduction in any watershed. They also provide quality habitat for a wide variety of plants and animals. Wetland restoration involves returning the water and vegetation to soils that once supported wetlands. The USEPA estimates that wetland restoration projects can reduce suspended solids by 77.5%, total phosphorus by 44%, and total nitrogen by 20%.

Detention basins, with their capability for temporary storage or semi-permanent storage of stormwater runoff and controlled release after big rain events, are important elements in watershed plans. There are many, many detention basins (as well as in-channel impoundments) in the Flint Creek Watershed. Detention basins planted with turf grass along their sides do not promote good infiltration, water quality improvement of good living areas for wildlife.

Studies completed by several credible actors over the past twenty years show that detention basins that serve multiple functions have many benefits. According to the USEPA, properly designed dry bottom infiltration basins reduce total suspended solids by 75%, total phosphorus by 65%, and total nitrogen by 60%. Wet bottomed basins which are designed to have wetland characteristics reduce total suspended solids by 77.5%, total phosphorus by 44% and total nitrogen by 20%.

Future detention basins and retrofitted basins should consist of naturalized basins serving multiple functions – water storage, water quality improvement, natural aesthetics and wildlife habitat.

Ideally, a minimum 5-foot wide shelf planted to native wet prairie and stabilized with erosion control blanket should be constructed above the normal water level in wet and wetland bottom basins. This area should be designed to inundate after every 0.5 inch rain event or greater. A minimum 10-foot wide shelf planted with native emergent plugs should extend from the normal water level to 2 feet below normal water level in wet and wetland bottom basins. Permanent pools in wet and wetland bottom basins should be at least 4 feet deep. Irregular islands and peninsulas should be constructed in wet and wetland bottom basins to slow the movement of water through the basin. They should be planted to native mesic or wet prairie depending on elevation above normal water level. A 4-6 foot deep artificial pool of water should be built at inlet(s) of wet/wetland bottom basins to capture sediment; a 4-6 foot deep micropool should be constructed at the outlet to prevent clogging.

Establishing native plantings takes at least 3 years of short term management. Measures needed include mowing during the first two growing seasons following seeding to reduce annual and biennial weeds. Spot applications of herbicides will also be required to knock out problematic invasive species, such as reed canary grass, buckthorn, box elder, teasel, and so forth. Inlet and Outlet structures should be checked for erosion and clogging periodically during the year. The following tables are AES recommendations for detention basin vegetation establishment:

Table 42. Establishment Schedule for Naturalized Detention Basins

Year 1 Establishment Recommendations
Mow prairie areas to a height of 6-12 inches in May, July, and September.
Spot herbicide non-native/invasive species throughout site in late May and again in August/September. Target thistle, reed canary grass, common reed, purple loosestrife, and all emerging woody saplings.
Check for clogging and erosion control at inlet and outlet structures during every site visit.
Year 2 Establishment Recommendations
Mow prairie areas to a height of 12 inches in June and August.
Spot herbicide non-native/invasive species throughout site in May and again in August/September. Target thistle, reed canary grass, common reed, purple loosestrife, and all emerging woody saplings.
Plant additional emergent plugs if needed and reseed any failed areas in fall.
Check for clogging and erosion control at inlet and outlet structures during every site visit.
Year 3 Establishment Recommendations
Spot herbicide non-native/invasive species throughout site in May and again in August/September. Target thistle, reed canary grass, common reed, purple loosestrife, and all emerging woody saplings.
Check for clogging and erosion control at inlet and outlet structures during every site visit.

Table 43. Three year cyclical long term Maintenance Schedule

Year 1 of 3 Year Maintenance Cycle
Conduct controlled burn in early spring. Mow to height of 12 inches in November if burning is restricted.
Spot herbicide problematic non-native/invasive species throughout site in mid August. Specifically target thistle, reed canary grass, common reed, & emerging woody saplings such as willow, cottonwood, buckthorn, & box elder.
Check for clogging and erosion control at inlet and outlet structures during every site visit.
Year 2 of 3 Year Maintenance Cycle
Spot herbicide problematic non-native/invasive species throughout site in August. Specifically target thistle, reed canary grass, common reed, & emerging woody saplings such as willow, cottonwood, buckthorn, & box elder.
Mow prairie areas to a height of 6-12 inches in November.
Check for clogging and erosion control at inlet and outlet structures during every site visit.
Year 3 of 3 Year Maintenance Cycle
Spot herbicide problematic non-native/invasive species in August. Specifically target thistle, reed canary grass, common reed, and emerging woody saplings. Cutting & herbiciding stumps of some woody saplings may also be needed.
Check for clogging and erosion control at inlet and outlet structures during every site visit.

Another Best Management Practice for reducing pollutant loading in watersheds is **street sweeping**. Because roads comprise such a sizeable percentage of land in an urbanized watershed, street sweeping can reduce non-point source pollutants in the watersheds, because pollutants such as sediment, trash, road salt, oils, nutrients and metals are gathered and disposed of properly rather than washing into the stormsewers, and from there, Flint Creek. Weekly street sweeping can remove between 9% and 16% of sediment and between 3% and 6% of nitrogen and phosphorus.

The Flint Creek Watershed Partnership had an active **raingarden** program initially, which was very useful in educating citizens about the benefits of native plants, and their ecosystem services. More time will be allocated to that program in the future.

Some newly identified projects will be discussed in the specific site section, as will projects that have yet to be completed from the 2007 plan.

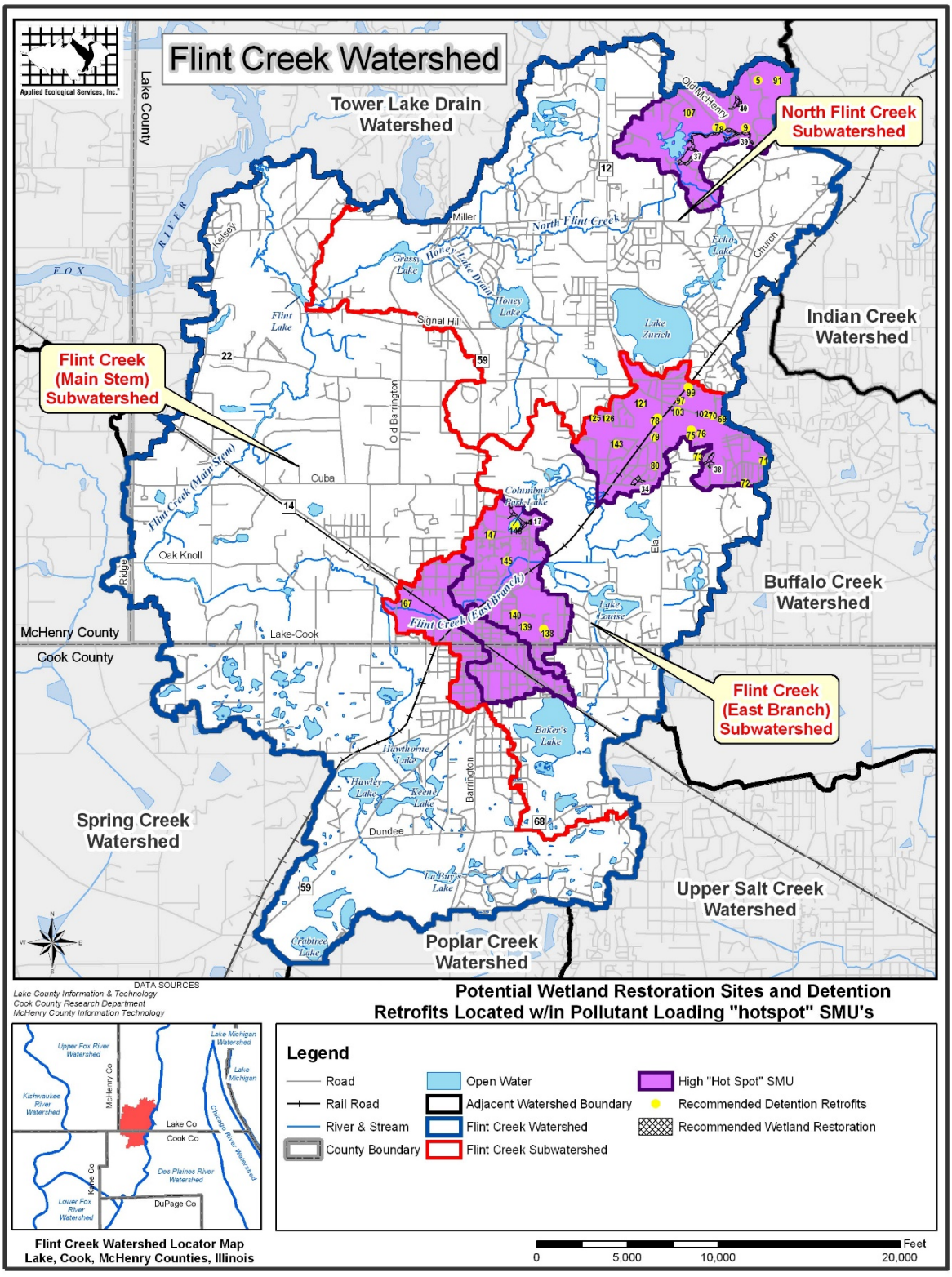


Figure 66: Potential Wetland Restoration Sites and Detention Retrofits

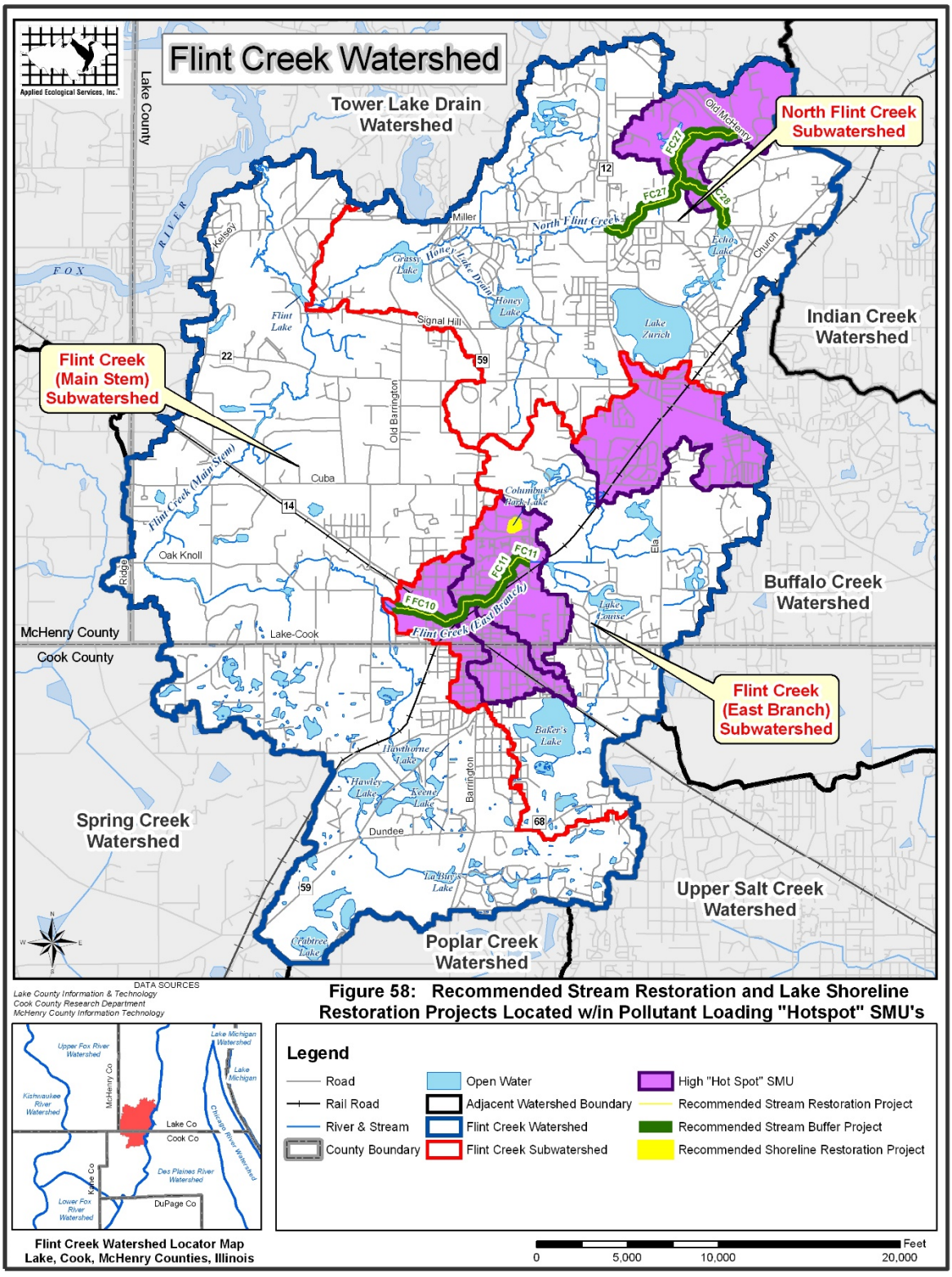


Figure 67: Recommended Stream Restoration and Lake Shoreline Restoration Projects

5.0 PRIORITY AREAS AND PRACTICES

A Prioritized Action Plan has been developed for the Flint Creek Watershed Partnership to provide stakeholders guidance on the action items for watershed improvement practices. This Plan should serve as a guide to assist partners in collaborating and partnering with an extended group of stakeholders to address water quality and flood reduction in the Watershed. The Plan is divided into five subsections:

1. Programmatic Action Plan
2. Site Specific Action Plan Additions
3. Site Specific Action Plans remaining from the 2007 Action Plans
4. Education and Outreach Plans
5. Water Quality Monitoring Plans

The Programmatic Action Plan (Section 5.1) is focused on watershed-wide items that are not site specific. New Site Specific Action Plans (Section 5.2) identifies plan additions of site locations where water quality, flood reduction/prevention projects or hydrologic modifications can be implemented (See also page XX). Similarly, the Site Specific Action Plans (Section 5.3) from the 2007 Action Plans also address the same issues, and have been prioritized. Additionally, where the priority is high, estimated costs and responsible entities for project implementation have been provided. Projects for which priorities are lower may state that gathering updated costs is part of the project.

Section 6.1 includes the Education and Outreach Plan. This section highlights the recommended activities needed to engage and educate an extended network of stakeholders in order to be accomplished. Section 6.3 addresses the Water Quality Monitoring and Groundwater Monitoring Plans. It also recognizes that, since some of our municipalities are below 25,000 in population, testing may include visual observations as part of the regimen. The Water Quality Monitoring Plan also incorporates increasing citizen volunteer scientists – one of the Programmatic Goals – as part of the Monitoring process.

Influenced by projections for changing patterns of precipitation and temperature, the most important recommendations are:

1. Remediate existing flood problems, prevent future flooding by reducing stormwater runoff, protecting and restoring areas for surface water storage and absorption, including floodplains, depressional storage areas, wetlands, and other buffer lands. Remediate in such a way that water quality improvement benefits are also provided. Educate and enlist homeowners and other property owners in understanding how their property management practices, including raingardens and porous pavement strategies, can benefit themselves and their neighbors and enhance natural environmental services. Assess existing hydrologic structures for their contribution to flooding.
2. Restore and maintain stream reaches by restoring natural and native riparian buffers, removing excessive debris, stabilizing streambeds and streambanks in ways that enhance and

protect native habitat. Similarly with lake shores, restore and stabilize shorelines, including creating natural and native buffers in ways that enhance and protect native habitat. Similarly, educate and enlist homeowners and other property owners in understanding how their property management practices, including stream and shoreline buffer strategies or choice of pavement sealants, can benefit themselves and their neighbors and enhance natural environmental services.

3. Use best practice stormwater management and low impact development practices for new and existing developments that promote infiltration and cleansing of stormwater runoff, as well as slowing, cooling or filtering, if necessary, the runoff.

4. Develop outreach and education strategies to improve public understanding and appreciation of watershed resources and issues, to understand the developmental evolution of the land they own, and the impact of their own practices and the power they have to improve the environmental services of their land. Engage the public in such ways that they become interested in citizen science opportunities, such as VLM, eBird or Riverwatch, etc. Develop the Flint Creek\Spring Creek Watersheds website and digital footprint to support citizen engagement and public support for watershed investments.

5. Modify and use planning and development standards, policies, capital improvement plans and budgets to protect and improve water quality, working with BACOG and area governments. Incorporate best practices for resilient communities.

6. Monitor and evaluate watershed plan implementation, the physical watershed conditions, stream and groundwater levels and conductivity, and citizen surveys to assess progress toward watershed goals.

Section 5.1 Programmatic Action Plan

The Programmatic Action Plan recommends watershed-wide action items that generally are not site specific. Action items are based on goals and objectives developed by the Flint Creek Watershed Partnership (FCWP) (see Goals and Objectives) and recommended regulatory changes for jurisdictional bodies. The Site Specific Action Plans identify actual locations where water quality, natural resource issues, and flood reduction/prevention opportunities have been identified in this report. A priority ranking was assigned to both programmatic and site-specific action recommendations. Assigning priority to watershed improvement projects is largely dependent upon need and feasibility, which is determined by size of the project, location, land use, ownership, funding, scope of work, and other factors such as level of interest and support by potential partners. Key stakeholders, technical resources, and some funding sources are listed in Table 44, below.

Key Stakeholders/Resources	Abbreviation
Ancient Oaks	AO
Audubon Society	AS
Barrington Area Council of Governments	BACOG
Barrington Hills Conservation Trust	BACT
Bobolink Foundation	BF
Chicago Metropolitan Agency for Planning	CMAP
Citizens for Conservation	CFC
Cook County	Cook County
Cook County Department of Transportation	CCDOT
Cook County Health Department	CCHD
Farm Bureau	FB
Federal Emergency Management Agency	FEMA
Flint Creek Watershed Partnership	FCWP
Forest Preserve District of Cook County	FPDCC
Friends of the Forest Preserve	FFP
Fox River Ecosystem Partnership	FREP
Golf Courses	Golf
Illinois Department of Natural Resources	IDNR
Illinois Department of Natural Resources – Office of Water Resources	IDNR-OWR
Illinois Department of Transportation	IDOT
Illinois Environmental Protection Agency	IEPA
Illinois Lakes Management Association	ILMA
Lake and Cook County Soil & Water Conservation District	SWCD
Lake County	Lake County
Lake County Department of Transportation	LCDOT
Lake County Department of Planning, Building, and Development	LCPBD
Lake County Forest Preserve District	LCFPD
Lake County Health Department	LCHD
Lake County Stormwater Management Commission	LCSMC
LC Health Department Lakes Management Unit	LMU
McHenry County Stormwater Committee	MCSC
Metropolitan Planning Council	MPC
Metropolitan Water Reclamation District of Greater Chicago	MWRD
Morton Arboretum	MA
Municipalities	Munis
Openlands	OP
Other Foundations	OF
Park Districts	PD
Residents or Owner	Residents/ Owner
Townships	TWP
US Army Corps of Engineers	USACE
US Fish & Wildlife Service	USFWS
USDA Natural Resources Conservation Service	NRCS
Wild Ones (Lake-to-Prairie Chapter)	Wild Ones

Key stakeholder responsibilities are included in the Glossary and discussed in more detail in Plan Implementation.

The Programmatic Action Plan is divided into two sections. The first section includes a table (Table 45) with recommended watershed improvement actions that are applicable throughout the watershed to meet specific goals and objectives developed, refined, and categorized by the FCWP. The six goals that were developed by the Partnership are included below. The second section includes recommended regulatory changes for jurisdictional bodies in the watershed

Programmatic Actions for Plan Goals

Goal A: Protect surface and groundwater resources and enhance overall water quality in the lakes and streams of the watershed

Goal B: Identify and protect important natural areas/open space in the watershed and provide appropriate passive recreational benefits

Goal C: Reduce existing flood damage in the watershed and prevent flooding from worsening downstream

Goal D: Improve aquatic and terrestrial habitat in the watershed

Goal E: Increase communication and coordination among municipal decision-makers and other stakeholders within the watershed

Goal F: Foster appreciation and stewardship of the watershed through education

The Programmatic Action Plan table (Table 45) lists actions to meet each of the above goals and associated objectives and in addition, provides information needed to facilitate implementation of specific actions. This includes the priority, cost (where applicable), designated lead regulatory, governmental, private, or other agency with the greatest potential for implementation, and the designated support agencies that would likely be responsible for issuing appropriate permits or providing technical, regulatory, or funding assistance.

Cost estimates are provided only for those watershed improvement actions that involve remedial action costs such as planting native vegetation. Cost estimates are not provided for preventative measures such as education and regulatory actions. **Cost estimates should not be considered actual costs, but used as a way to compare the relative costs of recommended BMPs**. Furthermore, BMP implementation projects vary dramatically by specific technique employed, size of area, property values, and other factors.

Priority was assigned to each action item and classified as H (high), M (medium), or L (low) and based on several factors including urgency, ownership types, cost, technical and financial needs, and potential shortcomings. High priority recommendations deserve immediate attention and are generally expected to be addressed in the short term (1-5 years) whereas medium and low priority recommendations are not as urgent and should be addressed in the long term (5-10+ years). Medium and low priority recommendations should not be written off as less important projects. In many cases, funding availability, technical assistance, or shortcomings may be responsible for a project being designated as medium or low priority.

Table 45: Programmatic Actions for Goals A-F

- **Goal A:** Protect surface and groundwater resources and enhance overall water quality in the lakes and streams of the watershed.

Objectives:

1) Lakes and streams shall at a minimum attain state water quality standards to fully support designated uses.
2) Reduce sediment and nutrient accumulation in lakes and streams by restoring eroded streambanks and lake shorelines using bioengineering practices.
3) Maintain and expand high quality native riparian buffers and restore native riparian buffers along those stream reaches identified as having poor buffer quality.
4) Retrofit existing stormwater management structures and design new structures within developed areas to specifically reduce nutrient and sediment loading.
5) Publicize the impacts of road salt usage on water quality and aquatic life and develop recommendations for education, alternatives, and use reduction.
6) Identify open space parcels appropriate for implementation of best management practices (BMPs) to reduce pollutants originating from known pollutant loading hotspots.
7) Reduce point source pollutant loading.
8) Educate the public about protecting shallow aquifer water quality, particularly in recharge areas.
9) Implement stormwater BMPs throughout the watershed to improve water quality and reduce runoff.
10) Reduce phosphorus, nutrient & other pollution by educating land-owners and landscape contractors on the effectiveness of native buffers and porous pavements.
11) Continue to educate landowners and developers about the dangers of high Polycyclic Aromatic Hydrocarbon surface sealers, and their impact on water quality, and aquatic life.
12) Work with the LCSMC and local villages and government agencies to educate well and septic owners on best maintenance practices

	Action	rank	Primary objective	Secondary Goal(s)	Cost	Lead Agency	Supporting Agencies
1	Work with BACOG and municipalities to develop education strategies and application strategies related to pavement salting and alternatives	H	A 1, 5, 8,10	B, F	n/a	BACOG, FCSCWP	Residents, CFC, Muni, TWPs
2	Identify appropriate water quality enhancement options on "high priority" parcels to maintain or improve water quality and green infrastructure	H	A6	B,D, E, F	n/a	CFC, BACT	BF, AS, FP FCSCWP
3	Amplify BACOG's education initiatives about the importance of groundwater recharge & quality	H	A8, A9, A10	B, C, F	n/a	BACOG	Munis, TWPs, CFC, BACT, FC/SCWP, Schools, Residents
4	Encourage/Educate owners to maintain their septic systems	H	A7	C, D, E, F	$250-350	Munis, TWPs	LCHD, CCHD, LCSMC, MWRD, Owners
	Develop and adopt stream and lake shoreline restoration guidelines			B, D, F	n/a		CFC, LCHD,

5	related to buffer vegetation, stabilization, and other bioengineering techniques.	H	A2, 3			FCSCWP, TWPs, Munis	
6	Encourage collaboration and sharing of MS4 information gathered by Munis & TWPs to supplement formal testing/monitoring schedules	H	A1, 5, 7	D, E	n/a	FCSCWP, TWPs Munis	LCHD, LCFP, CCFP
7	Review and update landscaping recommendations/ stormwater requirements for water quality BMPs to allow use of native vegetation.	M	A1, 2, 5, 7, 8, 9, 10	B, C, D, E, F	n/a	FCSCWP, Munis	CFC, BACT, LCSMC,
8	Implement a watershed-wide stream maintenance program to remove debris and fix problematic discharge and hydraulic structures	M	A2, 3	C,D, E	n/a	Muni, TWP, Owner	LCSMC, MWRD
9	Improve or implement BMPs on remaining agricultural/livestock land	M	A1	D	Var	Owner	FCSCWP, FB, LCSWC, Owners
10	Develop watershed-specific buffer requirements for streams and lakes.	M	A2, 3	B, D	n/a	LCSMC, MWRD, MCSC	FCSCWP, Munis, TWPs
11	Conduct wetland enhancement on existing low quality wetlands and restore/create new wetlands	L	A3	A, B, C D	$5-8K /acre	Owner	FCSCWP; NRCS, SWCD
12	Develop BMPs for handling sump pump discharge.	L	A7		Var	Owner	FCSCWP, NRCS, Owners

- **Goal B:** Identify and protect important natural areas/open space in the watershed and provide appropriate passive recreational benefits.

Objectives:

1) Permanently protect all sites with high quality natural areas or threatened and endangered species.
2) Identify buffer parcels for potential acquisition, protection, and/or restoration adjacent to sites with high quality natural communities and/or threatened and endangered species.
3) Adopt conservation design standards for all new development in designated high priority open space to maximize protection of natural areas and open space in new developments.
4) Identify and protect open space that provides important green infrastructure (conservation) corridor connections and provide passive recreation opportunities

	Action	Rank	Primary Objective	Secondary Goal(s)	Cost	Lead Agency	Supporting Agency
1	Identify "High Priority" open space parcels slated for future development and require conservation design to minimize impacts.	H	B1, 3, 4	A, C, D, E, F	n/a	Munis, TWPs, LCFP CCFP, CFC	FCSCWP BACT
2	Locate all unprotected high quality natural areas and/or T&E species	H	B1	D	n/a	CFC, AS, FCSCWP	Munis, TWPs, FPDs, AO
3	Include key greenway parcels identified in Figure 75 in community	H	B4	A, C, D, E	n/a	Munis; Twp,	

	comprehensive plans and green infrastructure plans					LC	FCSCWP, CFC, BACT, AO
4	Buffer existing protected Ecologically Significant Areas and/or T&E species locations by protecting adjacent unprotected "High Priority" open parcels	H	B2	D, E	n/a	CFC, BACT, IDNR	AO, AS, BF, FCSCWP, FPD
5	Conduct Natural Resource Inventories (NRIs) on key sites before development to identify any sensitive/high quality natural areas or species that should be preserved or protected.	H	B1, 4	D	$3K - $6K/ site	Owner, Munis – if required by building permit	NRCS, IDNR, SWCD
6	Use results of the Green Infrastructure Plan to create new trails and trail connections	M	B4	E, F	n/a	Munis; TWP	FCSCWP, CFC, AO
7	Adopt buffer guidelines between developments and high quality terrestrial or aquatic natural communities, wetlands & streams.	M	B1, 2, 3	D, E	n/a	LCSMC; USACE; MWRD	FCSCWP
8	Identify conservation overlay opportunities along existing green space corridors and open parcels for use in new developments or changes in existing zoning in order to identify critical greenways & future protection options	M	B3	A, C, D	n/a	Munis, TWPs	CMAP, CFC, FCSCWP
9	Support a multi-jurisdictional partnership to develop funding packages and grant proposals to implement greenway protection/connection strategies	M	B4	A, D, E	n/a	CFC, FCSCWP	FPD, SWCD, OP, OF, BF, AS,
10	Identify "high priority" private parcels; educate owners about options and incentives for protecting and restoring open space with conservation easements	M	B1, 2, 4	F	n/a	BACT	FCSCWP, CFC
11	Encourage adoption of municipal Codes to complement federal, state and county laws in place, as well as local Codes to protect locally significant resources and improve water quality generally	M	B1, 2	D, E	n/a	LCSMC, MWRD, USACE; MCSC	Munis; TWPs, FCSCWP
12	Engage schools for potential environmental education and recreation	L	B4	F	n/a	BACT, CFC, BACOG	FCSCWP, FPDs

- **Goal C:** Reduce existing flood damage in the watershed and prevent flooding from worsening downstream.
  Objectives:

  1) Inventory undeveloped floodplain that is not currently protected from development and protect it as open space.

  2) Mitigate for existing flood damage at all flood damage sites by identifying open space parcels suitable for wetland restoration or stormwater storage basins.

  3) Reconnect ditched stream reaches to historic floodplain where feasible.
  4) Implement multi-objective stormwater management best management practices (BMPs) within high priority open space and new developments that help reduce runoff and increased stream flows through infiltration of rainwater.

	Action	Rank	Primary Objective	Secondary Goal(s)	Cost	Lead Agency	Supporting Agency
1	Protect key "High and Medium Priority" undeveloped floodplain parcels and other priority flood reduction parcels as part of the natural drainage and green infrastructure network.	H	C1	A	n/a	Munis; Twp; Owner	FEMA; LCSMC; MWRD
2	Identify key Flood Problem Areas, classify and identify opportunities to mitigate on adjacent open space as appropriate.	H	C2	A	Var	Munis; Twps; Owners	FEMA; LCSMC; MWRD
3	Identify and construct multi-functional stormwater storage areas and restore/create wetlands	H	C2, 4	A, D	$10K -30K /acre	Owner	LCSMC; USACE
4	Implement a watershed-wide stream maintenance program to remove debris loads/jams	H	C	A, D, E	$200-500 each	Munis; TWPs, Owners	LCSMC, MWRD
5	Require in-watershed mitigation for any wetlands lost within the same watershed or subwatershed.	H	C4	A	Var	LCSMC; MWRD; USACE; Munis	TWPs
6	Modify streets, parking lots, lawns (i.e. rain gardens and natural swales), parks, and other open space within existing and new development for stormwater storage and infiltration.	M	C4	A	Var	Munis, Owners, TWPs	Residents; LCSMC-MWRD
7	Assess each new and old development site for proper implementation of stormwater management practices that best minimize runoff.	M	C4	A	n/a	Munis, HOA, LCPBD, LCSMC, MWRD,	Munis, TWPs
8	Assess storage capacity for older, sediment laden detention basins and consider options for those with storage deficiencies.	M	C	A	Var	Owner	LCSMC; USACE; MWRD
9	Provide educational information on flood proofing to residents along or within the 100-year floodplain.	L	C	none	n/a	FCWP; Owner	Munis, TWPs, FEMA

- **Goal D:** Improve aquatic and terrestrial habitat in the watershed.
  Objectives:

  1) Identify opportunities for habitat improvement on identified open space and improve habitat in degraded stream reaches using natural stream design approaches and improve habitat in degraded terrestrial communities by removing non-native plants and replacing with native plant communities

  2) Develop and implement short and long-term management and monitoring plans for all natural areas

  3) Encourage the development of lake management plans among stakeholders and HOAs

  4) Encourage native plantings in stakeholder landscapes.

	Action	Rank	Primary Objective	Secondary Goal(s)	Cost	Lead Agency	Supporting Agency
1	Install or restore pool/riffle complexes, habitat for fish and macroinvertebrates, and bioengineering bank stabilization in identified degraded stream reaches to improve habitat and increase oxygen levels.	H	D1	A, B	$3-5K each	Owners, Munis	LCSMC; IDNR-OWR; USFWS; NRCS; USACE

2	Control existing populations and prevent the spread of non-native/invasive species; replace with native plant communities.	H	D1, 3, 4	B	$1-5K/ site	CFC, FCSCWP, BACT	Residents, Owners, FPDs
3	Develop standardized 3 or 5-year and long term (5+ years) maintenance and monitoring plans for created natural areas in newly developed areas.	H	D2, 3, 4	B	$2-4K	LCSMC; MWRD; USACE, AES, CFC	IDNR; NRCS
4	Restore stream and terrestrial habitat in conjunction with construction of roads, bridges, culverts, etc. to minimize negative impacts.	H	D1	A, B	$5-10K /site	LCDOT; CCDOT; IDOT	NRCS; SWCD
5	Expand native seed and plant exchanges and native plant sales.	M	D3, 4	F	n/a	CFC, BACT	Residents, FCSCWP
6	Private owners of "High Priority" parcels for preserving natural resources assess whether native vegetation can be planted on their property	M	D1, 3, 4	A, B	n/a	Owner, HOA	NRCS; IDNR; CFC
7	Outreach to golf courses for buffer areas, or participation in programs such as Audubon Cooperative Sanctuary Program (ACSP)	M	D1	B, D, E, F	n/a	Golf	FCSCWP, Audubon, other
8	Promote native landscaping as an alternative to standard landscaping practices at residential, industrial, commercial, and roadside properties.	M	D4	F	n/a	CFC	FCSCWP
9	Review local ordinances to insure that current codes do not prohibit use of native vegetation in BMP projects and encourage BMPs in other residential and commercial landscaping and pavement design plans.	M	D4	A, B, C, F	n/a	Munis; TWPs; LCPBD	FCSCWP

- **Goal E:** Increase communication and coordination among municipal decision-makers and other stakeholders within the watershed.
  Objectives:

  1) Ensure that municipalities adopt updated Flint Creek Watershed-Based Plan.

  2) Encourage municipalities and stakeholders to participate in Flint Creek Watershed Partnership.

  3) Encourage adoption of municipal comprehensive plans, codes and ordinances supportive of watershed plan goals and objectives.
  4) Develop a planning, funding, and implementation mechanism to provide stream channel maintenance across multiple jurisdictions using environmentally friendly practices.

	Action	Rank	Primary Objective	Secondary Goal(s)	Cost	Lead Agency	Supporting Agency
1	Following Watershed-Based Plan final approval, meet with each applicable community leader to adopt the Plan.	H	E1	A-F	n/a	FCSCWP	Munic; TWP; CFC; LCSMC; MWRD; IEPA
2	Continue to recruit additional municipalities and stakeholders to participate in the FCWP using the Final Watershed-Based Plan as a means to get involved.	H	E2, 3, 4	A-F	n/a	FCSCWP	Munis, TWP
3	Recruit Citizen Science Volunteers to the VLM and RiverWatch and similar programs to monitor water quality	H	E2	A-F	n/a	FCSCWP	CFC, BACT, LCSWMC
4	Expand the Flint Creek/Spring Creek Watersheds website to provide news, education resources for all stakeholders	H	E2,3,4	A-F	n/a	FCSCWP	Munic; Twp; LCSMC; MWRD; FPD;

							SWCD; NRCS; CFC; FREP
5	Investigate the feasibility for citizen monitoring of creek and lake conditions via mobile app	M	E2	A-F	n/a	FCSCWP	ILMA, LCSMC, CFC, FREP, OF
6	Explore forming a multi-jurisdictional partnership to develop funding packages and grant proposals to implement recommendations in the Watershed-Based Plan	M	E1, 2	A-F	n/a	Munic; Twp	FCSCWP
7	Provide training and watershed education opportunities for local government planners and engineers related to implementing the Watershed-Based Plan and BMPs for water quality.	M	E1,3	F	n/a	FCSCWP	CFC, FREP, LCSMC; MWRD, CMAP

- **Goal F:** Foster appreciation and stewardship of the watershed through education.
  Objectives:

  1) Provide watershed stakeholders with an education plan that promotes the knowledge, skills, and motivation needed to take action on implementing the watershed plan.

  2) Encourage Volunteer Scientist Programs, such as RiverWatch and the Volunteer Lake Monitoring Program

  3) Educate the public on the benefits and goals of native plants and natural area restoration.

  4) Identify open space parcels adjacent to public facilities such as schools that would be appropriate for outdoor education.
  5) Implement environmental interpretation/education signage throughout greenway (conservation) corridors.

	Action	Rank	Primary Objective	Secondary Goal(s)	Cost	Lead Agency	Supporting Agency
1	Incorporate Water Quality Awareness questions in the Healthy Barrington Survey for 2020	H	F3	A-F	n/a	FCSCWP	BADC, CFC
2	Develop municipal profiles of key committees and HOAs that affect natural resource issues and concerns	H	F1	A-F	n/a	FCSCWP	Munis, TWPs, HOAs, Residents
3	Ensure that students graduating from a school system in the Flint Creek Watershed understands the importance of establishing a sustainable balance between people and nature.	H	F3	A-F	n/a	Schools, CFC, BACT, BACOG	FCSCWP, Residents, OF
4	Offer free workshops that help homeowners identify and choose the appropriate native plants, trees, and shrubs that can be used in landscaping.	M	F3, 4, 5	none	n/a	BACT, CFC, FCSCWP	Residents
5	Communicate documented benefits of local restoration efforts.	M	F1, 3	none	n/a	FCSCWP, CFC, BACT	Munis, TWPs, Media
6	Keep elected officials and staff of local government informed about current watershed improvement projects so they can communicate more effectively to the public.	H	F1, 3	A-F	n/a	FCSCWP, CFC, BACT	Munis, TWPs, Media

7	Support BACOG education efforts on groundwater, and the importance of well testing	H	F1,	A-F	n/a	BACOG	Munis, TWPs, FCSCWP
8	Support BACOG education efforts on salt, high PAH sealer, pharmaceutical, and plastics contaminations of water resources	H	F1, 3	A-F	n/a	BACOG	Munis, TWPs, FCSCWP
9	Encourage Owners/Stewards of Ecologically Significant Areas to install interpretive/education signage on sites.	M	F5	none	Var	FCSCWP, CFC, BACT	Owners

Recommended Regulatory Changes

Lake County Watershed Development Ordinance
Section 3.13 (Jurisdictional Coordination) summarizes the jurisdictional roles and responsibilities in the Flint Creek watershed and the ordinances currently in place related to land development. Development that affects water resources (rivers, streams, lakes, isolated wetlands, and floodplains) in the Lake County Portion of the Flint Creek watershed and the Barrington area within Cook County is regulated by the Lake County Watershed Development Ordinance (WDO) and enforced either by the LCSMC or Certified Communities. Barrington Hills is partially certified in the Lake County portion of the watershed. The WDO applies to projects that create a wetland impact within Waters of the United States (WOUS), Isolated Waters of Lake County (IWLC) or occur in buffer areas adjoining those waters. WOUS are those water bodies and wetland areas that are under USACE jurisdiction as determined by a jurisdictional determination. IWLC are all waters such as lakes, ponds, streams (including intermittent streams), farmed wetlands, and wetlands that are not under USACE jurisdiction.

The WDO was developed as the minimum standard to uniformly and consistently enforce stormwater management throughout Lake County, and as a result, is not watershed specific. Under current WDO regulations, wetlands lost to development must be replaced in Lake County, but not necessarily in the same watershed where the loss occurred. However, wetland replacement or mitigation ratios are higher for wetland mitigation that occurs outside of the watershed where the loss occurred. A rising trend for developers is to buy wetland credits from USACE-approved mitigation banks rather than create wetlands on or off-site of the development project. For watersheds that lack mitigation banks, this results in a net loss of wetlands for the watershed.

Several of the guidelines listed below are mentioned throughout the Best Management Practices (BMP) Toolbox (Appendix B), as well as in BMP toolboxes in several other watershed plans such as Squaw Creek, Sequoit Creek, North Branch Chicago River, Indian Creek, and Bull Creek/Bull's Brook. In addition, these recommended guidelines should be considered when developing the Cook County Stormwater Ordinance. These could also apply to McHenry County Stormwater Management Ordinance but would be less important for Flint Creek because of McHenry County's small contribution to the watershed. It is also important to note than any change to the WDO requires an amendment process.

- *Implement Stormwater Quality Runoff Standards for development sites*
  Certified Communities within the Lake County portion of the Flint Creek watershed could develop and adopt a separate "Stormwater Quality Runoff Ordinance" that sets turbidity or total suspended solid limits for development sites that discharge to WOUS or IWLC. If municipalities set these standards, the developer is required to conduct site runoff sampling during storm

events exceeding 0.5 inches and include the results in required weekly inspection reports. Failure to comply with standards results in violations and fines.

- *Alter wetland and stream buffer requirements.*
  Buffer requirements for non-ADID (low quality) wetlands are currently based on size. LCSMC could consider adopting a formula for calculating buffer widths based additionally on quality. Kane County, for example, considers both wetland size and floristic quality (using a Floristic Quality Index (FQI)) in determining the required buffer width for non-lineal wetlands. High quality (FQI>16), medium quality (FQI>7<16), and low quality (FQI<7) wetlands have their own buffer ratio, or percent of wetland size, that is multiplied by the total wetland acreage to achieve the required buffer width. Kane County requires a buffer equivalent to 50% of the total wetland size for high quality wetlands, 40% for medium quality wetlands, and 30% for low quality wetlands. ADID wetlands in Lake County often have FQI values greater than 16. Buffer widths equivalent to greater than 50% of wetland size should be considered for these higher quality wetlands.

  Lake County also has the opportunity to incorporate additional quality measures in the equation for calculating buffer widths yet to be adopted by other counties. These measures might include one or more of the following: existing adjacent land use, proposed adjacent land use, topography of adjacent land, habitat quality, and extent of habitat for threatened and endangered species. Currently, the WDO requires buffer areas hydrologically disturbed during construction to be revegetated using native plants. Regulations could be implemented that require developers to plant native vegetation in all buffers that are low quality even if they are not disturbed.

  It should be noted that LCSMC's buffer requirements are considered to be the **minimum standard** for the county. Individual communities have the option of adopting wider buffer requirements.

- *Adopt guidelines for stream maintenance.*
  There are currently no county-level programs or maintenance standards for on-going stream maintenance. Such programs are often developed and coordinated by parks, municipal public works departments, highway departments, forest preserves, conservation groups, and drainage districts. These organizations are often forced to cut or substantially reduce long-term maintenance budgets; other times, maintenance is overlooked or deemed unnecessary following a successful restoration install. Stream maintenance is critical to clear obstructions, remove vulnerable trees, and repair failed pipes before they cause blowouts. For restored streams, maintenance for several years following installation is critical to ensure the stream functions as designed. A recommended maintenance program with standards for regular stream maintenance is provided in Appendix E.
- *No net loss of wetlands*
  Efforts should be made at the regulatory level to preserve remaining wetlands for the simple reason that they naturally function in flood control and water quality. A joint agreement between permitting agencies (LCSMC, USACE) and the U.S. Fish and Wildlife Service (USFWS) and the Natural Resources Conservation Service (NRCS) to mitigate for all wetland losses in the same watershed as the impact should be pursued as the optimal action to achieve a no net loss policy for all wetlands within the Flint Creek watershed.
- *All municipalities within the watershed become "Certified Communities"*
  To date, Barrington Hills is a "Partially-Certified Community" under existing Lake County

stormwater ordinances. Inverness is located entirely with Cook County which has also has a stormwater ordinance. Barrington Hills is split between Lake and Cook County.

Local Municipal Codes and Ordinances

Each municipality within the watershed currently has a Village Code. However, most of these existing Codes generally do not adequately address natural resources issues. Updated existing Codes should focus on complementing federal, state, and county laws already in place. Local laws are needed to protect locally significant resources and address local issues. Several Villages in the Chicago region have developed local natural resource ordinances that complement countywide ordinances and would serve as excellent models for municipalities within the Flint Creek watershed. Examples include the Village of Long Grove Zoning Ordinance, the Village of Algonquin Zoning, Soil Erosion and Sediment Control, and Landscaping Codes. Some of the Flint Creek watershed issues not addressed by existing laws include:

- Restrictions on use of high phosphorus fertilizers;
- Guidelines for removing or protecting riparian vegetation;
- Protecting natural resources adjacent to wetlands;
- Natural flood storage;
- Preserving plant and animal biodiversity;
- Native planting requirements, particularly in buffers adjacent to wetlands;
- Conservation easements or deed restrictions.

Requirements for conservation development can also be written into local Village Codes. County and local governments should work together to develop incentives for conservation development. Conservation development is the ideal compromise between economic development and water resource protection. Some ways to incorporate conservation development into developing communities and provide incentives for developers include:

- Establish a joint county/community application process that reduces review time for conservation development;
- Reduce or eliminate fees for conservation development application review;
- Counties and municipalities work together to locate appropriate parcels for future conservation development, and then zone those parcels as conservation development;
- Require all developments to have a certain percentage of preserved open space;
- Develop native landscaping ordinances, particularly in unincorporated areas that may become incorporated;
- Reduce setback requirements between lots and encourage multi-level and clustered residential development;
- Provide credit for combining natural buffers with recreational opportunities;
- Require native plantings in all detention basins;
- Subtract intact natural areas from site area when computing detention requirements.

Conservation development zoning can be applied to re-zoning changes in rural areas. Often the density in the developed portion of a conservation development is as much as double what current zoning would permit which is offset by preserving open space. Conservation development zoning should outline the intent, design guidelines, density bonus and in what areas can be permitted for

conservation development zoning changes.

Often, areas that may be re-zoned to a conservation development include areas that are adjacent to areas zoned for conservation, rural residential districts, or less productive agricultural areas. These zones provide large areas to preserve agricultural character and environmentally sensitive areas. Additionally, areas that are defined as rural residential could provide a transition from higher density residential to rural.

Design guidelines for conservation developments can include the process used to determine the environmentally sensitive areas on the site and which areas are developable. Because each site will have different developable areas and sizes, design guidelines can be flexible and should consider different roadway length, width, and lot size. Density bonuses can be written into zoning codes and can include bonuses for the following: use of native vegetation throughout the development, including individual lots, reduction in pavement or impervious surface, percentage of open space, trail or sidewalk connection to other developments or regional trails, additional buffering of natural areas and adjacent spaces and creation of wildlife habitat.

Section 5.2 Site Specific Action Plan Additions Overview

For this watershed plan a "Critical Area" is best described as a location in the watershed where existing or potential future causes and sources of an impairment or existing function are significantly worse than other areas of the watershed. Six Critical Area types were identified during the Flint Creek Watershed-Based Plan update and include:

1. Stream restorations on highly degraded stream reaches;
2. Natural area restorations in highly degraded natural areas;
3. Lake shoreline restoration on highly degraded riparian areas and lake buffers;
4. Detention basin retrofits for poorly designed/functional detention basins;
5. Manure management at an equestrian facility; and
6. Bioswale conversion for eroding swales.

The list of Critical Areas is derived from a comprehensive list of measures found in the Action Plan of this report. Figure 68 and Table 46 identify the location and details of each new project, including the Critical Areas.

Site Specific Action Plan (Best Management Practice [BMP]) recommendations made in this section of the report are backed by findings from the watershed field inventory, overall watershed resource inventory, and input from stakeholders. In general, the recommendations address sites where watershed problems and opportunities can best be addressed to achieve watershed goals and objectives. The Site Specific Action Plan is organized by the jurisdiction in which recommendations are located making it easy for users to identify the location of project sites and corresponding project details. It is important to note that project implementation is voluntary and there is no penalty or reduction in future grant opportunities for not following recommendations.
Descriptions and location maps for each Management Measure category follow. Table 46 includes useful project details such as site ID#, Location, Units (size/length), Owner, Existing Condition, Management Measure Recommendation, Pollutant Load Reduction Efficiency, Priority, Responsible Entity, Sources of Technical Assistance, Cost Estimate, and Implementation Schedule.

Project importance, technical and financial needs, cost, feasibility, and ownership type were taken into consideration when prioritizing and scheduling Management Measures for implementation. High, Medium, or Low Priority was assigned to each recommendation. "Critical Areas" as discussed in Section 5.2 are all High Priority and highlighted in red on project category maps and the Action Plan table. For this watershed plan a "Critical Area" is best described as a location in the watershed where existing or potential future causes and sources of an impairment or existing function are significantly worse than other areas of the watershed. Implementation schedule varies greatly with each project but is generally based on the short term (1-10 years) for High Priority/Critical Area projects and 10-20+ years for medium and low priority projects. Maintenance projects are ongoing.

The Site Specific Management Measures Action Plan is designed to be used in one of two ways.

Method 1: The user should find the respective jurisdictional boundary (listed alphabetically in Table 46) then identify the Management Measure category of interest within that boundary. A Site ID# can be found for each recommendation that corresponds to the Site ID# on Figure 68.

Method 2: The user should go to Figure 68 specified then locate the corresponding Site ID# of the site specific recommendations for that category. Next, the user should go to Table 46 and and locate the jurisdiction where the project is located, then go to the project category and Site ID# for details about the project.

Pollutant load reduction is evaluated for Site Specific Action Plan projects based on efficiency calculations developed for the USEPA's Region 5 Model. This model uses "Pollutants Controlled Calculation and Documentation for Section 319 Watersheds Training Manual" (MDEQ, 1999) to provide estimates nutrient and sediment load reductions from the implementation of *agricultural* Management Measures. Estimate of nutrient and sediment load reduction from implementation of *urban* Management Measures is based on efficiency calculations developed by Illinois EPA. Illinois EPA pollutant load reduction worksheets for each Critical Area Management Measure are located in Appendix J.

If all site specific action plan projects listed in Table 46 were completed, pollutant loading reduction estimates would total 1,347 tons/yr of total suspended solids, 1,781 lbs/yr of total phosphorus, and 5,935 lbs/yr of total nitrogen. Total combined project implementation and maintenance costs on all recommended projects are estimated at $12,450,000.

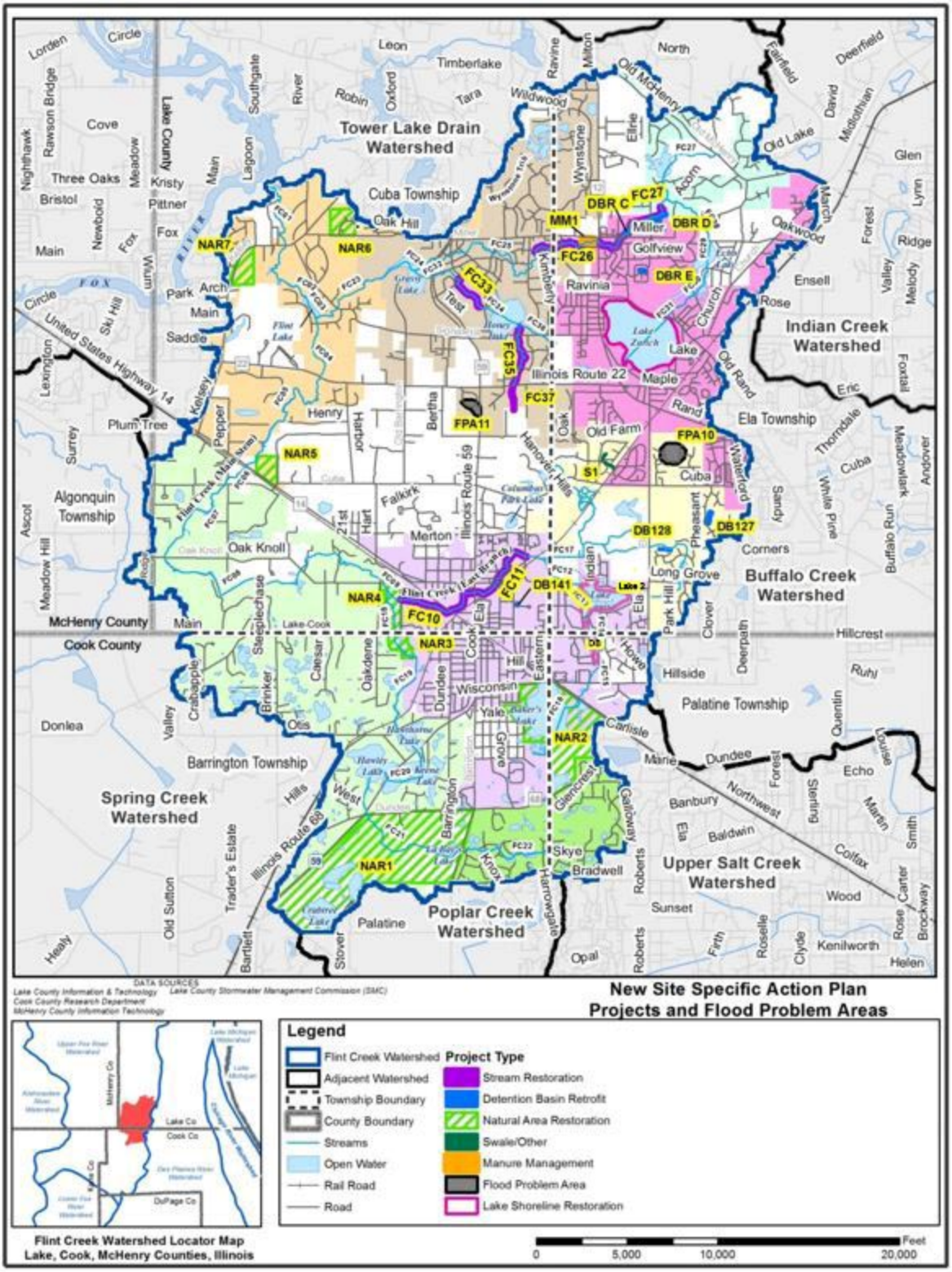


Figure 68: New Site Specific Action Plan Projects and Flood Problem Area

Go to **Section 5.2:** Site Specific Action Plan Additions (New)

Table 46. Site specific action plan table of new projects within the Flint Creek Watershed.

Municipality	Project Type	AES ID#	Location	Units (size/ length)	Owner/ Respon-sible Entity	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency			Priority	Sources of Technical Assistance	Cost Estimate	Implemen-tation Schedule (Years)
								TSS (tons/ yr)	TP (lbs/ yr)	TN (lbs/ yr)				
Unincor-porated Lake County	Manure Management	MM1	Southwest of Rte 12 and Miller Rd	3.7 acres	Country Charm Farms/ JGarvey	Existing equestrian stables and facilities draining directly to Flint Creek	Design a implement a manure management system on site	N/A	22	196	High/ Critical Area	NRCS	Costs vary by landowner; cannot be estimated.	1-5 years (short-term)
Barrington	Lake Shore native buffers	Lake 2	Fox Point, north of Lake Cook Rd.	11,121 linear ft.	Fox Point Home-owners and HOA	Shoreline is largely turf grass with areas of riprap	Remove ornamental and turf landscaping and replace with buffer of natives and maintain for 3 years to establish	N/A	N/A	N/A	High	Ecological Consultants	Costs may vary, $16,000 to $25,000, including initial maintenance	1-5 years (short-term)
Barrington	Detention Pond Buffers; possibly creek bank buffers	DB, FC13	Fox Point, south of Lake Cook Road	Est. 0.5 acres	Fox Point Home-owners and HOA	Shoreline is largely turf grass; Creek banks have narrow buffers.	Remove ornamental and turf landscaping and replace with buffer of natives and maintain for 3 years to establish	N/A	N/A	N/A	High	Ecological Consultants	Costs will vary	1-5 years (short-term)
Barrington	Feasibility Plan for Removal of Carp and Gizzard Shad & eliminating future access	Lake 2	Fox Point, both the Detention Basin and Lake Louise	See above	Fox Point Home-owners and HOA	Abundant common carp populations in Lake; unknown in Detention Pond	Carp/Gizzard Shad removal; evaluation of spillway barrier modification to preclude recolonization.	N/A	N/A	N/A	High	IDNR and Ecological Consultants	Costs will vary	1-5 years (short-term)
Barrington	Evaluate dredging options and timing for pond & Lake	DB, Lake 2	Fox Point, both the Detention Basin and Lake Louise	See above	Fox Point Home-owners and HOA	Lake is eutrophic, with substantial N & P and poor clarity	Once sources of P & N and sediment are addressed, and carp resolved, evaluate dredging options/ other mitigation	N/A	N/A	N/A	Medium	IDNR, USACE, Ecological Consultants	Costs will vary	5-10 years (long-term)

Municipality	Project Type	AES ID#	Location	Units (size/ length)	Owner/ Respon-sible Entity	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency			Priority	Sources of Technical Assistance	Cost Estimate	Implemen-tation Schedule (Years)
								TSS (tons/ yr)	TP (lbs/ yr)	TN (lbs/ yr)				
Barrington	Detention Basin Retrofit	DBR 140	Rt. 14 and Garlands Ln (Barrington Public Safety)	0.5 acres	Barrington	Wet bottom detention basin with wall on east side, landscaping is mostly ornamental with a small areas of erosion.	Remove ornamental and turf landscaping and replace with buffer of natives and maintain for three years to establish	18	31	244	Medium	Barrington, Ecological Consultant	$15,000 to design & install prairie buffer and naturalize basin including maintenance for 3 years, assumes simple design-build with no permit requirements	5-10 years (long-term)
Barrington	Stream Restoration	FC11	Rte 59 to Lake Zurich Rd	4,300 lf	Private Owners, IDOT	Moderately channelized and eroded stream reach with degraded riparian areas dominated by woody invasives; remeandering needed at CN railroad Elm Road underpass	Remeander section at CN railroad Elm Road underpass, selectively regrade and stabilize banks where necessary remove invasives throughout riparian corridor and replant with natives.	257	219	438	Medium	IEPA, USACE, McHenry County, Ecological Consultant, Engineer	$650,000 to design and install a project to selectively stabilize eroded areas using bioengineering techniques, increase stream length with meanders, remove invasives throughout stream corridor, naturalize buffer and streambanks with natives, and maintain for three years to establish	5-10 years (long-term)

Municipality	Project Type	AES ID#	Location	Units (size/ length)	Owner/ Respon-sible Entity	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency			Priority	Sources of Technical Assistance	Cost Estimate	Implemen-tation Schedule (Years)
								TSS (tons/ yr)	TP (lbs/ yr)	TN (lbs/ yr)				
Barrington	Stream Restoration	FC10	Flint Creek Dreamway Stream & Riparian Area Restoration Project - Flint Creek between Rt. 59 and Hart Rd	5000 lf	Barrington, Barrington Park District, and School District 220	Severely eroded banks and gullies along portions of the stream as well as heavily degraded and unmanaged riparian corridors.	Selectively pull back and grade sections of eroded bank, stabilize with rock toe where necessary, install in-stream riffle enhancements, and a complete ecological restoration of the riparian corridor including removing non-native and invasive species and reseeding to native mesic prairie and savanna.	134	636	2896	High/ Critical Area	IEPA, USACE, McHenry County, Ecological Consultant, Engineer	$570,000 to design and install full stream and riparian corridor restoration	1-5 years (short-term)
Barrington and Barrington Hills	Stream Restoration	FC18	Flint Creek north of Lake-Cook Rd to confluence with Flint Creek East Branch	2700 lf	District 220	Moderately channelized and moderately eroded stream reach with riparian area of shrub-scrub thicket dominated by buckthorn and weedy trees; outer riparian area is old field dominate by turf grass and teasel.	Design and implement a project to remove invasives from riparian corridor, spot stabilize eroded banks, install artificial pools and riffles, and replant buffer with natives.	162	137	275	High/ Critical Area	IEPA, USACE, McHenry County, Ecological Consultant, Engineer	$600,000 to design and install a project to selectively stabilize eroded areas using bioengineering techniques, naturalize buffer shoreline with natives, install artificial pools and riffles in channel, and maintain for three years to establish.	1-5 years (short-term)

Municipality	Project Type	AES ID#	Location	Units (size/ length)	Owner/ Respon-sible Entity	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency			Priority	Sources of Technical Assistance	Cost Estimate	Implemen-tation Schedule (Years)
								TSS (tons/ yr)	TP (lbs/ yr)	TN (lbs/ yr)				
Barrington Hills/Cook County Forest Preserves	Natural Area Restoration	NAR 1	Crabtree Preserve east of Rte 59 and 62	820 acres	CCFPD	Large preserve w/managed prairie and wetland complexes; some remnant but degraded dry-mesic woodland/savanna; Crabtree Lake does not appear to have much erosion, La Bay's Lake has no issues.	The most urgent recommendation is to manage the oak woodland areas by removing heavy buckthorn and thinning and/or removing box elder, silver maple, sugar maple, dead ash, elm, and cherry.	N/A	N/A	N/A	Medium	Ecological Consultant	$7,000,000 to remove invasives and manage oak woodland restoration.	5-10 years (medium to long - term)
Barrington Hills	Natural Area Restoration	NAR 3	Pederson Preserve, south of Lake-Cook Rd and east of Oakdene Rd	27 acres	BACT	Area appears to be under habitat restoration, evidence of buckthorn removal	Continue to maintain to improve condition	N/A	N/A	N/A	Medium	Ecological Consultant	$2,000 per year to control invasives and continue site management.	5-10 years (long-term)

Municipality	Project Type	AES ID#	Location	Units (size/ length)	Owner/ Respon-sible Entity	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency			Priority	Sources of Technical Assistance	Cost Estimate	Implemen-tation Schedule (Years)
								TSS (tons/ yr)	TP (lbs/ yr)	TN (lbs/ yr)				
Barrington Hills	Natural Area Restoration	NAR 4	Ridge/Oak Knoll, between Oak Knoll and Lake-Cook Rd and Old Hart and Hart Rd	54 acres	District 220	Buffer area along FC18 that is highly degraded with buckthorn and second growth woody trees; outside of immediate stream buffer is old field dominated by turf grass and teasel.	Remove all invasive wood species and old field and convert to wet to mesic prairie. Combine work with any work on stream reach FC18.	14	24	264	High/ Critical Area	Ecological Consultant	$250,000 to remove invasives, naturalize buffer with natives, and convert old field to wet to mesic prairie (should be combined with restoration of FC18).	1-5 years (short-term)
Barrington Township	Natural Area Restoration	Baker's Lake/ NAR 2	South and east portions of Baker's Lake riparian area	28 acres	CCFPD/ Barrington, Barrington Park District, Private Owners, Bakers Lake Partners	Most of border around south and east portions of lake are degraded shrub-scrub with buckthorn and second growth weedy trees dominant. Younghusband Prairie appears to be managed.	Remove weedy shrub-scrub border from south and east portions of lake and plant wet to mesic prairie. Remove old fence row weedy trees that exist in Younghusband Prairie.	1	11	14	Medium	Ecological Consultant	$350,000 to remove invasives, naturalize border with natives, convert to wet to mesic prairie, and remove fence row trees from Younghusband Prairie.	5-10 years (long-term)

Municipality	Project Type	AES ID#	Location	Units (size/ length)	Owner/ Respon-sible Entity	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency			Priority	Sources of Technical Assistance	Cost Estimate	Implemen-tation Schedule (Years)
								TSS (tons/ yr)	TP (lbs/ yr)	TN (lbs/ yr)				
Deer Park	Detention Basin Retrofit	DBR 127	Squires Pond at Pheasant Trl & Mallard Ct	3.7 acres	HOA	Wet bottom detention basin with mowed turf side slopes and geese present	Remove turf from slopes and buffer and install native prairie buffer; spot stabilize banks where necessary.	5	22	136	High/ Critical Area	Deer Park, Ecological Consultant	$60,000 to design & install prairie buffer, and naturalize basin including maintenance for 3 years, assumes simple design-build with no permit requirements	1-5 years (short-term)
Deer Park	Detention Basin Retrofit	DBR 128	Meadow Ln north of Glengarry (Meadow Land Pond)	1.4 Acres	HOA	Wet bottom detention basin, mowed turf to edges, slight erosion in spots, geese present	Design and install a project to remove turf, install native buffer, spot stabilize banks where necessary, and install wetland plugs along west edge. Maintain for three years to establish.	1	5	32	High/ Critical Area	Deer Park, Ecological Consultant	$34,500 to design & install prairie buffer & emergent plants, including maintenance for 3 years; assumes simple design-build with no permit requirements	1-5 years (short-term)

Municipality	Project Type	AES ID#	Location	Units (size/ length)	Owner/ Respon-sible Entity	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency			Priority	Sources of Technical Assistance	Cost Estimate	Implemen-tation Schedule (Years)
								TSS (tons/ yr)	TP (lbs/ yr)	TN (lbs/ yr)				
Deer Park	Other/Swales	S1	Hunters Land and Old Farm Trail	1.3 Acres	multiple residential lots	Open and eroded swales across multiple residential lots; mowed turf grass on all sides, flowing during high water with yard debris in swale.	Design and install a project to remove turf, stabilize and regrade swales and plant swale and narrow buffer with natives. Maintain for three years to establish.	1	2	7	High/ Critical Area	Deer Park, Ecological Consultant	$13,000 to design & install naturalized bioswale conversion including maintenance for 3 years, assumes simple design-build with no permit requirements	1-5 years (short-term)
Lake Barrington	Natural Area Restoration	NAR 5	Flint Creek Savanna South at Rt. 14 & Cuba Road	30 acres	CFC	Site appears to be actively managed by CFC; Recent and extensive buckthorn and weedy tree removal; evidence of native interseeding	Continue to remove invasive woody species and multiflora rose; continue to interseed areas, especially woodland/savanna.	N/A	N/ A	N/ A	Medium	Ecological Consultant	$3,000 per year to control invasives, continue interseeding and manage woodland.	5-10 years (long-term)
Lake Barrington	Natural Area Restoration	NAR 6	Wedgewood subdivision, north of Miller and Wedgewood Rd.	4 acres	public	Large lot subdivision with roadside turf swales that all drain to central detention basin; pond is bordered primarily by turf.	Design and install project to install a native buffer around detention basin and turn roadside swales into native bioswales.	2	4	13	Low	Ecological Consultant	$50,000 to design and install a native buffer surrounding detention basin and convert swales to native bioswales.	5-10 years (long-term)

Municipality	Project Type	AES ID#	Location	Units (size/ length)	Owner/ Respon-sible Entity	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency			Priority	Sources of Technical Assistance	Cost Estimate	Implemen-tation Schedule (Years)
								TSS (tons/ yr)	TP (lbs/ yr)	TN (lbs/ yr)				
Lake Barrington	Natural Area Restoration	NAR 7	Frier Farm, at Kelsey and Harbor Rd	45 acres	Lake Barrington	Site abuts Grass Lake Forest Preserve, mostly cattail marsh w/invading phragmites, unmaintained dry-mesic oak woodland on east side.	Eradicate phragmites in cattail marsh, manage dry-mesic oak woodland to east at marsh	N/A	N/ A	N/ A	Medium	Ecological Consultant	$30,000 for the first 3 years, and $4,000 per year after that to eradicate phragmites in marsh and manage woodland.	5-10 years (long-term)
Lake Zurich	Detention Basin Retrofit	DBR C	Detention basin at Manchester Rd and Hampshire Ln	1 acre	Lake Zurich	Wetland bottom detention full of phragmites.	Remove phragmites and replant entire basin bottom and slopes with natives. Maintain for three years to establish.	1	4	14	High/ Critical Area	Lake Zurich, Ecological Consultant	$18,000 to design & install prairie buffer and naturalize basin including maintenance for 3 years, assumes simple design-build with no permit requirements	1-5 years (short-term)

Municipality	Project Type	AES ID#	Location	Units (size/ length)	Owner/ Respon-sible Entity	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency			Priority	Sources of Technical Assistance	Cost Estimate	Implemen-tation Schedule (Years)
								TSS (tons/ yr)	TP (lbs/ yr)	TN (lbs/ yr)				
Lake Zurich	Detention Basin Retrofit	DBR D	Detention basin at Lorie Ln north of Miller Rd	9.3 acres	Lake Zurich	Wetland and two adjacent wet bottom detention basins with trails throughout. Phragmites and cattails in both basins, wetland full of invasives - teasel, reed canary, phragmites.	Remove invasives in both basins and wetland and reseed with natives and maintaint for three years to establish. Maintain for three years to establish.	4	19	101	High/ Critical Area	Lake Zurich, Ecological Consultant	$145,000 to implement invasive managemenet throughout wetland buffer and basins	1-5 years (short-term)
Lake Zurich	Detention Basin Retrofit	DBR E	Detention basin at Vista and Butterfield	1.4 Acres	Lake Zurich	Wet bottom detention with mowed turf to edges and cattails along all edges	Remove turf and invasives, install native prairie buffer along slopes and plant wetland plugs along toe. Maintain for three years to establish.	4	12	40	High/ Critical Area	Lake Zurich, Ecological Consultant	$34,500 to design & install prairie buffer & emergent plants, including maintenance for 3 years; assumes simple design-build with no permit requirements	1-5 years (short-term)

Municipality	Project Type	AES ID#	Location	Units (size/ length)	Owner/ Respon-sible Entity	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency			Priority	Sources of Technical Assistance	Cost Estimate	Implemen-tation Schedule (Years)
								TSS (tons/ yr)	TP (lbs/ yr)	TN (lbs/ yr)				
Lake Zurich	Lake Shoreline Restoration	Lake Zurich	Shoreline of Lake Zurich	1957.2 lf	Village of Lake Zurich	850.6 lf of severely eroded and 1106.6 lf of moderately eroded banks need to be stabilized.	Stabilize 850.6 lf of severely eroded shoreline and 1106.6 lf of moderately eroded shoreline using bioengineering techniques such as minor regrading and installation of native plants.	36	31	61	High/ Critical Area	IEPA, USACE, LCSMC, Ecological Consultant, Engineer	$300,000 to design and install a project to selectively stabilize eroded areas using bioengineering techniques, naturalize buffer shoreline with natives, and maintain for three years to establish.	1-5 years (short-term)

Municipality	Project Type	AES ID#	Location	Units (size/ length)	Owner/ Respon-sible Entity	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency			Priority	Sources of Technical Assistance	Cost Estimate	Implemen-tation Schedule (Years)
								TSS (tons/ yr)	TP (lbs/ yr)	TN (lbs/ yr)				
Lake Zurich	Stream Restoration	FC26	Rugby Ln. to Rt. 12; partially in Lake Zurich	4,400 lf	private and Village of Lake Zurich	Moderately channelized stream reach exhibiting high levels of erosion, with turf and woody invasives to stream edge along both banks and some hard armoring already in place.	Increase and restore riparian buffer where possible, stabilize streambanks between Seth Paine School to Manr Park, install pools and riffles, and install in-stream habitat (such as rootwads, etc).	376	320	640	High/ Critical Area	IEPA, USACE, LCSMC, Ecological Consultant, Engineer	$650,000 to design and install a project to selectively stabilize eroded areas using bioengineering techniques, remove invasives throughout stream corridor, naturalize buffer and streambanks with natives, install artificial pools and riffles and in-stream habitat in channel, and maintain for three years to establish.	1-5 years (short-term)

Municipality	Project Type	AES ID#	Location	Units (size/ length)	Owner/ Respon-sible Entity	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency			Priority	Sources of Technical Assistance	Cost Estimate	Implemen-tation Schedule (Years)
								TSS (tons/ yr)	TP (lbs/ yr)	TN (lbs/ yr)				
Lake Zurich	Stream Restoration	FC27	Flint Creek from Rt 12 to Brierwood	5,000 lf	private and Village of Lake Zurich	Moderately channelized and moderately eroded stream reach with residential lots and some HOA areas along both banks; narrow riparian buffer dominated by woody invasives.	Design and implement a project to regrade banks and stabilize where necessary, remove invasives from riparian area and replant with natives.	128	109	218	High/ Critical Area	IEPA, USACE, LCSMC, Ecological Consultant, Engineer	$750,000 to design and install a project to selectively stabilize eroded areas using bioengineering techniques, remove invasives throughout stream corridor, naturalize buffer and streambanks with natives, from channel, and maintain for three years to establish.	1-5 years (short-term)

Municipality	Project Type	AES ID#	Location	Units (size/ length)	Owner/ Respon-sible Entity	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency			Priority	Sources of Technical Assistance	Cost Estimate	Implemen-tation Schedule (Years)
								TSS (tons/ yr)	TP (lbs/ yr)	TN (lbs/ yr)				
North Barrington	Stream Restoration	FC33	with partners	2300 lf	private	Highly channelized and moderately eroded stream reach; left bank is golf course with mowed turf to edge, right is residential with woody invasives; some debris in channel (concrete).	Design and install a project to increase/install buffer of natives along both banks, spot stabilize eroded banks, and clear debris.	98	84	167	High/ Critical Area	IEPA, North Barrington, USACE, McHenry County, Ecological Consultant, Engineer	$350,000 to design and install a project to selectively stabilize eroded areas using bioengineering techniques, remove invasives throughout stream corridor, naturalize buffer and streambanks with natives, remove deris from channel, and maintain for three years to establish.	1-5 years (short-term)

Municipality	Project Type	AES ID#	Location	Units (size/ length)	Owner/ Respon-sible Entity	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency			Priority	Sources of Technical Assistance	Cost Estimate	Implemen-tation Schedule (Years)
								TSS (tons/ yr)	TP (lbs/ yr)	TN (lbs/ yr)				
North Barrington	Stream Restoration	FC35	Honey Lake inlet to Rt. 22	4100 lf	Private Owners	Low to moderately channelized stream reach exhibiting moderate levels of erosion through residential lots with degraded riparian area dominated by woody invasives, moderate levels of debris in channel.	Remove invasives and replant with natives along both banks, spot stabilizatioin of banks, remove debris and install aritificial pools and riffles.	105	89	179	High/ Critical Area	IEPA, North Barrington, USACE, McHenry County, Ecological Consultant, Engineer	$600,000 to design and install a project to selectively stabilize eroded areas using bioengineering techniques, remove invasives throughout stream corridor, naturalize buffer and streambanks with natives, remove deris from channel, install artificial poosl and riffles, and maintain for three years to establish.	1-5 years (short-term)
North Barrington	Stream Restoration	FC37	Honey Lake Drain from Haverton and Grassmere	~1,500 lf	Private, drainage SSA	Natural stream forced into culvert across residential properties.	Conduct feasibility study for daylighting and remeandering section of stream.	N/A	N/ A	N/ A	Medium	IEPA, North Barrington, USACE, McHenry County, Ecological Consultant, Engineer	Not enough information to estimate costs.	5-10 years (long-term)

Section 5.3: Site Specific Action Plan Continuations

The following maps are referenced in the specific plan descriptions.

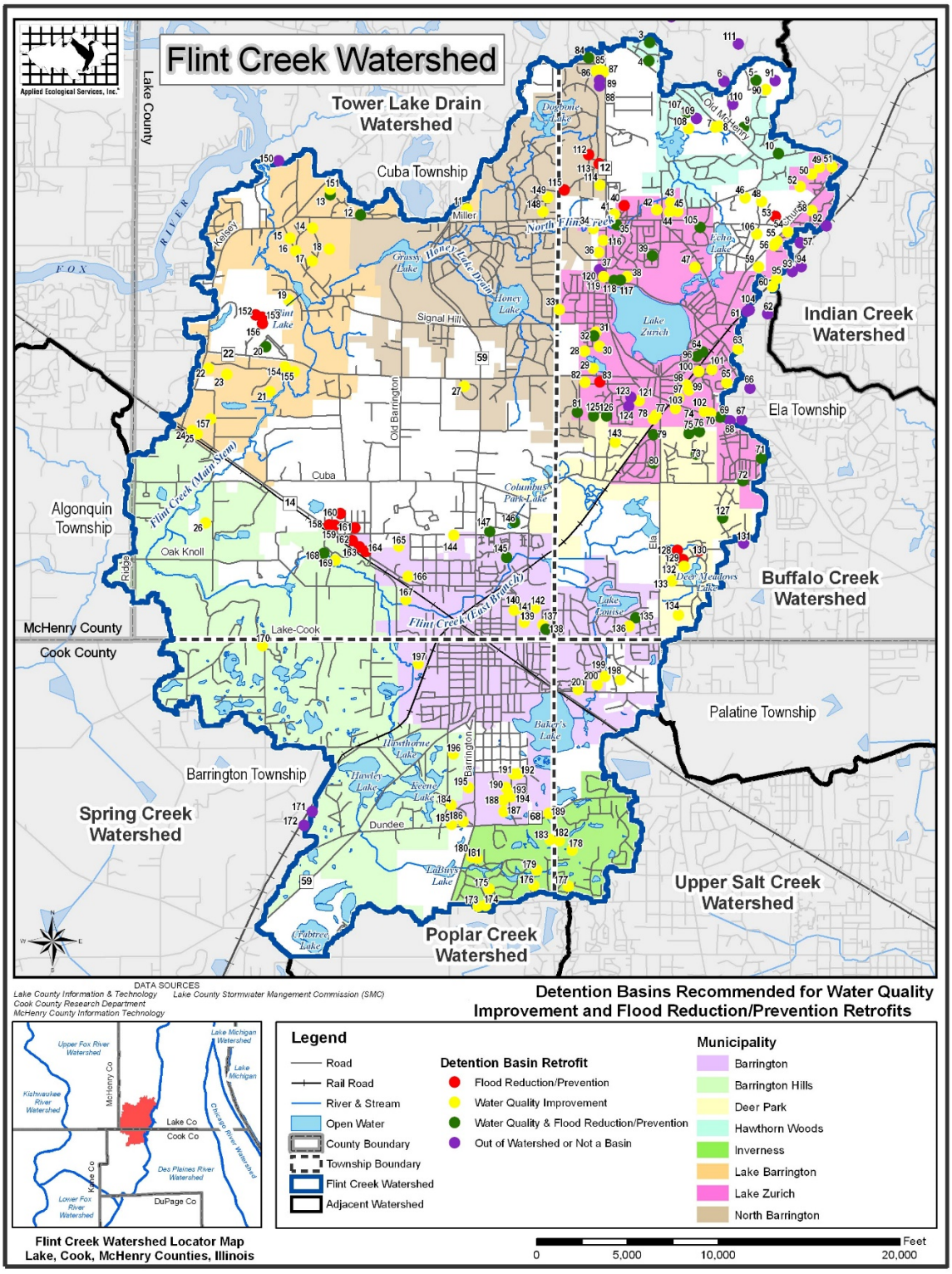


Figure 69: Detention Basins Recommended for Water Quality Improvement & Flood Reduction/Prevention Retrofits

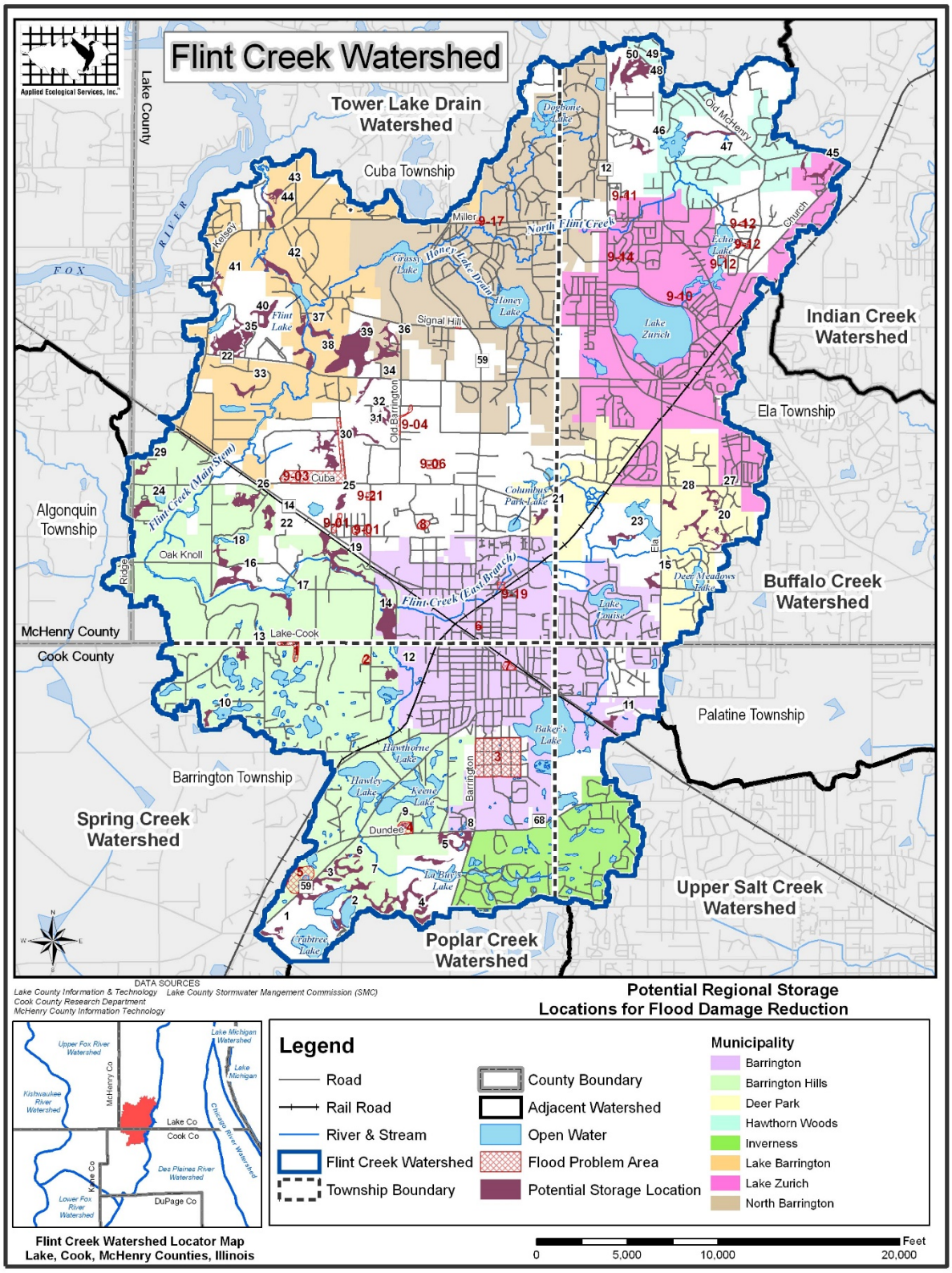


Figure 70: Potential Regional Storage Locations for Flood Damage Reduction

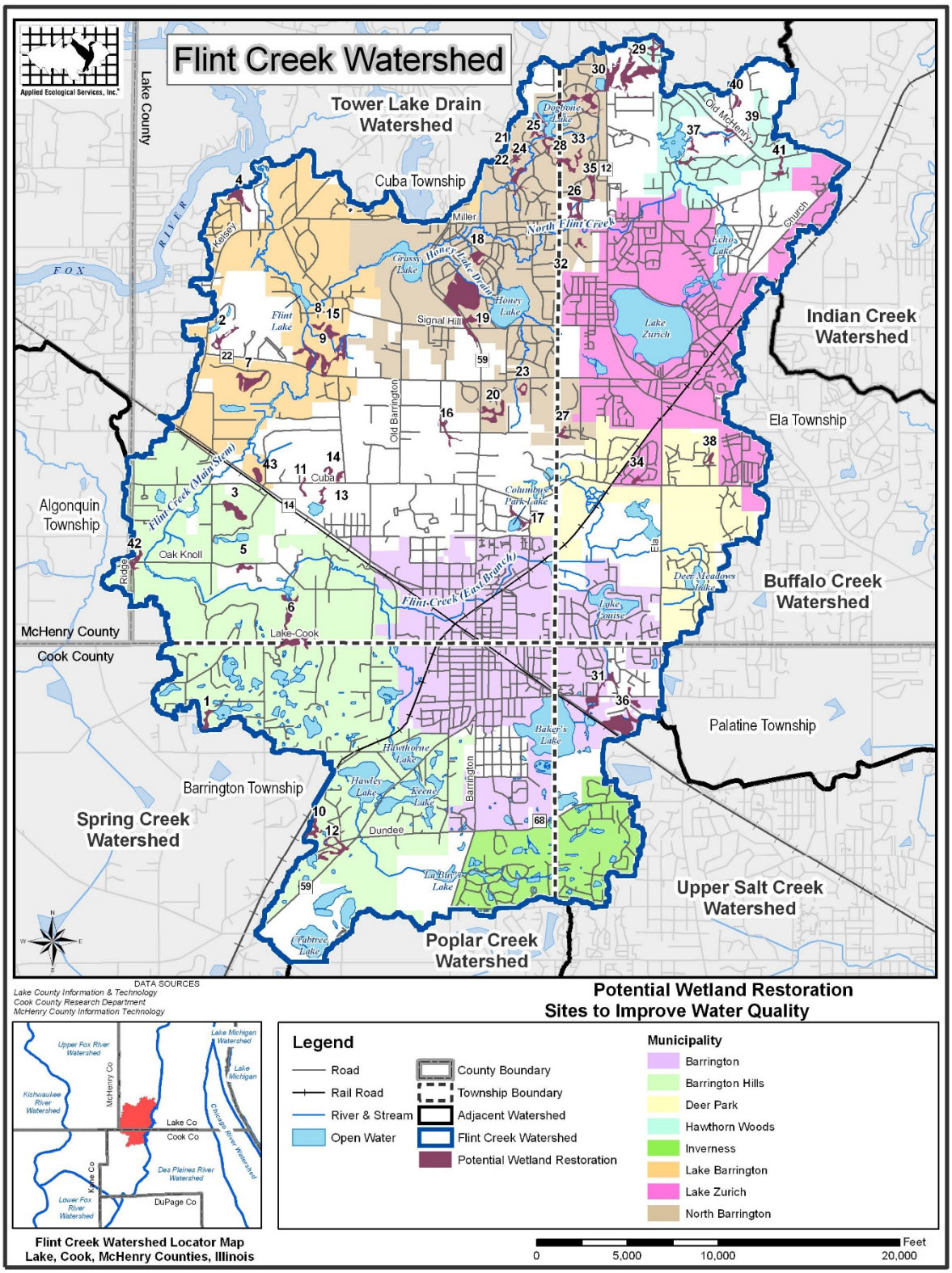


Figure 71: Potential Wetland Restoration

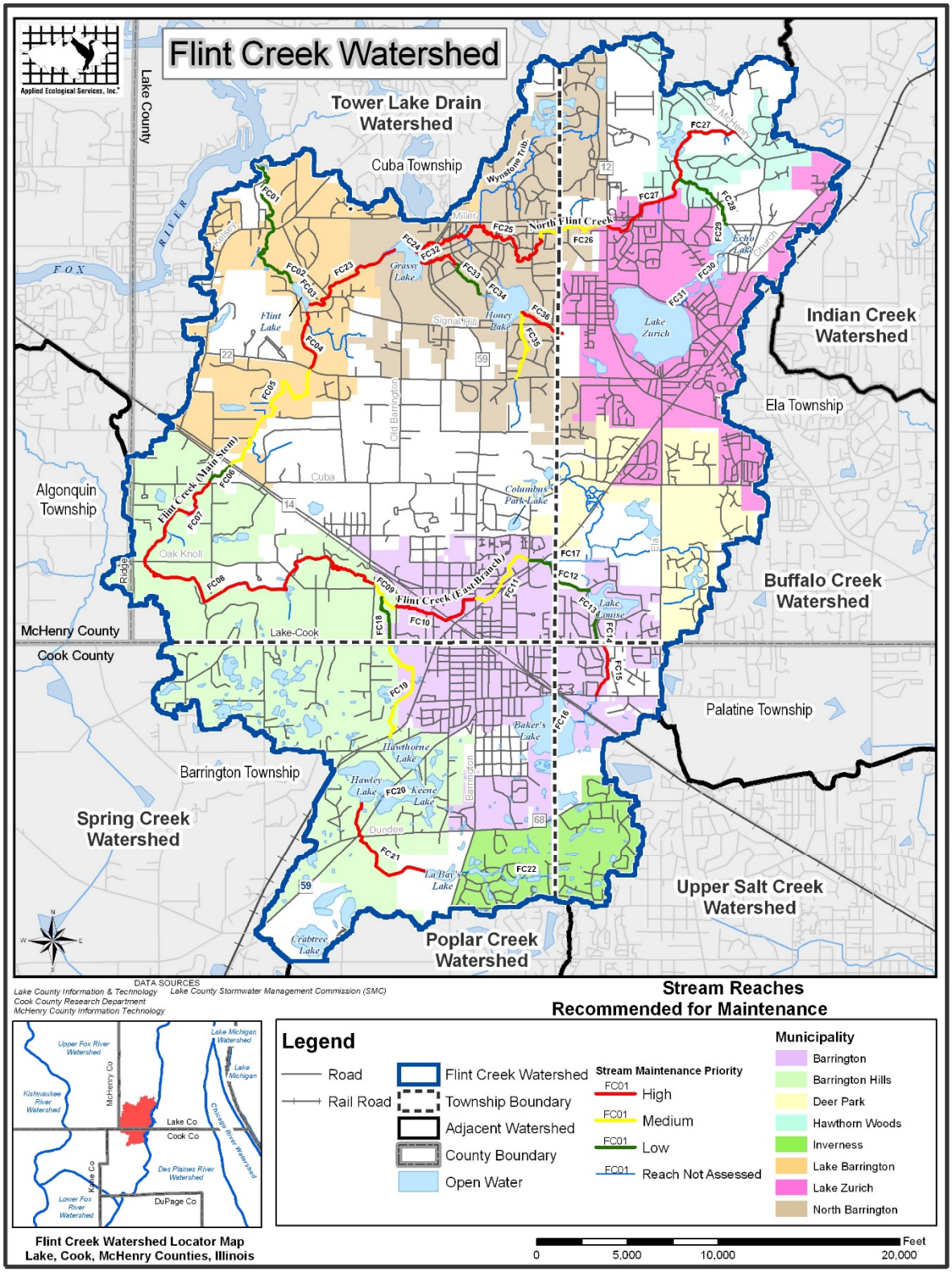


Figure 72: Stream Reaches Recommended for Maintenance

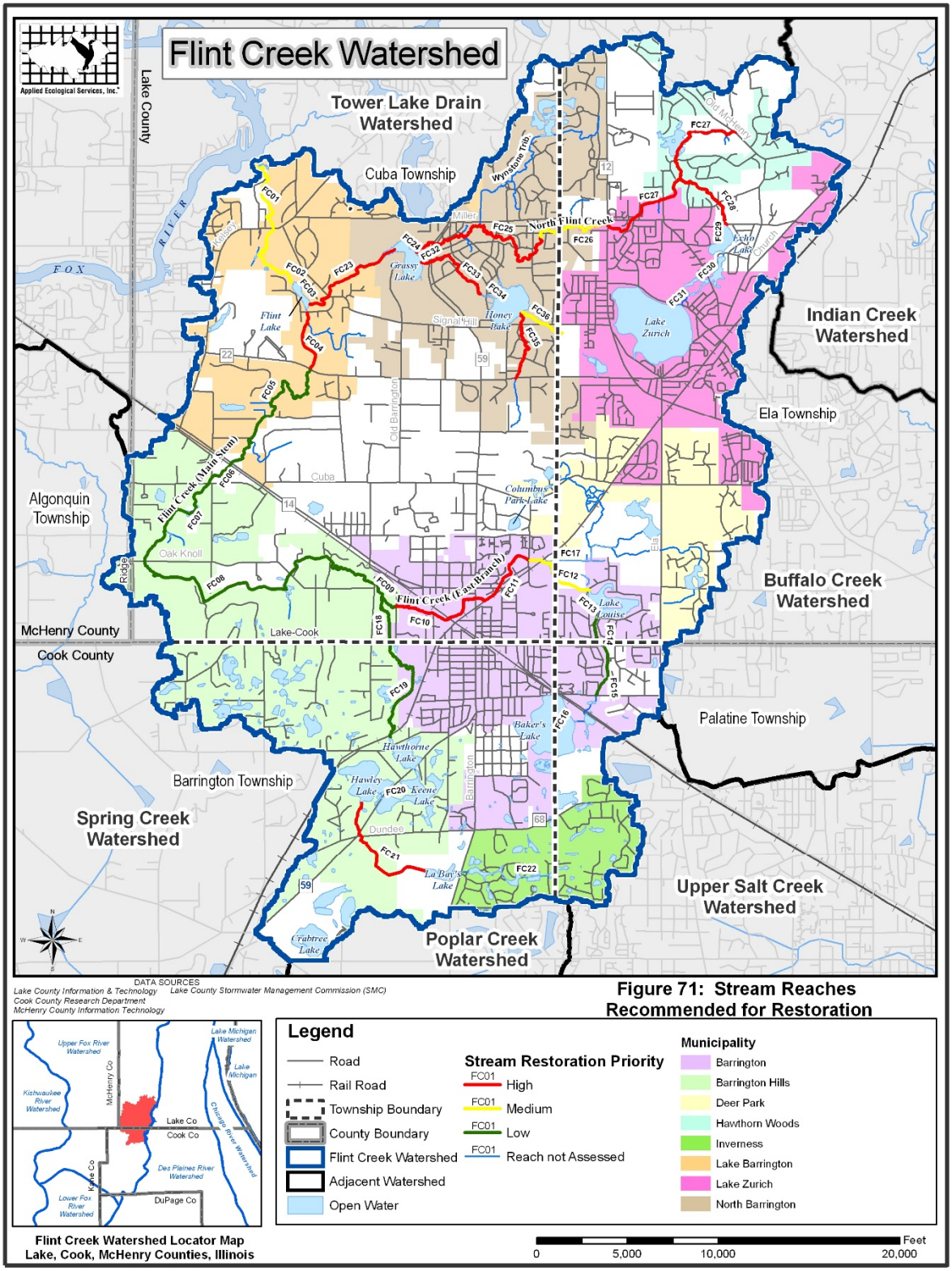


Figure 73: Stream Reaches Recommended for Restoration

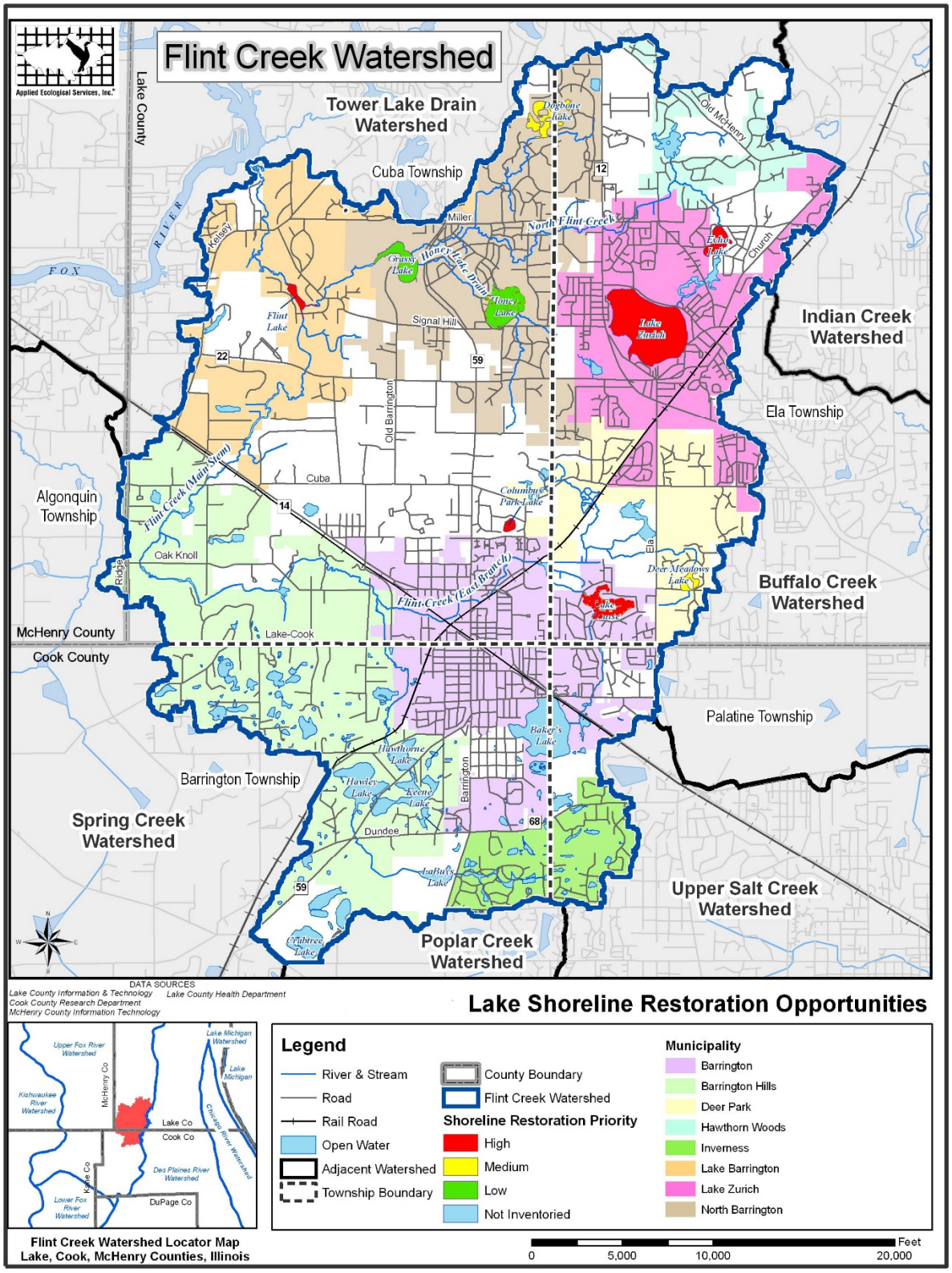


Figure 74: Lake Shoreline Restoration Opportunities

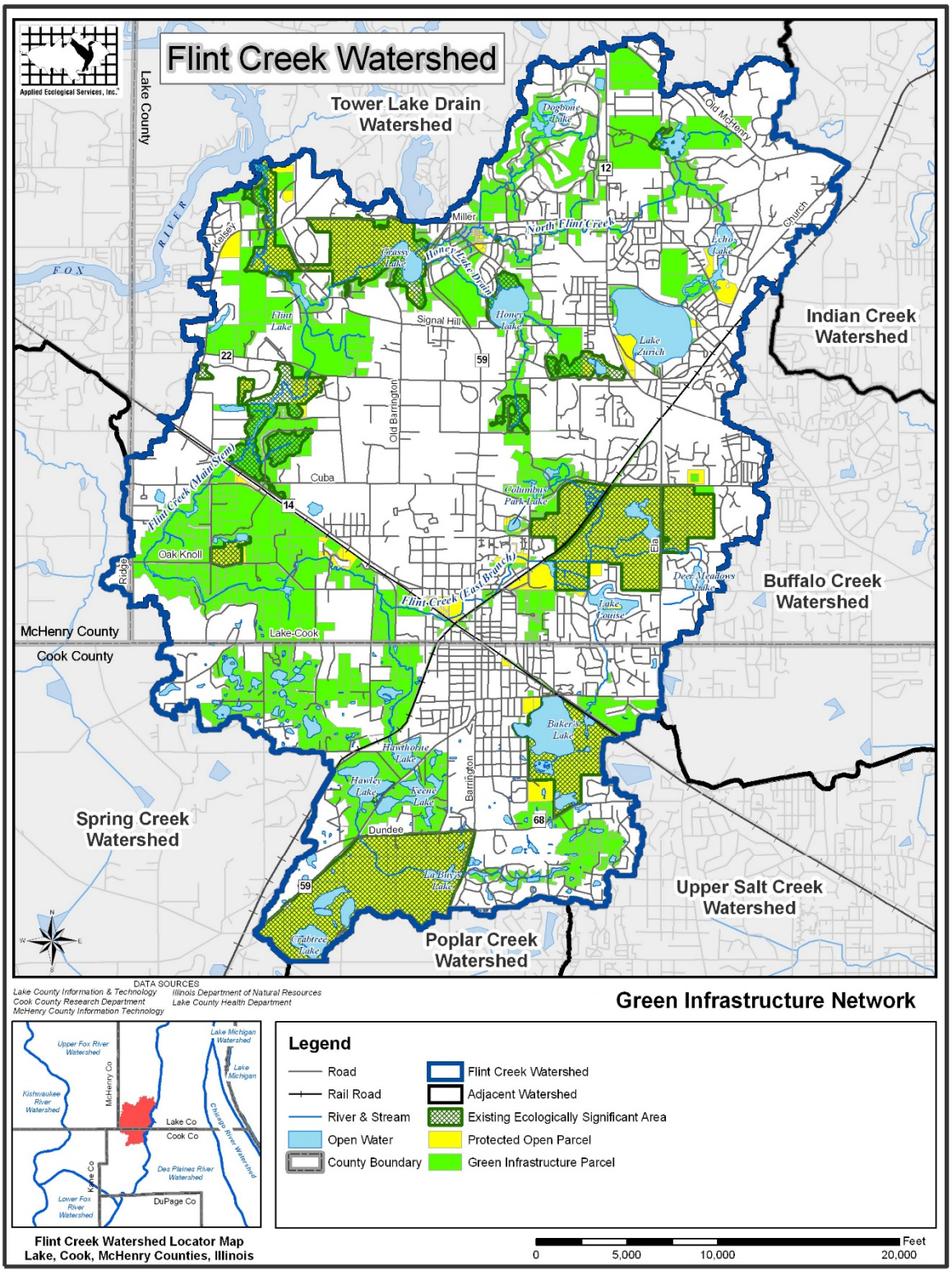


Figure 74: Green Infrastructure Network

Section 5.3 Site Specific Projects (Continuing from 2007 Plan)

Table 47. Site Specific Action Plan Continuing

Barrington											
BMP ID#	**Location**	**Acres / Linear ft.**	**Public or Private**	**Protected or Not Protected**	**Action Recommendation**	**Rank (H, M, or L)**	**Lead Agency/ Owner**	**Sources of Technical Assistance**	**Cost Estimate**	**Funding Mechanism**	**Schedule (Short, Med., Long Term)**
DETENTION BASIN RETROFITS (See Figure 69) Detention basin retrofit recommendations included in this plan primarily address improving water quality and reducing flooding but also improve natural resources (wildlife habitat) as a secondary function.											
Technical and Financial Assistance Needs: Technical assistance needed to implement detention basin retrofits is generally low to medium while financial assistance is generally moderate. Installing post 1992 construction outlet restrictors on appropriate Lake County basins requires less technical assistance than installing a native plant buffer. Private landowners will require the greatest assistance.											
135	Figure 69: Tall Trees Dr.	n/a	Private	Not Protected	Determine feasibility to convert dry bottom detention to wet bottom planted with native vegetation and constructed with post 1992 restrictor.	M	Private Owner	LCSMC	Varies	LCSMC; LC Watershed Board; HOA	5-10 Years
136	Castle Ct.	n/a	Private	Not Protected	Determine feasibility to convert dry bottom detention to wet bottom planted with native vegetation.	M	Private Owner	LCSMC; Barrington	Varies	EPA 319; IDNR C2000	5-10 Years
197	Lake Cook (Pepsi)	n/a	Private	Not Protected	Determine feasibility to convert dry bottom detention to wet bottom planted with native vegetation.	M	Private Owner	SWCD; MWRD; Barrington	Varies	EPA 319; IDNR C2000	5-10 Years

137	Garlands Ln. (The Garlands)	n/a	Private	Not Protected	Remove invasive and non-native vegetation and shrubs/trees from buffer area. Also located within a pollutant loading hotspot SMU.	M	Private Owner	LCSMC; Barrington	$1-3K/acre	LCSMC; LC Watershed Board; HOA	5-10 Years
138	Whitney Dr. (The Garlands)	n/a	Private	Not Protected	1) Remove existing turf grass buffer and replace with native vegetation; 2) determine feasibility to convert to post 1992 release rates; 3) also located within pollutant loading hotspot SMU.	M	Private Owner	LCSMC; Barrington	$3K/acre (Planting); $2-4K (92 release)	EPA 319; IDNR C2000; HOA	5-10 Years
144, 166	Carriage Trl.; Rt. 14/Western (GE Health)	n/a	Private	Not Protected	Determine feasibility to convert existing dry bottom basin to wet bottom planted with native vegetation.	M	Private Owner	Barrington	Varies	EPA 319; IDNR C2000; HOA	5-10 Years
145	Oak Rd. (Chippendale)	n/a	Private	Not Protected	Replace existing turf grass buffer with native vegetation and determine feasibility to convert to post 1992 release rates. Also located within pollutant loading hotspot SMU.	M	Private Owner	LCSMC; Barrington	$3K/acre (Planting); $2-4K (92 release)	EPA 319; IDNR C2000; LC Watershed Board	5-10 Years
162, 163, 164	Rt. 14/20th St. (Foundry of Barrington)	n/a	Private	Not Protected	Determine feasibility to convert to post-1992 release rates.	M	Private Owner	LCSMC	$2-4K (92 release)	LCSMC; LC Watershed Board	5-10 Years
167	Part of Dreamway Plan Barrington High School	n/a	Public	Not Protected	Increase native buffer and conduct maintenance on invasive and non-native species. Also located with pollutant loading hotspot SMU.	M	Barrington High School	Barrington	$3K/acre (Planting)	EPA 319; IDNR C2000; School District	5-10 Years
189	Barrington Middle School	n/a	Public	Not Protected	Increase native buffer and conduct maintenance on invasive and non-native species.	M	Barrington Middle School	Barrington	$3K/acre (Planting)	EPA 319; IDNR C2000; School District	5-10 Years

191, 192, 193, 194	Park Barrington	n/a	Private	Not Protected	Remove existing turf and rip-rap and replace with native vegetation buffer.	M	HOA	Barrington	$3K/acre (Planting)	EPA 319; IDNR C2000; PD	5-10 Years
FLOOD MITIGATION AT FLOOD PROBLEM AREA SITES (See Figure 70) The primary objective of implementing flood mitigation projects is to reduce existing flood damage. Secondary benefits include water quality and natural resource improvement depending on the nature of the project.											
Technical and Financial Assistance Needs: Technical and financial assistance needed to implement storage locations and wetland restorations is generally high because of land protection, design, permitting, and construction costs. Smaller mitigation projects such as detention retrofits and drainage improvements require less technical and financial assistance.											
FPA 9	See Figure 70	n/a	Mostly Private	Mostly Not Protected	Conduct feasibility study to determine if any flood mitigation measures are feasible for depressional flooding along several residential yards/basements in Fox Point Subdivision. One option is to create a naturalized depressional storage area in open space (owned by the Fox Point Homeowners Association) adjacent to the affected lots.	H	Owner (Fox Point HOA)	Barrington; LCSMC; USACE; FEMA	20-30K/acre	LCSMC; LC Watershed Board; Barrington	1-5 Years
LAKE SHORELINE RESTORATION (See Figure 68) Lake shoreline restoration projects are implemented to primarily buffer the waterbody and have equal benefits for improving water quality and improving natural resources by introducing native plants that are beneficial to wildlife.											
Technical and Financial Assistance Needs: Lake shoreline restoration is not as complex as restoring stream reaches but still requires a moderate amount of technical and financial assistance to complete the project. The cost for implementing this type of project depends on the amount of invasive species to be removed and extent of grading work involved in stabilizing the shoreline.											

Lake Louise	See Figure 68	38 acres	Private	Not Protected	Stabilize 204 linear feet of moderately eroded shoreline using bioengineering techniques such as minor regrading and installation of native plants.	M	HOA; Private Owners	USACE: IDNR-OWR; LCSMC; NRCS; SWCD	$100-300/ linear foot	LCSMC; EPA (C-2000 & 319); Lake Association	5-10 Years
REGIONALLY SIGNIFICANT STORAGE LOCATIONS (See Figure 70) Implementation of potential Regionally Significant Storage Locations primarily prevents and reduces flooding downstream but also improves water quality and natural resources if planted with native vegetation.											
Technical and Financial Assistance Needs: Technical and financial assistance needed to implement storage locations is generally high because of land protection, design, permitting, and construction costs.											
14	See Figure 70; Also partially in Barrington Hills	35.9	Private	Not Protected	Determine feasibility to construct multi-objective storage area on existing open space under construction; also recommended in 1994 Flint Creek Management Plan.	H	Private Owner	USACE; NRCS; LCSMC	20-30K/acre	LCSMC; USACE	1-5 Years
11	See Figure 70	17.6	Private	Not Protected	Determine feasibility to construct multi-objective storage area on existing golf course.	L	Private Owner	MWRD; USACE; NRCS	20-30K/acre	MWRD; USACE	10+ Years
POTENTIAL WETLAND RESTORATION SITES (See Figure 71) Wetland restoration projects are implemented primarily to improve water quality but also have excellent secondary benefits for reducing flooding and improving natural resources.											
Technical and Financial Assistance Needs: Wetland restoration projects are typically complex and require high technical and financial assistance needs to protect land, design, construct, monitor, and maintain the restoration.											

31	See Figure 71	12.9	Private	Not Protected	Determine feasibility for wetland restoration project on existing golf course.	L	Private Owner	NRCS; LCSMC; USACE	20K/acre	EPA 319; IDNR C2000; LCSMC	10+ Years
36	See Figure 71	32.5	Private	Not Protected	Determine feasibility for wetland restoration project on existing golf course.	L	Private Owner	NRCS; LCSMC; USACE	20K/acre	EPA 319; IDNR C2000; LCSMC	10+ Years

STREAM CHANNEL MAINTENANCE AND MONITORING (See Figure 72)

Most stream maintenance is conducted to keep the stream channel clear of problematic debris that may cause flooding issues. Water quality also benefits when problem hydraulic structures and discharge points are repaired.

Technical and Financial Assistance Needs: Technical and financial assistance associated with stream maintenance is generally low for minor tasks such as removing debris jams and repairing problematic hydraulic and discharge points.

FC10	Part of Dreamway Project Hart Rd. to Rt. 59	5,000 ft.	Mostly Public	Partially Protected	1) Install structures that increase flow velocity and transport sediment; 2) Remove debris jams in channel; 3) Repair problematic discharge points (specifically determine feasibility to divert Barrington Park District manhole to adjacent wetlands) and; 4) Repair problematic hydraulic structures.	H	Public and Private Owners	IDNR-OWR; USACE; LCSMC; NRCS	$1-2K each (Structures); $100-500 (Debris jams); $1-3K (Hydraulics and Discharges)	IDNR C2000; EPA 319; LCSMC; Barrington	1-5 Years
FC14	Lake Louise inlet to Lake-Cook Rd.	1,700 ft.	Private	Not Protected	Monitor success of recent stream restoration that occurred in 2005.	H	Private Owners	Barrington	n/a	n/a	1-5 Years
FC15	Lake-Cook Rd. to Hillside Ave.	3,000 ft.	Private	Not Protected	1) Install structures that increase flow velocity and transport moderate sediment levels; 2) Remove debris jams in channel; 3)	H	Private Owners	IDNR-OWR; USACE;	$1-2K each (Structures); $100-	IDNR C2000; EPA 319; MWRD	1-5 Years

					Repair problematic discharge points			MWRD; NRCS	500 (Debris jams); $1-3K (Discharges)		
FC11	Rt. 59 to Lake Zurich Rd.	4,300 ft.	Private	Partially Protected	1) Install structures that increase flow velocity and transport moderate sediment levels; 2) Remove debris jams in channel.	M	Private Owners	IDNR-OWR; USACE; LCSMC; NRCS	$1-2K each (Structures); $100-500 (Debris jams);	IDNR C2000; EPA 319; LCSMC	1-5 Years
FC19	Lake-Cook Rd. to Hawthorne Lake Dam; also within Barrington Hills	7,100 ft.	Private	Not Protected	1) Install structures that increase flow velocity and transport moderate sediment levels; 2) Repair problematic hydraulic structures; 3) Repair problematic discharge points.	M	Private Owners	IDNR-OWR; USACE; MWRD; NRCS	$1-2K each (Structures); $1-3K (Hydraulics & Discharges)	IDNR C2000; EPA 319; MWRD	1-5 Years
FC12	Lake Zurich Rd. to Lake Louise Dam; also within Ela Twp.	3,700 ft.	Mostly Public	Mostly Protected	Install structures that increase flow velocity and transport moderate sediment levels.	L	Public and Private Owners	IDNR-OWR; USACE; LCSMC; NRCS	$1-2K each (Structures)	IDNR C2000; EPA 319; LCSMC	10+ Years
FC18	Confluence with Flint Creek East to Lake-Cook Rd.; also within Barrington Hills	2,700 ft.	Private	Not Protected	Install structures that increase flow velocity and transport moderate sediment levels.	L	Private Owners	IDNR-OWR; USACE; LCSMC; NRCS	$1-2K each (Structures)	IDNR C2000; EPA 319; LCSMC	10+ Years

STREAM RESTORATION (See Figure 73)

Stream restoration projects are implemented primarily to improve water quality but also have excellent secondary benefits for reducing flooding and improving natural resources. They improve water quality by stabilizing eroded banks, reduce flooding by reconnecting channelized streams to the historic floodplain, and improve natural resources by improving aquatic habitat.

Technical and Financial Assistance Needs: Stream restorations are often complex and require high technical and financial assistance needs to protect land, design, construct, monitor, and maintain the restoration. The project becomes more complex when construction occurs on reaches that flow through several governing bodies or multiple private residences.

FC10	Part of DREAMWAY proposal Hart Rd. to Rt. 59	5,000 ft.	Mostly Public	Partially Protected	1) Extend narrow buffer on both banks and plant with native vegetation; 2) construct artificial pools and riffles to combat effects of channelization and improve habitat and 3) located within pollutant loading hotspot SMU. Note: some areas of this reach have been restored by Village of Barrington.	H	Public and Private Owners	IDNR-OWR; IDNR; NRCS; LCSMC; USACE	$100-300/linear foot	EPA 319; LCSMC; Barrington	1-5 Years
FC11	Part of CN ByPass Project Rt. 59 to Lake Zurich Rd.	4,300 ft.	Private	Partially Protected	1) Remove non-native vegetation and extend native plant buffer on both banks; 2) construct artificial pools and riffles to combat effects of channelization and improve habitat; 3) install rootwads and boulders to improve habitat; 4) also located within pollutant loading hotspot SMU.	H	Private Owners	IDNR-OWR; IDNR; NRCS; LCSMC; USACE	$100-300/linear foot	EPA 319; LCSMC; Barrington	1-5 Years
FC14	Lake Louise inlet to Lake-Cook Rd.	1,700 ft.	Private	Not Protected	Monitor success of recent stream restoration that occurred in 2005.	H	Private Owners	Barrington; HOA	n/a	n/a	1-5 Years
FC12	Lake Zurich Rd. to Lake Louise Dam;	3,700 ft.	Mostly Public	Mostly Protected	1) Remove non-native species from buffer; 2) construct artificial pools and riffles to combat effects of channelization and improve	M	Public and Private Owners	IDNR-OWR; IDNR; NRCS; LCSMC;	$100-300/linear foot	EPA 319; LCSMC; LCFPD	5-10 Years

	also within Ela Twp.				habitat; 3) install rootwads and boulders to improve habitat.			USACE; LCFPD			
FC15	Lake-Cook Rd. to Hillside Ave.	3,000 ft.	Private	Not Protected	1) Monitor success of stream section restored in 1999; 2) maintain restored native buffer; 3) construct artificial pools and riffles to combat effects of channelization and improve habitat; 4) install rootwads and boulders to improve habitat.	L	Private Owners	IDNR-OWR; IDNR; NRCS; MWRD; USACE	$100-300/linear foot	EPA 319; MWRD; HOA; Barrington	10+ Years
FC18	Confluence with Flint Creek East to Lake-Cook Rd.; also within Barrington Hills	2,700 ft.	Private	Not Protected	1) Construct artificial pools and riffles to combat effects of channelization and improve habitat; 3) install boulders and logs to improve habitat.	L	Private Owners	IDNR-OWR; IDNR; NRCS; LCSMC; USACE	$100-300/linear foot	EPA 319; LCSMC	10+ Years
FC19	Lake-Cook Rd. to Hawthorne Lake Dam; also within Barrington Hills	7,100 ft.	Private	Not Protected	1) Remove non-native species from buffer; 2) construct artificial pools and riffles to combat effects of channelization and improve habitat; 3) install boulders and rootwads to improve habitat.	L	Private Owners	IDNR-OWR; IDNR; NRCS; MWRD; USACE	$100-300/linear foot	EPA 319; MWRD	10+ Years

Barrington Hills

BMP ID #	Location	Acres/ Linear ft.	Public or Private	Protected or Not Protected	Action Recommendation	Rank (H, M, or L)	Lead Agency/ Owner	Sources of Technical Assistance	Cost Estimate	Funding Mechanism	Schedule (Short, Medium, Long Term)

DETENTION BASIN RETROFITS (See Figure 69)

Detention basin retrofit recommendations included in this plan primarily address improving water quality and reducing flooding but also improve natural resources (wildlife habitat) as a secondary function.

Technical and Financial Assistance Needs: Technical assistance needed to implement detention basin retrofits is generally low to medium while financial assistance is generally moderate. Installing post 1992 construction outlet restrictors on appropriate Lake County basins requires less technical assistance than installing a native plant buffer. Private landowners will require the greatest assistance.

168	Bisque Dr.	n/a	Private	Protected	Monitor success of stabilization project on basin	L	Private Owner	LCSMC; Barrington Hills	$3K/acre (Planting); $2-4K (92 release); $1-3K (repair weir)	EPA 319; IDNR C2000; LC Watershed Board; HOA	10+ Years
170	Countryside School	n/a	Public	Protected	Determine feasibility to convert existing dry bottom detention basin to wet bottom planted with native vegetation. Also located near Flood Problem Area 1.	H		MWRD; Barrington Hills	Varies	EPA 319; IDNR C2000; School District	1-5 Years
26	Buckley Rd.	n/a	Private	Not Protected	Determine feasibility to convert existing dry bottom detention basin to wet bottom planted with native vegetation.	M	Private Owner	Barrington Hills	Varies	EPA 319; IDNR C2000; HOA	5-10 Years

FLOOD MITIGATION AT FLOOD PROBLEM AREA SITES (See Figure 69)

The primary objective of implementing flood mitigation projects is to reduce existing flood damage. Secondary benefits include water quality and natural resource improvement depending on the nature of the project.

Technical and Financial Assistance Needs: Technical and financial assistance needed to implement storage locations and wetland restorations is generally high because of land protection, design, permitting, and construction costs. Smaller mitigation projects such as detention retrofits and drainage improvements require less technical and financial assistance.											
FP A 1	See Figure 69	n/a	Public Road	Not Protected	Conduct feasibility study to determine if Regional Storage Area # 13, Wetland Restoration # 6 and/or Detention Basin retrofit at # 170 will alleviate local drainage problem along Lake-Cook Rd. No known mitigation has occurred at this site.	H	Barrington Hills; Private Owners	NRCS; Barrington Hills; USACE	Varies	MWRD; USACE	1-5 Years
FP A 2	See Figure 69	n/a	Private	Not Protected	Conduct feasibility study to determine if any flood mitigation measures are feasible for depressional flooding occurring on at northwest corner of Oakdene Rd. and Hart Hills Road. No known mitigation has occurred at this site.	H	Barrington Hills	Barrington Hills; LCSMC	Varies	MWRD	1-5 Years
FP A 4	See Figure 69	n/a	Private	Not Protected	Conduct feasibility study to determine if Regional Storage Area # 9 will alleviate depressional flooding at northwest corner of Route 68 and Lakeview Ln. No known mitigation has occurred at this site.	H	Barrington Hills; Private Owners	NRCS; Barrington Hills; USACE	Varies	MWRD; USACE	1-5 Years
FP A 5	See Figure 69	n/a	Private	Not Protected	Conduct feasibility study to determine if Regional Storage Area #'s 3 and 6 and/or Wetland Restoration #'s 10 and 12 will alleviate depessional flooding between Rt. 59/68 and Old Dundee Rd. No known mitigation has occurred at this site.	H	Barrington Hills; Private Owners	NRCS; Barrington Hills; USACE	Varies	MWRD; USACE	1-5 Years

REGIONALLY SIGNIFICANT STORAGE LOCATIONS (See Figure 70)

Implementation of potential Regionally Significant Storage Locations primarily prevents and reduces flooding downstream but also improves water quality and natural resources if planted with native vegetation.

Technical and Financial Assistance Needs: Technical and financial assistance needed to implement storage locations is generally high because of land protection, design, permitting, and construction costs.

14	See Figure 70; Also partially in Barrington	35.9	Private	Not Protected	Determine feasibility to construct multi-objective storage area on existing open space; also recommended in 1994 Flint Creek Management Plan.	H	Private Owner	USACE; NRCS; LCSMC	20-30K/acre	LCSMC; USACE	1-5 Years
13	See Figure 70	6.5	Private	Not Protected	Determine feasibility to construct multi-objective storage area on existing open space; also possible flood mitigation for Flood Problem Area 1.	H	Private Owners	USACE; NRCS; LCSMC	20-30K/acre	LCSMC; USACE	1-5 Years
12	See Figure 70	6.2	Private	Not Protected	Determine feasibility to construct multi-objective storage area on existing open space; also possible flood mitigation for Flood Problem Area 2.	H	Private Owners	USACE; NRCS; LCSMC	20-30K/acre	LCSMC; USACE	1-5 Years
26	See Figure 70	14.9	Private	Not Protected	Determine feasibility to construct multi-objective storage area in existing agricultural field.	M	Private Owner	USACE; NRCS; SWCD; LCSMC	20-30K/acre	LCSMC; USACE	1-5 Years
22	See Figure 70	9.9	Private	Not Protected	Determine feasibility to construct multi-objective storage area in existing agricultural field.	M	Private Owner	USACE; NRCS; SWCD; LCSMC	20-30K/acre	LCSMC; USACE	1-5 Years
18	See Figure 70	7.0	Private	Protected	Determine feasibility to construct multi-objective storage area on existing open space.	M	Private Owners	USACE; NRCS; LCSMC	20-30K/acre	LCSMC; USACE	5-10 Years

10	See Figure 70	5.2	Private	Not Protected	Determine feasibility to construct multi-objective storage area on existing open space.	M	Private Owners	USACE; NRCS; LCSMC	20-30K/acre	LCSMC; USACE	5-10 Years
24	See Figure 70	9.5	Private	Not Protected	Determine feasibility to construct multi-objective storage area in partially open space adjacent to existing large lot residential development.	L	Private Owners	USACE; NRCS; LCSMC	20-30K/acre	LCSMC; USACE	10+Years
17	See Figure 70	8.8	Private	Not Protected	Determine feasibility to construct multi-objective storage area on existing golf course.	L	Private Owner	USACE; NRCS; LCSMC	20-30K/acre	LCSMC; USACE	10+ Years
29	See Figure 70	5.6	Private	Not Protected	Determine feasibility to construct multi-objective storage area in partially open space adjacent to existing large lot residential development.	L	Private Owners	USACE; NRCS; LCSMC	20-30K/acre	LCSMC; USACE	10+Years
19	See Figure 70	27.4	Private	Partially Protected	Determine feasibility to construct multi-objective storage area in Flint Creek (main stem) corridor/floodplain.	L	Private Owners	USACE; NRCS; LCSMC	20-30K/acre	LCSMC; USACE	10+ Years
BMP ID #	**Location**	**Acres/ Linear ft.**	**Public or Private**	**Protected or Not Protected**	**Action Recommendation**	**Priority (H, M, or L)**	**Lead Agency/ Owner**	**Sources of Technical Assistance**	**Cost Estimate**	**Funding Mechanism**	**Schedule (Short, Medium, Long Term)**

POTENTIAL WETLAND RESTORATION SITES (See Figure 71)

Wetland restoration projects are implemented primarily to improve water quality but also have excellent secondary benefits for reducing flooding and improving natural resources.

Technical and Financial Assistance Needs: Wetland restoration projects are typically complex and require high technical and financial assistance needs to protect land, design, construct, monitor, and maintain the restoration.

3	See Figure 71	11.4	Private	Not Protected	Determine feasibility for wetland restoration project on existing open and partially residential parcels; also located within high land use vulnerability SMU.	H	Private Owners	NRCS; LCSMC; USACE	20K/acre	EPA 319; IDNR C2000; LCSMC	1-5 Years
5	See Figure 71; Also partially in Cuba Twp	4.5	Private	Not Protected	Determine feasibility for wetland restoration project on existing open/partially open parcels and agricultural field; also located within high land use vulnerability SMU.	H	Private Owner	NRCS; LCSMC; SWCD; USACE	20K/acre	EPA 319; IDNR C2000; LCSMC	1-5 Years
10	See Figure 71	6.5	Private	Not Protected	Determine feasibility for wetland restoration project on existing agricultural field; also potential flood mitigation for Flood Problem Area 5.	H	Private Owner	NRCS; MWRD; SWCD; USACE	20K/acre	EPA 319; IDNR C2000	1-5 Years
12	See Figure 71	12.7	Private	Not Protected	Determine feasibility for wetland restoration project on partially open space north of Dundee Road; also potential flood mitigation for Flood Problem Area 5.	H	Private Owner	NRCS; MWRD; USACE	20K/acre	EPA 319; IDNR C2000; MWRD	1-5 Years
1	See Figure 71	5.3	Private	Not Protected	Determine feasibility for wetland restoration project on existing partially open and agricultural areas; also located within high land use vulnerability SMU.	M	Private Owner	NRCS; MWRD; SWCD; USACE	20K/acre	EPA 319; IDNR C2000; MWRD	5-10 Years
6	See Figure 71; Also partially in Cuba Twp	23.3	Private	Not Protected	Determine feasibility for wetland restoration project on existing golf course and south of Lake-Cook Road; area south of Lake-Cook could mitigate at Flood Problem Area 1; also located within high land use vulnerability SMU.	M	Private Owner	NRCS; LCSMC; MWRD; SWCD; USACE	20K/acre	EPA 319; IDNR C2000; LCSMC; MWRD	5-10 Years

42	See Figure 71	6.9	Private	Not Protected	Determine feasibility for wetland restoration project on existing open/partially open parcels.	M	Private Owner	NRCS; LCSMC; USACE	20K/acre	EPA 319; IDNR C2000; LCSMC	5-10 Years
STREAM CHANNEL MAINTENANCE AND MONITORING (See Figure 72) Most stream maintenance is conducted to keep the stream channel clear of problematic debris that may cause flooding issues. Water quality also benefits when problem hydraulic structures and discharge points are repaired.											
Technical and Financial Assistance Needs: Technical and financial assistance associated with stream maintenance is generally low for minor tasks such as removing debris jams and repairing problematic hydraulic and discharge points.											
FC07	Cuba Rd. to Oak Knoll Rd.	6,100 ft	Private	Not Protected	1) Install structures that increase flow velocity and transport moderate sediment levels; 2) Remove debris jams in channel; 3) Repair problematic discharge points.	H	Private Owners	IDNR-OWR; USACE; LCSMC; NRCS	$1-2K each (Structures); $100-500 (Debris jams); $1-3K (Discharges)	IDNR C2000; EPA 319; LCSMC	1-5 Years
FC08	Oak Knoll Rd. to Hart Rd.; Partially in Cuba Township	16,100 ft	Private	Not Protected	May be positively affected by Dreamway (new projects) 1) Install structures that increase flow velocity and transport high sediment levels; 2) Remove debris jams in channel; 3) Repair problematic hydraulic structures.	H	Private Owners	IDNR-OWR; USACE; LCSMC; NRCS	$1-2K each (Structures); $100-500 (Debris jams); $1-3K (Hydraulics)	IDNR C2000; EPA 319; LCSMC	1-5 Years
FC21	Rt. 59 to LaBuy's Lake Dam; also	6,300 ft.	Private	Mostly Protected	1) Install structures that increase flow velocity and transport high	M	Private Owners	IDNR-OWR; USACE;	$1-2K each (Structure	IDNR C2000; EPA 319;	5-10 Years

	partially in Barrington Twp (Crabtree Nature Preserve)				sediment levels; 2) Remove debris jams in channel.		and FPDCC	MWRD; NRCS; FPDCC	s); $100-500 (Debris jams)	MWRD; FPDCC	
FC09	Old Hart Rd. to Hart Rd.	1,900 ft	Private	Not Protected	May be positively affected by Dreamway (new projects) 1) Install structures that increase flow velocity and transport high sediment levels; 2) Remove debris jams in channel.	M	Private Owners	IDNR-OWR; USACE; LCSMC; NRCS	$1-2K each (Structures); $100-500 (Debris jams)	IDNR C2000; EPA 319; LCSMC	1-5 Years
FC19	Lake-Cook Rd. to Hawthorne Lake Dam; also within Barrington	7,100 ft.	Private	Not Protected	1) Install structures that increase flow velocity and transport moderate sediment levels; 2) Repair problematic hydraulic structures; 3) Repair problematic discharge points.	M	Private Owners	IDNR-OWR; USACE; MWRD; NRCS	$1-2K each (Structures); $1-3K (Hydraulics & Discharges)	IDNR C2000; EPA 319; MWRD	1-5 Years
FC18	Confluence with Flint Creek East to Lake-Cook Rd.; also within Barrington	2,700 ft.	Private	Not Protected	May be positively affected by Dreamway (new projects) Install structures that increase flow velocity and transport moderate sediment levels.	L	Private Owners	IDNR-OWR; USACE; MWRD; NRCS	$1-2K each (Structures)	IDNR C2000; EPA 319; LCSMC	10+ Years
STREAM RESTORATION (See Figure 73)											

Stream restoration projects are implemented primarily to improve water quality but also have excellent secondary benefits for reducing flooding and improving natural resources. They improve water quality by stabilizing eroded banks, reduce flooding by reconnecting channelized streams to the historic floodplain, and improve natural resources by improving aquatic habitat.

Technical and Financial Assistance Needs: Stream restorations are often complex and require high technical and financial assistance needs to protect land, design, construct, monitor, and maintain the restoration. The project becomes more complex when construction occurs on reaches that flow through several governing bodies or multiple private residences.

FC21	Rt. 59 to LaBuy's Lake Dam; partially in Barrington Twp (Crabtree Nature Preserve)	6,300 ft.	Private	Mostly Protected	1) Remove non-native species from buffer; 2) restore moderately eroded streambanks using multiple BMPs; 3) construct artificial pools and riffles to combat effects of channelization and improve habitat; 4) install boulders and rootwads to improve habitat; 5) potential stream remeandering site.	H	Private Owners and FPDCC	IDNR-OWR; IDNR; NRCS; MWRD; USACE; FPDCC	$100-300/linear foot	EPA 319; MWRD; FPDCC	1-5 Years
FC07	Cuba Rd. to Oak Knoll Rd.	6,100 ft	Private	Not Protected	1) Convert turf grass buffers to native vegetation and remove other non-native species; 2) construct artificial pools and riffles to combat effects of channelization and improve habitat; 3) install boulders and rootwads to improve habitat.	L	Private Owners	IDNR-OWR; IDNR; NRCS; LCSMC; USACE	$100-300/linear foot	EPA 319; LCSMC; Residents	10+ Years
FC08	Oak Knoll Rd. to Hart Rd.; partially in Cuba Township	16,100 ft	District 220	Not Protected	Convert turf grass buffers to native vegetation and remove other non-native species.	L	District 220	IDNR-OWR; IDNR; NRCS; LCSMC; USACE	$1,000-3,000/acre	EPA 319; LCSMC; Residents	10+ Years
FC09	Old Hart Rd. to Hart Rd.	1,900 ft	District 220	Not Protected	Convert turf grass buffers to native vegetation and remove other non-native species.	L	District 220	IDNR-OWR; IDNR; NRCS;	$1,000-3,000/acre	EPA 319; LCSMC; Residents	10+ Years

								LCSMC; USACE			
FC18	Confluence with Flint Creek East to Lake-Cook Rd.; also within Barrington	2,700 ft.	Private	Not Protected	1) Construct artificial pools and riffles to combat effects of channelization and improve habitat; 3) install boulders and logs to improve habitat.	L	Private Owners	IDNR-OWR; IDNR; NRCS; LCSMC; USACE	$100-300/linear foot	EPA 319; LCSMC	10+ Years
FC19	Lake-Cook Rd. to Hawthorne Lake Dam; also within Barrington	7,100 ft.	Private	Not Protected	1) Remove non-native species from buffer; 2) construct artificial pools and riffles to combat effects of channelization and improve habitat; 3) install boulders and rootwads to improve habitat.	L	Private Owners	IDNR-OWR; IDNR; NRCS; MWRD; USACE	$100-300/linear foot	EPA 319; MWRD	10+ Years

Barrington Township

BMP ID#	Location	Acres/ Linear ft.	Public or Private	Protected or Not Protected	Action Recommendation	Rank (H, M, or L)	Lead Agency/ Owner	Sources of Technical Assistance	Cost Estimate	Funding Mechanism	Schedule (Short, Medium, Long Term)

FLOOD MITIGATION AT FLOOD PROBLEM AREA SITES (See Figure 70)

The primary objective of implementing flood mitigation projects is to reduce existing flood damage. Secondary benefits include water quality and natural resource improvement depending on the nature of the project.

Technical and Financial Assistance Needs: Technical and financial assistance needed to implement storage locations and wetland restorations is generally high because of land protection, design, permitting, and construction costs. Smaller mitigation projects such as detention retrofits and drainage improvements require less technical and financial assistance.

FPA 3	See Figure 70	n/a	Private	Not Protected	Working on funding for flood mitigation measures for depressional flooding occurring in subdivision southwest of Baker's Lake. No known mitigation has occurred at this site.	H	Barrington Township	Barrington Township	Varies	MWRD	1-5 Years

LAKE SHORELINE RESTORATION (See Figure 74)

Lake shoreline restoration projects are implemented to primarily buffer the waterbody and have equal benefits for improving water quality and improving natural resources by introducing native plants that are beneficial to wildlife.

Technical and Financial Assistance Needs: Lake shoreline restoration is not as complex as restoring stream reaches but still requires a moderate amount of technical and financial assistance to complete the project. The cost for implementing this type of project depends on the amount of invasive species to be removed and extent of grading work involved in stabilizing the shoreline.

Baker s Lake	See Figure 69	112 acres	Mostly Public	Mostly Protected	Stabilize approximately 1,000 linear feet of severely eroded shoreline along Hillside Avenue using bioengineering techniques such as minor regrading and installation of native plants.	H	FPDCC	USACE: IDNR-OWR; MWRD; NRCS; SWCD	$100-300/ linear foot	LCSMC; EPA 319; IDNR C2000	1-5 Years

STREAM CHANNEL MAINTENANCE AND MONITORING (See Figure 70)

Most stream maintenance is conducted to keep the stream channel clear of problematic debris that may cause flooding issues. Water quality also benefits when problem hydraulic structures and discharge points are repaired.

Technical and Financial Assistance Needs: Technical and financial assistance associated with stream maintenance is generally low for minor tasks such as removing debris jams and repairing problematic hydraulic and discharge points.

FC21	Rt. 59 to LaBuy's Lake Dam; also partially in Barrington Hills	6,300 ft.	Public (Crabtree Nature Preserve)	Mostly Protected	1) Install structures that increase flow velocity and transport high sediment levels; 2) Remove debris jams in channel.	M	FPDCC	IDNR-OWR; USACE; MWRD; NRCS; FPDCC	$1-2K each (Structures); $100-500 (Debris jams)	IDNR C2000; EPA 319; MWRD; FPDCC	5-10 Years

STREAM RESTORATION (See Figure 73)

Stream restoration projects are implemented primarily to improve water quality but also have excellent secondary benefits for reducing flooding and improving natural resources. They improve water quality by stabilizing eroded banks, reduce flooding by reconnecting channelized streams to the historic floodplain, and improve natural resources by improving aquatic habitat.

Technical and Financial Assistance Needs: Stream restorations are often complex and require high technical and financial assistance needs to protect land, design, construct, monitor, and maintain the restoration. The project becomes more complex when construction occurs on reaches that flow through several governing bodies or multiple private residences.

FC21	Rt. 59 to LaBuy's Lake Dam; also partially in Barrington Hills	6,300 ft.	Public (Crabtree Nature Preserve)	Mostly Protected	1) Remove non-native species from buffer; 2) restore moderately eroded streambanks using multiple BMPs; 3) construct artificial pools and riffles to combat effects of channelization and improve habitat; 4) install boulders and rootwads to improve habitat; 5) potential stream remeandering site..	H	FPDCC	IDNR-OWR; IDNR; NRCS; MWRD; USACE; FPDCC	$100-300/linear foot	EPA 319; MWRD; FPDCC	1-5 Years

Cuba Township

BMP ID#	Location	Acres/ Linear ft.	Public or Private	Protected or Not Protected	Action Recommendation	Rank (H,	Lead Agency/ Owner	Sources of Technical Assistance	Cost Estimate	Funding Mechanism	Schedule (Short, Mediu

						M, or L)					**m, Long Term)**
DETENTION BASIN RETROFITS (See Figure 69) Detention basin retrofit recommendations included in this plan primarily address improving water quality and reducing flooding but also improve natural resources (wildlife habitat) as a secondary function.											
Technical and Financial Assistance Needs: Technical assistance needed to implement detention basin retrofits is generally low to medium while financial assistance is generally moderate. Installing post 1992 construction outlet restrictors on appropriate Lake County basins requires less technical assistance than installing a native plant buffer. Private landowners will require the greatest assistance.											
146	Lake Zurich Rd. (Columbus Park Lake)	n/a	Public	Protected	1) Replace existing turf grass buffer with native vegetation and treat algae problem; 2) determine feasibility to convert to post 1992 release rates; 3) also located within pollutant loading hotspot SMU.	H	Barrington Park District; Private Owner	LCSMC; BPD, LCPBD	$3K/acre (Planting); $2-4K (92 release)	EPA 319; IDNR C2000; LC Watershed Board; HOA	1-5 Years
20	Good Shepherd Hospital	n/a	Private	Not Protected	1) Remove rip-rap, turf and concrete swales and replace with native vegetation; 2) determine feasibility to convert to post 1992 release rates.	M	Private Owner	LCSMC; CFC	$5K (Remove rip-rip and plant); $2-4 K (92 release)	EPA 319; IDNR C2000; LC Drainage Fund; Lake County Watershed Board	5-10 Years
147	Crestview Dr.	n/a	Private	Not Protected	1) Remove invasive/non-native plants, trees, and shrubs from buffer and replant with natives; 2) determine feasibility to convert to post 1992 release rates; 3) also located within pollutant loading hotspot SMU.	M	Private Owner	LCSMC; LCPBD	$3K/acre (Planting); $2-4K (92 release)	EPA 319; IDNR C2000; LC Watershed Board; HOA	5-10 Years

152, 153, 156	Good Shepherd Hospital	n/a	Private	Not Protected	Determine feasibility to convert to post 1992 release rates. Note: basins could not be accessed to assess conditions.	M	Private Owner	LCSMC	$2-4 K (92 release)	LC Drainage Fund; Lake County Watershed Board	5-10 Years

FLOOD MITIGATION AT FLOOD PROBLEM AREA SITES (See Figure 70)

The primary objective of implementing flood mitigation projects is to reduce existing flood damage. Secondary benefits include water quality and natural resource improvement depending on the nature of the project.

Technical and Financial Assistance Needs: Technical and financial assistance needed to implement storage locations and wetland restorations is generally high because of land protection, design, permitting, and construction costs. Smaller mitigation projects such as detention retrofits and drainage improvements require less technical and financial assistance.

BMP ID#	Location	Acres/ Linear ft.	Public or Private	Protected or Not Protected	Action Recommendation	Rank (H, M, or L)	Lead Agency/ Owner	Sources of Technical Assistance	Cost Estimate	Funding Mechanism	Schedule (Short, Medium, Long Term)
FPA 9-03	See Figure 70	n/a	Private	Not Protected	Conduct feasibility study to determine if Regional Storage Area #'s 30 and 31 and/or Wetland Restoration #'s 11 and 14 will alleviate flooding for local drainage problem along Harbor Rd. and Cuba Rd.. A partial fix occurred to the broken drain tile at this site.	H	Cuba Township; Private Owners	LCSMC; Cuba Township; NRCS; USACE	Varies	LC Watershed Board; LC Drainage Fund; LCSMC; USACE; NRCS	1-5 Years
FPA 9-04	See Figure 70	n/a	Private	Not Protected	Conduct feasibility study to determine if Regional Storage Area # 32 will alleviate flooding for local drainage problem near Old Barrington Rd. and N. Edgemond	H	Cuba Township; Private Owners	LCSMC; Cuba Township;	Varies	LC Watershed Board; LC Drainage Fund;	1-5 Years

					Rd. Cuba Township Road District has raised Old Barrington Rd. and recommends running pipe north to pond on Rt. 22.			NRCS; USACE		LCSMC; USACE	
FPA 9-12	See Figure 70	n/a	Private	Not Protected	Conduct feasibility study to determine if any flood mitigation measures are feasible for local drainage problem in subdivision east of Echo Lake. Minor drainage improvement work has occurred along N. Lakewood Ln.	H	Cuba Township	LCSMC; Cuba Township	Varies	LC Watershed Board; LC Drainage Fund; LCSMC	1-5 Years
FPA 9-21	See Figure 70	n/a	Private	Not Protected	Conduct feasibility study to determine if Regional Storage Area # 25 will alleviate depressional flooding on Hart Rd. Historical aerials show a swale that is filled in west of road blocking flow to nearby pond.	H	Cuba Township; Private Owners	LCSMC; Cuba Township; NRCS; USACE	Varies	LC Watershed Board; LC Drainage Fund; LCSMC; USACE	1-5 Years
FPA 9-22	See Figure 70	n/a	Private	Not Protected	Conduct feasibility study to determine if any flood mitigation measures are feasible for local drainage problem along Signal Hill Road.	H	Cuba Township; Private Owners	LCSMC; Cuba Township	Varies	LC Watershed Board; LC Drainage Fund; LCSMC; Owner	1-5 Years
LAKE SHORELINE RESTORATION (See Figure 74) Lake shoreline restoration projects are implemented to primarily buffer the waterbody and have equal benefits for improving water quality and improving natural resources by introducing native plants that are beneficial to wildlife.											
Technical and Financial Assistance Needs: Lake shoreline restoration is not as complex as restoring stream reaches but still requires a moderate amount of technical and financial assistance to complete the project. The cost for implementing this type of project depends on the amount of invasive species to be removed and extent of grading work involved in stabilizing the shoreline.											
Colum bus	See Figure 74	6.6 acres	Mostly Public	Partially Protected	Stabilize 274 linear feet of moderately eroded shoreline and 110 linear feet of moderately eroded shoreline using bioengineering	H	Barrington Park District;	USACE: IDNR-OWR; LCSMC;	$100-300/	LCSMC; EPA 319; IDNR	1-5 Years

Park Lake					techniques such as minor regrading and installation of native plants. Also located within pollutant loading hotspot SMU.		Private Owner	NRCS; SWCD	linear foot	C2000; Park District	
REGIONALLY SIGNIFICANT STORAGE LOCATIONS (See Figure 70) Implementation of potential Regionally Significant Storage Locations primarily prevents and reduces flooding downstream but also improves water quality and natural resources if planted with native vegetation.											
Technical and Financial Assistance Needs: Technical and financial assistance needed to implement storage locations is generally high because of land protection, design, permitting, and construction costs.											
35	See Figure 70	31.6	Private	Not Protected	Determine feasibility to construct multi-objective storage area on existing agricultural land.	H	Private Owner	LCSMC; NRCS; SWCD; USACE	20-30K/acre	LCSMC; USACE	1-5 Years
30	See Figure 70	19.8	Private	Not Protected	Determine feasibility to construct multi-objective storage area on existing partially open space; also possible flood mitigation for Flood Problem Area 9-03.	H	Private Owners	LCSMC; NRCS; USACE	20-30K/acre	LCSMC; USACE	1-5 Years
32	See Figure 70	9.7	Private	Not Protected	Determine feasibility to construct multi-objective storage area on existing open space and agricultural land; also possible flood mitigation for Flood Problem Area 9-04.	H	Private Owners	LCSMC; NRCS; USACE	20-30K/acre	LCSMC; USACE	1-5 Years
25	See Figure 70	5.7	Private	Not Protected	Determine feasibility to construct multi-objective storage area on existing open space; also possible flood mitigation for Flood Problem Area 9-01 and 9-21.	H	Private Owners	LCSMC; NRCS; USACE	20-30K/acre	LCSMC; USACE	1-5 Years

39	See Figure 70; also in Lake Barrington and North Barrington	80.1	Private	Not Protected	Determine feasibility to construct multi-objective storage area on existing golf course (west half), and existing wetland (east half).	L	Private Owners	LCSMC; NRCS; USACE	20-30K/acre	LCSMC; USACE	10+ Years
40	See Figure 70	27.9	Private	Not Protected	Determine feasibility to construct multi-objective storage area on existing partially open space.	L	Private Owners	LCSMC; NRCS; USACE	20-30K/acre	LCSMC; USACE	10+ Years
16	See Figure 70	17.6	Private	Not Protected	Determine feasibility to construct multi-objective storage area on existing partially open space adjacent to residential development.	L	Private Owners	LCSMC; NRCS; USACE	20-30K/acre	LCSMC; USACE	10+ Years
31	See Figure 70	7.3	Private	Not Protected	Determine feasibility to construct multi-objective storage area on existing partially open space adjacent to residential development; also possible flood mitigation for Flood Problem Area 9-03.	L	Private Owners	LCSMC; NRCS; USACE	20-30K/acre	LCSMC; USACE	10+ Years
34	See Figure 70	6.1	Private	Partially Protected	Determine feasibility to construct multi-objective storage area on existing partially open space adjacent to residential development and existing wetland.	L	Private Owners	LCSMC; NRCS; USACE	20-30K/acre	LCSMC; USACE	10+ Years

POTENTIAL WETLAND RESTORATION SITES (See Figure 71)

Wetland restoration projects are implemented primarily to improve water quality but also have excellent secondary benefits for reducing flooding and improving natural resources.

Technical and Financial Assistance Needs: Wetland restoration projects are typically complex and require high technical and financial assistance needs to protect land, design, construct, monitor, and maintain the restoration.											
2	See Figure 71	7.0	Private	Not Protected	Determine feasibility for wetland restoration project on existing agricultural land; also located within high land use vulnerability SMU.	H	Private Owner	NRCS; LCSMC; SWCD; USACE	20K/acre	EPA 319; IDNR C2000; LCSMC	1-5 Years
4	See Figure 71	9.8	Private	Not Protected	Determine feasibility for wetland restoration project on existing partially open parcels and agricultural land; also located within high land use vulnerability SMU.	H	Private Owners	NRCS; LCSMC; SWCD; USACE	20K/acre	EPA 319; IDNR C2000; LCSMC	1-5 Years
5	See Figure 71; Also partially in Barrington Hills	4.5	Private	Not Protected	Determine feasibility for wetland restoration project on existing open/partially open parcels and agricultural land; also located within high land use vulnerability SMU.	H	Private Owner	NRCS; LCSMC; SWCD; USACE	20K/acre	EPA 319: IDNR C2000; LCSMC	1-5 Years
11	See Figure 71	2.8	Private	Not Protected	Determine feasibility for wetland restoration project on existing agricultural land; also potential flood mitigation for Flood Problem Areas 9-01and 9-03.	H	Private Owner	NRCS; LCSMC; SWCD; USACE	20K/acre	EPA 319; IDNR C2000; LCSMC	1-5 Years
13	See Figure 71	3.5	Private	Not Protected	Determine feasibility for wetland restoration project on existing agricultural land; also potential flood mitigation for Flood Problem Area 9-01.	H	Private Owner	NRCS; LCSMC; SWCD; USACE	20K/acre	EPA 319; IDNR C2000; LCSMC	1-5 Years
14	See Figure 71	8.0	Private	Not Protected	Determine feasibility for wetland restoration project on existing partially open residential land; potential flood mitigation for Flood Problem Area 9-03; also located within high land use vulnerability SMU.	H	Private Owners	NRCS; LCSMC; USACE	20K/acre	EPA 319; IDNR C2000; LCSMC	1-5 Years

16	See Figure 71	5.9	Private	Not Protected	Determine feasibility for wetland restoration project on existing partially open residential land and agricultural land; potential flood mitigation for Flood Problem Area 9-06; also located within high land use vulnerability SMU.	H	Private Owners	NRCS; LCSMC; SWCD; USACE	20K/acre	EPA 319; IDNR C2000; LCSMC	
17	See Figure 71	5.6	Partially Public	Partially Protected	Determine feasibility for wetland restoration adjacent to Columbus Park Lake; also located within pollutant loading hotspot SMU.	H	Barrington PD; Private Owners	NRCS; LCSMC; USACE; Park District	20K/acre	EPA 319; IDNR C2000; LCSMC; Park District	1-5 Years
6	See Figure 71; Also partially in Barrington Hills	23.3	Private	Not Protected	Determine feasibility for wetland restoration project on existing golf course and south of Lake-Cook Road; area south of Lake-Cook could mitigate at Flood Problem Area 1; also located in high land use vulnerability SMU.	M	Private Owner	NRCS; LCSMC; MWRD; SWCD; USACE	20K/acre	EPA 319; IDNR C2000; LCSMC; MWRD	5-10 Years
STREAM CHANNEL MAINTENANCE AND MONITORING (See Figure 72) Most stream maintenance is conducted to keep the stream channel clear of problematic debris that may cause flooding issues. Water quality also benefits when problem hydraulic structures and discharge points are repaired.											
Technical and Financial Assistance Needs: Technical and financial assistance associated with stream maintenance is generally low for minor tasks such as removing debris jams and repairing problematic hydraulic and discharge points.											
FC08	Oak Knoll Rd. to Hart Rd.; partially in	16,100 ft	Private	Not Protected	1) Install structures that increase flow velocity and transport high sediment levels; 2) Remove debris jams in channel; 3) Repair problematic hydraulic structures.	H	Private Owners	IDNR-OWR; USACE; LCSMC; NRCS	$1-2K each (Structures); $100-500 (Debris); $1-3K	IDNR C2000; EPA 319; LCSMC	1-5 Years

	Barrington Hills								(Hydraulics)		
FC05	Rt. 22 to Rt. 14; mostly in Lake Barrington	9,600 ft	Private	Partially Protected	1) Install structures that increase flow velocity and transport high sediment levels; 2) Repair problematic hydraulic structures.	M	Private Owners	IDNR-OWR; USACE; LCSMC; NRCS	$1-2K each (Structures); $1-3K (Discharges)	IDNR C2000; EPA 319; LCSMC	1-5 Years
FC01	Fox River to Kelsey Rd (Grassy Lake Forest Preserve); also in Lake Barrington	4,600 ft	Partially Public	Mostly Protected	Install structures that increase flow velocity and transport low sediment levels.	L	Private and LCFPD	IDNR-OWR; USACE; LCSMC; NRCS; LCFPD	1-2K each	IDNR C2000; EPA 319; LCSMC; LCFPD	10+ Years
FC06	Rt. 14 to Cuba Rd.	1,400 ft	Partially Public	Not Protected	Install structures that increase flow velocity and transport moderate sediment levels.	L	Partially Public Owners	IDNR-OWR; USACE; LCSMC; NRCS	1-2K each	IDNR C2000; EPA 319; LCSMC	10+ Years

STREAM RESTORATION (See Figure 73)

Stream restoration projects are implemented primarily to improve water quality but also have excellent secondary benefits for reducing flooding and improving natural resources. They improve water quality by stabilizing eroded banks, reduce flooding by reconnecting channelized streams to the historic floodplain, and improve natural resources by improving aquatic habitat.

Technical and Financial Assistance Needs: Stream restorations are often complex and require high technical and financial assistance needs to protect land, design, construct, monitor, and maintain the restoration. The project becomes more complex when construction occurs on reaches that flow through several governing bodies or multiple private residences.

FC01	Fox River to Kelsey Rd.; also in Lake Barrington	4,600 ft	Partially Public	Mostly Protected	Extend buffer on right bank and remove non-natives from all buffers	M	Private and LCFPD	IDNR-OWR; IDNR; NRCS; LCSMC; USACE; LCFPD	$1,000-3,000/ acre	EPA 319; LCSMC; LCFPD	5-10+ Years
FC05	Rt. 22 to Rt. 14; mostly in Lake Barrington	9,600 ft	Private	Partially Protected	Remove non-native species from existing wide buffer and supplement with native species.	L	Private Owners	IDNR-OWR; IDNR; NRCS; LCSMC; USACE	$1,000-3,000/ acre	EPA 319; LCSMC	10+ Years
FC06	Rt. 14 to Cuba Rd.	1,400 ft	Partially Public	Not Protected	1) Convert turf grass buffers to native vegetation and remove other non-native species; 2) construct artificial pools and riffles to combat effects of channelization and improve habitat;	L	Partially Public Owners	IDNR-OWR; IDNR; NRCS; LCSMC; USACE	$1,000-3,000/ acre (buffers); $1-3K each (artificial pool/riffle)	EPA 319; LCSMC	10+ Years
FC08	Oak Knoll Rd. to Hart Rd.; partially in Barrington Hills	16,100 ft	Private	Not Protected	Convert turf grass buffers to native vegetation and remove other non-native species.	L	Private Owners	IDNR-OWR; IDNR; NRCS; LCSMC; USACE	$1,000-3,000/ acre	EPA 319; LCSMC; Residents	10+ Years

Deer Park

BMP ID#	Location	Acres/ Linear ft.	Public or Private	Protected or Not Protected	Action Recommendation	Priority (H, M, or L)	Lead Agency/ Owner	Sources of Technical Assistance	Cost Estimate	Funding Mechanism	Schedule (Short, Medium, Long Term)
DETENTION BASIN RETROFITS (See Figure 69)											
Detention basin retrofit recommendations included in this plan primarily address improving water quality and reducing flooding but also improve natural resources (wildlife habitat) as a secondary function.											
Technical and Financial Assistance Needs: Technical assistance needed to implement detention basin retrofits is generally low to medium while financial assistance is generally moderate. Installing post 1992 construction outlet restrictors on appropriate Lake County basins requires less technical assistance than installing a native plant buffer. Private landowners will require the greatest assistance.											
73, 75, 76	Inglenook Ct. (Hamilton Estates)	n/a	Private	Not Protected	1) Determine feasibility to convert to post 1992 release rates; 2) treat extensive algae problem; 3) extend native plant buffers where appropriate; 4) also located within pollutant loading hotspot SMU.	M	Private Owner	LCSMC; Deer Park	$3K/acre (Planting); $2-4K (92 release)	EPA 319; IDNR C2000; LC Watershed Board; HOA	5-10 Years
74	Rand/Ela Rd.	n/a	Private	Not Protected	1) Remove rip-rap; conduct maintenance of invasive species; 2) extend native plant buffer; 3) determine feasibility to convert to post 1992 release rates; 4) also located within pollutant loading hotspot SMU.	M	Private Owner	LCSMC; Deer Park	$3K/acre (Planting); $2-4K (92 release)	EPA 319; IDNR C2000; LC Watershed Board	5-10 Years
127	Pheasant Trl.	n/a	Public	Not Protected	1) Remove turf, rip-rap, and concrete from shoreline and buffer and replace with native vegetation; 2) repair damaged inlets/outlets and	M	Private Owner	LCSMC; Deer Park	$3K/acre (Planting); $2-	EPA 319; IDNR C2000; LC Watershed Board; HOA	5-10 Years

					determine feasibility to convert to post 1992 release rates.				4K (92 release)		
128, 129, 130	Meadow Ln.	n/a	Private	Not Protected	Determine feasibility to convert to post 1992 release rates.	M	Private Owner	LCSMC; Deer Park	$2-4 K	LC Watershed Board	5-10 Years
143	Old Farm Rd.	n/a	Private	Not Protected	1) Remove existing turf grass buffer and plant with native vegetation to stabilize highly eroded shorelines; 2) also located within pollutant loading hotspot SMU.	M	Private Owner	Deer Park	$3K/acre	EPA 319; IDNR C2000; HOA	5-10 Years

LAKE SHORELINE RESTORATION (See Figure 74)

Lake shoreline restoration projects are implemented to primarily buffer the waterbody and have equal benefits for improving water quality and improving natural resources by introducing native plants that are beneficial to wildlife.

Technical and Financial Assistance Needs: Lake shoreline restoration is not as complex as restoring stream reaches but still requires a moderate amount of technical and financial assistance to complete the project. The cost for implementing this type of project depends on the amount of invasive species to be removed and extent of grading work involved in stabilizing the shoreline.

Deer/ Meadows Lake	See Figure 74	13.6 acres	Private	Not Protected	Stabilize 59 linear feet of moderately eroded shoreline along the northwest corner of the lake using bioengineering techniques such as minor regrading and installation of native plants.	M	Lake Association; Private Owners	USACE: IDNR-OWR; LCSMC; NRCS; SWCD	$100-300/ linear foot	LCSMC; EPA (C-2000 & 319); Lake Association	5-10 Years

REGIONALLY SIGNIFICANT STORAGE LOCATIONS (See Figure 70)

Implementation of potential Regionally Significant Storage Locations primarily prevents and reduces flooding downstream but also improves water quality and natural resources if planted with native vegetation.

Technical and Financial Assistance Needs: Technical and financial assistance needed to implement storage locations is generally high because of land protection, design, permitting, and construction costs.

20	Cuba Marsh (See Figure 70)	17.4	Public	Protected	Determine feasibility to construct multi-objective storage area on existing open space partially within Cuba Marsh Forest Preserve.	H	LCFPD	LCSMC; NRCS; USACE; LCFPD	20-30K/acre	LCSMC; USACE; LCFPD	1-5 Years
21	Cuba Marsh (See Figure 70)	5.4	Partially Public	Partially Protected	Determine feasibility to construct multi-objective storage area on existing partially open space adjacent to residential development	M	LCFPD	LCSMC; NRCS; USACE; LCFPD	20-30K/acre	LCSMC; USACE; LCFPD	5-10 Years
27	Cuba Marsh (See Figure 70)	7.4	Partially Public	Partially Protected	Determine feasibility to construct multi-objective storage area on existing partially open space adjacent to residential development	L	LCFPD	LCSMC; NRCS; USACE; LCFPD	20-30K/acre	LCSMC; USACE; LCFPD	10+ Years
28	Cuba Marsh (See Figure 70)	5.1	Public	Protected	Determine feasibility to construct multi-objective storage area on existing open space/wetland within Cuba Marsh Forest Preserve.	L	LCFPD	LCSMC; NRCS; USACE; LCFPD	20-30K/acre	LCSMC; USACE; LCFPD	10+ Years

POTENTIAL WETLAND RESTORATION SITES (See Figure 71)

Wetland restoration projects are implemented primarily to improve water quality but also have excellent secondary benefits for reducing flooding and improving natural resources.

Technical and Financial Assistance Needs: Wetland restoration projects are typically complex and require high technical and financial assistance needs to protect land, design, construct, monitor, and maintain the restoration.

38	See Figure 71	3.6	Public	Not Protected	Determine feasibility for wetland restoration project on existing open space; also located within pollutant loading hotspot SMU.	H	Public Owner	NRCS; LCSMC; USACE	20K/acre	EPA 319; IDNR C2000; LCSMC	1-5 Years
34	See Figure 71	3.0	Public	Not Protected	Determine feasibility for wetland restoration project on existing ball fields; also located within pollutant loading hotspot SMU.	M	Public Owner	NRCS; LCSMC; USACE	20K/acre	EPA 319; IDNR C2000; LCSMC	5-10 Years

Ela Township

BMP ID#	Location	Acres/ Linear ft.	Public or Private	Protected or Not Protected	Action Recommendation	Rank (H, M, or L)	Lead Agency/ Owner	Sources of Technical Assistance	Cost Estimate	Funding Mechanism	Schedule (Short, Medium, Long Term)
DETENTION BASIN RETROFITS (See Figure 69)											
Detention basin retrofit recommendations included in this plan primarily address improving water quality and reducing flooding but also improve natural resources (wildlife habitat) as a secondary function.											
Technical and Financial Assistance Needs: Technical assistance needed to implement detention basin retrofits is generally low to medium while financial assistance is generally moderate. Installing post 1992 construction outlet restrictors on appropriate Lake County basins requires less technical assistance than installing a native plant buffer. Private landowners will require the greatest assistance.											
5	Lochanora Dr.	n/a	Private	Not Protected	1) Remove rip-rap/turf slopes and replace with native vegetation; 2) repair outlet A; 3) determine feasibility to convert to post 1992 release rates; 4) also located within pollutant loading hotspot SMU.	H	Private Owner	LCSMC; Lake County	$5K/acre (Remove rip-rap and plant) $2-4K (92 release)	EPA 319; IDNR C2000; LC Watershed Board; LC Drainage Fund; HOA	1-5 Years
7	Abbey Glen Rd.	n/a	Public	Not Protected	1) Replace turf grass slopes with native vegetation; 2) treat moderate algae problem; 3) also located within pollutant loading hotspot SMU.	H	School	Lake County	$3K/acre (Planting)	EPA 319; IDNR C2000; School District	1-5 Years
8	Abbey Glen Rd.; Old	n/a	Public	Not Protected	Establish native plants on banks. Also located with pollutant loading hotspot SMU.	H	School	Lake County	$3K/acre (Planting)	EPA 319; IDNR C2000; School District	1-5 Years

	McHenry Rd.										
46	Echo Lake Rd. (Alpine Chapel)	n/a	Public	Not Protected	Remove turf buffer and replant with native vegetation.	M	School	Lake County	$3K/acre	EPA 319; IDNR C2000	5-10 Years
53	Gabriel Dr.	n/a	Private	Not Protected	Determine feasibility to convert to post 1992 release rates.	M	Private Owner	LCSMC	$3K/acre (Planting); $2-4 K/acre (92 release)	LC Watershed Board; LC Drainage Fund	5-10 Years
91	Gentry Dr. (White Birch Meadows)	n/a	Private	Not Protected	Replace turf grass buffer with native vegetation. Also located in pollutant loading hotspot SMU.	M	Private Owner	Lake County	$3K/acre (Planting)	EPA 319; IDNR C2000; HOA	5-10 Years
63	Mohawk Trl. (Ela Area Public Library)	n/a	Public	Not protected	Remove turf buffer and replant with native vegetation.	M	Public Library	Ela Twp	$3K/acre	EPA 319; IDNR C2000	5-10 years
107	Sycamore Dr. (Lakewood Estates)	n/a	Private	Not Protected	1) Remove turf grass buffer and replant with native vegetation; 2) determine feasibility to retrofit to post 1992 release rates; 3) also located within pollutant loading hotspot SMU.	M	Private Owner	LCSMC; Lake County	$3K/acre (Planting); $2-4 K/acre (92 release)	EPA 319; IDNR C2000; LC Watershed Board; LC Drainage Fund; HOA	5-10 Years
FLOOD MITIGATION AT FLOOD PROBLEM AREA SITES (See Figure 70)											

The primary objective of implementing flood mitigation projects is to reduce existing flood damage. Secondary benefits include water quality and natural resource improvement depending on the nature of the project.

Technical and Financial Assistance Needs: Technical and financial assistance needed to implement storage locations and wetland restorations is generally high because of land protection, design, permitting, and construction costs. Smaller mitigation projects such as detention retrofits and drainage improvements require less technical and financial assistance.

FPA 9-11	See Figure 66	n/a	Private	Not Protected	No information is known about the local drainage problem at the northeast corner of Route 12 and Miller Rd. Conduct feasibility study to determine cause of flooding for local drainage problem and if any flood mitigation measures are feasible.	H	Ela Township; Private Owners	LCSMC; Cuba Township	Varies	LC Watershed Board; LC Drainage Fund; LCSMC	1-5 Years

LAKE SHORELINE RESTORATION (See Figure 74)

Lake shoreline restoration projects are implemented to primarily buffer the waterbody and have equal benefits for improving water quality and improving natural resources by introducing native plants that are beneficial to wildlife.

Technical and Financial Assistance Needs: Lake shoreline restoration is not as complex as restoring stream reaches but still requires a moderate amount of technical and financial assistance to complete the project. The cost for implementing this type of project depends on the amount of invasive species to be removed and extent of grading work involved in stabilizing the shoreline.

Echo Lake	See Figure 67	24.5 acres	Public; two southwest parcels owned by Lake Zurich & Lake County	Not Protected	Stabilize 593 linear feet of moderately eroded shoreline (does not include parcels owned by Lake Zurich and Lake County) using bioengineering techniques such as minor regrading and installation of native plants.	M; H Lake Zurich/ Lake County Parcels	Lake Association; Private Owners	USACE: IDNR-OWR; LCSMC; NRCS; SWCD	$100-300/ linear foot	LCSMC; EPA (C-2000 & 319); Lake Association	5-10 Years

REGIONALLY SIGNIFICANT STORAGE LOCATIONS
(See Figure 70)

Implementation of potential Regionally Significant Storage Locations primarily prevents and reduces flooding downstream but also improves water quality and natural resources if planted with native vegetation.

Technical and Financial Assistance Needs: Technical and financial assistance needed to implement storage locations is generally high because of land protection, design, permitting, and construction costs.

49	See Figure 70	25.2	Private	Not Protected	Determine feasibility to construct multi-objective storage area on existing agricultural land.	H	Private Owner	LCSMC; NRCS; SWCD; USACE	20-30K/acre	LCSMC; USACE	1-5 Years
50	See Figure 70	7.6	Private	Not Protected	Determine feasibility to construct multi-objective storage area on existing agricultural land.	M	Private Owner	LCSMC; NRCS; SWCD; USACE	20-30K/acre	LCSMC; USACE	5-10 Years
23	Cuba Marsh (See Figure 70)	7.2	Public	Protected	Determine feasibility to construct multi-objective storage area on existing open space partially within Cuba Marsh Forest Preserve.	M	LCFPD	LCSMC; NRCS; USACE; LCFPD	20-30K/acre	LCSMC; USACE; LCFPD	5-10 Years
15	Cuba Marsh (See Figure 70)	6.7	Public	Protected	Determine feasibility to construct multi-objective storage area on existing open space partially within Cuba Marsh Forest Preserve.	M	LCFPD	LCSMC; NRCS; USACE; LCFPD	20-30K/acre	LCSMC; USACE; LCFPD	5-10 Years
46	See Figure 70	6.3	Private	Not Protected	Determine feasibility to construct multi-objective storage area in agricultural and commercial open space.	M	Private Owner	LCSMC; NRCS; USACE	20-30K/acre	LCSMC; USACE	5-10 Years
48	See Figure 70	5.8	Private	Not Protected	Determine feasibility to construct multi-objective storage area on existing agricultural land.	M	Private Owner	LCSMC; NRCS;	20-30K/acre	LCSMC; USACE	5-10 Years

								SWCD; USACE			
47	See Figure 70	7.1	Public	Not Protected	Determine feasibility to construct multi-objective storage area along ditch between existing ditch and commercial development	L	Private Owner	LCSMC; NRCS; SWCD; USACE; IDNR-OWR	20-30K/acre	LCSMC; USACE	10+ Years
POTENTIAL WETLAND RESTORATION SITES (See Figure 71) Wetland restoration projects are implemented primarily to improve water quality but also have excellent secondary benefits for reducing flooding and improving natural resources.											
Technical and Financial Assistance Needs: Wetland restoration projects are typically complex and require high technical and financial assistance needs to protect land, design, construct, monitor, and maintain the restoration.											
29	See Figure 71	36.6	Private	Not Protected	Determine feasibility for wetland restoration project on existing agricultural portion south of Old McHenry Road.	H	Private Owner	NRCS; LCSMC; SWCD; USACE	20K/acre	EPA 319; IDNR C2000; LCSMC	1-5 Years
30	See Figure 71 Partially in N. Barrington	28.1	Private	Not Protected	Determine feasibility for wetland restoration project on existing agricultural field east of Rt. 12	H	Private Owner	NRCS; LCSMC; SWCD; USACE	20K/acre	EPA 319; IDNR; C2000; LCSMC	1-5 Years
37	See Figure 71	9.3	Public	Not Protected	Determine feasibility for wetland restoration on northern portion containing agricultural land; also located in pollutant loading hotspot SMU	H	Private Owner	NRCS; LCSMC; SWCD; USACE	20K/acre	EPA 319; IDNR C2000; LCSMC	1-5 Years

39	See Figure 71	6.2	Public	Not Protected	Determine feasibility for wetland restoration on northern portion containing agricultural land; also located in pollutant loading hotspot SMU	H	Private Owner	NRCS; LCSMC; SWCD; USACE	20K/acre	EPA 319; IDNR C2000; LCSMC	1-5 Years
40	See Figure 71	3.6	Private	Not Protected	Determine feasibility for wetland restoration on northern portion containing agricultural land; also located in pollutant loading hotspot SMU	H	Private Owner	NRCS; LCSMC; SWCD; USACE	20K/acre	EPA 319; IDNR C2000; LCSMC	1-5 Years
26	See Figure 71	23.0	Private	Not Protected	Determine feasibility for wetland restoration project on existing open and partially open parcels.	M	Private Owners	NRCS; LCSMC; USACE	20K/acre	EPA 319; IDNR C2000; LCSMC	5-10 Years
STREAM CHANNEL MAINTENANCE AND MONITORING (See Figure 72) Most stream maintenance is conducted to keep the stream channel clear of problematic debris that may cause flooding issues. Water quality also benefits when problem hydraulic structures and discharge points are repaired.											
Technical and Financial Assistance Needs: Technical and financial assistance associated with stream maintenance is generally low for minor tasks such as removing debris jams and repairing problematic hydraulic and discharge points.											
FC27	Rt. 12 to Old McHenry Rd.; also partially in Hawthorn Woods and Lake Zurich	10,900 ft.	Partially Public	Not Protected	1) Install structures that increase flow velocity and transport moderate sediment levels; 2) Remove problematic debris loads; 3) Repair problematic discharge points.	H	Partially Public Owner	IDNR-OWR; USACE; LCSMC; NRCS	$1-2K each (Structures); $100-500 (Debris); $1-3K (Discharges)	IDNR C2000; EPA 319; LCSMC	1-5 Years

FC12	Lake Zurich Rd. to Lake Louise (Cuba Marsh); also within Barrington	3,700 ft.	Mostly Public	Mostly Protected	Install structures that increase flow velocity and transport moderate sediment levels.	L	Private Owners	IDNR-OWR; USACE; LCSMC; NRCS; LCFPD	$1-2K each (Structures)	IDNR C2000; EPA 319; LCSMC; LCFPD	10+ Years
FC28	Confluence with Flint Cr. North to Echo Lake Dam; also w/in Hawthorn Woods	4,100 ft.	Private	Not Protected	Install structures that increase flow velocity and transport low sediment levels.	L	Private Owner	IDNR-OWR; USACE; LCSMC; NRCS	$1-2K each (Structures)	IDNR C2000; EPA 319; LCSMC	10+ Years

STREAM RESTORATION (See Figure 73)

Stream restoration projects are implemented primarily to improve water quality but also have excellent secondary benefits for reducing flooding and improving natural resources. They improve water quality by stabilizing eroded banks, reduce flooding by reconnecting channelized streams to the historic floodplain, and improve natural resources by improving aquatic habitat.

Technical and Financial Assistance Needs: Stream restorations are often complex and require high technical and financial assistance needs to protect land, design, construct, monitor, and maintain the restoration. The project becomes more complex when construction occurs on reaches that flow through several governing bodies or multiple private residences.

FC27	Rt. 12 to Old McHenry Rd.; also	10,900 ft.	Partially Public	Not Protected	1) Increase buffer width using native vegetation and remove other non-native species; 2) restore moderately eroded streambanks using multiple BMPs; 3) construct artificial pools	H	Partially Public Owner	IDNR-OWR; IDNR; NRCS;	$100-300/linear foot	EPA 319; LCSMC; Residents	1-5 Years

	partially in Hawthorn Woods and Lake Zurich				and riffles to combat effects of channelization and improve habitat; 4) install boulders and rootwads to improve habitat; 5) also located within pollutant loading hotspot SMU.			LCSMC; USACE			
FC28	Confluence with Flint Cr. North to Echo Lake Dam; partially w/in Hawthorn Woods	4,100 ft.	Private	Not Protected	1) Increase buffer width using native vegetation and remove other non-native species; 2)) construct artificial pools and riffles to combat effects of channelization and improve habitat; 3) install boulders and rootwads to improve habitat; 4) also located within pollutant loading hotspot SMU.	H	Partially Public Owner	IDNR-OWR; IDNR; NRCS; LCSMC; USACE	$100-300/linear foot	EPA 319; LCSMC; Residents	1-5 Years
FC12	Lake Zurich Rd. to Lake Louise; also within Barrington	3,700 ft.	Mostly Public	Mostly Protected	1) Remove non-native species from buffer; 2) construct artificial pools and riffles to combat effects of channelization and improve habitat; 3) install rootwads and boulders to improve habitat.	M	Public and Private Owners	IDNR-OWR; IDNR; NRCS; LCSMC; USACE; LCFPD	$100-300/linear foot	EPA 319; LCSMC; LCFPD	5-10 Years

Hawthorn Woods

BMP ID#	Location	Acres/ Linear ft.	Public or Private	Protected or Not Protected	Action Recommendation	Priority (H, M, or L)	Lead Agency/ Owner	Sources of Technical Assistance	Cost Estimate	Funding Mechanism	Schedule (Short, Medium,

											Long Term)
DETENTION BASIN RETROFITS (See Figure 69) Detention basin retrofit recommendations included in this plan primarily address improving water quality and reducing flooding but also improve natural resources (wildlife habitat) as a secondary function.											
Technical and Financial Assistance Needs: Technical assistance needed to implement detention basin retrofits is generally low to medium while financial assistance is generally moderate. Installing post 1992 construction outlet restrictors on appropriate Lake County basins requires less technical assistance than installing a native plant buffer. Private landowners will require the greatest assistance.											
9	Copperfield Dr.	n/a	Public	Not Protected	1) Remove turf and replant with native vegetation to buffer from street and stabilize moderately eroded banks; 2) determine feasibility to retrofit to post 1992 release rates; 3) also located within pollutant loading hotspot SMU.	H	Private Owner	LCSMC; Lake County	$3K/acre (Planting); $2-4 K/acre (92 release)	EPA 319; IDNR C2000; LC Watershed Board; LC Drainage Fund; HOA	1-5 Years
3, 4	Thornfield	n/a	Private	Not Protected	1) Plant additional native plants along banks; 2) unclog outlets; 3) treat algae; 4) determine feasibility to convert to post 1992 release rates.	M	Private Owner	LCSMC, Hawthorn Woods	$2-4 K (92 release); 3K/acre (Planting)	EPA 319; IDNR C2000; LC Watershed Board; HOA	5-10 Years
10	Chancellor Ct. (Copperfield)	n/a	Private	Not Protected	1) Remove existing rip-rap and turf and replant to native vegetation; 2) determine feasibility to convert to post 1992 release rates.	M	Private Owner	LCSMC, Hawthorn Woods	$2-4 K (92 release); 5K/acre (Planting)	EPA 319; IDNR C2000; LC Watershed Board; HOA	5-10 Years
POTENTIAL WETLAND RESTORATION SITES (See Figure 71)											

Wetland restoration projects are implemented primarily to improve water quality but also have excellent secondary benefits for reducing flooding and improving natural resources.

Technical and Financial Assistance Needs: Wetland restoration projects are typically complex and require high technical and financial assistance needs to protect land, design, construct, monitor, and maintain the restoration.

41	See Figure 69	4.7	Private	Not Protected	Determine feasibility for wetland restoration project on existing agricultural land.	H	Private Owner	NRCS; LCSMC; SWCD; USACE	20K/acre	EPA 319; IDNR; C2000; LCSMC	1-5 Years

STREAM CHANNEL MAINTENANCE AND MONITORING (See Figure 72)

Most stream maintenance is conducted to keep the stream channel clear of problematic debris that may cause flooding issues. Water quality also benefits when problem hydraulic structures and discharge points are repaired.

Technical and Financial Assistance Needs: Technical and financial assistance associated with stream maintenance is generally low for minor tasks such as removing debris jams and repairing problematic hydraulic and discharge points.

FC27	Rt. 12 to Old McHenry Rd.; also partially in Ela Twp. and Lake Zurich	10,900 ft.	Partially Public	Not Protected	1) Install structures that increase flow velocity and transport moderate sediment levels; 2) Remove problematic debris loads; 3) Repair problematic discharge points.	H	Partially Public Owner	IDNR-OWR; USACE; LCSMC; NRCS	$1-2K each (Structures); $100-500 (Debris); $1-3K (Discharges)	IDNR C2000; EPA 319; LCSMC	1-5 Years

FC28	Confluence with Flint Creek North to Echo Lake Dam; also partially within Ela Twp.	4,100 ft.	Private	Not Protected	Install structures that increase flow velocity and transport sediment.	L	Private Owner	IDNR-OWR; USACE; LCSMC; NRCS	$1-2K each (Structures)	IDNR C2000; EPA 319; LCSMC	10+ Years

STREAM RESTORATION (See Figure 73)

Stream restoration projects are implemented primarily to improve water quality but also have excellent secondary benefits for reducing flooding and improving natural resources. They improve water quality by stabilizing eroded banks, reduce flooding by reconnecting channelized streams to the historic floodplain, and improve natural resources by improving aquatic habitat.

Technical and Financial Assistance Needs: Stream restorations are often complex and require high technical and financial assistance needs to protect land, design, construct, monitor, and maintain the restoration. The project becomes more complex when construction occurs on reaches that flow through several governing bodies or multiple private residences.

FC27	Rt. 12 to Old McHenry Rd.; also partially in Ela Twp. and Lake Zurich	10,900 ft.	Partially Public	Not Protected	1) Increase buffer width using native vegetation and remove other non-native species; 2) restore moderately eroded streambanks using multiple BMPs; 3) construct artificial pools and riffles to combat effects of channelization and improve habitat; 4) install boulders and rootwads to improve habitat; 5) also located within pollutant loading hotspot SMU.	H	Partially Public Owner	IDNR-OWR; IDNR; NRCS; LCSMC; USACE	$100-300/linear foot	EPA 319; LCSMC; Residents	1-5 Years
FC28	Confluence with Flint Creek	4,100 ft.	Private	Not Protected	Where feasible, 1) Increase buffer width using native vegetation and remove other non-native species; 2)) construct artificial pools and riffles to combat	H	Private Owners	IDNR-OWR; IDNR; NRCS;	$100-300/linear foot	EPA 319; LCSMC; Residents	1-5 Years

	North to Echo Lake Dam; also partially within Ela Twp.				effects of channelization and improve habitat; 3) install boulders and rootwads to improve habitat; 4) also located within pollutant loading hotspot SMU.			LCSMC; USACE			

Inverness

BMP ID#	Location	Acres / Linear ft.	Public or Private	Protected or Not Protected	Action Recommendation	Priority (H, M, or L)	Lead Agency/ Owner	Sources of Technical Assistance	Cost Estimate	Funding Mechanism	Schedule (Short, Medium, Long Term)
DETENTION BASIN RETROFITS (See Figure 69)											
Detention basin retrofit recommendations included in this plan primarily address improving water quality and reducing flooding but also improve natural resources (wildlife habitat) as a secondary function.											
Technical and Financial Assistance Needs: Technical assistance needed to implement detention basin retrofits is generally low to medium while financial assistance is generally moderate. Installing post 1992 construction outlet restrictors on appropriate Lake County basins requires less technical assistance than installing a native plant buffer. Private landowners will require the greatest assistance.											
179	MaCalpin Dr. (Braymore Hills)	n/a	Private	Not Protected	Stabilize highly eroded shoreline with native vegetation.	H	Private Owner	MWRD; NRCS; CFC	$3K/acre	EPA 319; IDNR C2000; HOA	1-5 Years

180, 181	Barrington Rd./Braymore Dr.	n/a	Private	Not Protected	Remove existing turf from side slopes of large basins and replant with native vegetation.	M	Private Owner	MWRD; NRCS; CFC	$3K/acre	EPA 319; IDNR C2000; HOA	5-10 Years

Lake Barrington

BMP ID#	Location	Acres / Linear ft.	Public or Private	Protected or Not Protected	Action Recommendation	Priority (H, M, or L)	Lead Agency/ Owner	Sources of Technical Assistance	Cost Estimate	Funding Mechanism	Schedule (Short, Medium, Long Term)
DETENTION BASIN RETROFITS (See Figure 69)											
Detention basin retrofit recommendations included in this plan primarily address improving water quality and reducing flooding but also improve natural resources (wildlife habitat) as a secondary function.											
Technical and Financial Assistance Needs: Technical assistance needed to implement detention basin retrofits is generally low to medium while financial assistance is generally moderate. Installing post 1992 construction outlet restrictors on appropriate Lake County basins requires less technical assistance than installing a native plant buffer. Private landowners will require the greatest assistance.											
12	Miller Rd.	n/a	Private	Not Protected	Determine feasibility to convert to post 1992 release rates.	M	Private Owner	LCSMC	$2-4K	LC Watershed Board	5-10 Years
13	Wedgewood Ln.	n/a	Private	Not Protected	1) Replace turf grass banks with native vegetation; 2) stabilize erosion at inlet A; 3) determine feasibility to convert to post 1992 release rates.	M	Private Owner	LCSMC; Lake Barrington	$3K/acre (Planting); $1K (Stabilization); $2-4K (92	EPA 319; IDNR C2000; HOA; LC Watershed Board	5-10 Years

									release rates)		
151, 157	Fieldstone Ct.; Pepper Rd	n/a	Private	Not Protected	Determine feasibility to convert existing dry bottom detention basin to wet bottom planted with native vegetation.	M	Private Owner	LCSMC; Lake Barrington	Varies	EPA 319; IDNR C2000; HOA	5-10 Years

LAKE SHORELINE RESTORATION (See Figure 74)

Lake shoreline restoration projects are implemented to primarily buffer the waterbody and have equal benefits for improving water quality and improving natural resources by introducing native plants that are beneficial to wildlife.

Technical and Financial Assistance Needs: Lake shoreline restoration is not as complex as restoring stream reaches but still requires a moderate amount of technical and financial assistance to complete the project. The cost for implementing this type of project depends on the amount of invasive species to be removed and extent of grading work involved in stabilizing the shoreline.

Flint Lake	See Figure 74	11 acres	Private	Not Protected	Stabilize 1,128 linear feet of moderately eroded shoreline (primarily along western shoreline) using bioengineering techniques such as minor regrading and installation of native plants; also increase buffer width. No severe erosion was noted. Also, determine feasibility to remove dam to restore original stream channel and riparian wetlands.	H	Lake Association; Private Owners	USACE: IDNR-OWR; LCSMC; NRCS; SWCD	$100-300/ linear foot	LCSMC; EPA (C-2000 & 319); Lake Association	1-5 Years

REGIONALLY SIGNIFICANT STORAGE LOCATIONS (See Figure 70)

Implementation of potential Regionally Significant Storage Locations primarily prevents and reduces flooding downstream but also improves water quality and natural resources if planted with native vegetation.

Technical and Financial Assistance Needs: Technical and financial assistance needed to implement storage locations is generally high because of land protection, design, permitting, and construction costs.

33	In Lake Barrington See Figure 70	6.0	Private	Partially Protected	Determine feasibility to construct multi-objective storage area on existing open space, detention basin and new construction area north of industrial area.	M	Private Owners	LCSMC; NRCS; USACE	20-30K/acre	LCSMC; USACE	5-10 Years
43	See Figure 70	7.3	Partially Public	Partially Protected	Determine feasibility to construct multi-objective storage area on existing open space.	M	Private and Public Owners	LCSMC; NRCS	20-30K/acre	LCSMC; USACE	5-10 Years
41	See Figure 70	5.2	Private	Not Protected	Determine feasibility to construct multi-objective storage area on existing open space.	M	Private Owner	LCSMC; NRCS	20-30K/acre	LCSMC; USACE	5-10 Years
39	See Figure 70; also in Cuba Twp and North Barrington	80.1	Private	Not Protected	Determine feasibility to construct multi-objective storage area on wetland.	H	Private Owners	LCSMC; NRCS; USACE	20-30K/acre	LCSMC; USACE	1-5 Years
37	See Figure 70	8.6	Private	Not Protected	Determine feasibility to construct multi-objective storage area on existing golf course.	L	Private Owner	LCSMC; NRCS; USACE	20-30K/acre	LCSMC; USACE	10+ Years
44	See Figure 70	7.6	Partially Public	Partially Protected	Determine feasibility to construct multi-objective storage area online with Flint Creek (main stem)/ floodplain.	L	Private and Public Owners	LCSMC; NRCS; IDNR-OWR	20-30K/acre	LCSMC; USACE	10+ Years
38	See Figure 70	5.0	Private	Not Protected	Determine feasibility to construct multi-objective storage area on existing golf course.	L	Private Owner	LCSMC; NRCS	20-30K/acre	LCSMC; USACE	10+ Years
POTENTIAL WETLAND RESTORATION SITES (See Figure 71)											

Wetland restoration projects are implemented primarily to improve water quality but also have excellent secondary benefits for reducing flooding and improving natural resources.

Technical and Financial Assistance Needs: Wetland restoration projects are typically complex and require high technical and financial assistance needs to protect land, design, construct, monitor, and maintain the restoration.

7	See Figure 71	14.5	Private	Partially Protected	Determine feasibility for wetland restoration project on open area partially surrounded by residential development; site also noted in 1994 Flint Creek Watershed Management Plan; also located within high land use vulnerability SMU.	M	Private Owners	NRCS; LCSMC; USACE	20K/acre	EPA 319; IDNR C2000; LCSMC	5-10 Years
8, 9, 15	See Figure 71	2.8; 29.0; 6.1	Private	Not Protected	Determine feasibility for wetland restoration project on existing golf course; also located in high land use vulnerability SMU.	L	Private Owner	NRCS; LCSMC; USACE	20K/acre	EPA 319; IDNR C2000; LCSMC	10+ Years

STREAM CHANNEL MAINTENANCE AND MONITORING (See Figure 72)

Most stream maintenance is conducted to keep the stream channel clear of problematic debris that may cause flooding issues. Water quality also benefits when problem hydraulic structures and discharge points are repaired.

Technical and Financial Assistance Needs: Technical and financial assistance associated with stream maintenance is generally low for minor tasks such as removing debris jams and repairing problematic hydraulic and discharge points.

FC04	Flint Lake inlet to Rt. 22	2,200 ft.	Private	Not Protected	1) Install structures that increase flow velocity and transport moderate sediment levels; 2) Remove debris jams in channel; 3) Repair problematic discharge points.	H	Private Owners	IDNR-OWR; USACE; LCSMC; NRCS	$1-2K each (Structures); $100-500 (Debris jams); $1-3K (Discharges)	IDNR C2000; EPA 319; LCSMC	1-5 Years

FC23	Flint Lake inlet to Grassy Lake outlet; also within North Barrington	6,000 ft.	Partially Public (Grassy Lake Forest Preserve)	Partially Protected	1) Install structures that increase flow velocity and transport moderate sediment levels; 2) Remove debris jams in channel; 3) Repair problematic discharge points.	H	Private and Public Owners	IDNR-OWR; USACE; LCSMC; NRCS; LCFPD	$1-2K each (Structures); $100-500 (Debris jams); $1-3K (Discharges)	IDNR C2000; EPA 319; LCSMC; LCFPD	1-5 Years
FC05	Rt. 22 to Rt. 14 (Flint Creek Savanna); partially in Cuba Township	9,600 ft.	Private	Partially Protected	1) Install structures that increase flow velocity and transport high sediment levels; 2) Repair problematic hydraulic structures.	M	Private and Public Owners	IDNR-OWR; USACE; LCSMC; NRCS	$1-2K each (Structures); $1-3K (Discharges)	IDNR C2000; EPA 319; LCSMC; CFC	1-5 Years
BMP ID#	**Location**	**Acres / Linear ft.**	**Public or Private**	**Protected or Not Protected**	**Action Recommendation**	**Priority (H, M, or L)**	**Lead Agency/ Owner**	**Sources of Technical Assistance**	**Cost Estimate**	**Funding Mechanism**	**Schedule (Short, Medium, Long Term)**
FC01	Fox River to Kelsey Rd (Grassy Lake Forest Preserve); also Cuba Township	4,600 ft.	Partially Public (Grassy Lake Forest Preserve)	Mostly Protected	Install structures that increase flow velocity and transport low sediment levels.	L	Private and LCFPD	IDNR-OWR; USACE; LCSMC; NRCS; LCFPD	$1-2K each	IDNR C2000; EPA 319; LCSMC; LCFPD	10+ Years

FC02	Kelsey Rd. to Flint Lake Dam	4,400 ft.	Partially Public (Grassy Lake Forest Preserve)	Mostly Protected	Install structures that increase flow velocity and transport moderate sediment levels.	M	LCFPD	IDNR-OWR; USACE; LCSMC; NRCS; LCFPD	$1-2K each	IDNR C2000; EPA 319; LCSMC; LCFPD	5-10 Years

STREAM RESTORATION (See Figure 73)

Stream restoration projects are implemented primarily to improve water quality but also have excellent secondary benefits for reducing flooding and improving natural resources. They improve water quality by stabilizing eroded banks, reduce flooding by reconnecting channelized streams to the historic floodplain, and improve natural resources by improving aquatic habitat.

Technical and Financial Assistance Needs: Stream restorations are often complex and require high technical and financial assistance needs to protect land, design, construct, monitor, and maintain the restoration. The project becomes more complex when construction occurs on reaches that flow through several governing bodies or multiple private residences.

FC04	Flint Lake inlet to Rt. 22	2,200 ft.	Private	Not Protected	1) Extend buffers on both banks along golf course and plant with native vegetation; 2) restore moderately eroded streambanks using multiple BMPs.	H	Private Owners	IDNR-OWR; IDNR; NRCS; LCSMC; USACE	$100-300 linear foot	EPA 319; LCSMC; Residents	1-5 Years
FC23	Flint Lake inlet to Grassy Lake outlet; also within North Barrington	6,000 ft.	Partially Public (Grassy Lake Forest Preserve)	Partially Protected	1) Remove non-native species from buffer; 2) restore moderately eroded streambanks using multiple BMPs; 3) construct artificial pools and riffles to combat effects of channelization and improve habitat.	H	Public and Private Owners	IDNR-OWR; USACE; LCSMC; NRCS; LCFPD	$100-300 linear foot	EPA 319; LCSMC; LCFPD	1-5 Years

FC01	Fox River to Kelsey Rd.; also Cuba Township	4,600 ft.	Partially Public (Grassy Lake Forest Preserve)	Mostly Protected	Extend buffer on right bank and remove non-natives from all buffers	M	Private and LCFPD	IDNR-OWR; IDNR; NRCS; LCSMC; USACE; LCFPD	$1,000-3,000/ acre	EPA 319; LCSMC; LCFPD	5-10+ Years
FC02	Kelsey Rd. to Flint Lake Dam	4,400 ft.	Partially Public (Grassy Lake Forest Preserve)	Mostly Protected	Extend buffer on right bank and remove non-natives from all buffers	M	Private and LCFPD	IDNR-OWR; IDNR; NRCS; LCSMC; USACE; LCFPD	$1,000-3,000/ acre	EPA 319; LCSMC; LCFPD	5-10+ Years
FC05	Rt. 22 to Rt. 14; partially in Cuba Township	9,600 ft.	Private	Partially Protected	Remove non-native species from existing wide buffer and supplement with native species.	L	Private Owners	IDNR-OWR; IDNR; NRCS; LCSMC; USACE	$1,000-3,000/ acre	EPA 319; LCSMC	10+ Years

Lake Zurich

BMP ID#	Location	Acres/ Linear ft.	Public or Private	Protected or Not Protected	Action Recommendation	Rank (H, M, or L)	Lead Agency/ Owner	Sources of Technical Assistance	Cost Estimate	Funding Mechanism	Schedule (Short, Medium, Long Term)
DETENTION BASIN RETROFITS (See Figure 69)											

Detention basin retrofit recommendations included in this plan primarily address improving water quality and reducing flooding but also improve natural resources (wildlife habitat) as a secondary function.

Technical and Financial Assistance Needs: Technical assistance needed to implement detention basin retrofits is generally low to medium while financial assistance is generally moderate. Installing post 1992 construction outlet restrictors on appropriate Lake County basins requires less technical assistance than installing a native plant buffer. Private landowners will require the greatest assistance.

69	Deerpath Plaza	n/a	Private	Not Protected	1) Extend native plant buffer; 2) conduct maintenance on overgrown invasive shrubs and other species; 3) determine feasibility to convert to wet bottom detention basin; 4) also located within pollutant loading hotspot SMU.	H	Private Owner	Lake Zurich	$3K/acre	EPA 319; IDNR C2000	1-5 Years
70	Deerpath Plaza	n/a	Private	Not Protected	1) Create native plant buffer upslope from retaining wall; 2) plant emergent native plants. Also located within pollutant loading hotspot SMU.	H	Private Owner	Lake Zurich	$3K/acre	EPA 319; IDNR C2000	1-5 Years
63	Mohawk Trl. (Ela Area Public Library)	n/a	Public	Not Protected	Remove turf buffer and replant with native vegetation.	M	Public Library	Lake Zurich	$3K/acre	EPA 319; IDNR C2000	5-10 Years
97, 102, 103	Rand/Ela Rds	n/a	Private	Not Protected	1) Remove turf grass buffers and replace with native vegetation; 2) control invasive and non-native species; 3) also located within pollutant loading hotspot SMU.	M	Private Owners	Lake Zurich	$3K/acre (Planting & maintenance)	EPA 319; IDNR C2000	5-10 Years
98, 99	Rosehall Dr. (Mews Townhouses)	n/a	Private	Not Protected	Maintain newly constructed basin primarily by controlling invasive and non-native species. Also located within pollutant loading hotspot SMU.	M	Private Owners	Lake Zurich	$1-3K/acre	EPA 319; IDNR C2000	5-10 Years

FLOOD MITIGATION AT FLOOD PROBLEM AREA SITES
(See Figure 70)

The primary objective of implementing flood mitigation projects is to reduce existing flood damage. Secondary benefits include water quality and natural resource improvement depending on the nature of the project.

Technical and Financial Assistance Needs: Technical and financial assistance needed to implement storage locations and wetland restorations is generally high because of land protection, design, permitting, and construction costs. Smaller mitigation projects such as detention retrofits and drainage improvements require less technical and financial assistance.

FPA 9-10	See Figure 70	n/a	Private	Not Protected	Conduct feasibility study to determine if any flood mitigation measures are feasible for depressional flooding. In current flood plain.	H	Lake Zurich; Private Owners	LCSMC; Lake Zurich; LCSMC	Varies	LC Watershed Board; LCSMC	1-5 Years
FPA 9-14	See Figure 70	n/a	Private	Not Protected	Village of Lake Zurich conducst on-going grate maintenance to alleviate local drainage problem.	H	Lake Zurich	LCSMC; Lake Zurich	Varies	LC Watershed Board; LCSMC	1-5 Years

STREAM CHANNEL MAINTENANCE AND MONITORING
(See Figure 72)

Most stream maintenance is conducted to keep the stream channel clear of problematic debris that may cause flooding issues. Water quality also benefits when problem hydraulic structures and discharge points are repaired.

Technical and Financial Assistance Needs: Technical and financial assistance associated with stream maintenance is generally low for minor tasks such as removing debris jams and repairing problematic hydraulic and discharge points.

FC26	Rugby Ln. to Rt. 12; also partially in North Barrington	4,400 ft.	Private	Not Protected	1) Install structures that increase flow velocity and transport moderate sediment levels; 2) Repair problematic hydraulic structures; 3) Repair problematic discharge points.	M	Private Owners	IDNR-OWR; USACE; LCSMC; NRCS	$1-2K each (Structures); $1-3K (Hydraulics & Discharges)	IDNR C2000; EPA 319; LCSMC	1-5 Years

STREAM RESTORATION (See Figure 73)

Stream restoration projects are implemented primarily to improve water quality but also have excellent secondary benefits for reducing flooding and improving natural resources. They improve water quality by stabilizing eroded banks, reduce flooding by reconnecting channelized streams to the historic floodplain, and improve natural resources by improving aquatic habitat.

Technical and Financial Assistance Needs: Stream restorations are often complex and require high technical and financial assistance needs to protect land, design, construct, monitor, and maintain the restoration. The project becomes more complex when construction occurs on reaches that flow through several governing bodies or multiple private residences.

FC27	Rt. 12 to Old McHenry Rd.; also partially in Hawthorn Woods and Ela Twp.	10,900 ft.	Partially Public	Not Protected	1) Increase buffer width using native vegetation and remove other non-native species; 2) restore moderately eroded streambanks using multiple BMPs; 3) construct artificial pools and riffles to combat effects of channelization and improve habitat; 4) install boulders and rootwads to improve habitat; 5) also located within pollutant loading hotspot SMU.	H	Partially Public Owner	IDNR-OWR; IDNR; NRCS; LCSMC; USACE	$100-300/linear foot	EPA 319; LCSMC; Residents	1-5 Years
FC26	Rugby Ln. to Rt. 12; also partially in North Barrington	4,400 ft.	Private	Not Protected	1) Increase native plant buffer width along residential areas and remove other non-native species; 2) construct artificial pools and riffles to combat effects of channelization and improve habitat; 3) install rootwads, boulders, and logs to improve habitat.	M	Private Owners	IDNR-OWR; USACE; LCSMC; NRCS; LCFPD	$100-300 linear foot	EPA 319; LCSMC; Residents	5-10 Years

North Barrington

BMP ID#	Location	Acres/ Linear ft.	Public or Private	Protected or Not Protected	Action Recommendation	Rank (H, M, or L)	Lead Agency/ Owner	Sources of Technical Assistance	Cost Estimate	Funding Mechanism	Schedule (Short, Medium, Long Term)
DETENTION BASIN RETROFITS (See Figure 69)											
Detention basin retrofit recommendations included in this plan primarily address improving water quality and reducing flooding but also improve natural resources (wildlife habitat) as a secondary function.											
Technical and Financial Assistance Needs: Technical assistance needed to implement detention basin retrofits is generally low to medium while financial assistance is generally moderate. Installing post 1992 construction outlet restrictors on appropriate Lake County basins requires less technical assistance than installing a native plant buffer. Private landowners will require the greatest assistance.											
11	Grand view Dr.	n/a	Public	Not Protected	Replace turf slopes with native vegetation to stabilize highly eroded slopes. Construct outlet to replace make-shift pipe and sandbags.	H	Private Owners	LCSMC; North Barrington	$3K/acre (Planting); $2K (Outlet)	EPA 319; IDNR C2000; LC Watershed Board; HOA	1-5 Years
87	Rand/ Timber (State Bank)	n/a	Private	Not Protected	Determine feasibility to convert dry bottom basin to wet bottom.	M	Private Owners	North Barrington	Varies	EPA 319; IDNR C2000	5-10 Years
FLOOD MITIGATION AT FLOOD PROBLEM AREA SITES (See Figure 70)											
The primary objective of implementing flood mitigation projects is to reduce existing flood damage. Secondary benefits include water quality and natural resource improvement depending on the nature of the project.											
Technical and Financial Assistance Needs: Technical and financial assistance needed to implement storage locations and wetland restorations is generally high because of land protection, design, permitting, and construction costs. Smaller mitigation projects such as detention retrofits and drainage improvements require less technical and financial assistance.											

36	Rt. 59	n/a	Public	Not Protected	Determine feasibility to construct multi-objective storage area on existing wetland surrounded by residential development	H	Private Owners	LCSMC; North Barrington	$30-40K/acre	EPA 319; IDNR C2000; LC Watershed Board; HOA	1-5 Years

LAKE SHORELINE RESTORATION (See Figure 74)

Lake shoreline restoration projects are implemented to primarily buffer the waterbody and have equal benefits for improving water quality and improving natural resources by introducing native plants that are beneficial to wildlife.

Technical and Financial Assistance Needs: Lake shoreline restoration is not as complex as restoring stream reaches but still requires a moderate amount of technical and financial assistance to complete the project. The cost for implementing this type of project depends on the amount of invasive species to be removed and extent of grading work involved in stabilizing the shoreline.

Honey	See Figure 67	66 acres	Private	Not Protected	No severe or moderate erosion is present. The entire lake shoreline (10,880 linear feet) exhibits slightly or no erosion. No immediate actions are recommended at this time. Future recommendations include minor stabilization efforts and introduction of native plant buffers.	L	Biltmore Country Club and 11 Private Owners	USACE: IDNR-OWR; LCSMC; NRCS; SWCD	$100-300/ linear foot	LCSMC; EPA (C-2000 & 319); Lake Association; Country Club	10+ Years
Grassy Lake	See Figure 67	40 acres	Public	Protected	No severe or moderate erosion is present. The entire lake shoreline (8,643 linear feet) exhibits slight or no erosion. No immediate actions are recommended at this time. Future recommendations include thinning of dense cattail stands that surround the lake and introduction of native emergent vegetation. WORK ONGOINT	L	Lake County Forest Preserve District	USACE: IDNR-OWR; LCSMC; NRCS; SWCD	$100-300/ linear foot	LCSMC; EPA (C-2000 & 319); LCFPD	10+ Years

REGIONALLY SIGNIFICANT STORAGE LOCATIONS (See Figure 70)

Implementation of potential Regionally Significant Storage Locations primarily prevents and reduces flooding downstream but also improves water quality and natural resources if planted with native vegetation.											
Technical and Financial Assistance Needs: Technical and financial assistance needed to implement storage locations is generally high because of land protection, design, permitting, and construction costs.											
36	See Figure 70	18.5	Private	Not Protected	Determine feasibility to construct multi-objective storage area on existing wetland surrounded by residential development	L	Private Owners	LCSMC; NRCS	20-30K/acre	LCSMC; USACE	10+ Years
POTENTIAL WETLAND RESTORATION SITES (See Figure 71) Wetland restoration projects are implemented primarily to improve water quality but also have excellent secondary benefits for reducing flooding and improving natural resources.											
Technical and Financial Assistance Needs: Wetland restoration projects are typically complex and require high technical and financial assistance needs to protect land, design, construct, monitor, and maintain the restoration.											
20	See Figure 71	11.9	Private	Not Protected	Determine feasibility for wetland restoration project on existing open space.	H	Private Owner	NRCS; LCSMC; USACE	20K/acre	EPA 319; IDNR C2000; LCSMC	1-5 Years
27	See Figure 71	3.3	Private	Not Protected	Determine feasibility for wetland restoration project on existing golf open space and agricultural land; also located in high land use vulnerability SMU.	H	Private Owners	NRCS; LCSMC; SWCD; USACE	20K/acre	EPA 319; IDNR C2000; LCSMC	1-5 Years
32	See Figure 71	2.7	Private	Not Protected	Determine feasibility for wetland restoration project on existing private opens space adjacent to commercial area.	M	Private Owner	NRCS; LCSMC; USACE	20K/acre	EPA 319; IDNR C2000; LCSMC	5-10 Years
18, 19, 21, 22, 24, 25,	See Figure 71 30 Partiall	7.2, 63.4, 3.9, 7.6, 5.7, 4.2,	Private	Not Protected	Determine feasibility for wetland restoration project on existing golf course.	L	Private Owner	NRCS; LCSMC; USACE	20K/acre	EPA 319; IDNR C2000; LCSMC	10+ Years

28, 30, 33, 35	y in Ela Twp	6.6, 28.1, 3.0, 5.0									
23	See Figure 70	3.4	Private	Not Protected	Determine feasibility for wetland restoration project on existing partially open residential lots.	L	Private Owner	NRCS; LCSMC; USACE	20K/acre	EPA 319; IDNR C2000; LCSMC	10+ Years
STREAM CHANNEL MAINTENANCE AND MONITORING (See Figure 72) Most stream maintenance is conducted to keep the stream channel clear of problematic debris that may cause flooding issues. Water quality also benefits when problem hydraulic structures and discharge points are repaired.											
Technical and Financial Assistance Needs: Technical and financial assistance associated with stream maintenance is generally low for minor tasks such as removing debris jams and repairing problematic hydraulic and discharge points.											
FC23	Flint Lake inlet to Grassy Lake outlet; also within Lake Barrington	6,000 ft.	Partially Public (Grassy Lake Forest Preserve)	Partially Public	1) Install structures that increase flow velocity and transport moderate sediment levels; 2) Remove debris jams in channel; 3) Repair problematic discharge points.	H	Public and Private Owners	IDNR-OWR; USACE; LCSMC; NRCS; LCFPD	$1-2K each (Structures); $100-500 (Debris jams); $1-3K (Discharges)	IDNR C2000; EPA 319; LCSMC; LCFPD	1-5 Years
FC25	Grassy Lake inlet to Rugby Ln.	10,600 ft.	Private	Partially Public	1) Install structures that increase flow velocity and transport moderate sediment levels; 2) Remove debris jams in channel; 3) Repair problematic discharge points.	H	Private Owners	IDNR-OWR; USACE; LCSMC; NRCS	$1-2K each (Structures); $100-500 (Debris jams); $1-3K	IDNR C2000; EPA 319; LCSMC	1-5 Years

									(Discharges)		
FC32	Grassy Lake inlet to Golfview Dr.	2,200 ft.	Private	Partially Protected	1) Install structures that increase flow velocity and transport moderate sediment levels; 2) Remove debris jams in channel;	H	Private Owners	IDNR-OWR; USACE; LCSMC; NRCS	$1-2K each (Structures); $100-500 (Debris jams)	IDNR C2000; EPA 319; LCSMC	1-5 Years
FC36	Honey Lake inlet to headwaters	2,700 ft.	Private	Not Protected	Install structures that increase flow velocity and transport moderate sediment levels; Regularly Removing debris jams in channel. NOW WORKING	H	Private Owners	IDNR-OWR; USACE; LCSMC; NRCS	$1-2K each (Structures); $100-500 (Debris jams)	IDNR C2000; EPA 319; LCSMC	1-5 Years
FC26	Rugby Ln. to Rt. 12; partially in Lake Zurich	4,400 ft.	Private	Not Protected	1) Install structures that increase flow velocity and transport moderate sediment levels; 2) Repair problematic hydraulic structures; 3) Repair problematic discharge points.	M	Private Owners	IDNR-OWR; USACE; LCSMC; NRCS	$1-2K each (Structures); $1-3K (Hydraulics & Discharges)	IDNR C2000; EPA 319; LCSMC	1-5 Years
FC35	Honey Lake inlet to Rt. 22	4,100 ft.	Private	Not Protected	1) Install structures that increase flow velocity and transport moderate sediment levels; 2) Repair problematic hydraulic structures; 3) Repair problematic discharge points.	M	Private Owners	IDNR-OWR; USACE; LCSMC; NRCS	$1-2K each (Structures); $1-3K (Hydraulics & Discharges)	IDNR C2000; EPA 319; LCSMC	1-5 Years
FC33	Golfview Dr. to Honey	2,200 ft.	Private	Not Protected	Install structures that increase flow velocity and transport low sediment levels.	L	Private Owners	IDNR-OWR; USACE;	$1-2K each	IDNR C2000; EPA 319; LCSMC	10+ Years

	Lake Dam							LCSMC; NRCS	(Structures)		

STREAM RESTORATION (See Figure 73)

Stream restoration projects are implemented primarily to improve water quality but also have excellent secondary benefits for reducing flooding and improving natural resources. They improve water quality by stabilizing eroded banks, reduce flooding by reconnecting channelized streams to the historic floodplain, and improve natural resources by improving aquatic habitat.

Technical and Financial Assistance Needs: Stream restorations are often complex and require high technical and financial assistance needs to protect land, design, construct, monitor, and maintain the restoration. The project becomes more complex when construction occurs on reaches that flow through several governing bodies or multiple private residences.

FC23	Flint Lake inlet to Grassy Lake outlet; also within Lake Barrington	6,000 ft.	Partially Public (Grassy Lake Forest Preserve)	Partially Public	1) Remove non-native species from buffer; 2) restore moderately eroded streambanks using multiple BMPs; 3) construct artificial pools and riffles to combat effects of channelization and improve habitat.	H	Public and Private Owners	IDNR-OWR; USACE; LCSMC; NRCS; LCFPD	$100-300 linear foot	EPA 319; LCSMC; LCFPD	1-5 Years
FC25	Grassy Lake inlet to Rugby Ln.	10,600 ft.	Private	Partially Public	1) Increase native plant buffer width primarily in turf grass areas; 2) restore moderately eroded streambanks using multiple BMPs; 3) construct artificial pools and riffles to combat effects of channelization and improve habitat.	H	Mostly Private Owners	IDNR-OWR; USACE; LCSMC; NRCS; LCFPD	$100-300 linear foot	EPA 319; LCSMC; Residents	1-5 Years
FC32	Grassy Lake inlet to Golfview Dr.	2,200 ft.	Private	Partially Protected	1) Increase native plant buffer widths and remove additional non-native species; 2) restore moderately eroded streambanks using multiple BMPs; 3) construct artificial pools and riffles to combat effects of channelization and improve habitat.	H	Private Owners	IDNR-OWR; USACE; LCSMC; NRCS; LCFPD	$100-300 linear foot	EPA 319; LCSMC; Residents	1-5 Years

FC33	Golfview Dr. to Honey Lake Dam	2,200 ft.	Private	Not Protected	Extend native plant buffer widths on both banks within golf course; 2) construct artificial pools and riffles to combat effects of channelization and improve habitat; 3) install logs, rootwads and boulders to improve habitat. IN PROCESS	H	Private Owners	IDNR-OWR; USACE; LCSMC; NRCS; LCFPD	$100-300 linear foot	EPA 319; LCSMC; Residents	1-5 Years
FC35	Honey Lake inlet to Rt. 22	4,100 ft.	Private	Not Protected	1) Increase native plant buffer widths and remove additional non-native species; 2) restore moderately eroded streambanks using multiple BMPs; 3) construct artificial pools and riffles to combat effects of channelization and improve habitat; 4) install rootwads and boulders to improve habitat.	H	Private Owners	IDNR-OWR; USACE; LCSMC; NRCS; LCFPD	$100-300 linear foot	EPA 319; LCSMC; Residents	1-5 Years
FC26	Rugby Ln. to Rt. 12; partially in Lake Zurich	4,400 ft.	Private	Not Protected	1) Increase native plant buffer width along residential areas and remove other non-native species; 2) construct artificial pools and riffles to combat effects of channelization and improve habitat; 4) install rootwads, boulders, and logs to improve habitat.	M	Private Owners	IDNR-OWR; USACE; LCSMC; NRCS; LCFPD	$100-300 linear foot	EPA 319; LCSMC; Residents	5-10 Years
FC36	Honey Lake inlet to headwaters	2,700 ft.	Private	Not Protected	1) Increase native plant buffer widths and remove additional non-native species; 2) construct artificial pools and riffles to combat effects of channelization and improve habitat; 3) install rootwads and boulders to improve habitat.	M	Private Owners	IDNR-OWR; USACE; LCSMC; NRCS; LCFPD	$100-300 linear foot	EPA 319; LCSMC; Residents	5-10 Years

Section 6: Information and Education Components

Policy Recommendations

Various recommendations are made throughout this report related to how local governments can improve the condition of Flint Creek watershed through policy. Policy recommendations focus on improving watershed conditions by preserving green infrastructure, protecting groundwater, minimizing road salts, minimizing lawn fertilizer, sustainable management of stormwater, and allowances for native landscaping. To be successful, the Flint Creek Watershed-Based Plan would need to be adopted and/or supported by local communities. The process of creating and implementing policy changes can be complex and time consuming. And, although there are numerous potential policy recommendations for the watershed, the following policy recommendations are considered the most important and highest priority for implementation. **Behavior change: The expected change is municipal and citizen support for greener zoning and ordinances to encourage greater use of pervious surfaces and water filtering natural borders, bioswales, detention areas and stormwater options for developers and residents**.

6.1 Information and Education Goals:

1. Publicize the effectiveness of best management practices of filter strips and buffer zones along creekside and lakeside properties, partnering with BACT and CFC, and others, and making it as straightforward as possible for owners to participate. Working with landscapers to reduce the use of herbicides and phosphorus in their fertilizers would also play a part.
2. Partnering with BACOG and local municipalities, publicize the impacts of road salt usage on water quality and aquatic life and develop recommendations for education, alternatives and use reduction.
3. Partnering with, BACT, CFC, Ancient Oaks and others, identify open space parcels and recruit owners willing to implement BMPs to reduce nutrient and sediment loading, increase buffer areas with natural plantings, eradicate buckthorn, and protect T&E flora and fauna.
4. Partnering with BACOG and government agencies, continue to educate landowners, landlords and developers about the dangers of high PAH sealers on water quality and aquatic life.
5. Partnering with BACOG, Lake County, CFC, the EPA and governmental agencies, encourage the use of green infrastructure best practices, as well as continue to monitor green infrastructure innovations that protect surface and groundwater resources and enhance overall water quality.
6. Partnering with governmental agencies, BACOG, LCHD and LCSMC, continue to educate well and septic owners on best maintenance practices
7. Partnering with government agencies, continue to educate citizens about noteworthy efforts of their local governments to mitigate flooding, and share information on how they can partner
8. Encourage adoption of municipal comprehensive plans, codes and ordinances supportive of watershed goals and objectives, Green Infrastructure Network (GIN) approaches, and work with the County on ways to encourage and streamline governments' participation.
9. Partner with local organizations, such as BACT and CFC and others, on engaging citizens of all ages in becoming citizen scientists, monitoring flora, fauna, lakes or streams.
10. Partner with local organizations to educate citizens on the value of the ecological services afforded by healthy ecosystems.
11. Partner with local organizations to create periodic surveys measuring citizen awareness of healthy watershed issues.
12. Partnering with Partnership members, citizens and experts in the field, continue to improve area capabilities and utility of stream gages, well monitoring and lake and stream testing practices to best

inform officials and citizens on area water resource levels and water quality. Secure funding for additional analyses and capabilities investments.

Target Audiences
The target audiences for goals 1, 2, 3, 4, 6, 7, 8, and 9, 10, 12 are citizens, HOAs, civic groups and church congregations.
The target audiences for goal 2 includes citizens, parking lot owners, developers, HOAs, governmental agencies, and anyone else responsible for winter public safety.
The target audiences for goal 5, 7, and 12 includes local governmental agencies, as well as Lake County governmental agencies.
The target audience for goal 11 is local agencies, Healthier Barrington, a triennial survey, and any similar organization in Lake Zurich and Hawthorn Woods.
All of the goals assume good partnership with local municipalities and other governmental agencies.

Programs, tools, materials, actions, campaigns and delivery mechanisms
Many of the education goals require dissemination of information, and the first element in the strategy is to identify all of the effective local media groups, and to understand the roles they could play. This includes municipal newsletters, and those of other partnering entities, web-based groups, everything from neighborhood and HOA networks to more commercial operations, such as Living60010 and 365Barrington. It includes our own Flint Creek website, as well as those of other organizations, and other social media, such as Instagram, FaceBook and Pinterest. Tools include the possibility of targeted mailings, limited "ads" or targeted messaging, brochures, other informational pieces, presentations, Slideshare and YouTube presence, and so forth. Many of these strategies are light on costs, albeit heavy on time, both for creating appropriate content, and distributing it intelligently. Recruiting volunteers to assist, especially those who are social media savvy, will be important. High school community service resources will be approached for assistance.

Near term and ongoing campaigns will include "Choose Latex or Asphalt Emulsion Sealants" run in partnership with BACOG, which will occur in the Spring and Summer. Work is currently active on a Fall and Winter campaign for reduction of salt usage. There is a significant opportunity to educate citizens on when to expect salt to be used, and when it is just a waste. BACT is beginning a Buckthorn Buster campaign, already begun by Ancient Oaks.

Future campaigns will focus on Native Buffers, Raingardens, Swales and Butterfly Gardens (which help T&E species), and will be directed at Creekside landowners and lake shore landowners and management groups. Ideally, there will be some grant funding available for installation, and clear obligations for maintenance of the native plantings, especially for the first three years.

Meanwhile, the Partnership expects to work with both County agencies, BACOG, and local government agencies to think through and research watershed friendly codes and ordinances, especially green infrastructure, to encourage smart tools, such as protection overlays, setbacks, conservation easements, and so forth, in municipal comprehensive plans and zoning to protect environmentally sensitive areas, and support their adoption via programs to educated citizenry as to their value. There may be opportunities to evolve incentives for developers who propose sustainable or innovative approaches to preserve green infrastructure and use naturalized stormwater treatment approaches. Some of these programs would initially be targeted to civic groups, such as Rotary or Lions, etc., to engage them in the conversation.

Behavior change: The objective is to change community norms to encourage good stewardship of our water resources, via rain gardens, bioswales, conservation easements, meaningful collaboration for watershed projects.

Section 6.2: Priorites/Schedules, Lead and Supporting Organizations, Outcomes and Costs:

Table 48. Priorities/Schedules and **Lead** (in **BOLD**) and Supporting Organizations, Outcomes, **Indicators** and Costs

Goal Number	Priority Rank	Schedule of Key Steps	Partners	Outcomes/ Success **Indicators**	Costs
1	H	Yr. 1-2: Presentations to Partners of approved plan Adoption by 8 government agencies Yr. 3-5: Ongoing Presentation, Adoption by 2 more	**FCSWP,** Municipalities	Partners adopt and/or support (via a resolution) the FCWP Plan **All major village partners adopt**.	n/a
2	H	Yr. 1 Find out who has ordinances & follow-up procedures against phosphorus; compile lists of HOAs and lake mgmt. assoc., and Creekside owners; prepare information. Include education and outreach efforts on eradicating buckthorn. Yr. 2-3: outreach to targets; search for helpful funding; pilots Yr. 4-6: Expand efforts; monitor maintenance Yr. 7-10: ongoing outreach	**FCSCWP,** HOAs, civic clubs, municipalities	Reduced phosphorus and nutrient levels in waterways. Effective buffers can reduce P, N and TSS by 45%, 40% and 73% respectively **Numbers of water side buffers increase**	$100-300 per linear foot of shoreline
3	H	Yr. 1: Compile information on salt and alternatives. Work with BACOG & NWWA. Help publicize Yr. 2-3: Survey attitudes; publicize Yr. 4-6: Repeat, continue research Yr. 7-10: Repeat, continue research	**BACOG, NW Water Planning Alliance (NWPA),** Municipalities FCSCWP	Reduced chloride use and lower conductivity readings over time **Downward trend**	$5-10K for brochures, shared among partners
4	H	Yr. 1: Partnering with BGI (Barrington Greenway Initiative) to identify parcels and owners; work with municipalities for incentives; help recruit volunteers, and highlight buckthorn eradication Yr. 2-3: Develop plans for sites and continue recruiting owners Yr. 4-6: Monitor, maintain and continue recruiting Yr. 7-10: Monitor, maintain and continue recruiting	**CFC, AS, BF,** OF, BACT, AO, FPDs, FOFP, IDNR, municipalities FCSCWP	Over 10 years, 25% growth in greenways **More greenways, conservation easements, and more waterways buffers with no buckthorn**	$100-$300 per linear foot of shoreline affected, assuming sizeable buffers
5	H	Yr. 1: Compile information on high PAH sealers and alternatives. Help compile info on owners of large pavement areas. Work with BACOG on outreach. Help publicize. Yr. 2-3: Work w/ municipalities to ban. Repeat., survey attitudes; publicize	**BACOG,** Municipalities, FCSCWP, CFC, BACT, IDNR, LCSMC	Reduced use of high PAH sealers **Greater awareness of low PAH alternatives. More sealers**	Cost of publications and research; Perhaps a speaker.

		Yr. 4-6: Repeat, Survey, publicize Yr. 7-10: Repeat, Survey, publicize		**not using high PAH sealers**	$5-10K over 10 years
6	H	Yr 1: Compile information on BMP green infrastructure; host open Partnership meeting on sustainable infrastructure with a focus on watersheds. Publicize concepts. Year 2-3: Continue to work with Partnership, and encourage member Partners to include BMP green infrastructure elements in ordinances and codes. Year 4-6: Continue to update BMP green infrastructure information; develop list of additional resources, including funding. Continue to work with municipalities on ordinances and codes Year 7-10: Continue the process	**FCSCWP,** BACOG, Municipalities, CFC, BACT, IDNR, LCSMC, EPA, CMAP	Integration of BMP Green Infrastructure in Municipal Codes and Ordinances including retrofits. **More villages with ordinances aligned with green infrastructure best practices**	n/a
7	M	Yr. 1: Develop information on website, using LCHD, ISGS and LCSMC info Yr. 2-3: Publicize & support programming with BACOG and municipalities Yr. 4-6: Refresh & repeat Yr. 7-10: Refresh & repeat	**FCSCWP,** BACOG, and municipalities	See more participation in well Level 1 testing, Lower E.coli in lakes, depending on geese population. **Growth in Level 1 testing**	n/a
8	M	Yr. 1: Website & media articles about municipal/gov. investments & impacts Yr. 2-3: Continued, plus presentations Yr. 4-6: Continued, plus presentations Yr. 7-10: Continued, plus presentations	**FCSCWP,** Municipalities	Less flooding, more swales, raingardens & public support for governments **More articles**	n/a
9	H	Yr. 1: Assessment of current municipal ordinances Yr. 2-3: Work with gov. agencies at state, and county levels on recommended codes & ordinances Yr. 4-6: Presentations to municipalities and civic orgs Yr. 7-10: Continuation	**BACOG, FCSCWP,** CMAP, FREP, LC, LCSWC	More municipal adoptions of green BMP watershed friendly codes & ordinances **Two munis scoring 60+**	n/a
10	H	Yr. 1: Gathering information on volunteer scientist programs, esp. for lakes and waterways Yr. 2-3: Partner with orgs to recruit, and publicize with area garden clubs, civic orgs, etc. Yr. 4-6: Partner with orgs to recruit, and publicize with area garden clubs, civic orgs, etc. Organize and find funding a recognition celebration Yr. 7-10: Partner with orgs to recruit, and publicize with area garden clubs, civic orgs, etc. Organize and find funding for a recognition celebration	**BACT**, CFC, CMAP, ILMA, FCSCWP	More lake, creek, bird, butterfly, flora volunteer monitors **Growth in VLM volunteers; Garden clubs assisting with buffer designs, projects**.	$5 - $10K over 10 years

11	H	Yr. 1: Gather information and write articles for area media; find some funding to encourage native plantings Yr. 2-3: Continue gathering; post on website, area media and present programming. Recognize key greenspace achievements (BGI) Yr. 4-6: Continue gathering; post on website, area media and programming Yr. 7-10: Continue gathering; post on website, area media and present programming. Survey for impact	**BACT, CFC**, FPDs, FOFP, FCSCWP	Growth in amount of protected greenspace and protected areas around sensitive areas; more conservation easements. **More (15+) conservation easements.**	Variable, depending on incentives for seeding and maintenance funding needed
12	H	Yr. 1: Research key questions; find community partner surveys. Yr. 2-3: Survey, assess, adjust other strategies as appropriate Yr. 4-6: Survey, assess, adjust other strategies as appropriate Yr. 7-10: Survey, assess, adjust other strategies as appropriate	**FCSCWP,** BADC,	Growth in civic understanding of the importance of protecting water and ecological services and increased willingness to play a part. **Growth in number who identify drinking water source**	Variable, depending on whether can piggyback on existing surveys or need to create own.
13	H	By yr. 5: Coordinate MS4 testing and citizen scientist work and sync testing points to drive action and priorities in the Watershed Improve the current watershed testing regimen with information from calibrated/ coordinated stream gages and expanded well level/water quality monitoring. By yr. 10: Secure funding for more analyses, possible equipment upgrades for better intelligence on water flows, groundwater levels and overall water quality.	**FCSCWP,** BACOG, BACT, government agencies, LCHD, EPA	Growth in civic understanding; improved coordination among agencies, improved comparability of stream reach data; assessments **Funding for water flow research and more water testing**	$60 K - $75K depending on services, costs of eqpt. improvements

6.3 Monitoring Success

It is important to establish interim management milestones to determine whether nonpoint pollution management and programmatic measures are being implemented. Milestones and their relationship to watershed goals and objectives established by stakeholders early on are represented in Table 49

FCWP stakeholders will assess progress annually, and reflect on efforts such that it will become clear as to whether changes to an approach, or even the plan itself, are needed. Progress from each partner will be documented. **We expect to see a greater awareness and more discussion of a common responsibility to care for our watersheds and other natural areas, more homeowners investing in their Creekside and lakeshore buffers, and more support for code and ordinance changes supporting green infrastructure, including conservation easements.**

Plan recommendations require local commitments, resources and collaboration for success. Funding is also critical, and both LCSMC grants, IDNR grants and the EPA's Clean Water Act Section 319 program are especially critical, as are identifying, developing and applying for other funding resources.

Table 49: Interim milestones for assessing progress in meeting the goals of the Watershed Plan

Goal	Indicator	Two-year milestone	Five-year milestone	Ten-year milestone
Improve water quality	Lin. ft. streambank stabilization	–	10,000	22,000 total
	Lin. ft. shoreline stabilized	–	2,000	4,000 total
	Lin. ft. shoreline/ creekside buffers	–	2,000	4,000 total
Protect surface & groundwater resources	Convert dry detention basin to wet w/native vegetation	1	1	3 total
	Develop chloride mitigation strategies	Investigate cul-de-sac low/no salt options	Recruit volunteer cul-de-sac pilot participation	Rollout
	Expand anti high PAH efforts	1 additional ordinance ban	County ordinance	State Ordinance
	Encourage BMP green infrastructure projects & supporting code/ordinances	Assessment of current area codes & ordinances	3 municipalities with codes & ordinances to support green infrastructures	80% municipalities supporting green infrastructure codes & ordinances
Protect natural areas/open space	Increase number of acres with conservation status	20 acres	100 acres	200 acres
	Increase number of acres buffering key natural areas	20 acres	150 acres	250 acres
Improve aquatic & terrestrial habitat	Recruit privately owned native buffers installations	2	6	10 total
	Wetland restoration	1	2	4 total
	Conduct study of utility of hydrologic structures	Request proposals	Secure partial funding	Implementation of identified priorities
Strengthen local partnerships	Develop local funding partnerships for buffers & other projects	3 grant proposals	7 grant proposals	15 proposals
	Recruit more HOAs with water resources	2	3	7 total
Reduce existing flooding	Feasibility studies of multi-objective storage open space	2	3	7 total
	Create plans for alleviating depressional flooding	2	2	7 total
Raise public awareness	Digital Media Development	Complete website & digital media plan	Execute & Evaluate	Ongoing & evaluation
	Publish articles on water resources	5 published	15 published	30 total published

	Create raingardens & monarch gardens	5 new	10 new	15 total
Engage students & residents in citizen science programs	Grow number of VLM volunteers	Add 2	Add 5	10 Total
	Expand number of RiverWatch volunteers	Add 2	Add 3	7 Total

6.4 Criteria for Determining Progress

The success of the Plan will be determined by how many of the Plan's recommendations are implemented. High priority BMPs are expected to be implemented within the first five years, assuming timely approval and adoption by member municipalities. Medium BMPs are expected to be implemented within 10 years. Logically, progress made with implementing BMP recommendations should eventually positively impact water quality, so that the Watershed's waters would, over time, no longer be classified as impaired.

Table 50. Criteria for Determining Progress: Analyte Loading to the Fox River

Criteria	*5 year benchmark*	*10 year benchmark*
Phosphorus	15% reduction	30% total reduction
Total Dissolved Solids	7% reduction	15% total reduction
No. of lake mgmt. plans	2	5 total

Another criterion for determining progress will be delisting of a water body due to use attainment as reported in the IEPA's integrated water quality reports (Section 303(d) in the 2027 Integrated Report.)

Frankly, given that so much of our stream banks and shorelines are privately owned, the limitations of funding, and the nature of our non-point sources of pollution, and the prevalence of carp throughout the watershed, we do not anticipate meeting Watershed quality standards during the duration of this Watershed Plan. We expect to make progress. It could take another 30 years to meet the water quality standards. Given the poor water quality assessments assigned to Flint Creek in 1991 (the most polluted tributary of the Fox), we have made progress and expect to continue to do so.

6.5 Monitoring Components for Evaluating Effectiveness

The Flint Creek Watershed Partnership consists of both lakes and three branches of the Flint Creek. We have in place an approved monitoring plan for both the Flint Creek and the Spring Creek watersheds. We are well served by the LCHD Lakes Management Unit, and their every periodic lake monitoring program.

Ongoing monitoring of water quality to evaluate the effectiveness of the watershed plan will largely depend on the following programs:

1) Continuation of the lake monitoring program by the LCHD Lakes Management Unit, with an emphasis on collecting samples for analysis of total phosphorus, dissolved oxygen, and E.coli.
2) RiverWatch and Volunteer Lake Monitoring Program. We will strive to expand VLMP and RiverWatch participation and analyze data at minimum on a three-year cycle, with a focus on clarity and P concentrations and macroinvertebrates.

3) Required MS4 testing done by our municipal partners, again tracking Phosphorus, BOD, TSS, and pH.
4) Stream gages in Flint (and Spring) Creeks monitoring water levels and conductivity (e.g. chloride)
5) June testing as outlined in the Water Quality Monitoring study for Flint (and Spring) Creeks by KOT Consulting

Evaluation of the effectiveness of the Watershed Plan will require analysis of changes, if any, in total phosphorus concentrations over time, a continued monitoring of chloride infiltration (currently we are below levels of concern for chloride, and we intend to stay that way), and Total Dissolved Solids. We will work with our partners to track BMPs implemented in the Watershed by municipalities, especially green infrastructure projects, as well as progress made by our not-for-profit partners. Continued collaboration and analysis will help us understand any changes that occur or trends that emerge.

The overall goals for the Flint Creek Watershed Partnership are to engage our citizens to partner in improving the quality of the surface waters of our watershed so they are unimpaired, support a diversity of flora and fauna, and protect our groundwater resources, by implementing an appropriate mix of best practices, as well as advocate for their continued protection. Municipalities and other government agencies are vital partners, with their ability to communicate with their citizens, conduct research, as well as employ appropriate incentives and encouragements via codes, and regulations. Not-for-profits are also vital partners, as many have long been working toward environmental stewardship, and we will build on the foundations they have built, as well as on the foundation that Clean Air and Clean Water regulations and their coordinating agencies have created over the years. We recognize that this is a long term goal, and we hope to make good progress toward it with this plan. Changing mindsets takes time.

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Appendix A: Links to LCHD Lake Reports

Lake County Health Department – Environmental Services

Links to Flint Creek Watershed Lake Summary Reports

2000 Columbus Park Lake: https://www.lakecountyil.gov/DocumentCenter/View/10607

2004 Deer Lake Meadows Lake Report: https://www.lakecountyil.gov/DocumentCenter/View/5895

2004 Dogbone Lake Report: https://www.lakecountyil.gov/DocumentCenter/View/5896

2015 Echo Lake Report: https://www.lakecountyil.gov/DocumentCenter/View/14157

2008 Flint Lake Report: https://www.lakecountyil.gov/DocumentCenter/View/5962

2015 Honey Lake Report: https://www.lakecountyil.gov/DocumentCenter/View/14158

2015 Lake Louise Report: https://www.lakecountyil.gov/DocumentCenter/View/14160

2015 Lake Zurich Report: https://www.lakecountyil.gov/DocumentCenter/View/14161

APPENDIX B: "TOOLBOX" OF WATERSHED BMPS

(Adopted from Lake County Stormwater Management Commission)

1.1 Introduction

The watershed restoration and management techniques described in this chapter, when applied to the Flint Creek watershed, are tools that can be used to help achieve the watershed goals and objectives identified in the Watershed-Based Plan. The watershed techniques presented are broadly organized to reflect the plan goals of 1) improving water quality, 2) reducing runoff and minimizing flood damages, and 3) protecting and restoring natural resources/open space. Most watershed protection tools can be categorized as either "preventative" or "remedial." Some tools, such as long-term maintenance programs, are both preventative and remedial. For purposes of this plan, maintenance programs are placed in the preventative category since under almost all circumstances, timely maintenance will serve to prevent future problems.

Preventative measures reduce the likelihood that new watershed problems such as flooding or water quality degradation will arise, or that existing problems will worsen. Preventative techniques generally target new development in the watershed and are geared toward protecting and preventing degradation of existing resources. Planning, regulatory and administrative programs and alternative site designs are examples of preventative measures. Prevention also includes measures that protect the natural drainage system through land acquisition and conservation management.

Remedial measures are used to solve known watershed problems or to improve current watershed conditions. Remedial measures include retrofitting drainage system infrastructure such as detention basins and stormsewer outfalls to improve water quality, adjust release rates, or reduce erosion. Both water quality and water quantity problems can be addressed by installing measures that improve infiltration and reduce runoff. Examples include disconnecting downspouts from stormsewers, installing biofilters and re-landscaping with deep-rooted native vegetation. Other remedial techniques range from stabilizing eroded streambanks and restoring wetlands, to floodproofing and constructing reservoirs for flood mitigation.

1.2 Watershed Protection Tools to Improve Water Quality

The Illinois Environmental Protection Agency (IEPA) has identified the most significant causes of impairment to streams in the watershed as: organic enrichment and nutrients (especially ammonia nitrogen). The most significant identified sources of impairment to streams include municipal point sources, land development/construction, urban runoff/stormsewers and contaminated sediments. It is notable that the causes and sources of impairment identified by the IEPA are considerably different for the streams and the lakes. In general, the diverse and diffuse nature of nonpoint pollutant sources presents a challenge for improving water quality. Therefore, to effectively address the scattered and cumulative impacts of nonpoint source pollution, various techniques have to be applied at numerous sites throughout the watershed.

1.2.1 Preventative Measures: Protecting Water Quality

Preventative measures will address how land needs to be developed and maintained to reduce future increases in nonpoint source pollutant loads. Traditionally as land has been developed in a watershed, water quality has declined. If land continues to be developed in a traditional manner in

the Flint Creek watershed, it is anticipated that water quality will continue to degrade. Improvements will need to be made in development designs and in land management practices in order to protect water quality in the watershed. Development design features are addressed in the water quality measures described below and in the following flood reduction section of this chapter. Maintaining streams and riparian buffers can also go a long way to preventing water pollution. Individual property owners play a significant role in implementing these measures, and in reducing the use of products and practices that contribute to water pollution.

Several preventative techniques for protecting water quality include:

- Watershed planning
- Policy/regulatory actions
- Appropriate site planning
- Stormwater/landscaping BMPs such as vegetative filter strips, riparian buffers, swales, wetland detention basins, green roofs, rain barrels/cisterns, and rain gardens
- Improved agricultural practices
- Stream maintenance program
- Nonpoint source pollution prevention program

Watershed Planning

Watershed planning is a broad land use management tool used to predict future land use impacts on water resources, develop water resource protection goals for watersheds, subwatersheds, and the communities contained with each, identify tools needed to protect water resources under future land use conditions, and often anticipate costs for implementing watershed protection tools (Center for Watershed Protection 1998). Watershed planning typically addresses land use management strategies, such as policy changes, land use planning such as alternative site designs, open space protection, and land restoration. Watershed planning is critical for implementing innovative water quality protection practices.

Policy/Regulatory Actions

Policies and regulations establish and enforce minimum standards for protecting water quality. Regulations are most useful when incorporated into state and federal statutes and administrative rules, or in local ordinances. Nonpoint pollution from new developments can be most effectively addressed at the local level since local units of government are responsible for land use planning and development approvals. As a result of past problems, many local municipalities and counties have water quality provisions in development ordinances or in separate soil erosion and sediment control ordinances. In addition to local controls, the federal Clean Water Act includes several requirements directed at nonpoint source pollution. Water quality impacts are considered in stormwater permits for large municipalities, wetland permitting (Section 404) and with soil erosion and sediment control requirements for new developments (Rule 5).

Lake, Cook, and McHenry County Watershed Requirements

Lake, Cook, and McHenry Counties has a Watershed Development Ordinance with three primary requirements that address water quality. One requirement is to use landscaping best management practices (BMPs) to treat runoff for impervious surface for a development before releasing it to the drainage system. The ordinances do not dictate how water quality treatment should be done, they

only require that these runoff quantities be treated. Environmental consulting companies are generally brought in to help developers address runoff and water quality.

The second requirement for water quality protection is the installation of soil erosion and sediment control measures on building sites for the purpose of preventing erosion, or at minimum, preventing sediment from leaving the site. Soil erosion/sediment control requirements include the use of filter barriers, sediment traps, settling basins, side slope stabilization, filters on stormsewer inlets, and temporary and permanent vegetative stabilization.

The third water quality requirement is to provide buffers for waterbodies to filter sheet flow runoff before it drains into the waterbody. This requirement applies to streams, rivers, wetlands and lakes.

The ordinances do not include performance standards for the required BMPs. Therefore, while the effectiveness of various BMPs has been documented, variability in the approval, application, maintenance, and monitoring of the BMPs leads to variable results for preventing water quality impacts from development.

Appropriate Site Planning

Site planning that incorporates open space protection and stormwater/landscaping best management practices is an effective tool for protecting and improving water quality. Alternative site designs and conservation developments are planning and design processes that reduce impervious cover, incorporate runoff reduction strategies, and protect open space for infiltration and recreational opportunities. These planning processes are described in more detail in later sections of this toolbox. Landscaping best management practices, which can be incorporated into new developments or redevelopments, are described below.

Stormwater/Landscaping Best Management Practices

A number of BMPs such as vegetative filter strips/level spreaders, riparian buffers, bioswales, green roofs, wetland detention basins, porous pavement, rain barrels/cisterns, rain gardens, vegetated swales, native landscaping, and stream and wetland restoration can be implemented to reduce water quality impacts. Some of these and other BMPs can also be incorporated into farming practices.

Filter strips/level spreaders
Filter strips are linear sections of the landscape covered with dense, preferably native, vegetation. The vegetation slows, absorbs, and filters stormwater runoff before it reaches an adjacent water body. Level spreaders are narrow strips of rock or other material laid on the contour that slow and redistribute runoff across a vegetated slope. When used in conjunction with level spreaders, filter strips effectively protect the water quality of adjacent wetlands and streams. Filter strips/level spreaders can be used alone or be placed within riparian buffers (Conservation Design Forum 2004).

Riparian buffers
Riparian buffers are wide strips of vegetation that preferably flank all sides of a wetland, stream, or other water body. Maintaining buffers along stream and river channels and lakeshores can reduce some of the water quality and habitat degradation effects associated with increased imperviousness (and runoff) in the watershed. Buffers provide hydrologic, wildlife habitat, recreational and aesthetic

benefits as well as water quality functions. Sediment, phosphorus and nitrogen are at least partly removed from water passing through a naturally vegetated buffer (see Table 1). The percentage of pollutants removed depends on the pollutant load, the type of vegetation, the amount of runoff and the character of the buffer area. The most effective buffer width can vary along the length of a channel. Adjacent land uses, topography, runoff velocity and soil and vegetation types are all factors used to determine the optimum buffer width. Where a standard width is needed for regulatory purposes, 100 feet is considered a minimum buffer width for typical surface water requirements. Wider buffers are recommended for more sensitive areas such as high quality streams and wetlands (Mitchell 1996).

Table 1. Potential Pollutant Removal capability of Urban Stream Buffers

Pollutant	**Potential Removal Rate***
Sediment	75%
Total nitrogen	40%
Total phosphorus	50%
Trace metals	60-70%
Hydrocarbons	75%

Source: Schueler (1995).
*Potential removal rate based on combined 25-foot grass strip in outer zone and 75 foot forested buffer in middle and streamside zone.

The Lake, McHenry, and Cook County strormwater ordinances require the designation of buffers along all stream channels, lakes and wetlands. Required buffer widths vary depending on the watershed area to the buffer, quality of wetland, and other factors such as stream quality related to fish and macroinvertebrate communities. Individual communities have the option of adopting wider buffer requirements.

Several state and federal programs exist to provide incentives for maintaining riparian buffers. The Wetlands Reserve Program makes funding available for the purchase and restoration of wetlands and riparian buffer connections between wetlands. The Illinois Buffer Partnership promotes and supports the voluntary efforts of farmers and landowners in the planting, maintenance and enhancement of streamside buffers. Property tax incentives for conservation also include reduced assessments for land dedicated to open space, conservation easements on natural areas and common areas in developments through the Real Property Conservation Rights Act and the Natural Areas Preservation Act.

Bioswales
Bioswales are infiltration/filtration systems planted with dense vegetation designed to filter, retain, and encourage evapotranspiration of stormwater. Bioswales are often constructed with an infiltration trench below the vegetated swale to encourage infiltration and provide temporary stormwater storage (Conservation Design Forum 2004).

Green roofs
Green roofs are roof-top gardens designed to absorb, temporarily store, and filter rainwater before it is released into downspouts. Green roofs can be elaborate landscape features with aesthetic and

recreational benefits, or be simple systems designed specifically for stormwater benefits (Conservation Design Forum 2004).

Wetland detention basins

Detention basins are used to temporarily store stormwater and release it at a rate specified by local ordinances (Conservation Design Forum 2004). Wetland detention basins, or wet-bottom basins, are either shallow marsh systems planted with native emergent vegetation or open water ponds with a fringe of wet prairie vegetation. Wetland basins store the first flush of runoff from impervious surfaces and allow sufficient time for sediment and other solids to settle out to the bottom of the basin. Native plants aid in the water cleansing process by absorbing pollutants. The settling and filtering process results in cleaner water being discharged from the basin than the inflow stormwater.

Permeable paving blocks/Porous pavement

When used in low traffic areas such as emergency drives, overflow or seasonal parking lots and residential driveways, permeable paving blocks and porous pavement are effective techniques for controlling runoff and therefore protecting water quality (Dreher and Price 1997). Permeable paving blocks contain openings that are filled with soil and planted with vegetation. Porous pavement uses large size aggregate material that allows precipitation to rapidly infiltrate into the ground.

Rain barrels/cisterns

Rain barrels and cisterns are temporary storage bins for rainwater that can be tapped into for landscape irrigation and other uses. They can be used alone or in conjunction with landscape features such as rain gardens.

Rain gardens

Rain gardens are landscape/stormwater features designed specifically to absorb, temporarily store, and filter stormwater runoff from small areas such as residential lots, and from rooftops or downspouts. Rain gardens are effective tools for preventing small-scale flooding.

Vegetated Swales

Vegetated swales are stormwater conveyance features often located along roads that are planted with dense, preferable native, vegetation. Unlike bioswales, vegetated swales typically are not constructed with infiltration trenches. Vegetated swales must be wide enough to effectively filter and infiltrate stormwater.

Native Landscaping

Native landscaping on a small or large scale utilizes vegetation endemic to a specific geographic region (Conservation Design Forum 2004). Native or natural landscaping promotes biodiversity and open space protection by providing habitat for endemic wildlife. It also promotes stormwater infiltration and filtration by utilizing vegetation with deep root systems.

Stream and Wetland Restoration

Stream and wetland restoration maintains and restores natural water quality protection features. It includes activities such as repairing eroded streambanks, naturalizing detention basins, and enhancing wetlands with native plants.

Implementing Agricultural Practices

Agriculture is minimal in the Flint Creek watershed but should still be considered a potential source of nutrient loading to streams and lakes. The Natural Resource Conservation Service (NRCS) publishes guidelines for farmers to prevent soil erosion and to improve or protect water quality and water resources. The following information was taken from the NRCS Field Office Technical Guide (FOTG). Several of these practices described below are similar to BMPs for riparian sites (such as filter strips and buffers), but specific suggestions are given for agricultural sites.

Residue Management, No till/Strip till
This practice manages the amount, orientation and distribution of crop and other plant residues on the soil surface year-round, while growing crops planted in narrow slots, or tilled, residue free strips previously untilled by full-width inversion implements. The purpose of this conservation practice is to reduce sheet and rill erosion thereby promoting improved water quality. Additional benefits of this practice are to reduce wind erosion, to maintain or improve soil organic matter content and tilth (tillage), to conserve soil moisture, to manage snow, to increase plant available moisture or reduce plant damage from freezing or desiccation, and to provide food and escape cover for wildlife. This technique includes tillage and planting methods commonly referred to as no till, zero till, slot plant, row till, direct seeding, or strip till.

Residue management is when loose residues are left on the field, and then uniformly distributed on the soil surface to minimize variability in planting depth, seed germination, and emergence of subsequently planted crops. When combines or similar machines are used for harvesting, they are equipped with spreaders capable of distributing residue over at least 80% of the working width. No till or strip till may be practiced continuously throughout the crop sequence, or may be managed as part of a system which includes other tillage and planting methods such as mulch till (see below). Production of adequate amounts of crop residues is necessary for the proper functioning of this conservation practice and can be enhanced by selection of high residue producing crops and crop varieties in the rotation, use of cover crops, and adjustment of plant populations and row spacings.

Maintaining a continuous no till system will maximize the improvement of soil organic matter content. Also, when no till is practiced continuously, soil reconsolidation provides additional resistance to sheet and rill erosion. The effectiveness of stubble to trap snow or reduce plant damage from freezing or desiccation increases with stubble height. Variable height stubble patterns may be created to further increase snow storage.

Residue Management, Mulch till
Mulch tillage (also known as chiseling or disking) manages the amount, orientation and distribution of crop and other plant residue on the soil surface year-round, while growing crops where the entire field surface is tilled prior to planting. The purpose of this conservation practice is to reduce sheet and rill erosion, which leads to improved water quality. Additional benefits are the same as no till practices. It applies to stubble mulching on summer-fallowed land, to tillage for annually planted crops, and to tillage for planting perennial crops.

Mulch till may be practiced continuously throughout the crop sequence, or may be used as part of a residue management system that includes other tillage methods such as no till. Like not till, mulch till requires production of adequate amounts of crop residue to function properly.

Nutrient Management
Nutrient management is the management of the amount, source, placement, form, and timing of the application of plant nutrients and soil amendments to minimize the transport of applied nutrients into surface water or ground water. Nutrient management seeks to supply adequate nutrients for optimum crop yield and quantity while also helping to sustain the physical, biological and chemical properties of the soil.

Nutrient management plans are developed with assistance from the Natural Resources Conservation Service (NRCS). A nutrient budget for nitrogen, phosphorus and potassium is developed considering all potential sources of nutrients including, but not limited to animal manure, commercial fertilizer, crop residue and legume credits. Realistic yields are based on soil productivity information, potential yield or historical yield data based on a 5-year average. A procedure for calculating 5-year average yields is found in the *Illinois Agronomy Handbook*. Nutrient management plans specify the form, source, amount, timing and method of application of nutrients on each field in order to achieve realistic production levels while minimizing transport of nutrients to surface and/or groundwater.

Filter Strip
A filter strip is an area of permanent herbaceous vegetation situated between environmentally sensitive areas and cropland, grazing land, or otherwise disturbed land. Filter strips reduce sediment, particulate organic matter, sediment adsorbed contaminants and dissolved contaminant loadings in runoff to improve water quality. Filter strips also restore or maintain sheet flow in support of a riparian forest buffer, and restores, creates, and enhances herbaceous habitat for wildlife and beneficial insects. This practice applies only when used in conjunction with other conservation practices as part of a conservation management system.

The filter strip flow length is determined based on the field slope percent and length, filter strip slope percent, erosion rate, amount and particle size distribution of sediment delivered to the filter strip, density and height of filter strip vegetation, and runoff volume associated with erosion producing events.

Filter strips should be permanently designated plantings to treat runoff and should not be part of the adjacent cropland's rotation. Overland flow entering the filter strip should be primarily sheet flow. Concentrated flow shall be dispersed. Filter strips cannot be installed on unstable channel banks that are eroding due to undercutting of the toe bank. Permanent herbaceous vegetation should consist of a single species or a mixture of grasses, legumes and/or other forbs (a herbaceous plant other than a grass) adapted to the soil, climate and farm chemicals used in adjacent cropland. Filter strips must be properly maintained so that they function properly.

Filter strips should be located to reduce runoff and increase infiltration and ground water recharge throughout the watershed. Filter strips should also be strategically placed to intercept contaminants, thereby enhancing the water quality in the watershed. To avoid damage to the filter strip, consider using plant species that are tolerant to herbicides used in the upslope crop rotation. Filter strip sizes should be adjusted to accommodate planting, harvesting, and maintenance equipment. Filter strip widths greater than that needed to achieve a 30 minute flow-through time at ½-inch depth will not likely improve the effectiveness of the strip in addressing water quality concerns created by sediment, particulate organics, and sediment adsorbed contaminants.

Contour Buffer Strip
Contour buffer strips are narrow strips of permanent, herbaceous vegetative cover established across the slope and alternated down the slope with parallel, wider cropped strips. Crop strips are alternated with buffer strips down the hill slope. Normally a crop strip will occupy the area at the top of the hill. Contour buffer strips reduce sheet and rill erosion, reduce transport of sediment and other water-borne contaminants, and enhance wildlife habitat. This practice applies to cropland and is most suitable on uniform slopes ranging from 4 to 8 percent with slopes less than the Critical Slope Length (the length of slope above which contouring loses its effectiveness).

The buffer strips are generally of equal width, unless a varying width buffer strip is needed to keep either a cropped strip adjacent to it of uniform width or to maintain the strip boundary grades within NRCS criteria (Illinois Field Office Technical Guide). Width of buffer strips at their narrowest point shall be no less than 15 feet for grasses or grass legume mixtures and no less than 30 feet when legumes are used alone.

Contour Farming
Contour farming is the tillage, planting, and other farming operations performed on or near the contour of the field slope. The purpose is to reduce sheet and rill erosion and to reduce the transport of sediment and other water-borne contaminants. Contour farming is most effective on slopes between 2 and 10 percent, is less effective on slopes exceeding 10 percent and is ineffective on slopes exceeding 25%. Contour farming requires that all tillage and planting operations be parallel to contour baselines or terraces, diversions, or contour buffer strip boundaries where these practices are used. All runoff from contouring should be delivered to stable outlets, such as grassed waterways, field borders, water and sediment control basins, or underground outlets for terraces and diversions.

Selecting Appropriate BMPs

To choose an appropriate BMP, it is essential to determine in advance the objectives to be met by the BMP and to calculate the cost and related effectiveness of alternative BMPs. Once a BMP has been selected, expertise is needed to insure that the BMP is properly installed, monitored and maintained over time. BMPs to consider for the Flint Creek watershed and their potential effectiveness in meeting water quality objectives are found in Table 2.

Table 2. BMP effectiveness toward meeting BMP objectives.

	BMP OBJECTIVE						
BEST MANAGEMENT PRACTICE	**Runoff Rate Control**	**Runoff Volume Control**	**Physical Habitat Preservation**	**Sediment Pollution Control**	**Nutrient Control**	**BOD Control**	**Other* Pollutant Control**
Impervious Area Reduction	2	2	2	2	2	2	2
Impervious Area Disconnection	2	2	1	2	2	2	2
Filter Strips	2	2	2	2	2	2	2
Swales	2	2	1	2	2	2	2

Infiltration Devices	2	3	1	3	3	3	3
Porous Pavement	2	2	1	3	3	3	3
Wet Detention	3	1	2	3	2	3	2
Wetland Detention	3	1	2	3	2	3	2
Dry Detention	2	1	1	2	1	1	1
Settling Basins	2	1	1	2	2	2	2
Water Quality Inlets	1	1	1	2	1	1	1
Sand Filters	1	1	1	3	2	2	2
Rock Outlet Protection	1	1	2	2	1	1	1
Storage Area Cover	1	1	1	2	2	1	2-3
Street Sweeping	1	1	1	1-2	1	1-2	1-2
Source Controls	1	1	1	1	2	2	2
Stream Protection/ Restoration	2	1	3	2	2	2	1
Wetland Protection/ Restoration	2-3	2-3	3	2-3	2	2-3	2

Effectiveness Key:
3 = Fully achieves objective
2 = Partially achieves objective
1 = Does not achieve objective

* Other pollutants include toxic compounds such as heavy metals and pesticides, fecal bacteria, petroleum based hydrocarbons and deicing materials such as salt. A "2" in this column indicates that the BMP controls some of these pollutants but not others.

Source: Dreher (1994)

Tables 3 and 4 depict percentage pollutant removal rates for different BMPs from data collected and reported by the Center for Watershed Protection (CWP) in June 1997. These removal efficiencies are based on one hundred twenty-three performance-monitoring studies that the CWP compiled into a database. Because performance can be extremely variable within a group of BMPs, estimates of BMP performance should be considered as a long-run average, not as a fixed or constant value. (Schueler 1995, Claytor & Schueler 1996, Schueler 1997, Center for Watershed Protection 1998, Price & Dreher 2000).

Table 3. Comparison of median Pollutant Removal Efficiencies among selected BMP groups: Conventional pollutants.

		Median Stormwater Pollutant Removal Rate (%)					
Best Management Practice	**No. of Studies[1]**	**Total Suspended Solids**	**Total P[2]**	**Soluble P[3]**	**Total N[4]**	**Nitrate**	**Carbon[5]**
Detention pond	2	7	10	2	5	3	(-1)
Dry ED* pond	6	61	19	(-9)	31	9	25
Wet pond	30	77	47	51	30	24	45
Wet ED* pond	6	60	58	58	35	42	27
PONDS [A]	36	67	48	52	31	24	41
Shallow marsh	14	84	38	37	24	78	21
ED* wetland	5	63	24	32	36	29	ND
Pond/wetland	11	72	54	39	13	15	4
WETLANDS	35	78	51	39	21	67	28
Surface sand filters	6	83	60	-37	32	(-9)	67
FILTERS [B]	11	87	51	-31	44	(-13)	66
CHANNELS	9	0	(-14)	(-15)	0	2	18
SWALES [C]	9	81	29	34	ND	38	67

* ED = extended detention
[1] Number of performance monitoring studies.
[2] Total P = total phosphorus
[3] Soluble phosphorus as measured as ortho-P, soluble reactive phosphorus or biologically available phosphorus.
[4] Total N = total nitrogen
[5] Carbon = measure of organic carbon (BOD, COD or TOC)
[A] Excludes conventional and dry ED ponds.
[B] Excludes vertical sand filters and vegetated filter strips
[C] Includes biofilters, wet swales and dry swales

Table 4. Median Pollutant Removal reported for selected BMP groups: Fecal coliform, hydrocarbons and selected trace metals.

	Median Stormwater Pollutant Removal Rate (%)					
Best Management Practice	**Bacteria [E]**	**Hydro-Carbons [F]**	**Cadmium**	**Copper**	**Lead**	**Zinc**
Detention and Dry ED* Ponds	ND	ND	54	26	43	26
Ponds [A]	65	83	24	57	73	51
Wetlands	77	90	69	39	63	54
Filters [B]	55	81	--	34	71	80
Channels	0	ND	55	14	30	29
Swales [C]	(-50)	62	42	51	67	71

* ED = extended detention
[A] Excludes conventional and dry ED ponds.
[B] Excludes vertical sand filters and vegetated filter strips
[C] Includes biofilters, wet swales and dry swales
[D] The number of studies is less than 5 for some BMP groups for bacteria, TPH, Cd and medians should be considered provisional.
[E] Bacteria values represent mean removal rates.
[F] Hydrocarbons measured as total petroleum hydrocarbons or oil/grease.

Stream Maintenance Program

A recommended stream maintenance plan is included in the Flint Creek watershed-based plan. Stream maintenance is most effective when part of an ongoing program to repair eroded streambanks and remove blockages caused by accumulated sediment, fallen trees and overgrown weedy, non-native vegetation or debris. "Debris" refers to a wide range of materials that may include tree limbs and branches that accumulate naturally and large items of trash or lawn waste accidentally or intentionally dumped into channels or drainage swales. Routine clearing of debris from streams is a cost effective way to prevent flooding. In addition to sediment and debris removal, stream maintenance can also involve using best management practices (BMPs) to stabilize eroding streambanks. However, stream maintenance activities normally do not alter the shape of the channel (Dreher and Heringa 1998; Stowe and DuPage County 1991; Wildlife Society 1983; Illinois Department of Natural Resources 1983).

The Lake County Stormwater Management Commission (LCSMC) has developed "Riparian Area Management: A Citizen's Guide", which educates landowners about debris removal and riparian landscaping. There are currently no coordinated programs or maintenance standards established at the county-level for on going stream maintenance. Maintenance is typically done as needed in response to problems or complaints about blockages or erosion.

LCSMC anticipates adopting environmentally friendly stream maintenance standards in the future to provide guidance and consistency for projects throughout Lake County. In the interim, LCSMC recommends that the guidelines adopted by DuPage County (1995) or the American Fisheries Society (1983) be used. In addition, Applied Ecological Services (AES) has compiled a list of potential maintenance standards and other recommendations related to stream and buffer maintenance. The recommendations are as follows:

1) Identify, map and prioritize all stream reaches that municipalities and townships should include in annual maintenance plans.
2) Develop guidelines for bridges and culvert construction that will minimize habitat destruction and impediments to fish migration and require highway departments and municipalities to follow the guidelines.
3) Develop and enforce a anti-dumping ordinance.
4) Continue to enforce buffer requirements outlined in the required ordinances and work with developers to restore stream reaches and implement maintenance programs.
5) Work with landowners to remove and replace failing hard armoring along streams with bioengineering alternatives.
6) Develop and implement ordinances prohibiting new dams and on-line detention for stormwater and flood control. Remove all unnecessary dams.
7) Retrofit as many storm sewer structures as possible to reduce runoff velocity and scouring.
8) Develop a stream clean-up program to encourage local citizens and organizations to participate in periodic clean up days.
9) Restore native understory vegetation and remove as many non-native weedy trees and shrubs as possible for at least 10-20 feet along stream corridors.
10) Avoid fertilizing along streambanks.
11) Avoid any channel modification unless the modification is included in an approved stream restoration plan.

12) Remove debris jams when they cause unacceptable flow problems or are causing at least moderate sediment accumulation.
13) Enforce erosion control measures on all new development.
14) Maintain all created and natural riffles, pools, and other high quality in-stream habitat at least twice a year to ensure they are functioning properly.
15) Eliminate livestock access to streams to reduce bank erosion and degraded water quality conditions downstream.

Nonpoint Source Pollution Prevention Program

Pollution prevention or source reduction programs reduce the generation and exposure to the elements of pollutants that collect on streets, parking lots and other surfaces and eventually wash into streams, rivers and lakes. Because nonpoint source pollution is generated in relatively small amounts from numerous sites (including homeowner's lawns and driveways, schools, construction sites and businesses), the most effective source reduction programs are community programs that include a combination of regulation, guidance and education.

Source controls keep pollutants from entering the stormwater in the first place. In most cases, source controls are more cost effective than structural water quality BMPs to reduce pollutant loading. However, a combination of source reduction and structural BMPs are usually the most effective method to control pollution from runoff.

Source reduction is simply changing everyday practices to reduce the quantity of pollutants that end up on the land and in the water. In addition to reducing pollutant inputs, pollution prevention programs also recommend using environmentally friendly products and changing the timing of some activities to minimize the amount of materials that wash off the land. Opportunities to reduce pollutant loads are numerous and range from recycling and reducing applications of lawn chemicals to driving less and minimizing road salt usage. Some common source reduction opportunities are listed in Table 5.

Table 5. Source Reduction Activities.

SOURCE REDUCTION ACTIVITY	WHO'S RESPONSIBLE
1. Collect and recycle crankcase oil	homeowners, business, government
2. Reduce pesticide and fertilizer applications to lawns	homeowners, business, government
3. Don't litter	everyone
4. Clean up and properly dispose of pet wastes	homeowners, businesses (kennels)
5. Properly store and dispose of household chemicals	homeowners
6. Remove illegal and improper connections to storm drains	homeowners, business, government
7. Landscape yards and business grounds to reduce runoff	homeowners, business, government
8. Maintain septic tank properly	homeowners
9. Direct downspouts from paved surfaces	homeowners, business, government
10. Install rain barrels	homeowners
11. Sweep up rather than hose off to clean	homeowners, business, government
12. Sweep street gutters and keep stormsewer inlets clean of leaves and trash	homeowners, business, government

13. Prevent erosion	homeowners, business, government
14. Minimize quantity of road salt used	businesses, government

1.2.2 Remedial Measures: Improving Water Quality

Water quality in the Flint Creek watershed can be improved using a number of retrofitting techniques. Retrofitting refers to modification of existing stormwater control structures such as detention basins and conveyance systems such as ditches and stormsewers. These structures were originally designed to improve drainage and reduce flood risk, but they can also be retrofitted to improve water quality. This section will focus on enacting a lakes management plan, properly maintaining septic tanks and fields to improve water quality, retrofitting existing detention basins and stormwater outfalls, and stabilizing streambanks.

Lakes Management

Increased lakeshore development, failing septic systems, polluted stormwater runoff, and other improper land use practices are likely degrading water quality in the Flint Creek watershed. With increased nutrients and fertilizers, lakes can become choked with plants and the water can become green and murky. If water quality deteriorates, recreational activities such as fishing, boating, and swimming can become impaired; the local economy could suffer, and the general health of watershed residents could be threatened.

Protecting the quality of our lakes is an important concern for most watershed residents. Each lake is a valuable resource that must be properly managed if it is to be enjoyed by present and future generations. To assist with this endeavor, the Lake County Health Department - Lakes Management Unit (LMU) provides technical expertise essential to the management and protection of Lake County surface waters. The following information on lakes management and on the specific objectives to achieve the goals was prepared and written by the LMU. The information below is a summary of objectives relevant to the lakes in the Flint Creek watershed to achieve water quality goals, including: shoreline erosion control, the Volunteer Lakes Monitoring Program, dissolved oxygen concentration maintenance, aquatic plant management, nuisance algae management, control of exotic species, enhancement of wildlife habitat, fisheries assessment, control of Canada geese, beaver activity management, and carp management. Please contact the LMU for additional information including the pros and cons of these described practices, suggestions and recommendations, and cost estimates:

Lake County Health Department
Lakes Management Unit
3010 Grand Avenue
Waukegan, IL 60085
Phone: 847 377-8020
Fax: 847 249-4972
Internet: http://www.co.lake.il.us/health/ehs/lakes.htm

Objective 1: Shoreline Erosion Control
Erosion is a potentially serious problem affecting lake shorelines and occurs as a result of wind, wave or ice action or from overland flow of rainwater runoff. While some erosion to shorelines is

natural, human alteration of the environment can accelerate and exacerbate the problem. Erosion not only results in loss of shoreline, but also negatively influences the lake's overall water quality by contributing nutrients, sediment and pollutants to the water. This effect is felt throughout the food chain since poor water quality negatively affects everything from microbial life to sight feeding fish and birds to people who want to use the lake for recreational purposes. Over time the resulting increased amount of sediment will begin to fill in the lake, decreasing overall lake depth and volume and potentially impairing various recreational uses.

Options to control shoreline erosion for water quality include:

- Option 1: Create a Buffer Strip.
- Option 2: Install Biolog, Fiber Roll or Straw Blanket with Plantings.
  These products are long cylinders of compacted synthetic or natural fibers wrapped in mesh. The rolls are staked into shallow water. Once established, a buffer strip of native plants can be planted along side or on top of the roll (depending if rolls are made of synthetic or natural fibers).
- Option 3: Establish a "No Wake" Zone or No Motor Area.
- Option 4: Hard armoring with rip-rap. This technique may be required for severe erosion.

In most cases a combination of these options is optimal for shoreline stabilization. Each specific site has its own characteristics and needs a specially designed set of treatments.

Objective 2: Participate in the Volunteer Lake Monitoring Program

In 1981, the Illinois Volunteer Lake Monitoring Program (VLMP) was established by the Illinois Environmental Protection Agency (Illinois EPA) to gather fundamental information on Illinois inland lakes, and to provide an educational program for citizens. Annually, 150-200 lakes (out of 3,041 lakes in Illinois) are sampled by approximately 250 citizen volunteers. The volunteers are primarily lakeshore residents, lake owners/managers, members of environmental groups, public water supply personnel and citizens with interest in a particular lake.

The VLMP relies on volunteers to gather a variety of information on their chosen lake. The primary measurement is Secchi disk transparency or Secchi depth. Analysis of the Secchi disk measurement provides an indication of the general water quality condition of the lake, as well as the amount of usable habitat available for fish and other aquatic life.

Microscopic plants and animals, water color, and suspended sediments are factors that interfere with light penetration through the water column and lessen the Secchi disk depth. As a rule, one to three times the Secchi depth is considered the lighted or euphotic zone of the lake. In this region of the lake there is enough light to allow plants to survive and produce oxygen. Water below the lighted zone can be expected to have little or no dissolved oxygen. Other observations such as water color, suspended algae and sediment, aquatic plants, and odor are also recorded. The sampling season is May through October with volunteer measurements taken twice a month. After volunteers have completed one year of the basic monitoring program, they are qualified to participate in the Expanded Monitoring Program. In the expanded program, selected volunteers are trained to collect water samples that are shipped to the Illinois EPA laboratory for analysis of total and volatile suspended solids, total phosphorus, nitrate-nitrite nitrogen and ammonia nitrogen. Other parameters that are part of the expanded program include dissolved oxygen, temperature and zebra mussel monitoring. Additionally, chlorophyll *a* monitoring has been added to the regiment of

selected lakes. These water quality parameters are routinely measured by lake scientists to help determine the general health of the lake ecosystem.

For more information about the VLMP contact the VLMP Regional Coordinator:

Holly Hudson
Chicago Metropolitan Agency for Planning (CMAP)
222 S. Riverside Plaza, Suite 1800
Chicago, IL 60606
(312) 454-0400

Objective 3: Options for Lakes with Low Dissolved Oxygen Concentrations
Fish and other aquatic organisms need oxygen to live. As water moves past their gills (or other breathing apparatus), microscopic bubbles of oxygen gas in the water, called dissolved oxygen (DO), are transferred from the water to their blood. Oxygen can be present in the water, but at too low a concentration to sustain aquatic life. Oxygen also is needed by virtually all algae and all aquatic plants, and for many chemical reactions that are important to lake functioning. Lake DO concentrations naturally vary and are controlled by several biological, chemical and physical processes.

Dissolved oxygen concentrations in a lake can vary greatly depending on the time of day. This is mainly due to oxygen being produced during photosynthesis and consumed during respiration and decomposition. Because it requires light, photosynthesis occurs only during the daylight hours. Respiration and decomposition, on the other hand, occurs 24 hours a day. This difference alone can account for large daily variations in DO concentrations. During the night, when photosynthesis cannot counter balance the loss of oxygen through respiration and decomposition, DO concentration may steadily decline. DO concentrations are generally lowest just before dawn, when photosynthesis resumes.

More oxygen dissolves into water when wind stirs the water; as the waves create more surface area, more diffusion can occur. Another physical process that affects lake DO concentrations is the relationship between water temperature and gas saturation. Cold water can hold more of any gas, in this case oxygen, than warmer water. As water becomes warmer it holds less and less DO. During the summer months in the warmer top portion of a lake, the total amount of oxygen present may be limited by temperature. Generally this is not an issue as they never become so warm that DO concentrations would drop below 5 milligrams/liter (mg/l) at 100% saturation that would cause moderate impairment for aquatic life. Temperature effects can also cause reduced DO in deeper lakes (usually greater than 10 feet deep) as thermal stratification may cut off all oxygen sources from reaching the lower depths. DO concentrations drop as organisms continue to respire and consume oxygen. The bottom layer of the lake may eventually become anoxic, that is, totally devoid of oxygen. Oxygen losses can also occur in summer if large amounts of plants or algae quickly die, either naturally or as a result of an application of fast acting aquatic herbicides or algaecides. Decomposition is more rapid in the summer due to warmer water temperature, which uses a large amount of DO very quickly, causing a DO crash.

Ice-covered, nutrient-enriched lakes may also develop variations of DO dependent on depth. If there is little or no snow cover to block sunlight, algae and some plants may continue to photosynthesize, resulting in a small increase in DO just below the ice. But as microorganisms

continue to decompose material in the lower water column and in the sediment, they consume oxygen, and the DO is depleted. No oxygen input from the air occurs because of the ice cover, and, if snow covers the ice, it becomes too dark for photosynthesis. This condition can cause high fish mortality during the winter, known as "winter kill." Lakes in this area that do not have at least 25% of their surface area with a depth of at least 10 feet are prone to winter kill.

Options to increase DO in a lake include:

- Option 1: Aeration via Artificial Circulation.
- Option 2: Reduce Lake Phosphorus Concentrations.
- Option 3: Snow Removal from Ice-Covered Lakes.
- Option 4: Increase Lake Depth.
- Option 5: Aquatic Plant Management.
- Option 6: Reduce Organic Matter.

Objective 4: Nuisance Aquatic Plant Management

All nuisance aquatic plant management techniques have both positive and negative characteristics. If used properly, they can be beneficial to a lake's well being. If misused or abused, they all share similar outcomes - negative impacts to the lake. Putting together a good aquatic plant management plan should not be rushed. Plans should consist of a realistic set of goals before implementation. The plan should be based on the management goals of the lake and involve usage issues, habitat maintenance/restoration, and limitations of the lake. For an aquatic plant management plan to achieve long term success, follow up is critical. A good aquatic plant management plan considers both the short and long-term needs of the lake. The management of the lake's vegetation does not end once the nuisance vegetation has been reduced/eliminated. It is critical to continually monitor problematic areas for re-growth and remove as necessary. An association or property owner should not always expect immediate results. A quick fix of the vegetation problems may not always be in the best interest of the lake. Sometimes the best solutions take several seasons to properly solve the problem. The management options covered below are commonly used techniques that are coming into wider acceptance and have been used in Lake County. There are other plant management options that are not covered below as they are not very effective, unreliable, or are too experimental to be widely used.

Options to manage aquatic plants include:

- Option 1: Aquatic Herbicides.
- Option 2: Mechanical Harvesting.
- Option 3: Grass Carp.
- Option 4: Hand Removal.
- Option 5: Water Milfoil Weevil.
- Option 6: Reestablishing Native Aquatic Vegetation.

Objective 5: Nuisance Algae Management

The growth of nuisance or excessive algae can cause a number of problems. Excessive algal growth can cause decreases in water clarity and light penetration. This can lead to several major problems such as loss of aquatic plants, decline in fishery health, and interference with recreational activities. Health hazards, such as swimmer's itch and other skin irritations, have also been linked to nuisance algae growth. Normally, excessive/nuisance algae growth is a sign of larger problems such as

excessive nutrients and/or lack of aquatic plants. Some treatment methods, such as copper sulfate, are only quick remedies to the problem. Solving the problem of nuisance algal growth involves treating the factors that cause the growth, not the algae itself. Long-term solutions typically include an integrated approach such as alum treatments, re-vegetation with aquatic plants, and limiting external sources of nutrients. Interestingly enough, these long-term management strategies are seldom used, typically because of their high initial costs. Instead, the cheap, quick fix of using copper sulfate, though temporary, is much more widely used. However, the costs of continually applying copper sulfate over years, even decades, can eventually far exceed the costs of a slower acting, eventually more effective, integrated approach.

As with aquatic plant management techniques, algae management practices have both positive and negative characteristics. If used properly, they can be beneficial to a lake's well being. If misused or abused, they all share similar outcomes - negative impacts to the lake. Putting together a good management plan should not be rushed. Plans should consist of a realistic set of goals well thought out before implementation. The plan should be based on the management goals of the lake and involve usage issues (beaches, boat ramps, etc.), habitat maintenance/restoration issues, and nutrient levels. For an algal management plan to achieve long term success, follow up is critical. The management of the lake's algae problem does not end once the blooms and/or mats have been reduced/eliminated. It is critical to continually monitor problematic areas for re-growth and treat as necessary. An association or property owner should not always expect immediate results. A quick fix of the algal problem may not always be in the best interest of the lake. Sometimes the best solutions take several seasons to properly address the problem. The management options covered below are commonly used techniques and those that are coming into wider acceptance, and have been used in Lake County. There are other algae management options that are not covered below as they are not very effective, unproven, unfounded, or are too experimental to be widely used.

Options to manage nuisance algae include:

- Option 1: Algaecides.
- Option 2: Alum Treatment.
- Option 3: Re-vegetation With Native Aquatic Plants.

Objective 6: Eliminate or Control Exotic Species

Numerous exotic plant species have been introduced into our local ecosystems. Some of these plants are aggressive, quickly out-competing native vegetation and flourishing in an environment where few natural predators exist. Plants such as purple loosestrife (*Lythrum salicaria*), buckthorn (*Rhamnus cathartica*) and reed canary grass (*Phalaris arundinacea*) are three examples. The outcome is a loss of plant and animal diversity and degradation of habitat. This section will address terrestrial shoreline exotic species.

Purple loosestrife is responsible for the "sea of purple" seen along roadsides and in wetlands during summer. It can spread quickly and dominate a wetland or shoreline due to an extensive root system, large seed production (estimates range from 100,000 to 2.7 million seeds per plant) and high seed germination rate. Buckthorn is an aggressive shrub species that grows along lake shorelines as well as most upland habitats. It shades out other plants and is quick to become established on disturbed soils. Reed canary grass is an aggressive plant species that was introduced to stabilize shorelines. It is found on lakeshores, streambanks, marshes and exposed moist ground. Although it does serve to stabilize shorelines to some extent, it has low food value and does not provide winter habitat for

wildlife. It is very successful in taking over disturbed areas and, if left unchecked, will dominate an area, particularly a wetland or shoreline, in a short period of time. Since it begins growing early in the spring, it quickly outcompetes native vegetation that begins growth later in the year. Control of purple loosestrife, buckthorn and reed canary grass is discussed below. However, these control measures can be similarly applied to other exotic species such as garlic mustard (*Alliaria officinalis*) or honeysuckle (*Lonicera* spp.) as well as some aggressive, weedy native species, such as box elder (*Acer negundo*).

Presence of exotic species along a lakeshore is by no means a death sentence for the lake or plant and animal life. If controlled, many exotic species can perform many of the original functions that they were brought here for. For example, reed canary grass was imported for its erosion control properties. It still contributes to this objective (offering better erosion control than commercial turfgrass), but needs to be isolated and kept in control. Many exotics are the result of garden or ornamental plants escaping into the wild. One isolated plant along a shoreline will probably not create a problem by itself. However, problems arise when plants are left to spread, many times to the point where treatment is difficult or cost prohibitive. A monitoring program should be established, problem areas identified, and control measures taken when appropriate. This is particularly important in remote areas of lake shorelines where the spread of exotic species may go unnoticed for some time.

Options to eliminate or control exotic species include:

- Option 1: Biological Control.
- Option 2: Control by Hand.
- Option 3: Herbicide Treatment.

Objective 7: Enhance Wildlife Habitat Conditions

The key to increasing wildlife species in and around a lake can be summed up in one word: habitat. Wildlife need the same four things all living creatures need: food, water, shelter, and a place to raise their young. Since each wildlife species has specific habitat requirements, which fulfill these four basic needs, providing a variety of habitats will increase the chance that wildlife species may use an area. Groups of wildlife are often associated with the types of habitats they use. For example, grassland habitats may attract wildlife such as northern harriers, bobolinks, meadowlarks, meadow voles and leopard frogs. Marsh habitats may attract yellow-headed blackbirds and sora rails, while manicured residential lawns attract house sparrows and gray squirrels. Thus, in order to attract a variety of wildlife, a mix of habitats is needed. In most cases, quality is more important than quantity.

It is important to understand that the natural world is constantly changing. Habitats change or naturally succeed to other types of habitats. For example, grasses may be succeeded by shrubs or shade intolerant tree species (e.g., willows, locust, and cottonwood). The point at which one habitat changes to another is rarely clear, since these changes usually occur over long periods of time, except in the case of dramatic events such as fire or flood.

In all cases, the best wildlife habitats are ones consisting of native plants. Unfortunately, non-native plants dominate many of our lake shorelines. Many of them escaped from gardens and landscaped yards (i.e., purple loosestrife) while others were introduced at some point to solve a problem (i.e., reed canary grass for erosion control). Wildlife species prefer native plants for food, shelter and

raising their young. In fact, one study showed that plant and animal diversity was 500% higher along naturalized shorelines compared to shorelines with conventional lawns (University of Wisconsin – Extension, 1999).

Options to enhance wildlife habitat include:

- Option 1: Increase Habitat Cover
- Option 2: Increase Natural Food Supply
- Option 3: Increase Nest Availability
- Option 4: Limit Disturbance.

Objective 8: Conduct a Fisheries Assessment

Many lakes have a fish stocking program in which fish are stocked every year or two to supplement fish species already occurring in the lake or to introduce additional fish species into the system. However, very few lakes that participate in stocking check the progress or success of these programs with regular fish surveys. Lake managers should have information about whether or not funds delegated to fish stocking are being well spent, and it is very difficult to determine whether stocked fish species are surviving and reproducing or how they are affecting the rest of the fish community without a comprehensive fish assessment.

A simple, inexpensive way to derive direct information on the status of a fishery is to conduct a creel survey that evaluates the types, numbers and sizes of fish caught by anglers actively involved in recreational fishing on the lake. Such information provides insight on the status of fish populations in the lake, as well as a direct measure of the quality of fishing and the fishing experience. However, the numbers and types of fish sampled by anglers are limited, focusing on game and large, catchable-sized fish. Thus, in order to obtain a comprehensive assessment of the fish community status, including non-game fish species, more quantitative methods must be employed. These include gill netting, trap netting, seining, trawling, angling (hook and line fishing) and electroshocking. Each method has its advantages and limitations, and frequently multiple gear and approaches are employed. The best gear and sampling methods depend on the target fish species and life stage, the types of information desired and the environment to be sampled.

The best time of year to sample fish depends on the sampling method, the target fish species and the types of data to be collected. In many lakes and regions, the best time to sample fish is during the fall turnover period after thermal stratification breaks down and the lake is completely mixed because (1) the young of the year (YOY) and age 1+ (one year or older) fish of most target species should be present and vulnerable to most standard collection gear, including seines, trap nets and electroshockers; (2) species that dwell in the hypolimnion during the summer may be more vulnerable to capture during fall overturn; and (3) lower water temperatures in the fall can help reduce sampling-related mortality. Sampling locations are also species-, life stage-, and gear-dependent. As with sampling methods and time, locations should be selected to maximize capture efficiency for the target species of interest and provide the greatest gain in information for the least amount of sampling effort.

The Illinois Department of Natural Resources (IDNR) will perform a fish survey at no charge on most public and some private water bodies. In order to determine if your lake is eligible for a survey by the IDNR, contact a Fisheries Biologist, at (815) 675-2319.

Objective 9: Alleviate Excessive Numbers of Canada Geese (Branta canadensis)
Canada geese are migratory waterfowl common throughout North America. Geese in urban areas can be undesirable primarily due to the large amount of feces they leave behind. Recreational activities on lawns and parks are impeded due to goose feces. Large amounts of feces may end up in the water, either directly from geese on the water or rainwater runoff from lawns where feces have accumulated. Goose feces are high in organic phosphorus that can contribute to excessive algae growth in lakes. This may inhibit other recreational activities such as boating or swimming, as well as create poor habitat for fish and wildlife, and possibly bad odors when the algae decays.

Geese become problematic for many reasons. They seek locations that have open water, adequate food supplies and safety from predators. If these factors are present, geese may not migrate. Since geese exhibit a high level of site fidelity, they return to (or stay at) the same area each year. Thus, adults will likely come back to the same area year after year to nest. If conditions remain optimal, one pair of geese can quickly multiply causing additional problems. Increased development in Lake County has inadvertently created ideal habitat for goose populations. Manicured lawns mowed to the edge of lakes and detention ponds provide geese with open areas with ample food and security. Other conditions that encourage goose residency include open water during winter (primarily the result of aerators in lakes and ponds), mild winters and people feeding birds with bread or other food.

Large populations of geese pose a potential disease threat both to resident and wild populations of waterfowl. This problem may be more serious in residential populations since these birds stay in one area for long periods of time and are more likely to transmit any disease to neighboring groups of geese. There is no threat of disease transmission to humans or domestic dogs and cats since most of the diseases are specific to birds.

Options to alleviate excessive numbers of geese include:

- Option 1: Removal.
- Option 2: Dispersal/Repellent Techniques.
- Option 3: Exclusion.
- Option 4: Habitat Alteration.
- Option 5: Do Not Feed Waterfowl!

Objective 10: Beaver Management
The beaver (*Castor canadensis)* is the largest rodent in North America. Adults typically weigh 40-50 pounds, but may weigh over 90 pounds. Beavers make their homes in lodges or dens along a lake or streambank. They can live in a small group of two or in larger colonies of five or more. Beavers generally confine their activities to an area within 1/2 mile of their lodge or den.

Beavers were common in Illinois prior to the 1900's. Extensive hunting and trapping in the late 1800's and early 1900's nearly extirpated the beaver from the state. However, conservation efforts, including hunting and trapping laws and reintroduction programs, in the middle 1900's successfully brought the populations back. Currently, beavers are found throughout Illinois.
Beavers are frequently blamed for destroying valuable shrubs and trees and flooding yards and farm fields. In a lake, beavers may dam a culvert or a stream causing lake water levels to rise or fall depending on the directional flow of the culvert or stream. On many lakes, beavers do not build dams since the water level is deep enough. In these cases they build lodges along the shoreline.

Beavers provide many benefits as well. Their engineering skills benefit natural environments by creating wetlands, pools and other habitats favored by many other wildlife species including waterfowl, other mammals, amphibians and fish. Several endangered species also benefit from habitats created by beaver.

Options for beaver management include:

- Option 1: Exclusion.
- Option 2: Removal.
- Option 3: Habitat Alteration.

Objective 11: Controlling Excessive Number of Carp

A frequent problem that plagues many of the lakes in the County is the presence of common carp (*Cyprinus carpio*). Common carp were first introduced into the United States from Europe in the early 1870's, and were first introduced into Illinois River systems in 1885 to improve commercial fishing. The carp eventually made their way into many inland lakes and are now so wide spread that many people do not realize that they are not native to the U.S.

Carp prefer warm waters in lakes, streams, ponds and sloughs that contain high levels of organic matter, a common condition in many lakes in Lake County. Carp feed on both plant and animal matter by rooting through the bottom sediment. Because their feeding habits cause a variety of water quality problems, carp are very undesirable in lakes. Rooting around for food causes re-suspension of sediment and nutrients, which can both lead to increased turbidity. Additionally, spawning, which occurs near shore in shallow water, can occur from late April until June. The spawning activities of carp can be violent, further contributing to turbidity problems. Adult carp can lay between 100,000 –500,000 eggs, which hatch in 5-8 days. Initial growth is rapid with young growing 4 ¾" to 5" in the first year. Adults normally range in size from 1-10 lbs., with some as large as 60 lbs. Average carp lifespan is 7-10 years, but they may live up to 15 years.

There are several techniques to remove carp from a lake. However, rarely does any technique completely eradicate carp from a lake. Commonly, once a lake has carp, it has carp forever. However, it is up to the management entity to dictate how big the problem is allowed to become. Rotenone is the only reliable piscicide (fish poison) on the market at this time, but it kills all fish that is comes into contact with. Currently, there is a rotenone laced baiting system that can selectively remove carp. While the process is a step in the right direction, several factors still need to be worked out in order for it to be a viable alternative to the whole lake treatment. Until this baiting technique is further developed and produces consistent results, it is not being recommended by the LMU at this time.

Options for controlling excessive numbers of carp include:

- Option 1: Rotenone (Rotenone is a piscicide).
- Option 2: Lake drawdown and removal.
- Option 3: Selective removal via fish sampling (nets, electrofishing gear, etc).

Lakes Summary

All lake management techniques have both positive and negative characteristics. If used properly, they can all be beneficial to a lake's well being. If misused or abused, they all share similar outcomes - negative impacts to the lake. Putting together a good lake management plan should not be rushed. The plan should be based on realistic management goals of the lake and involve usage issues, habitat maintenance/restoration, and limitations of the lake. For a lake management plan to achieve long term success, follow up is critical. An association or property owner should not always expect immediate results. A quick fix of the problems may not always be in the best interest of the lake. Sometimes the best solutions take several seasons to properly solve the problem.

Septic Tank Maintenance and Repair

Septic, or on-site waste disposal systems are the primary means of sanitary flow treatment in the unincorporated parts of a watershed. Because of the prohibitive cost of providing centralized sewer systems to many areas, septic tank systems will remain the primary means of treatment into the future. Annual maintenance of septic sewer systems is crucial for their operation, particularly the annual removal of accumulated sludge. The cost of replacing failed septic tanks is very high, about $15,000 per unit. Property owners are responsible for their septic sewer systems and all septic systems require new permits every few years. When septic systems fail, untreated sanitary flows are discharged into open watercourses that pollute the water and pose a potential public health risk. Septic systems discharging to the ground surface are a risk to the public health directly through body contact or contamination of drinking water sources, provide conditions favorable to insect vectors such as flies and mosquitoes, and contribute significant amounts of nitrogen and phosphorus to the watershed.

The following information on individual sewage disposal and septic inspections has been provided by the Lake County Health Department.

Individual Sewage Disposal Program (ISD)

The Lake County Health Department's (LCHD) Individual Sewage Disposal Program (ISD) regulates the use of septic systems in the County for both residential and commercial properties. The LCHD must review plans for new septic systems and/or additions or alterations to homes that affect on-site wastewater systems in unincorporated or incorporated areas of Lake County where sanitary sewer is not yet available. This review process is required by County Ordinance Article V and is intended to protect public health from nuisances and hazards associated with sewage disposal.

The ISD program offers a wide array of services used in siting, planning and installing septic systems. The LCHD's trained staff of sanitarians, soil scientists, plan reviewers, and administrators facilitate the communication process in the regulation of ISD permits between the homeowner, design engineers and septic contractors.

Well and Septic Evaluations

The LCHD will perform well and septic evaluations at existing properties. These services are most often requested when a property transaction (either a sale or a refinancing) is taking place, and in

many cases is required by a lender and/or buyer. A fee for this service is charged, per Lake County Board of Health Ordinance Article XIII.

The evaluation begins with a thorough search of all LCHD records to determine if a plan of the septic system is available, and if there were any past requests for service regarding the property. Requests for service include previous septic evaluations, property additions/alterations and any complaints that may have been referred to the LCHD. A summary of any relevant information that LCHD finds in their records will be included in the report.

An on-site evaluation is then made during which LCHD staff visually inspect the components of the septic system for any signs of past or present failures (where sewage reaches the ground surface). If the condition of the septic system is questionable, LCHD staff may dye the system to better assess its function, or collect samples from the ground surface if liquid is present. They may also, in the report of the evaluation, recommend that a licensed septic contractor further evaluate the septic system.

If requested, LCHD staff will also inspect the condition of the water well, and if it is sound, will collect a water sample for laboratory analysis. The sample will be analyzed for coliform bacteria and nitrates, indicators of contamination of the water supply. A report of the evaluation will then be generated, stating the Department's findings at the time of the evaluation. It is not, however, a guarantee that the septic system and/or well will continue to function properly in the future.

Individual Sewage Disposal (ISD) Inspections

The LCHD inspects new septic system before, during and after construction. Inspections are completed by LCHD staff sanitarians working with Lake County's Licensed Septic Contractors The purpose of the inspections is to ensure property owners that installations are completed in accordance with the Lake County Board of Health Ordinance Article V, governing Individual Sewage Disposal systems. The LCHD attempts to inspect during each stage of the construction of a septic system serving a residence or commercial establishment.

Maintenance Tips for Homeowners

The most useful tip for septic system maintenance is to routinely pump solids from the septic tank. The pumping frequency is related to usage, however the sludge (settled solids) and scum (floating solids) depth should never exceed 1/3 of the total depth. For older systems, pumping frequency should be every 2-3 years.

Usage is an important factor, especially for smaller lots common in lake areas. In general, Homeowners should try to conserve water use, and avoid surge loading (i.e., many consecutive loads of laundry). Homeowners should never dispose of chemicals through a septic system, and should avoid food products, such as those produced by trash disposals, and materials that are not readily degradable, such as condoms, cigarette butts, etc. It is especially important that clearwater discharges from sumps or water softeners not be directed into the septic system. Routine use of most household chemicals should not harm the system.

To protect the seepage system, homeowners should avoid traffic, and excessive cutting or filling over the system. Grass cover should be maintained for insulation and warmer season

evapotranspiration (the total moisture that leaves an area by evaporation from soil, snow, and water surfaces plus that transpired by plants). Stormwater flows overland or from sumps and gutters should not be discharged across the seepage areas.

Septic systems that discharge to the ground surface are a risk to the public health directly through body contact or contamination of drinking water sources. Septic systems can also provide conditions favorable to insect vectors such as flies and mosquitoes, and may contribute significant amounts of nitrogen and phosphorus to a watershed. Therefore, it is imperative that homeowners don't ignore septic failures. If plumbing fixtures back-up or will not drain, the system is failing. It is illegal to discharge laundry or other graywater to the surface.

Typically in Lake County, lake area lots are at high risk for sewage and septic-related problems. The sites are generally very small, restricting the area available for wastewater treatment. Plus, urban-type population density in the lake areas (which also typically have older septic systems) increases the health risks. The Lake County Health Department is actively exploring ways to better address the existing and anticipated problems in these difficult areas, viewing the individual septic systems as a single wastewater treatment "system".

Detention Basin Retrofits

The goal of many detention basin retrofitting is to enhance a basin's water quality values. This is accomplished by changing the basin's functional design so it collects and filters sediment and other pollutants from stormwater while it is being stored. Existing detention basins can be retrofitted in several ways to improve water quality. Water flows can be adjusted by reducing release rates for more frequent rain events to provide more time for settling. For even better results, the outlets on dry bottom detention basins can be altered to create wet bottom (or wetland) basins that significantly improve water quality. Wet detention basins hold some level of water all of the time. Wet basins can store the first flush of runoff from impervious surfaces and allow sufficient time for sediment and other solids to settle out to the bottom of the basin. This settling process results in cleaner water being discharged from the basin than the inflow stormwater. Wetland plants in the basin aid in the water cleaning process by trapping, absorbing and transforming nutrients, solids and metals from the inflow stormwater. Therefore, the primary detention basin retrofit goals are to increase the residence time for stormwater in the basin so that pollutants can settle out; and using deep-rooted native plants around the basin to filter, absorb and transform pollutants and reduce erosion.

Redesigned detention basins also offer opportunities for improving the aesthetics of the basin, discouraging nuisance geese and providing habitat for other wildlife. Turf grass on the side slopes can be replaced with deep-rooted native vegetation to stabilize slopes and discourage nuisance geese and related pollution. For the best results, all of these techniques can be combined along with excavation of micro-pools and establishment of wetland vegetation in the basin to provide multiple benefits. Constructed wetland detention basins (detention wetlands) use features found in natural wetlands and lakes. They are designed with shallow shoreline slopes, emergent wetland vegetation and open water areas. Detention wetland designs allow for water quality improvement through filtration of runoff by vegetation and by allowing water to pool so sediment can settle out. Detention wetlands also provide more habitat for plants and animals, and are often more aesthetically pleasing. Detention wetlands generally require less maintenance than traditional

designs, and are also less attractive to nuisance geese (Price and Dreher 1995, 1997; Price, Dreher and Schaal 1994; Terrene Institute 1994)

Most of the detention basins within the Flint Creek watershed are constructed to temporarily store excess stormwater runoff to reduce flood peaks. When properly designed, constructed and maintained, detention basins control stormwater release rates from developed sites. Although many were originally constructed as single purpose facilities for flood reduction, many of these basins can be retrofitted to significantly reduce water pollution from lawns, streets, sidewalks, parking lots and rooftops before it is discharged into the river.

Flint Creek Watershed Detention Basin Inventory
LCSMC conducted a detention basin inventory in the Flint Creek watershed in 2007 to document existing conditions in the basins, and to identify opportunities for detention basin retrofits. During the inventory, detention basins were physically located, photographed and identified as one of three design types: dry bottom, wet bottom, and wetland. In addition to identifying basin type, location and pollutant removal effectiveness, maintenance and design problems such as shoreline erosion, clogged inlets/outlets and short-circuiting (water rushing straight through the basin rather than being stored for a period of time), and potential retrofit and restoration opportunities were recorded. Section 3.11: Design Drainage System contains a detailed summary of detention basins in the watershed.

Detention Basin Inventory Findings
Appendix F contains a table that includes a description for each detention basin that was inventoried in the Flint Creek watershed. In general, provided there are no design problems such as short circuiting, wet bottom and wetland detention basins are considered to have positive water quality benefits (or 'good' pollutant removal effectiveness). All dry bottom detention basins are assumed to have poor pollutant removal effectiveness, unless specifically designed with water quality features (such as sand filters).

Key Problems with Detention Basin Design and Maintenance

Several key design and maintenance problems are:

Shoreline and side slope structure and condition: Steep sideslopes are more likely to contribute to erosion and can present potential safety hazards. Another problem seen was sideslopes overgrown with herbaceous weeds (i.e. reed canary grass or purple loosestrife) and excess woody vegetation.

Turf grass: Turf grass is a poor choice for use in wet detention basins. It is relatively intolerant of frequent wetting and drying, conditions common to detention basins. Turf grass also attracts nuisance geese.

Turbidity: Turbidity problems are most likely due to shoreline erosion or erosion upstream of the basin.

Excess algae: Problems are likely due to nutrient loading from upstream and surrounding land uses.

Excess sediment accumulation: Sediment accumulation reduces the available volume for water storage.

Inlet or outlet problems: Most of the problems identified include litter and clogging in outlets.

Concrete channels: These channels immediately pass runoff (with pollutants) downstream rather than allowing it to be filtered by vegetation. Concrete channels also preclude low flow runoff from infiltrating into the ground.

Poor drainage: Refers to wet conditions in areas that were intended to be dry bottom basins, or poor drainage near inlets/outlets.

Access problems: Refers to basins that could not be inventoried due to no trespassing signs, electric fencing, heavy construction activity, or other difficulties for access.

Missing basins: Two detention basins were not located where indicated.

Potential Detention Basin Retrofit Opportunities for the Flint Creek watershed

Several different types of retrofit opportunities were identified during the detention basin inventory:

Create wet or wetland basin: Dry basins can be converted to wetland basins by excavating portions of the basin bottom to create wetland pockets and/or redesigning the outlet to allow for some water retention and planting wetland vegetation. Settling (or stilling) basins could be installed at the inlets and the basins planted in native vegetation. The increase in pollutant removal effectiveness will be a function of the volume of stormwater stored as the first flush size and the length of time it is stored. The excavated wetland pocket(s) as well as the extent to which native vegetation is used in the basin and buffer areas will also be determinants in pollutant removal effectiveness.

Remove concrete channels: Concrete channels could be removed and converted to vegetated swales or filled in to allow water to spread out throughout the basin. After the concrete is removed, the newly created swale should be planted in native vegetation to improve infiltration and pollutant removal rates.

Clean clogged inlets and outlets: Clogged inlet and outlet structures collect trash and fill up with sediment that can back up water upstream. Trash racks could be installed to limit trash collecting in pipes. Inlets and outlets should be routinely monitored for obstructions.

Stabilize shorelines and improve/expand buffers: Shorelines of wet basins with erosion problems could be stabilized using native vegetation. Eroding shorelines within the basin can contribute to the amount of sediment, nutrients and other pollutants eventually draining downstream. Native vegetation buffers should be established around the perimeter of all basins where possible to stabilize shorelines, discourage nuisance geese (and their pollution contribution) and filter pollutants. In many cases, buffers can be expanded to provide improved filtering functions and greater wildlife habitat.

Replace turf grass with native vegetation: Turf grass is relatively intolerant of water level fluctuations and is maintenance intensive. In addition, it is not as effective as native vegetation for filtering, absorbing and transforming pollutants in runoff. For these reasons, strong consideration

should be given to replacing turf grass with native vegetation in detention basins throughout the watershed.

Stop applying blue dye: Blue dye decreases light penetration for aquatic plants, which can lead to algal blooms and decreased water clarity.

Reduce woody vegetation cover: Woody vegetation can shade suppress and reduce cover of understory herbaceous plants, which have deep fibrous root systems to hold soil in place. Exotic woody plants such as buckthorn and honeysuckle spread quickly and should be controlled, if not eliminated.

Remove algae: Excessive algal growth decreases water clarity (increased turbidity) and prevents light from penetrating deeper waters to promote healthy aquatic plant growth. Algae can be removed over a short period of time using copper sulfate algicide treatments, or over a longer period of time using a combination of ecologically sensitive methods such as alum treatments, aquatic plant vegetation, and nutrient control. These longer term methods are recommended over quick fixes and will typically cost less over time than repeated copper sulfate treatments.

Outfall Retrofits

Creating Wetland Meanders

Outfalls, especially stormsewer pipes, can be retrofitted to add water quality benefits. One technique for retrofitting outfalls is to daylight stormsewers so they flow through created pocket wetlands or wetland meanders before the stormwater is discharged to the stream. The created wetlands filter pollutants from the runoff and dissipate energy before the water reaches the stream. The Village of Barrington has successfully used this technique on Flint Creek. For more information on the design of created wetland meanders, contact John Heinz, Public Works Director for the Village of Barrington at 847-381-7903.

End-of-Pipe Retrofits

End-of-pipe retrofits can also be used to filter runoff before discharging it to the stream. Sand filters are underground vaults that have a number of chambers with different media that remove pollutants from stormwater runoff. For this reason they are also known as a multi-chamber treatment train (MCTT). In a sand filter, the first chamber is usually empty or filled with water and is used to capture heavier solids. The second chamber contains sand or other filter media that removes smaller solids and dissolved and organic materials. Sand filters are moderately to highly effective for pollutant removal and can last for an extended period of time although they can require significant maintenance. MCTT filters have also been designed to use other filter media such as compost or peat.

Several proprietary retrofit products (such as Stormceptors and others) use cyclonic action to remove pollutants from stormwater runoff. These retrofits are used primarily on small, highly impervious sites, such as parking lots. A typical unit incorporates a circular holding tank that receives runoff from a flow diversion structure and allows solids to settle out. The normal flows are treated and high peak flows by-pass the unit to the downstream drainage network. The unit can trap sand, oil and grease reasonably if the tank is regularly cleaned and maintained (Claytor 1999).

An oil and grit separator is an underground structure with multiple chambers to remove pollutants from stormwater runoff at very small sites. The typical separator contains three chambers, one dry and two wets. The first chamber has a permanent pool of water and a trash rack designed to trap grit, coarse sediments, trash and debris. Two 6" orifices open out from behind the trash rack to pass water to the second chamber. Water can also pass over the chamber wall from the first to the second chamber. An inverted elbow pipe drains the second chamber to the third chamber. It is expected that the oil and grease will initially float on the surface in the second chamber and then adhere to suspended particles, which eventually settle to the bottom of the chamber. The contents of both chambers should be removed on a quarterly basis as part of normal maintenance. Recent study has suggested that pollutant removal performance of oil/grit separators is extremely limited (Shepp 1995).

Streambank Stabilization

Streambank erosion is a problem for streams in the Flint Creek watershed that has the potential to become more severe. Streambank erosion results in a number of problems including poor water quality (because of high sediment loads), loss of terrestrial habitat (due to land loss) and degradation of aquatic habitat (loss of aquatic vegetation and clean substrate when deposited sediment buries the streambed).

Streambank erosion can be reduced using a number of techniques that range from soft, natural solutions such as native vegetation to hard solutions like rock riprap. The preferred technique for streambank stabilization is soil bioengineering. Soil bioengineering utilizes living plant materials as the primary component of a structural system. The end result is a mechanically stable native plant community that is capable of self-repair over time.

With soil bioengineering, native vegetation can be used alone or in combination with harder structures such as natural boulders. The use of native vegetation alone is a relatively low-cost method for stabilizing streambanks that is most effective in lower velocity portions of the river. Combining native vegetation with structural measures such as natural boulders can stabilize streambanks where volumes and velocities are higher.

In cases where the volume and energy of the stormwater flow is extreme, a bioengineering solution may not be effective. In this case, rock outlet protection or riprap may be the most effective technique. Rock outlet protection refers to the use of riprap or stone underlain with filter fabric to prevent erosion or scour where a stormsewer or other outfall drains into the river.

1.3 Watershed Protection Tools to Minimize Flood Damage

1.3.1 Preventative Measures: Keep Flood Damage from Expanding

Flood prevention techniques seek to prevent flooding problems before they occur. Flood prevention techniques take the form of land use controls that include programmatic/regulatory controls and implementation of infiltration techniques in existing and new developments. Regulatory controls such as zoning, floodplain, and stormwater ordinances seek to prevent flood damages by limiting development in areas where flooding is most likely to occur, and by

standardizing stormwater runoff requirements for new developments. Infiltration techniques, whether applied to old or new developments, decrease runoff that can lead to flooding.

Programmatic/Regulatory Controls

Zoning Ordinances
Zoning ordinances regulate development by dividing a community into zones or districts and then setting development criteria for each district. Zoning can be used to control where new development or redevelopment occurs, so that new flood problems are not created and existing flood problems are not worsened. Two zoning approaches can be used to prevent inappropriate development in floodprone areas. They involve establishing separate zoning districts or using overlay zoning. Separate districts designate floodplain as a special zoning district that only allows development that is not susceptible to flood damage, such as recreational uses, conservation or agriculture. Overlay zoning adds special development limitations to the underlying zoning (i.e. residential, commercial, industrial etc.) in areas subject to flooding.

Floodplain and Stormwater Ordinances
In addition to zoning ordinances, regulations that restrict construction in floodplains are usually found in one or more of the following documents: subdivision ordinances, building codes, and/or separate "stand-alone" stormwater ordinances. If the zoning for a site allows a structure to be built, then the applicable subdivision and building regulations will impose construction standards to protect buildings from flood damage, and will require compensatory storage to prevent the development from aggravating an existing flooding problem. Subdivision ordinances specifically govern how land will be subdivided into lots, and set standards for infrastructure provided by the developer including roads, sidewalks, utilities, stormwater detention, stormsewers and drainage ways. Building codes should establish flood protection standards for all structures.

The Illinois Department of Natural Resources (IDNR) regulates development in the floodplain through a statewide permit program. All development in floodplains requires a permit. The Lake, McHenry, and Cook County watershed ordinances restrict development in mapped floodways and limits development in the 100-year floodplain. Lowest floor elevations (including basements) must be a minimum of 2 feet above the base flood elevation (BFE) for residential structures constructed in the floodplain. Non-residential structures must also meet these lowest floor elevation requirements, or be dry-floodproofed to 2 feet above the BFE. In addition to elevating the structures, compensatory storage must be provided for water storage lost due to floodplain fill at a ratio of 1.2:1 for riverine floodplain and 1:1 for depressional floodplain.

Several developments in the Flint Creek watershed were constructed before stormwater ordinances became effective; therefore ordinance requirements for detention and water quality treatment did not apply to these areas. However, ordinances apply to both new developments and redevelopment projects, the ordinance flood prevention and water quality provisions have the potential to improve conditions in redeveloped areas or areas where homeowners desire significant improvements to their structures.

Table 6. WDO Runoff Volume Reduction Hierarchy.

1. Preservation of natural resource features of the development site (e.g. floodplains, wetlands, isolated Waters of Lake County, prairies and woodlands).
2. Preservation of the existing natural streams, channels, and drainageways.
3. Minimizing impervious surfaces created at the site (e.g. narrowing road width, minimizing driveway length and width, clustering homes, and shared driveways).
4. The use of open vegetated channels to convey stormwater runoff.
5. Preservation of the natural infiltration and storage characteristics of the site (e.g. disconnection of impervious cover and on-lot bioretention facilities).
6. Structural measures that provide water quality and quantity control.
7. Structural measures that provide only quantity control and conveyance.

Watershed ordinances emphasize the use of detention as the primary stormwater management control measure for Lake County. Detention is used to prevent an increase in the rate of runoff from a site after it is developed, and is the designated measure to achieve recommended post-development release rates. The release rate requirements apply to all developments and vary depending on the ordinance and County.

Floodplain Acquisition
Floodplain acquisition can be an effective tool for reducing future flooding because it prevents developments in the floodplain. In addition to eliminating floodplain development and the resulting flood damages, floodplain acquisition can provide multiple benefits with the addition of amenities such as greenways, recreational trails, river access points and wildlife habitat corridors.

Infiltration Techniques for Existing Developments

Natural Landscaping
One technique for reducing runoff (and thereby preventing new flooding problems) is the use of natural landscaping. Natural landscaping utilizes deep-rooted native vegetation such as grasses, wildflowers and wetland plants rather than turf grass in both new and existing developments. Natural landscaping has a number of benefits:

- It promotes increased infiltration of stormwater thereby reducing runoff.
- It filters runoff and improves water quality.
- Native vegetation and natural landscaping provides habitat for plants and animals.
- It costs less to install and maintain than conventional landscaping.

Larger sites where native vegetation could be used include: institutional sites such as schools, churches and hospitals; office and industrial parks; housing developments; community parks; and golf courses. In addition to larger sites, native vegetation also is an appropriate replacement for traditional lawns and gardens on individual residential and commercial lots and can be very effective at infiltrating runoff from rooftops, decks, driveways and parking lots. Local landscaping and weed

ordinances may need to be revised to allow for - and promote - the use of native vegetation. (Northeastern Illinois Planning Commission 1997; USDA Natural Resources Conservation Service, 1997; Buslaff 1997; Highland Park Environmental Commission 1998).

Permeable Paving Blocks and Porous Pavement

Another way to reduce runoff from a site is to use permeable paving blocks or porous pavement. Permeable paving blocks contain openings that are filled with soil and planted with vegetation. Porous pavement uses large size aggregate material so that precipitation can rapidly infiltrate into the ground. Permeable paving blocks and porous pavement are effective techniques when used in low traffic areas such as emergency drives, overflow or seasonal parking lots and residential driveways. Using permeable paving blocks and porous pavement can reduce runoff volumes and pollutant loadings (Dreher and Price 1997).

Infiltration Devices

Infiltration trenches and basins are two similar runoff reduction devices. Infiltration trenches and basins are excavated depressional areas where stormwater runoff is directed. Infiltration areas are planted with appropriate vegetation (also referred to as bio-infiltration or bioretention practices) or covered with decorative rock. Both infiltration trenches and basins reduce runoff and recharge groundwater, thereby decreasing the need for stormwater storage. Bioretention/infiltration practices not only provide water quantity control benefits, but also improve water quality. These types of practices are especially appropriate as designed "rain gardens" that have the added advantage of being aesthetically pleasing. Individual yards and business sites can be designed or retrofitted to include bioretention practices.

Infiltration devices can be used in the Flint Creek watershed with a few limitations. First, they may freeze up in winter making them temporarily ineffective. Designs should include a backup system for this circumstance. They may also require a sediment trap to reduce the frequency of clogging. More importantly though, infiltration trenches and basins require permeable soils (hydrologic soil groups A and B). When properly installed on sites with permeable soils, infiltration devices can be an effective tool for reducing the runoff rate, volume and pollutant loads (Dreher and Price 1997, Department of Environmental Resources Prince George's County, 1997).

<u>Infiltration Techniques for New Development</u>

Natural Drainage Measures

A series of features that can be used in new development sites (and larger redevelopment sites) throughout the watershed are 'natural' drainage measures. Natural drainage measures use vegetated swales, filter strips and other techniques that absorb, filter and convey runoff. Natural drainage measures can significantly reduce runoff volumes by allowing infiltration of stormwater, while conventional drainage systems (e.g. stormsewers, concrete-lined channels, or curbs and gutters) accelerate the delivery of runoff to the receiving water. In addition to infiltration benefits, natural drainage measures can remove pollutants from runoff by using vegetation to filter and absorb pollutants. Natural drainage measures often cost less to build than conventional drainage systems, and the use of native vegetation with natural drainage practices requires less maintenance and provides wildlife habitat.

Impervious Area Reduction
The greater the amount of impervious surface, the greater the runoff volume will be from a site. In fact, CMAP (formerly NIPC) estimates that, on an annual basis, stormwater runoff volumes from impervious surfaces such as parking lots are four times as great as the volume off of lawns (Dreher and Price 1997). Along with the increased amounts of runoff, there are also greater amounts of nonpoint source (NPS) pollutants carried in the runoff.

Studies indicate that there is a direct relationship between the amount of impervious surface in a watershed and the quality of the receiving stream (Table 7).

Table 7. Relationship between Impervious Cover and Stream Quality.

Impervious Cover	Stream quality
0 -10%	good (stressed)
11 - 25%	fair (impacted)
>25%	low (degraded)

Source: Schueler and Claytor (1997)

There are several ways to reduce imperviousness through the use of alternative site designs.

Alternative Site Designs
Alternative site design techniques are approaches that can be used for new developments and redeveloped sites. Alternative site designs use a series of best management practices to:

- Reduce the amount of impervious surface area on the development site thereby reducing the amount of stormwater runoff and the risk of new flooding.
- Preserve the natural infiltration and storage characteristics of a site.
- Improve the water quality of runoff from a site by using the landscape to filter and infiltrate runoff.

Alternative site designs incorporate runoff reduction strategies, water quality enhancements, and protect more open space for infiltration and recreational opportunities. Alternative site designs use the following techniques: maintain the natural drainage system; use vegetated swales rather than traditional curb, gutter and stormsewer; reduce the percent of impervious surface; and cluster buildings (Dreher and Price 1997; Price, Dreher and Schaal 1994; Terrene Institute 1994; Schueler 1995; Arendt 1996).

Alternative Streetscapes
Alternative streetscapes are most often recommended and used in residential developments. Designing the development to include smaller turnarounds, narrower streets, narrower sidewalks and shorter setbacks are examples of impervious reduction practices in alternative streetscapes. Residential streets should be designed for the minimum required pavement width needed to support travel lanes, parking, emergency and service vehicles, and should be based on the volume of traffic. Excessive pavement widths make streets the largest single component of impervious cover in a subdivision, therefore, narrowing streets can significantly reduce the amount of impervious surface. For example, reducing lower density residential street widths from 32 to 20 feet will result in an approximate 18% reduction in impervious surface for a typical ¼ acre lot subdivision, and a 6% reduction in impervious area over an entire watershed (Table 8). Examples of narrow residential

Table 8. Innovative site planning techniques and their effect on impervious cover.

	Strategy	Impervious Reduction (%)
1	Reduce residential sidewalks by 50% by installing sidewalks on only 1 side of the street	1.3
2	Reduce residential sidewalks from 5 feet to 4 feet width	0.5
3	Reduce local access street widths from 32 feet to 27 feet	2.5
	Reduce local access street widths from 32 feet to 25 feet	3.5
	Reduce local access street widths from 32 feet to 20 feet	6.0
4	Reduce commercial parking by 5 percent	2.7
	Reduce commercial parking by 10 percent	5.3
	Reduce commercial parking by 20 percent	10.7
5	Reduce multifamily parking by 5 percent	0.7
	Reduce multifamily parking by 10 percent	1.5
	Reduce multifamily parking by 20 percent	3.0
6	Reduce commercial, industrial and multifamily roof areas by 10 percent	4.3
	Reduce commercial, industrial and multifamily roof areas by 20 percent	8.5

Source: Center For Watershed Protection (Draft).

street widths range from 16-20 feet with no parking, to 26-28 feet with parking. "Several national engineering organizations have recommended that residential streets can be as narrow as 22 feet in width (AASHTO, 1994; ASCE, 1990) if they serve neighborhoods that produce low traffic volumes (less than 500 daily trips, or 50 homes)" (Center for Watershed Protection 1998). Narrower streets also tend to discourage cut-through traffic and speeding. Turnarounds offer another opportunity to reduce unnecessary street pavement. A hammerhead design requires the least amount of pavement. Additionally, cul-de-sacs can be constructed with a smaller radius and the center can be recessed, left open and landscaped for runoff infiltration and snow storage in the winter.

Another significant reduction in impervious area can be achieved by reducing building setbacks. Reduced setbacks result in shorter driveways and less impervious surface. For example a 30-foot setback decreased to 20 feet still allows sufficient length for parking in the driveway. However, it eliminates 10 feet of wasted driveway space (and impervious surface) that was too short for another car length. This design practice adds the benefit of more back yard, which tends to be utilized for "living space" more than front yard areas.

Sidewalk area can also be decreased to reduce imperviousness without losing functionality. For example, sidewalks can be narrowed from 5 feet to 4 feet in residential areas, and/or only installed on one side of the street. Another option for reducing paved area is to design pervious paths located away from the streetscape as an alternative to traditional sidewalks. Overall, combining the above reductions in impervious area from narrower streets, smaller turnarounds, shorter setbacks and narrower sidewalks will result in a significant reduction in imperviousness within a development (Dreher and Price 1997).

Alternative Parking Lot Designs

Alternative parking lot designs that reduce impervious surface can be used in most types of non-residential developments and some multi-family developments. These "green" parking lots use techniques to reduce parking lot runoff by either reducing the size of the paved parking lot, or designing the parking lot to catch and infiltrate runoff. Several techniques used to reduce the size of parking lots include:

- reviewing and updating peak parking demand assumptions to make sure that allocated parking is actually needed and being used;
- banking parking for new developments rather than constructing a parking lot that will initially be oversized;
- reducing the size of some of the parking stalls for smaller vehicles;
- sharing parking lots between users.

Parking lot designs that increase infiltration usually incorporate excavated islands or swales between rows of cars where runoff is directed through curb cuts. The vegetated swales infiltrate and filter the runoff, thereby reducing the volume of stormwater directed to stormsewers. Alternative parking lot designs frequently cost less to build and maintain than traditional lots. For example, bio-swales used in a parking lot at the Oregon Museum of Science and Industry resulted in a $78,000 savings compared to a conventional lot design (USDA Natural Resources Conservation Service 1997).

When the techniques described in this section are used together on a development site to reduce runoff, this is referred to as a runoff volume reduction hierarchy. The goal of this hierarchy is to maintain runoff volumes and rates from the developed site as close as possible to pre-development conditions. When these techniques are combined with an integrated on-site system to also improve water quality, this system is called a treatment train. The goal of the treatment train is to reduce pollutants in urban stormwater runoff to the maximum extent possible through the use of multiple stormwater management techniques.

1.3.2 Remedial Measures: Fixing Flood Damage

Flooding and other water quantity problems can be reduced by both structural and non-structural means. Structural flood control measures require the building of structures such as reservoirs, levees and floodwalls to control the flow of floodwaters and to reduce flood damages. Non-structural measures include practices such as acquisition or relocation of floodprone buildings, floodproofing and use of runoff reduction techniques such as native landscaping.

Structural Flood Control

Structural measures control or contain water and are generally designed to prevent floodwaters from reaching buildings. Structural alternatives generally include reservoirs, levees and floodwalls, diversions, stream channel conveyance improvements and drainage and stormsewer improvements. Because of their size and cost, structural projects are often implemented with help from state or federal flood control agencies such as the Illinois Department of Natural Resources - Office of Water Resources, the US Army Corps of Engineers (USACE) and the USDA Natural Resources Conservation Service.

Since structural flood control is generally the most expensive type of mitigation measure in terms of installation time and costs, maintenance requirements and environmental impacts, a thorough assessment of alternatives should be conducted before choosing a structural flood control measure. The advantages and disadvantages of structural flood control techniques are discussed in Table 9 (Association of State Floodplain Managers 1996).

Table 9. Benefits and Drawbacks to Structural Flood Control Measures.

Advantages	Shortcomings
• May provide the greatest amount of protection for land area used. • Because of land limitations, may be the only practical solution in some circumstances. • Can incorporate other benefits into structural project design such as water supply and recreational uses. • Regional detention may be more cost-efficient and effective than requiring numerous small detention basins.	• They disturb the land and disrupt natural water flows, often destroying wildlife habitat. • They require regular maintenance, which if neglected, can have disastrous consequences. • They are built to a certain flood protection level that can be exceeded by larger floods, causing extensive damage. • They can create a false sense of security, as people protected by a project often believe that no flood can ever reach them. • Although it may be unintended, in many circumstances they promote more intensive land use and development in the floodplain. • They can create new flooding problems if improperly designed or built. • Levees and reservoirs can significantly degrade riparian and aquatic habitat and water quality.

Reservoirs/Regional Detention

Reservoirs and regional detention are large structures that control flooding by holding high flows behind dams or in storage basins. After a flood peaks, water is released or pumped out slowly at a rate that is equal to or less than the capacity of the downstream channel. Reservoirs that maintain a normal water level may be used for water supply and/or to provide water-based recreational benefits. In addition, wet or dry detention basins can serve multiple uses by doubling as parks or providing other open space uses.

The amount of land needed, coupled with the expense of construction, management and maintenance limit the use of reservoirs. Additionally, reservoirs may fail to prevent floods that exceed their design levels; may eliminate the natural and beneficial functions of the floodplain; and may negatively impact water quality and aquatic habitat. Impoundments are also known to affect temperature, pH, dissolved oxygen and nutrient transport. In addition, reservoirs frequently act as giant sediment basins accumulating sediment over a period of years that reduces stormwater storage capacity.

Detention Basins

Enlarging or adjusting flows through existing detention basins, or constructing new basins can remedy some localized flooding problems. Detention basins are considered to be effective at flood reduction in watersheds of up to 30 square miles. While regional detention is generally more cost-effective than constructing numerous small detention facilities, in some cases there may not be

sufficient land available for regional detention. Also, for very localized flood problems, a smaller detention basin may be the most economical solution. In addition, slowing release rates from new and existing detention basins can reduce the downstream flood risk and some of the impacts of flashy hydrology on the stream channel.

Levees and Floodwalls
Earthen levees or concrete floodwalls are erected between rivers or lakes and the properties to be protected. Levees and floodwalls confine water to the stream channel by artificially raising the banks. Levees must be well designed to account for large floods, underground seepage, pumping of internal drainage and erosion and scour. A serious concern with levees is that they frequently offer a false sense of security. In some cases land use behind a levee can change to high intensity, high-value occupation under the false assumption that all future floods will be controlled by the levee, when in reality, large floods may overtop or breach the levee creating more flood damage than would have occurred. Problems also arise when the present runoff volume in the channel exceeds the design capacity of older levees that were constructed for lower flow conditions.

Levees and floodwalls have other limitations. Placed along the lake, river or stream edge, they degrade riparian and aquatic habitat. Levees are expensive to construct, require considerable land and maintenance and are more likely to push floodwater onto other properties upstream or downstream. In some cases, it may be necessary to include expensive and noisy pumping operations for internal drainage. Levees also act as barriers to river access, block views and disrupt local drainage patterns.

Barriers
Constructing barriers such as low floodwalls and berms around an individual property can keep floodwaters from reaching the building. Berms are commonly used in areas subject to shallow flooding. Not considered engineered structures, berms are made by re-grading or filling an area. Low floodwalls may be built around stairwells to protect the basement and lower floor of a split-level home. By keeping water away from the building walls, the problems of seepage and hydrostatic pressure are reduced.

As with levees, the use of floodwalls and berms must also include a plan to install drainpipes and/or sump pumps to handle leaks and water seepage through or under the barrier, and to get rid of water that may collect inside. Care must be taken in the design, location and installation of berms or floodwalls to insure that floodwaters are not inadvertently pushed onto adjacent properties.

Improved Channel Conveyance
Channel conveyance improvements alter the channel so that more water is carried away at a faster rate. Improvements generally include making the channel wider, deeper, smoother and/or straighter. Some channels in urban areas have also been lined with concrete or put in underground pipes.

Straightening, deepening and/or widening a stream or river channel, commonly referred to as 'channelization', has traditionally been the common remedy for local drainage or flooding problems. Channelized rivers and streams drain water faster from areas adjacent to and upstream of the channel, but can create or worsen flooding problems downstream as larger volumes of water are transported at a faster rate. Channelized waterways tend to be unstable and experience more streambank erosion. Therefore, the need for periodic reconstruction, streambank stabilization and

silt removal becomes cyclic in these circumstances making stream and channel maintenance very expensive.

Dredging is another type of conveyance improvement. It is frequently cost prohibitive due to the expense of disposing of the dredged material. In addition, unless instream and/or upstream tributary erosion are corrected, the dredged areas usually fill back in within a few years, and the process and expense have to be repeated. Channel conveyance improvements such as channelization and dredging are considered to be environmentally destructive because pool/riffle and riparian habitat are lost, negatively impacting both aquatic and terrestrial plants and animals. Increased water temperature and higher turbidity are two common water quality impacts associated with improved channel conveyance.

Drainage Improvements

Drainage improvements can be in the form of open ditches, swales or stormsewers. Man-made ditches and stormsewers help drain areas where the surface drainage system is inadequate, or where underground drainageways may be safer or more practical. Particularly appropriate for depressions and low spots that will not drain naturally, drainage and stormsewer improvements usually are designed to carry the runoff from smaller, more frequent storms. Stormsewer improvements include installing new sewers, modifications of sewer inlets, installing larger pipes and using measures such as flap gates to prevent back flows.

Because drainage ditches and stormsewers convey water faster to other locations, improvements are only recommended for small local problems where the receiving stream or river has sufficient capacity to handle the additional volume and flow of water. To reduce the cumulative downstream flood impacts of numerous small drainage projects, additional detention and/or runoff reduction practices should be undertaken in conjunction with drainage system improvements.

In some areas, streets, parking lots or athletic fields can be modified to store water from larger, less frequent storms to relieve and reduce overloading of the local drainage system. Although street modifications for stormwater storage are not appropriate in all areas, in many circumstances, they can be more effective and less expensive than increasing the size of receiving stormsewer systems.

Non-Structural Flood Control

In addition to structural controls for flood remediation, flooding problems can also be addressed using non-structural means. Some of the non-structural flood control techniques include floodproofing, acquisition of floodplain buildings, building elevation and building relocation. More communities and countywide agencies could get involved in non-structural programs such as acquisition by helping to identify repetitively flooded properties. In addition to being used for prevention, runoff reduction techniques may also be used by individual homeowners or neighborhood associations in retrofit projects to lessen existing flooding problems.

Building Relocation

Moving a building to higher ground is an extremely effective way to protect it from flooding. While almost any building can be moved, the cost goes up for heavier structures, such as those made of brick, and for large or irregularly shaped buildings. Building relocation is generally cost-effective where flooding is relatively severe and/or frequent. Buildings that have suffered structural damage or contamination from frequent or long duration flooding should not be considered for relocation.

While relocation is typically the responsibility of the building owner, government-sponsored loans or grants may be available for cost-share. Communities and county-wide agencies could play a greater role in building relocation by improving public and local official awareness of this option, and by identifying buildings or properties well-suited for relocation and seeking potential cost-share funds to assist individual property owners.

Buyouts/Acquisition

Like relocation, acquisition ensures that buildings in a floodprone area will cease to be subject to damage. The major difference is that acquisition is undertaken by a government agency, so the cost is not borne by the property owner. With acquisition, the flooded structure is removed and the land is converted to an appropriate public use such as a park. Acquiring and clearing buildings from the floodplain is not only the best long-term flood protection measure; it also is a way to convert a problem area into a community asset that can provide environmental and recreational benefits.

More communities and countywide agencies could get involved in acquisition by:

1. improving public awareness of this option;
2. budgeting the 25% matching funds necessary for state and federal funding;
3. establishing guidelines for determining when acquisition is preferable to flood control or flood proofing; and
4. prioritizing properties for purchase.

To achieve maximum benefits from this type of public investment, acquisition and land reuse should be a component of a community's redevelopment plan, and be incorporated as a strategy in park, greenways and capital improvement plans.

Building Elevation

Raising a house above the flood level is the best way to protect a structure that cannot be removed from the floodplain. The structure is elevated on a foundation or piers so that the lowest floor is above the base flood elevation. When flooding occurs, water levels stay below the main floor, causing no damage to the structure or its contents. Raising a building above the flood level is cheaper than moving it, and can be less disruptive to a neighborhood. Commonly practiced in floodprone areas nationwide, this protection technique is required by law for new and substantially damaged residences located in a 100-year floodplain.

Although flood damages can be reduced significantly or eliminated through building elevation, there are some limitations to remaining in a flood prone location. While the building itself is sufficiently elevated to be protected from flood damage, flooding may isolate the building and make it inaccessible. Flood waters surrounding the building can also result in a loss of utility service or septic use, making the building uninhabitable. Additionally, pollutant contamination in floodwaters may present health and safety concerns.

Floodproofing

Floodproofing measures can provide either wet floodproofing or dry floodproofing. In areas where there is shallow flooding, dry floodproofing measures can be used to prevent water from entering some buildings. A wet floodproofing strategy allows water to enter the building, but moves damageable belongings, appliances and utilities out of harm's way. Wet floodproofing includes

some of the least expensive and easiest mitigation practices to install. Although floodwaters are not controlled, with wet floodproofing damage can be greatly reduced.

Dry floodproofing is a combination of practices that are used to seal a building against floodwaters. The building must be waterproofed; that is, walls, floors and all openings must be sealed and made watertight. Buildings with crawlspaces generally cannot be dry floodproofed because water can seep under walls into the crawlspace. However, buildings on slabs and buildings with basements can benefit from dry floodproofing.

Because of the need to address hydrostatic pressure, a structural engineer should be consulted when designing the dry floodproofing measures. If a dry floodproofed structure is not sufficiently reinforced, basement walls and floors can become cracked, buckled or broken by the pressure of floodwater.

Wet floodproofing protects from damage when floodwaters cannot be kept out of a building. It is a relatively simple means of making sure that nothing gets damaged or ruined when floodwaters get in. Wet floodproofing techniques range from moving a few valuable items to a higher floor, to totally rebuilding the area that floods. At the very least, several low-cost steps can be taken to wet floodproof a structure. Simply moving furniture and electrical appliances out of the floodprone portions of the building can prevent thousands of dollars in damages. One strong advantage is that no matter how little is done; flood damage will be reduced.

Wet floodproofing measures work in cases where there is a level above the flood zone to which items can be relocated. It generally does not work for one-story houses where living areas get flooded. An advantage of using wet floodproofing vs. dry floodproofing is that by allowing water in the structure, the danger of wall collapsing due to uneven pressure is alleviated.

Runoff Reduction

Examples of runoff reduction techniques that can be installed as retrofits in developed areas include the use of natural landscaping, permeable pavement, infiltration trenches, basins or swales, and disconnection of downspouts from impervious areas. Descriptions of natural landscaping, permeable pavement and infiltration techniques were provided in the flood prevention section. Disconnecting downspouts is also relatively simple and inexpensive. In these cases, runoff from rooftops is collected in rainbarrels or diverted directly to lawns or rain gardens (bioretention areas) for infiltration.

Implementing these runoff reduction retrofits is generally the responsibility of individual property owners. While these techniques may not have a significant impact when applied individually on a single site, the cumulative effect when used at numerous sites throughout the watershed can result in significant flood reduction benefits. For example, a 1989 engineering report by Baxter & Woodman for the City of Highland indicates an average-sized home in Highland Park can contribute 3,000 gallons to sewers during a one-hour duration, 2-year frequency storm (1.45 inches; Baxter & Woodman 1989). Since public participation is necessary for watershed effectiveness, an aggressive public information and outreach effort should be used for implementation of these techniques.

Insurance

Insurance does not prevent flooding or flood damage; it helps owners protect their property investments by paying for repairs and replacement of items damaged in a flood. While a typical

homeowner's insurance policy does not cover flood damages to property, flood insurance coverage is available through the National Flood Insurance Program (NFIP), as is additional basement backup insurance.

Federal law demands that all federally insured lending institutions require that buildings located in the 100-year floodplain have flood insurance. Flood insurance is available to anyone located within a community that participates in the NFIP regardless of their location respective to the mapped floodplain. Some communities may also participate in the Community Rating System (CRS), which is a program that credits a community for exceeding the minimum requirements of the NFIP. Residents of CRS communities pay reduced flood insurance rates as a result of their community's flood mitigation activities. LCSMC provides technical and planning assistance to municipalities regarding NFIP compliance and to a limited extent for the CRS program.

1.4 Watershed Tools to Protect, Restore and Enhance Natural Resources and Greenways

Natural resources in the Flint Creek watershed can be protected and enhanced by:

- Developing and changing zoning ordinances,
- Acquiring and protecting open space with conservation easements,
- Promoting conservation developments,
- Developing greenways and trails,
- Protecting threatened and endangered species and their habitat,
- Preserving and restoring wetlands,
- Developing and implementing green infrastructure plans, and
- Restoring streams and riparian buffers.

Improving natural resources and providing recreational access to streams and lakes in the watershed is key to changing public perceptions of the watershed.

1.4.1 Preventative Measures: Natural Resources Protection

Several techniques can be used for protecting natural areas and open space in both public and private ownership. The first step in the process is to identify and prioritize properties for protection. All remaining undeveloped land in the Flint Creek watershed has been identified and prioritized for flood control, water quality improvement, and/or natural areas protection as part of the watershed planning process. The highest priority natural areas should be acquired by public agencies or donated to public agencies dedicated to land conservation through a conservation easement. Other open space can be protected using conservation design development techniques, and be managed by private landowners or homeowner's associations. Protection of land by donation, deed restriction, conservation easement, etc. is a type of land use control that prevents future development or modification of natural or open space.

Land Use Controls

Protected Ownership/Conservation Easements
There are several options for land transfer ranging from donation to fee simple purchase. Donations can be solicited and encouraged through incentive programs. Unfortunately, while preferred by money-strapped conservation programs, land donations are often not adequate to protect high priority sites. A second option is outright purchase (or fee-simple land purchase). Outright purchase is frequently the least complicated and most permanent protection technique, but is also the most costly. The conservation easement is a less expensive technique than outright purchase that does not require the transfer of land ownership but rather a transfer of use rights. Conservation easements might be attractive to property owners who do not want to sell their land at the present time, but would support perpetual protection from further development. Conservation easements can be donated or purchased.

Conservation Design Developments
The goal of conservation development is to protect open space and natural resources for people and wildlife while at the same time allowing development to continue. Conservation design developments designate half or more of the buildable land area as undivided permanent open space. They are density neutral, allowing the same density as in conventional developments. Density is realized on smaller areas of land by clustering buildings and infrastructure. In addition to clustering, conservation design developments incorporate natural riparian buffers and setbacks for streams, wetlands, other water bodies and adjacent agricultural land (Dreher and Price 1997; Terrene Institute 1994; Schueler 1995; Arendt 1996).

The first and most important step in designing a conservation development is to identify the most essential lands to preserve in conservation areas. Natural features including streams, wetlands, lakes, steep slopes, mature woodlands, native prairie and meadow (as well as significant historical and cultural features) are included in conservation areas. Clustering is a method for preserving these areas. Clustered developments allow for increased densities on less sensitive portions of a site, while preserving the remainder of the site in open space for conservation and recreational uses (such as trails, soccer or ball fields).

Clustering is often used in planned unit developments (PUDs) or planned residential developments (PRDs). PUDs contain a mix of zoning classifications that may include commercial, residential and light industrial uses, all of which are blended together. As with clustering, the purpose of a PUD is to maintain density while preserving open space. Well-designed PUDs usually locate residences and offices within walking distance of each other to reduce traffic. Planned residential developments (PRDs) apply similar concepts to residential developments.

A good example of a clustered development and permanent open space protection is Prairie Crossing (Des Plaines River watershed) developed by Prairie Holdings Corporation. Prairie Crossing is a planned, mixed-use development including retail, restaurant, a hospital campus and office space, in addition to 300+ homes. The development is 677 acres with approximately 70% of that as open space, including more than 10 miles of trails, and a large lake with beach and boat dock. It is located adjacent to the 2,500 acre Liberty Prairie Reserve. Prairie Crossing also has an organic farm, a charter school, the Byron Colby historic barn, a stable and the Metra Prairie Crossing-Libertyville Train Station. Additionally, buildings are being constructed to reduce energy consumption by approximately 50% as compared to conventional homes.

Greenways and Trails

Greenways and trails can provide a large number of functions and benefits to nature and the public. For plants and animals, greenways provide habitat, a buffer from development and a corridor for migration. Greenways located along streams include riparian buffers that protect water quality by filtering sediments and nutrients from surface runoff and stabilizing streambanks. By buffering the stream from adjacent developed land use, riparian greenways offset some of the impacts associated with increased impervious surface in a watershed. Maintaining a good riparian buffer can mitigate the negative impacts of approximately 5% additional impervious surface in the watershed (Schueler 1995).

Greenways also provide long, linear corridors with options for recreational trails. Trails along the river provide watershed residents with an opportunity to exercise and enjoy the outdoors. Even more important, trails allow users to see and access the stream, thereby connecting people to their river and watershed. Trails can also be used to connect natural areas, cultural and historic sites and communities, and serve as a safe transportation corridor between work, school and shopping destinations (Northeastern Illinois Planning Commission and Openlands Project 1997a, 1997b; Labaree 1992).

Techniques for establishing greenways and trails involve several steps. The first step involves the development of a plan that proposes general locations for greenways and trails. In the case of trails, the plan also identifies who the users will be and provides direction on trail standards. Plans can be developed at the community and/or county level as well as regionally, statewide, and in a few cases, at the national level. Public and stakeholder input are crucial for developing successful greenway and trail plans.

Several techniques can be used for establishing greenways and trails. Greenways can remain in private ownership, they can be purchased, or easements can be acquired for public use. If the lands remain in private ownership, greenway standards can be developed, adopted and implemented at the local level through land use planning and regulation. Development rights for the greenway can be purchased from private landowners where regulations are unpopular or not feasible.

If the greenways will include trails for public use, the land for trails is usually purchased and held by a public agency such as a forest preserve district or local park system. In some cases, easements will be purchased rather than purchasing the land itself. Usually longer trail systems are built in segments, and completing connections between communities depends heavily on the level of public interest in those communities.

In new developing areas, the local planning authority can require trails. Either the developer or the community can build the trails. In some cases, the developer will voluntarily plan and build a trail connection through the development and use this as a marketing tool to future homebuyers. In other cases, the local planning authority may require the developer to donate an easement for the trail.

To install trails through already developed areas, land can purchased by a community agency with a combination of local, state and federal funds. Impediments to land purchase can significantly slow up trail connections in already established areas.

Threatened and Endangered (T&E) Species

Threatened and endangered species are those plant and animal species whose survival is in peril. Both the federal government and the State of Illinois maintain lists of species that meet threatened or endangered criteria within their respective jurisdictions. Federally endangered species are those that are in danger of extinction throughout all or a significant portion of their range. A state-endangered species is any species that is in danger of extinction as a breeding species in Illinois. Threatened species are those that are likely to become endangered in the foreseeable future.

Considerations in protecting endangered species include:

- Making sure there is sufficient habitat available - food, water and "living sites". For animals this means areas for making nests and dens and evading predators while for plants, it refers to availability of preferred substrate and other desirable growing conditions.
- Providing corridors for those species that need to move between sites.
- Protecting them from impacts due to changes in hydrology or increased pollutant loadings.

Several techniques can be used to protect T&E species. One technique is to acquire sites where T&E species occur. Purchase and protection of the site where the species is located (with adequate surrounding buffer) may be sufficient to protect that population. But, in some instances it just isn't feasible or possible to buy the needed land. Where the site and buffer area isn't available for purchase, where an animal moves in too large an area (or migrates between sites), or where changes in hydrology or pollution from outside the site affect the species, other techniques must be used to protect the T&E species. Developing a resource conservation or management plan for the species and habitat of concern is the next step. Resource plans consider the need for buffer areas and habitat corridors, and consider watershed impacts from hydrology changes or pollutant loadings. The conservation plan will include recommendations for management specific to the species and its habitat, whether located on private or public lands. The conservation plan will guide both the property owner, and the local unit of government that plans and permits adjacent land uses, in how to manage habitat to sustain the species.

Wetlands

Wetlands provide a multitude of benefits and functions. Wetlands improve water quality by removing suspended sediment and dissolved nutrients from runoff. They control the rate of runoff discharged from the watershed and reduce flooding by storing rainfall during storm events. Wetlands also provide habitat for plants and animals including many of those that are threatened and endangered.

Wetland protection techniques that can be employed in the Flint Creek watershed include:

- adopt a watershed regulation requiring no-net-loss of wetlands with a corresponding policy recommending gains in wetland acreages;
- develop management plans for the high quality (ADID) wetlands;
- prioritize and acquire high quality wetlands outright or purchase easements;
- develop regulatory requirements for wider wetland buffers;

- mitigate all wetland losses within the same watershed;
- provide local incentives for voluntary wetland protection and restoration; and
- solicit cost-share funding from established regional, state and federal funding programs for wetland acquisition and restoration.

No-Net-Loss/Wetland Mitigation
Since the 1970s, wetlands have been regulated through a permit program administered by the US Army Corps of Engineers (USACE) under Section 404 of the Clean Water Act. Even with the regulatory program, wetlands continued to be converted, albeit at a slower rate.

In the 1990s the Federal government adopted a policy of no-net-loss of wetlands to stem the tide of continued wetland losses. The no-net-loss policy has generated requirements for wetland mitigation so that permitted losses due to filling and other alterations can be replaced. Wetland mitigation for some projects involves the purchase of credits in established wetland mitigation banks.

In order to address the specific circumstances and conditions in individual jurisdictions, and to protect local interests, state and local units of government have adopted more stringent laws than the Federal requirements to protect wetlands. Frequently these laws and ordinances add support to the no-net-loss wetland policy. Adoption of a watershed-wide no-net-loss policy for wetlands within the watershed plan could include a recommendation to the USACE that all wetland losses in the Flint Creek watershed be mitigated or replaced in the same watershed.

Management Plans for ADID Wetlands
Approximately 431 acres of wetlands in the Bull Creek/Bull's Brook watershed are classified as high quality (ADID) wetlands by the 1992 Lake County Wetland Inventory. Management plans, developed cooperatively between the wetland owners and local, state and federal agencies, are a measure that could prevent degradation of these high quality wetlands. The management plans would provide guidance to owners, whether private or public, on how to manage the ADID wetlands to sustain their values as high quality wetlands. Management plan recommendations could also be incorporated into appropriate park and forest preserve district plans, local land use and transportation plans, and the watershed plan.

Acquisition of High Priority Wetlands
Acquisition as a protection technique is covered under Protected Ownership in Protecting Open Space and Natural Areas. The location of T&E species, ADID wetlands and high quality natural areas are several criteria, among others, that could be used to prioritize wetlands for acquisition.

Wetland/Stream Buffers
Wetland buffers protect a wetland from water quality and hydrologic impacts resulting from adjacent land uses. In addition, if vegetated and managed properly, buffers can provide considerable wildlife habitat. Buffers should be comprised of native, unmowed vegetation that is periodically managed for non-native and invasive species.

Local ordinances currently require that buffers be maintained around all areas defined as Waters of the United States or Isolated Waters of Lake, Cook, and McHenry Counties, exceptional functional value wetlands (including ADID wetlands), other wetlands, lakes and ponds. The *Native Plant Guide for Streams and Stormwater Facilities in Northeastern Illinois* is the minimum standard for re-vegetation of

disturbed buffer areas. Buffers are divided into two types in the WDO, linear buffers and water body buffers.

Buffer requirements are considered to be the minimum standard. Individual communities have the option of adopting more stringent buffer requirements. Adjacent land use, topography, runoff velocity and soil and vegetation types are all factors in determining the optimum buffer width for wetlands. Where a standard width is needed for regulatory purposes, 100 feet is considered a minimum buffer width for typical surface water requirements. Wider buffers are recommended for sensitive areas (Mitchell 1996). Required setbacks from the wetland should be calculated from the outer edge of the buffer rather than from the wetland itself.

Green Infrastructure Plans

A Green Infrastructure Plan is a blueprint for water resources protection. Its purpose is to identify appropriate locations for the preservation of open space, that when preserved, will:

1) protect and enhance the natural hydrologic functions of the watershed;
2) allow movement of runoff through the watershed in a manner that supports and enhances aquatic life; and
3) provide natural conveyance, floodwater storage, and water quality benefits.

In essence, a Green Infrastructure Plan is a plan for open space and natural areas protection that also improves water quality and prevents flood damage.

The first step in preparing a Green Infrastructure Plan is to identify water resources, natural features, and open space that are either already connected or that could be developed into a network natural corridors. Examples include floodplains, lakes, wetlands, wetland buffers, hydric soils, drain tiles, regionally significant depressional areas, parks, greenways and trails, and forest preserves. The next step is to outline the network by connecting isolated water features to each other. Hydric soils are a useful connector for isolated natural resources because they provide opportunities for wetland restoration. The final step is to remove developed areas from the boundary of the plan and refine the network to work around or through existing developments.

Green Infrastructure Plans often require regulatory changes to zoning and development codes and can be difficult to implement quickly if unprotected open space must first be acquired and permanently protected. However, if incorporated into local government land use plans, Green Infrastructure Plans can be a very strong tool for protecting natural resources, improving water quality, and preventing flood damage.

1.4.2 Remedial Measures: Restore/Enhance Natural Resources

Stream Restoration

Stream restoration techniques are used to improve stream conditions so they more closely mimic natural conditions. For an urban stream reaches, restoration to natural conditions may not be possible or feasible. For instance, physical constraints due to adjacent development may limit the ability to re-meander a stream. In addition, the natural stream conditions may not be able to accommodate the increased volume of flow from the developed watershed.

Even in cases where restoring the stream to its natural condition isn't possible, the stream can still be naturalized and improved by reestablishing riparian buffers, performing stream channel maintenance, stabilizing streambanks using bioengineering techniques, and, where appropriate, by removing manmade dams and installing pool/riffle complexes. Stream restoration projects may be one component of floodplain restoration projects, and can be supplemented with trails and interpretive signs, providing recreational and educational benefits to the community.

Pool/Riffle Complexes

Establishing pool/riffle complexes in the streambed is another method for restoring stream conditions. Pools and riffles naturally occur in streambeds in a sequence that follows the meander of the stream. However, pool/riffle sequences are usually lost when streams are channelized.

Riffle restoration is usually done with rock weirs placed in sequences at spacing intervals determined by the bankfull width of the stream. The cobble and boulder weirs are spaced so a distance of approximately six bankfull widths separates them. Pools develop between the riffles. The pool/riffle sequences benefit fish and macroinvertebrates by aerating the water during low flow conditions, and by providing more diverse substrate and deeper water for habitat.

The placement of the stone for the riffles can also reduce streambank erosion immediately downstream as stream flow is funneled through the center of the stream channel and away from the banks. Pool/riffle complexes are often installed in conjunction with the other streambank stabilization techniques described above for even better stream restoration results (Illinois State Water Survey 1998).

Wetland Enhancement and Restoration

Wetland enhancement projects are necessary to improve the diversity and function of degraded wetlands. The term enhancement refers to improving the functions and values of an existing wetland. Converted wetland sites (or sites that were formerly wetlands but have now been converted to other uses) can also be restored to provide many of their former wetland benefits. Wetland restoration is the process of establishing a wetland on a site that is not currently wetland, but was in the past prior to conversion.

Wetland functional values vary substantially from wetland to wetland; they receive special consideration because of the many roles that they play. Because of the wetland protection laws currently in place, the greatest impact on wetlands from future development in the Flint Creek watershed will likely be a shift in the types of wetlands. Often in mitigation projects, various types of marshes, wet prairies and other wetlands are filled and replaced elsewhere, usually with open water wetlands. This replacement may lead to a shift in the values served by the wetland communities due to a lack of diversity of wetland types. The wetland restorations that are proposed in the Flint Creek watershed should include a variety of different wetland types to increase the diversity of wetlands in the watershed. The restoration of wetlands will provide new stormwater storage areas, will improve water quality by treating stormwater runoff and will create new and better plant and animal habitat. In addition to these values, wetlands can be part of regional greenways or trail networks, they can be constructed with trails to allow the public to explore them more easily

and they can be used to educate the public through signs, organized tours and other techniques. Wetland restorations are an exceptional way to meet multiple objectives within a single project.

Agricultural practices

Contour Buffer Strip
Contour buffer strips can be utilized to enhance wildlife habitat. To enhance wildlife habit, a native, warm season, grass species mixture, recommended for wildlife purposes, can be used. Mowing the buffer strips should be delayed to every other year or every third year depending on geographical location. Mow only after the desired species of ground nesting birds have hatched and allow for re-growth before the growing season ends. To enhance wildlife cover, the width of buffer strips should be increased to 30 feet or wider as determined based on the requirements for nesting and escape cover of the target wildlife species. The maximum width between buffer strips should not exceed 300 feet.

Filter Strip
To restore, create or enhance herbaceous habitat for wildlife and beneficial insects, additional filter strip flow length devoted to this purpose must be added. Any addition to the flow length for wildlife or beneficial insects shall be added to the downhill slope of the filter strip. Plantings to enhance wildlife may be added to that portion of the filter strip devoted to other purposes to the extent that they do not detract from its primary functions. Plant species selected for this purpose shall be adapted to the wildlife and beneficial insect species targeted. The filter strips should not be mowed during the nesting season of the target species. Also, livestock and vehicular traffic should be excluded during the nesting season of the target species.

1.4.3 Wetland Incentives and Cost-Share Opportunities

There are a number of incentive programs to implement wetland projects. Fund sources for wetland protection and restoration, as well as technical assistance, are available from programs at the local, regional, state and federal levels of government. Additional funding information is provided in the report.

US Army Corps of Engineers (USACE) Continuing Authorities Program
At the Federal level, the USACE Continuing Authorities Program (CAP) from Section 206 of the 1996 Water Resources Development Act targets wetland restoration. This section, also known as the "Aquatic Ecosystem Restoration" program gives the USACE the authority to carry out aquatic ecosystem restoration and protection if the projects will improve the quality of the environment, are in the public interest and are cost effective. The objective of section 206 is to restore degraded ecosystem structure, function and dynamic processes to a less degraded and more natural condition. The local sponsors of aquatic ecosystem restoration projects are required to contribute 35% towards the total project cost.

US Department of Agriculture (USDA) - Natural Resources Conservation Service (NRCS) Programs
The USDA - NRCS has four incentive programs that may have applicability in the Flint Creek watershed: the Environmental Quality Incentives Program (EQIP), the Wetland Reserve Program

(WRP), the Conservation Reserve Program (CRP), and the Wildlife Habitat Incentive Program (WHIP). The goal of WRP is to restore and protect degraded wetlands such as farmed wetlands. WRP has three options available: permanent easements, 30-year easements and restoration agreements. NRCS will reimburse the landowners for easements on the property plus a portion of the restoration costs based on the type of easement agreed to by the landowner. The EQIP program is accommodating to grass-roots conservation. Typically EQIP monies will fund 75% of land improvements and installation of conservation practices such as grade stabilization structures, grassed waterways, and filter strips adjacent to water resources (including wetlands). Funding for the EQIP program is possible if the planning committee successfully nominates the Flint Creek watershed as a natural resource "priority area". EQIP and WRP are only applicable to agricultural lands.

The goal of the CRP program (and CREP - Conservation Reserve Enhancement Program) is to give incentives to landowners who take frequently flooded and environmentally sensitive land out of crop production and plant specific types of vegetation. Participants earn annual rental payments and sign-up incentives. This program offers up to 90% cost share. Rental payments are boosted by 20% for projects such as installation of riparian buffers and filter strips. Windbreaks, contour buffer strips, and shallow water areas are additional funded practices. The WHIP program is available for private landowners to make improvements for wildlife on their property. This program offers up to 75% cost share. This grant program is competitive and funding depends on the project's ranking compared to others in the state. Contact David Misek at the local USDA-NRCS office for details at (847) 223-1056.

US Fish and Wildlife Service (USFWS) Partners for Wildlife

Up to 100% cost-share funding is available for private landowners with restorable wetlands through the Partners for Wildlife program of the USFWS and the Illinois Department of Natural Resources – Division of Wildlife Resources. The landowner must agree to maintain the restored wetland for a minimum of 10 years. The restored wetlands should fulfill multiple objectives including providing habitat for waterfowl, improving water quality, providing flood protection and recharging groundwater.

Illinois Department of Natural Resources (IDNR) Conservation 2000

The C2000 program, administered by the Illinois Department of Natural Resources (IDNR) Office of Realty and Environmental Planning seeks to "to maintain and enhance the ecological and economic conditions in resource-rich landscapes by supporting Ecosystem Partnerships of local and regional interests." C2000 funds are available both for wetland/habitat acquisition and restoration.

Illinois Environmental Protection Agency (IEPA) Section 319

Funding for wetland related projects is provided by the IEPA through the Nonpoint Source Management Program (Section 319 of the Clean Water Act). Wetland-related projects funded with 319 funds, be they buffers, wetland restorations or other projects, must help "…to control nonpoint source pollution (NPS), improve Illinois water resources, and promote the public's knowledge and awareness of NPS pollution."

Northeastern Illinois Wetlands Conservation Account

Wetland restoration funds are also available through grants from the Northeastern Illinois Wetlands Conservation Account. This funding source is available to the 6 county Chicago region and is jointly administered by The Conservation Fund and the US Fish & Wildlife Service.

Wetlands Restoration Fund
Wetland restoration money is available through this fund formed to accept fee-in-lieu of wetland mitigation monies generated by the wetlands permitting program. Corlands administers this fund for the 6 county Chicago region.

Lake, Cook, and McHenry County Soil and Water Conservation District Technical Assistance
At the local level, technical assistance is available from local soil an water conservation districts. The staff offers free assistance to develop conservation plans, assist with technical design of conservation practices and provide and interpret natural resources information. Assistance would be especially useful in development of management plans for high quality (ADID) wetlands.

Tax Assessment Reduction
At the local level, incentives are available to preserve land in open space through the County Assessor's office. Land that remains in open space for at least three years is eligible for a dual assessment. This means that as long as the land is used as open space, taxes are paid on a lower use value (rather than market value) based on the value of the poorest open space land in the county (according to court decisions). In order to be eligible for assessment as open space, the property must be at least 10 acres and meet a number of other criteria.

Appendix C: SMC Flint Creek Stream Inventory

Stream Inventory Procedures and Form

C.1 STREAM INVENTORY PROCEDURE

During summer 2006, the Lake County Stormwater Management Commission conducted a stream inventory of the Flint Creek watershed. Water quality sampling was not performed as part of the stream inventory, but the sources and causes of water quality impairment in the streams were investigated. An important component of the assessment process is the evaluation of current hydraulic, geomorphic, and aquatic stream characteristics. The major stream characteristics that were assessed and noted include:

- channel conditions such as bank height, erosion problems and bank vegetation
- hydraulic structures such as bridges and culverts in the river or floodplain
- point discharges into the river
- land use and vegetative cover in the riparian corridor
- channel substrate and degree of sedimentation.

These characteristics were identified for each stream reach using the stream inventory procedure described below. Several procedures were considered self-explanatory and were therefore not described. The discussion below is organized in the same order as the data was collected on the stream inventory report form (SIRF).

C.1.1 Stream Inventory Report Form

C.1.1.1 Reach Boundaries

A stream reach is defined as a stream segment having fairly homogenous hydraulic, geomorphic and riparian cover and land use characteristics (such as all ditched agriculture or all natural and wooded). Reaches generally should not exceed 2,000 feet in length. Where possible, beginning and end stations should be established along the stream using permanent physical landmarks such as bridges that are readily recognized.

C.1.1.2 Channel Flow Status (Stream Stage)

The degree to which the channel is filled with water. The flow status will change as the channel enlarges (e.g., aggrading stream beds with actively widening channels) or as flow decreases as a result of dams and other obstructions, diversions for irrigation, or drought. When water does not cover much of the streambed, the amount of suitable substrate for aquatic organisms is limited. In high-gradient streams, the decrease in water level exposes logs and snags, thereby reducing the areas of good habitat. Channel flow is especially useful for interpreting biological condition under abnormal or lowered flow conditions. This parameter becomes important when more than one biological index period is used for surveys or the timing of sampling is inconsistent among sites or annual periodicity.

C.1.2 Channel Conditions (SIRF Section A)

C.1.2.1 Channelization

Channelization refers to channel modifications performed by humans. 'The one-third rule should be applied again where low means < 33% of the reach is channelized, moderate means 33 to 66% and high means > 66% of the reach is channelized. The presence of a pilot channel should be noted under 'Pilot Channel Formed' for channelized streams. A narrow, meandering pilot channel may develop within the wide and

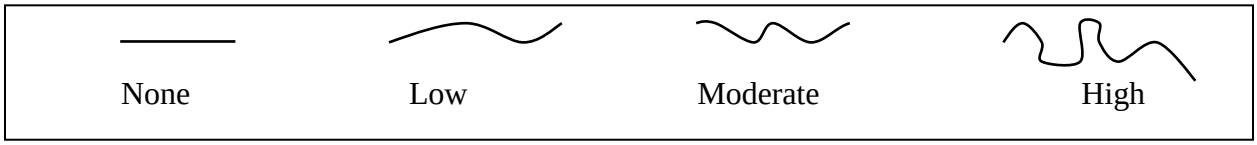
flat trapezoidal ditch that was excavated during channelization. A pilot channel is indicative of recovery from channelization. Spoils piles refer to any excavated or dredged materials that have been deposited along the banks. If present identify which bank is affected.

C.1.2.2 Sinuosity

Sinuosity is dependent on the stream stage in many channelized reaches. For instance, in many cases a narrow, highly sinuous pilot channel has developed during low stream stage within a wider, non-sinuous channel that was excavated during channelization. Therefore, sinuosity should be estimated for both baseflow conditions (describing sinuosity in the pilot channel) and for the bankfull-flow events. However, if the stream inventory report form is completed during bankfull flow, then sinuosity during baseflow conditions will be difficult to estimate. Figure C-1 should be used for estimating the degree of sinuosity.

Figure C-1

SINUOSITY ESTIMATION GUIDE



C.1.2.3 Pool/Riffle Development

The proportion represented by riffles, runs, and pools should be noted to describe the morphological heterogeneity of the reach. Pools should be well-defined areas of deeper than average water. Pools generally do not extend in length more than three or four times the stream width. Pools should almost immediately be followed by a riffle environment for the stream to be characterized as having high pool/riffle development. A riffle is characterized by shallower water and higher velocities with rippling or disturbances to the surface water tension that allow turbulence and mixing to occur. Many streams in Lake County will have low or no pool/riffle development.

C.1.2.4 Bank Erosion

Severe bank erosion is a significant concern for Lake County's stream and rivers. Severely eroded banks have exposed soil on nearly vertical banks extending from the top of bank to the low water mark so erosion is constantly occurring. Highly eroded streambanks contribute heavy loads of sediment and erode during times of higher flows. Active slumping and sloughing may be apparent where fresh, moist, loose soil and other signs of recent bank movement such as exposed tree roots or suspended fences extending into the stream are found. Eroded areas are most prevalent in the outer edges of bends and meanders. All cases of severe erosion should be photographed and noted on the form and the map or aerial photo. If the photo is taken looking up/down stream the aspect should be noted. Structures that are present and threatened by slumping should also be recorded. Right and left bank are determined by facing upstream.

On impounded areas of streams, the absence of bank or littoral vegetation along the normal water mark resulting in constant erosion would also be considered severe.

C.1.2.5 Armoring

Armoring refers to the placement of gabions, wood, metal, riprap or other similar artificial materials along the streambank to reduce bank erosion. The one-third rule should be applied again where low means < 33% of the reach is armored, moderate means 33 to 66% and high means > 66% of the reach is armored. Portions of armoring that are failing should be noted.

C.1.2.6 Sediment Accumulations

Sediment accumulations that affect the channel capacity and flow conveyance should be described. Sediment deposition measures the amount of sediment that has accumulated in pools and the changes that have occurred to the stream bottom as a result of deposition. Deposition occurs from large-scale movement of sediment. Sediment deposition may cause the formation of islands, point bars (areas of increased deposition usually at the beginning of a meander that increase in size as the channel is diverted toward the outer bank) or shoals, or result in the filling of runs and pools. In some cases, sediment accumulations may not impact channel conveyance.

C.1.2.7 Mid-Stream Bars and Islands

Record whether exposed mid-stream bars or islands are present. Although these structures may increase habitat availability for organisms, they also reduce the unobstructed stream width and may enhance the debris-accumulating potential of the stream reach.

C.1.2.8 Mean Water Depth

Water depth should be measured at the deepest portion of the channel cross section (known as the thalweg) with a sturdy 4- to 5-foot rod inscribed with depth marks in inches. The range of water depths should reflect the variation between the deepest and shallowest portions of the channel cross-section in the reach.

C.1.2.9 Mean Bank Height, Top Mean Channel Width and Bottom Mean Channel Width

Mean bank height should be measured from the top to the bottom of the streambank. The top of the bank occurs where there is a convex-shaped transition in bank slope between the stream bank and the outlying floodplain. The bottom of the bank occurs where there is a concave-shaped transition in slope between the stream substrate and the stream banks, and it may be below the water level.

Top and bottom mean bank widths refer to the mean bank-to-bank width across the top and across the bottom of the banks. If the top of one bank is higher in elevation than the top of the opposite bank, the top mean channel width should be measured from the elevation of the lowest bank. In estimating these and other values, the investigator should be conscious of longitudinal changes in bank dimensions in order to arrive at estimated values.

C.1.2.10 Beaver Activity

Low beaver activity includes an occasional bank slide or chewed stump within the reach. These features must become progressively more apparent to rate as moderate activity. High activity is characterized by almost constant activity in the wooded areas with felled trees in excess of 12 inches; slides and beaver cut brush being common in the stream. All dams and lodges should be noted and indicate high beaver activity.

C.1.2.11 Stream Debris Load

1. Instream Debris Load

Stream debris load refers to natural and man-made debris including leaves, sticks, logs, lumber, trash and sediment. The one-third rule should be applied again where low means < 33% of the reach contains debris obstructing or deflecting flow, moderate means 33 to 66% and high means > 66% of the reach is characterized by large accumulations of lodged and partially compacted debris spanning the entire stream width.

2. Overbank Debris Load

The overbank debris load refers to loosened, floatable materials that are prevalent enough to potentially cause debris jams at culverts and bridges during high flows events. The locations and types of debris as well as how it may impact the reach should be noted. Similarly to the instream debris load section, the one-third rule should be applied.

C.1.3 Hydraulic Structures (SIRF Section B)

Hydraulic structures include low head dams, weirs, bridges, levees, and culverts. Dimensions as well as construction materials should be measured and recorded. Structures should be photographed and their locations should be recorded by taking a GPS waypoint. Elevations will be determined from existing data or field survey dependent upon the approved scope of work. Notes should include condition, drop or change in elevation, blockages and other characteristics.

C.1.4 Point Discharges (SIRF Section C)

Point discharges include all sanitary, storm sewer and agricultural drainpipes greater than 4 inches in diameter. They also include open channels, swales, gullies and other significant tributaries. Locations of all point discharges should be recorded by taking a GPS waypoint. Check the problem column (see SIRF) if the condition of the discharge point is blocked, cracked, etc. The volume of flow should be noted in the appropriate column using the following categories: none, trickle, moderate, substantial, other. Notes should include comments on odors, sheens or high turbidity if present.

C.1.5 Vegetation and Land Use (SIRF Section D)

C.1.5.1 Floodplain Vegetation (within 100 ft of stream)

For the respective banks the land use and vegetative cover should be noted as percentages of the floodplain surface area (note: percentages should total 100%). The vegetated buffer is given a score from 0-10 (see SIRF for specific criteria).

C.1.5.2 Predominant Bank Vegetation (%) and Predominant Tree/Shrub Species

These measurements provide an indication of bank stability and the potential for the development of debris blockages in the channel. For the respective banks the predominant vegetation type should be noted as percentages of the bank surface area (note: percentages should total 100%). Due to the rapid colonization capabilities of some tree and shrub species, the presence or absence of tree and shrub types should be documented even if trees or shrubs were uncommon in the stream reach. Also, where possible, tree and shrub species included in the 'Other' category should be identified. Canopy cover should be estimated as a percentage of shaded coverage of the channel.

C.1.5.3 Aquatic Vegetation

The general type and relative dominance of aquatic plants are documented in this section. Besides being an ecological assemblage that responds to perturbation, aquatic vegetation provides a refuge and food for aquatic fauna. Filamentous algae can grow in fast or slow flowing streams over solid surfaces within the stream channel. Extensive filamentous algae coverage is indicative of excessive nutrient levels. Submergent, emergent, free floating, rooted floating or no vegetation should also be considered when estimating percentage of aquatic vegetation over the total area of the reach.

C.1.6 Substrate and Water Quality (SIRF Section E)

C.1.6.1 Substrates

The substrate in the stream channel should be classified using the following definitions:

1. Claypan (Hardpan)

Claypan is made up of particles less than 0.0002 inches in diameter, which forms a dense, gummy surface that is difficult to penetrate.

2. Silt
Silt particles are between 0.0002 to 0.002 inches in diameter. Silt is a fine material that generally feels "greasy" when rubbed between fingers.

3. Sand
Sand is made up of materials from 0.002 to 0.08 inches in diameter. Sand exhibits a gritty texture when rubbed between fingers.

4. Gravel
Gravel is a mixture of rounded coarse material from 0.08 to 2.5 inches in size.

5. Cobble
Cobble is made up of stones from 2.5 to 10 inches in diameter.

6. Boulder
Boulders are defined as rounded stones over 10 inches in diameter or large "slabs" over 10 inches in length.

7. Organic
Organic substrate refers to living or decaying plant material.

8. Concrete
Channels lined with concrete or other man-made materials should be noted.

C.1.6.2 Substrate Stability

Substrate stability will be assessed according to how well the stream substrate supports the weight of the observer walking within the stream. Assessing substrate stability requires that the observers walk through representative lengths of the stream channel in the reach. To help ensure the safety of the observers, waders should be worn at all times to prevent cuts and infections, and at least two observers should walk each reach together. Stream channels should not be walked if the safety of the recorder is in jeopardy at any time because of strong current, deep-water sections, soft substrate, or any other potential danger. Substrate stability classified as 'None' indicates that the substrate can't support the observer's weight and the observer quickly sinks into the substrate. These substrate types are usually deep silts that for obvious safety reasons must not be walked in. 'Low' substrate stability can be walked over, but the observer will sink several inches into the substrate if he stands for an extended time period. These substrates may include silts and loose sand or gravel. 'Moderate' substrate stability would describe substrate that can be walked over without sinking more than an inch or two into the substrate and may include coarse gravel, cobble, perhaps mixed with some boulders. 'High' substrate stability can be readily walked on without sinking into the substrate. 'High' substrate stability often occurs when cobble, boulders, shale or claypan covers the stream bottom.

C.1.6.3 Substrate Embeddedness

Substrates should be considered embedded if more than 50% of the surface of the substrates are surrounded, impacted in or covered by unnatural accumulations of fine material such as sand or silt. Embedded substrates can't be easily dislodged. Naturally silty or sandy streams are not considered embedded; however, if sedimentation has buried the natural coarse substrates with sand or silt then the stream reach should be considered embedded. The degree of embeddedness can often be determined by jabbing a sturdy rod into the stream bottom to determine whether the underlying stream substrate is coarse material, or sand and silt. Embeddedness is the extent to which cobbles, gravel, and boulder substrates are embedded. High embeddedness would occur if over 66% of the site area was embedded (as defined above), moderate embeddedness would occur if from 33 to 66% of the site area was embedded and low means less than 33% of the area was embedded. 'N/A' ratings should be applied to stream channels that are naturally composed of silt and sand, because in such channels embeddedness of coarse substrates is 'not applicable.'

C.1.7 Instream Cover (SIRF Section F)

All types of cover present should be noted. Cover should not be counted when it is in areas of the stream with insufficient depth. General comments on perceived abundance of various cover types should be reported.

C.1.8 Aquatic and Terrestrial Organisms (SIRF Section G)

Some measurements for the Aquatic and Terrestrial Organisms section (SIRF Section G) require that riffles be distinguished from runs and pools. Pools and riffles were defined in section D.1.2.3. Runs are deeper than riffles, have relatively rapid, non-turbulent flow and are generally located downstream from riffles where the stream narrows. The streambed is often flat beneath a run and therefore the water surface is not visibly broken.

Biological information (versus chemical or physical information) is widely regarded as the most reliable type of data collection for evaluating the ecological conditions of stream reaches. For a very basic yet somewhat informative assessment of ecological conditions, the following procedures should be followed. For fish and macroinvertebrate sampling, the sample locations, the type of gear used for the sample collection and the approximate sample effort (in minutes or feet of stream reach) should be noted. Although SMC did not sample for fish, macroinvertebrates or birds in the North Branch, their presence was noted when they were encountered in a stream reach.

C.1.8.1 Macroinvertebrates

If sufficient flow exists, macroinvertebrates should be sampled by kick net (approximately 3' x 3' screens) in riffle areas at least once per reach. The observer should stand upstream of the kick net and use one or both feet to disrupt the substrate and dislodge macroinvertebrates from the substrate so that they drift downstream into the kick net screen. If sufficient flow does not exist for the effective use of kick nets, macroinvertebrates should be handpicked from rocks in riffle areas. The presence should be noted of major groups of macroinvertebrates such as stonefly, mayfly and caddisfly larvae, snails, water pennies, riffle beetles, damselfly and dragonfly nymphs, isopods and sowbugs, leeches, and worms. If riffle areas and rocks do not exist such as in recently channelized streams, impounded streams, or under low-flow conditions, then macroinvertebrates should be sampled from vegetation, debris or other instream material.

C.1.8.2 Fish

Fish sampling should be performed with a seine (or ideally, electroshocking equipment) at three or more stream locations. The types and relative abundances (percent composition of the catch by species) should be noted for each fish species captured. However, high flow may in some circumstances not permit safe and effective seining. In such instances, visual observations of types of fish present should be made where water clarity permits. Based on past experience, some species or groups that can be tentatively identified by visual observation alone without sampling gear include carp, goldfish, minnows, panfish and bass. In all biological evaluations, presence of rare or threatened and endangered animal and plant species is of great interest.

C.1.8.3 Birds

During the field investigation, types and numbers of birds that utilize streams and adjacent aquatic habitat should also be noted. Such birds that are common to Lake County include ducks, geese, herons, kingfishers, sandpipers, plovers, gulls, terns, swifts and some swallows.

Note: Any reptiles, amphibians or mammals observed should be noted as specific as possible.

C.1.9 Additional Comments

Additional notes or comments should include any irregularities such as cars in the stream, floodplain construction activity, presence of livestock in the stream, foul smelling discharges, errors in existing mapping or other peculiarities. Opportunities and obstacles to access should also be noted on each form.

C.1.9.1 Suggested Equipment List

- waders (2 pairs)
- digital camera, waterproof recommended
- gps unit
- polarized sunglasses
- 100+ foot tape measure
- 4-foot wood rod with depth marks or metal yard stick
- watch with second hand
- sampling gear

C.1.9.2 Access

Approval for access on private property is important. In the North Branch watershed, SMC met with the four drainage districts to obtain permission to enter their 50-foot easements on the three forks in order to access the river. In addition, SMC staff prepared a permission letter for presentation to members of the public encountered during the stream inventory. The sample permission letter used to access private property for the West Fork assessment is in Figure C-2.

FIGURE C-2 SAMPLE ACCESS PERMISSION LETTER

To Whom It May Concern:

The Lake County Stormwater Management Commission (SMC) is currently working on a comprehensive watershed management plan for the North Branch of the Chicago River in Lake County. As part of this process, we will be performing a complete assessment of the West Fork of the North Branch of the Chicago River. This assessment will examine things such as channel conditions; outfalls; substrate condition and water quality; and instream cover and shading. SMC staff members Sean Wiedel, Watershed Specialist, and Tim Andruss, Watershed Intern, will perform the assessment along with various volunteers. All of the above individuals are authorized by the SMC and the Union Drainage District #1 to gain reasonable access to the North Branch to perform the stream assessment.

The information collected in the field assessment will be incorporated into a comprehensive watershed plan for the North Branch of the Chicago River. This plan will address water quality and flooding problems, natural resource protection and development of greenways in the watershed along with other problems and opportunities.

The anticipated completion dates of the components of the plan are:

- Field Assessment
- Public Meetings
- Draft Plan
- Final Plan

If you would like additional information on the North Branch of the Chicago River watershed project, please contact Sean Wiedel at SMC (847-918-7695). Thank you for your cooperation.

Sincerely,

Ward Miller
Executive Director
Lake County SMC

Gordon McKavanaugh
Commissioner
Union Drainage District #1

STREAM INVENTORY REPORT FORM

STREAM NAME:_____ REACH ID:_____ DATE:_____

REACH BOUNDARY- DOWNSTREAM:_____ GPS Ref. #_____

REACH BOUNDARY-UPSTREAM:_____ GPS Ref. #_____

APPROX. LENGTH (ft):_____ TEMP. (°F)_____ TIME:_____

INVESTIGATORS:_____ RECENT RAIN: (Now, 12, 24, 48 hours, week)_____

GAGE READING:_____

A. CHANNEL CONDITIONS:

CHANNEL FLOW (STREAM STAGE):

NONE	LOW	MODERATE	NORMAL	HIGH
Very little water in channel and mostly present as standing pools	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed	Water fills > 75% of the available channel; or <25% of channel substrate is exposed	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed	Water levels are higher than the base of both banks
0 1	2 3 4	5 6	7 8	9 10

CHANNELIZATION: NONE_____ LOW____ MODERATE____ HIGH_____

PILOT CHANNEL FORMED (YES / NO)

SPOILS PILES ON BANKS (Left / Right / Both)

BANKFULL SINUOSITY: NONE____ LOW____ MODERATE____ HIGH____

BASEFLOW SINUOSITY: NONE____ LOW____ MODERATE____ HIGH____

POOL/RIFFLE DEVELOPMENT: % POOL ____ % RIFFLE ____ % RUN ____

DEGREE OF BANK EROSION:

NONE			LOW			MODERATE			HIGH		
Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems; less than 5% of bank affected.			Moderately stable; infrequent, small areas of erosion mostly healed over; 5-33% bank has areas of erosion.			Moderately unstable; 33-66% of bank has areas of erosion; high erosion potential during floods.			Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 66-100% of bank with erosional scars.		
Left Bank	10	9	8	7	6	5	4	3	2	1	0
Right Bank	10	9	8	7	6	5	4	3	2	1	0

TYPES AND LOCATIONS OF HIGH CASES:

GPS#	PHOTO #	Side of Channel (L/R)	NOTES (aspect of photo if applicable):

DEGREE OF ARMORING: NONE____ LOW____ MODERATE____ HIGH____

TYPES AND LOCATIONS OF HIGH CASES:_____

SEDIMENT ACCUMULATIONS:

NONE	LOW	MODERATE	HIGH
Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment depositions	Some new increase in bar formation, mostly from gravel, sand, or fine sediment; 20-50% of the bottom affected; slight deposition in pools	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected, sediment deposits at obstructions, constrictions and bends; moderate deposition of pools prevalent	Heavy deposits of fine material, increase bar development; more than 80% bottom changing frequently, pools almost absent due to substantial sediment deposition
10 9	8 7 6	5 4 3	2 1 0

TYPES AND LOCATIONS OF HIGH CASES:_____

MID-STREAM BARS AND ISLANDS: YES:_____ NO:_____

MEAN BANK HEIGHT	HEIGHT (FT)	GPS #	AVERAGE	RANGE
MEAN BANK SLOPE (RUN/RISE)	SLOPE	GPS #	AVERAGE	RANGE
MEAN WATER DEPTH	DEPTH (FT)	GPS #	AVERAGE	RANGE
TOP MEAN CHANNEL WIDTH (FT)	WIDTH (FT)	GPS #	AVERAGE	RANGE
BOTTOM MEAN CHANNEL WIDTH (FT)	WIDTH (FT)	GPS#	AVERAGE	RANGE
MEAN VELOCITY (FT/S)	TRAVEL TIME (sec/ 10ft)	GPS#	AVERAGE	RANGE

BEAVER ACTIVITY: NONE_____ LOW_____ MODERATE_____ HIGH_____

DAM/LODGE: YES (NUMBER OF DAMS)_____ NO_____

STREAM DEBRIS LOAD (as defined in methodology):

INSTREAM: LOW _____ MODERATE _____ HIGH _____

OVERBANK: LOW _____ MODERATE _____ HIGH _____

NOTES:_____

_____

IMPOUNDED: YES:_____ NO:_____

COMMENT:_____

SOURCE:_____

B. HYDRAULIC STRUCTURES:

(Note sizes & locations in channel or adjacent floodplain.)

TYPE & MATERIAL	DIMENSIONS (inches)	GPS #	PHOTO #	L/R or Center of Channel	P♣	ASPECT (up/down)	NOTES:

♣ P= Problem (Check for Yes)

C. DISCHARGE POINTS:

(Pipes, ditches, swales, tributaries; note numbers, sizes and locations of discharges with diameters of 4 inches or more.)

TYPE & MATERIAL	DIMEN-SIONS (inches)	GPS #	PHOTO #	L/R or Center of Channel	P♣	FLOW*	NOTES

NOTES (ex: suspicious effluent etc.):_____

_____

♣ P= Problem (Check for Yes)

* **None, Trickle, Moderate, Substantial, Other**

D. VEGETATION & LAND USE:

FLOODPLAIN VEGETATION(within 100 ft of stream)

***DOMINANT LAND USE (%)*:**

LEFT: AGRICULTURAL:_____ OPEN SPACE:_____ RECREATIONAL: _____

COMMERCIAL/INDUSTRIAL:_____RESIDENTIAL:_____ OTHER:_____

RIGHT: AGRICULTURAL:_____ OPEN SPACE:_____ RECREATIONAL:_____

COMMERCIAL/INDUSTRIAL:_____ RESIDENTIAL:_____OTHER:_____

***LAND COVER (%)*:**

LEFT: TREES: _____ LAWN:_____ WETLANDS:_____ CROPS:_____ SHRUBS:_____

HERBACEOUS: _____ IMPERVIOUS:_____ WATER:_____OTHER: _____

RIGHT: TREES:_____ LAWN:_____ WETLANDS:_____ CROPS:_____ SHRUBS:_____

HERBACEOUS:_____ IMPERVIOUS:_____ WATER:_____OTHER:_____

***WIDTH OF VEGETATED BUFFER*:**

NONE	LOW	MODERATE	HIGH
Width of riparian zone <20 feet; little or no riparian vegetation due to human activities	Width of riparian zone 20-40 feet; human activities have impacted zone a great deal	Width of riparian zone 40-60 feet; human activities impacted zone minimally	Width of riparian zone >60 feet; human activities (parking lots, roadbeds, lawns, crops) have not impacted zone
Left Bank 0 1 2	3 4 5	6 7 8	9 10
Right Bank 0 1 2	3 4 5	6 7 8	9 10

Notes_____

_____

_____

BANK VEGETATION (within 10 ft of stream):

PREDOMINANT VEGETATION (%)

LEFT BANK: UNMOWED GRASS:___ LAWN:___ WETLAND:___ TREES:___ SHRUB:___

CROP:___ HERBACEOUS: ___ NONE:___ OTHER:_____

RIGHT BANK: UNMOWED GRASS:___ LAWN:___ WETLAND:___ TREES:___ SHRUB:___

CROP:___ HERBACEOUS: ___ NONE:___ OTHER:_____

PREDOMINANT TREE/SHRUB SPECIES ON BANKS (CHECK ALL PRESENT)

WILLOWS_____ BOX ELDER_____ HONEYSUCKLE_____

BUCKTHORN_____ HARDWOODS_____ OTHER_____

CANOPY (PERCENT SHADED COVERAGE OF CHANNEL):_____

AQUATIC/INSTREAM VEGETATION

VEGETATION (%): ROOTED EMERGENT:_____ ROOTED SUBMERGENT:_____

ROOTED FLOATING:_____ FREE FLOATING:_____ FLOATING ALGAE:_____

ATTACHED ALGAE:_____ NO VEGETATION:_____

E. SUBSTRATE AND WATER QUALITY:

SUBSTRATE COMPOSITION (%): CLAYPAN_____ SILT_____ SAND_____ GRAVEL_____

COBBLE_____BOULDER_____ CONCRETE_____ ORGANIC MATTER_____

CATEGORIZE AS "NONE", "LOW", "MODERATE", OR "HIGH" (Locate worst cases.):

SUBSTRATE STABILITY OF ENTIRE REACH:_____

SUBSTRATE EMBEDDEDNESS OF ENTIRE REACH:_____

GREASE & OIL IN WATER COLUMN_____ GREASE & OIL IN SEDIMENT_____

TURBIDITY (including tributaries, point discharges; LOW, MODERATE, HIGH):_____

WATER COLOR: CLEAR_____ BROWN_____ GREEN_____ GRAY_____

COMMENTS/PROBABLE CAUSES:_____

F. INSTREAM COVER FOR FISH:

(Check all that apply.)

UNDERCUT BANKS_____ POOLS OVER 28" DEEP_____ MACROPHYTES_____ LOGS_____

OVERHANGING VEGETATION_____ ROOTWADS_____ BOULDERS_____ BACKWATERS_____

COMMENTS:_____

_____

G. AQUATIC AND TERRESTRIAL ORGANISMS:

(Check or note all that were observed.)

MACROINVERTEBRATES:

MAYFLIES:_____ CADDISFLIES:_____ DRAGONFLY/DAMSELFLY NYMPHS:_____

SNAILS:_____ SCUDS:_____ SOWBUGS:_____ LEECHES:_____ WORMS: _____

WATER PENNIES:_____ BEETLES:_____ OTHER:_____

FISH:

CARP:_____ BLACK BULLHEADS:_____ CREEK CHUBS:_____ GREEN SUNFISH:____ BLUEGILL: ____

LARGEMOUTH BASS:____ JOHNNY DARTERS:___ FATHEAD MINNOWS:____ GOLDEN SHINERS:

OTHERS:_____

BIRDS:

DUCKS:___GEESE:___ HERONS:___ KINGFISHERS:___ SANDPIPERS/PLOVERS:

GULLS/TERNS:_____ OTHERS:_____

REPTILES:_____

AMPHIBIANS:_____

MAMMALS:_____

MUSSEL BEDS: NO ___ YES ___ IF YES: GPS #'S ____ ____ ____

H. PHOTO LOG: **PHOTOGRAPHER**:_____

GPS #	PHOTO #	L/R or Center of Channel	Aspect (Up/ Downstream)	Photo Description:

FLINT CREEK WATERSHED

STREAM INVENTORY SUMMARY

The Lake County Stormwater Management Commission conducted an extensive inventory of water quality, aquatic life, physical habitat, and in-stream flow characteristics to determine conditions within the Flint Creek watershed stream network. Habitat and channel condition assessments are based on data collected during the stream inventory. Though not specifically assessed, the inventory addressed aquatic and riparian life where possible or identifiable.

The data summarized below for the Flint Creek stream inventory were collected from July to September 2006. SMC personnel assessed approximately 24.3 miles of stream channels, and the Lake County Health Department - Lakes Management Unit inventoried an additional 9.9 miles of on-line lakes and wetlands. Lake County Health Department Lakes Management Unit Detailed Lake Reports are available in PDF format online at http://www.co.lake.il.us/health/ehs/lakes.asp. Approximately 8.5 miles of tributary wetlands, overflow and drainage swales and zero- and first-order feeder channels (the smallest perennial streams as well as those that only carry water for part of the year or after storm events) in the Flint Creek network were not assessed in the course of the stream inventory.

GENERAL DESCRIPTION

The Flint Creek watershed drains 37.7 square miles (24,113 acres) in northeastern Illinois and is a headwaters unit within the larger Fox River watershed in the Mississippi River basin. The Flint Creek watershed is bordered to the north, west and south by other watersheds within the Fox River drainage. To the north, these include the Squaw Creek, Slocum Lake Drain, and Tower Lake Drain watersheds, to the west, the Spring Creek watershed, and to the south, the Poplar Creek watershed. To the east, watersheds within the Des Plaines River drainage border the Flint Creek watershed, including the Indian Creek, Buffalo Creek, and Salt Creek watersheds. The Flint Creek watershed covers portions of three counties, including 28.7 square miles (18,343 acres) of southwestern Lake County, 8.9 square miles (5,710 acres) of northwestern Cook County, and 0.1 square miles (60 acres) of McHenry County. Additionally, the watershed includes parts of eight municipalities (Barrington, Barrington Hills, Deer Park, Hawthorn Woods, Inverness, Lake Barrington, Lake Zurich, and North Barrington). No major tributaries originate in or flow through McHenry County and therefore no areas of McHenry County were assessed in the stream inventory.

Two primary drainage networks comprise the Flint Creek watershed, the Grassy Lake Drain system in the north and the Flint Creek system in the south. The two converge at Flint Lake, an artificial impoundment in Lake Barrington. The Grassy Lake Drain subwatershed includes 8.9 miles of assessed stream channels while the Flint Creek subwatershed includes 13.7 assessed miles. Below the Flint Lake dam, the mainstem of Flint Creek flows north approximately 1.7 miles to its confluence with the Fox River.

HISTORY

The streams of the Flint Creek watershed have a history similar to those of other watersheds of comparable size in northeastern Illinois. The natural drainage pattern of the region is primarily controlled by topography and material left by glacial processes during the last ice age. The eastern boundary of the Flint Creek watershed is a moraine,

or ridgeline, arcing from north to south to southwest, separating the Des Plaines and Fox River drainages. Streams in the Flint Creek watershed rise on this moraine and generally run westward or northward toward the Fox River. Likewise, the deposits left by the glaciers play a role in determining the sediments that compose the bed and banks of the stream as well as the terrain through which the channel flows. Fine-grained, cohesive sediments (clays and silts) tend to characterize the streambank materials (particularly in lower reaches) while clays, silts, sands, and gravels dominate the streambeds with the occasional presence of cobble-dominated riffles. All stream channels in the Flint Creek watershed exhibit a single thalweg, or main channel. Correspondingly, highly braided channels and mid-channel island and bar formation are rare or absent.

Like many similar-sized stream systems in the region, the Flint Creek watershed has been impacted by human activity, particularly during the period of Euro-American settlement. Stream channels and wetlands have been channelized and/or deepened to improve drainage and runoff first for agriculture and later for suburban development. The natural drainage pattern of the watershed has also been altered by agricultural drainage and stormwater collection systems that gather and channel surface runoff into pipes, swales, and ponds.

In some cases, runoff is slowly released into the drainage network, although in other instances it may be conveyed rather quickly from the ground surface through the stormwater drainage system to the stream channel. In the latter example, infiltration of rainfall to the groundwater aquifer is reduced and poorly dispersed, the lag period between the rain event and the flood response pulse of the stream is decreased, and the maximum or “peak” discharge resulting from a given amount of precipitation is increased. Discharge is the volume of water flowing past a point in a given period of time (usually measured in cubic feet per second, or CFS). The combined effect is that stream responses to rainfall become “flashy,” or more pronounced. In other words, following a rain event, a stream reaches peak flow and returns to baseflow conditions more quickly than under natural conditions. Baseflow is the discharge that a stream receives from groundwater contribution alone and does not include surface runoff or subsurface saturation runoff during rain events. Because the time period of the flood is reduced, the discharge of the peak flow also increases.

Channelization includes not only the straightening of meanders, but often the excavation of a deeper channel and the clearing of any debris from the channel that might impede flow. Channelization may affect downstream channels in a manner similar to efficient stormwater conveyance systems by reducing the sinuosity, or degree of meandering, of the stream channel. These activities effectively reduce the length of the stream channel relative to its valley and increase its gradient, resulting in corresponding increases in velocity (rate at which water is flowing at a point measured in feet/second) and discharge. As velocity and discharge increase, the stream becomes capable of eroding and transporting greater amounts and larger-sized grains of its bed and bank sediments. This type of erosion can lead to channel incision or “down-cutting” and the development of “head-cuts,” which are localized areas of increased gradient that migrate upstream as the stream channel adjusts (similar to the upstream end of a gully). Channelization also reduces the number of naturally occurring features in the channel, particularly pools, riffles, and bars. However, naturally occurring fluvial processes (such as erosion, sediment transport and deposition) begin to reform these features as the stream channel adjusts toward its former grade. Consequently, highly modified stream channels often require extensive and/or routine maintenance (such as dredging) to preserve their efficiency, utility and conveyance.

FLINT CREEK MAINSTEM

The Flint Creek mainstem (from this point, referred to as the Mainstem) is formed by the confluence of the Grassy Lake Drain and Flint Creek in Flint Lake, an impoundment in Lake Barrington. From the Flint Lake dam, Flint Creek flows north for approximately 1.7 miles to its mouth at the Fox River. Below Flint Lake, which was constructed in the center of a residential subdivision, land uses in the stream corridor are limited to large-lot residential development and open space (Lake County Forest Preserve District - Grassy Lake Preserve). While portions of the mainstem have been channelized, some areas, particularly below Kelsey Road, exhibit moderate degrees of meandering and pool-riffle development.

FLINT CREEK

Streams in the Flint Creek subwatershed collectively flow some 21 miles from three source areas to Flint Lake. A western fork of Flint Creek flows west from a series of retention ponds in the Village of Inverness to LaBuys Lake, an impoundment in the Crabtree Nature Preserve in Cook County. From there, the west fork flows through Hawley, Keene, and Hawthorn Lakes in Barrington Hills and then north to its confluence with the east fork of Flint Creek northwest of the intersection of Lake Cook and Hart Roads in Barrington. The eastern fork of Flint Creek begins in Baker Lake, also in Cook County, and flows north to Lake Louise in Barrington. Downstream (northwest) of Lake Louise, the eastern fork flows through the southern end of Cuba Marsh, the third major tributary area. From the marsh, Flint Creek flows south and west through central Barrington, the most intensively developed stream corridor in the entire watershed. From the confluence of the two forks, Flint Creek flows through two golf courses before entering Flint Lake. Outside of central Barrington, land uses in the stream corridor primarily consist of open space, large-lot residential and recreational open space (golf courses and equestrian). Between Illinois Highway 22 and U.S. Highway 14 (Northwest Highway), Flint Creek flows through an extensive wetland managed by Citizens for Conservation, a local conservation group. Much of Cuba Marsh is part of the Lake County Forest Preserve District - Cuba Marsh Preserve.

GRASSY LAKE DRAIN

The Grassy Lake Drain flows just over a mile from Grassy Lake to Flint Lake. Two tributary systems feed Grassy Lake, North Flint Creek and the Honey Lake Drain. North Flint Creek begins near the Lake Zurich Middle School north campus on Old McHenry Road in Hawthorn Woods. North of Miller Road, it converges with the Echo Lake Drain, a small tributary that flows north out of Lake Zurich at Old Rand Road, into a wetland complex, and into the south end of Echo Lake. From the dam across the north end of Echo Lake, the stream flows 0.8 miles through wetlands to North Flint Creek. In total, North Flint Creek flows approximately 5 miles from Old McHenry Road to Grassy Lake. Residential uses of varying intensities and open space occupy almost the entire stream corridor.

The Honey Lake Drain flows approximately 0.8 miles from Honey Lake in North Barrington to Grassy Lake. Two tributaries enter Honey Lake from the southeast. The western tributary rises in a wetland area south of Illinois Highway 22 and flows north 0.8 miles to Honey Lake. The eastern, or Signal Hill tributary, originates at a drain tile outlet at the head of a drainage ditch 0.5 miles southeast of Honey Lake. The two tributaries flow through relatively deep ravines in residential areas. Below Honey Lake, The Honey Lake Drain flows across the Biltmore Country Club golf course and then enters a ravine and flows through a residential area before reaching Grassy Lake.

STREAM ASSESSMENT: LAKE COUNTY SMC STREAM INVENTORY

An inventory of stream channels in the Lake and Cook County portions of the Flint Creek watershed was conducted in 2006 by Lake County SMC. Although the watershed includes a small portion of McHenry County (approximately 60 acres), no tributaries originate in or traverse that area. The stream network was divided into thirty-six individual reaches for data collection purposes (see Map FC-1). A reach is a segment of the stream exhibiting relatively homogeneous hydraulic, geomorphic, riparian, and land use conditions throughout. In the Flint Creek watershed, eleven of these reaches consist entirely or primarily of lakes and/or wetlands and were not assessed by SMC. However the Lake County Health Department – Lakes Management Unit Reports are available for Flint, Grassy, Honey, Echo, and Zurich. These reports are available at http://www.co.lake.il.us/health/ehs/lakes.asp.

Table FC-1. Flint Creek watershed stream reaches

Stream Network	Number of Assessed Reaches	Average Length (ft.)
Mainstem	2	4500
Flint Creek	14	5157
Grassy Lake Drain	9	5244
TOTAL	25	5136

The remaining twenty-five reaches consist primarily of stream channels and were assessed. Assessed reaches average approximately 5,136 feet in length (see Table FC-1).

Inventory methodology included walking the entire reach, measuring channel dimensions, noting streambank and riparian conditions, and documenting hydraulic structures and discharge points using a standardized database. Over 460 photographs were taken as documentation using a digital cameral linked to a hand-held GPS (global positioning system). This allowed each photo to be imprinted with geographic coordinates and later placed into a GIS (geographic information system) database for accurate mapping of each item documented in the photo.

The major stream characteristics inventoried include:

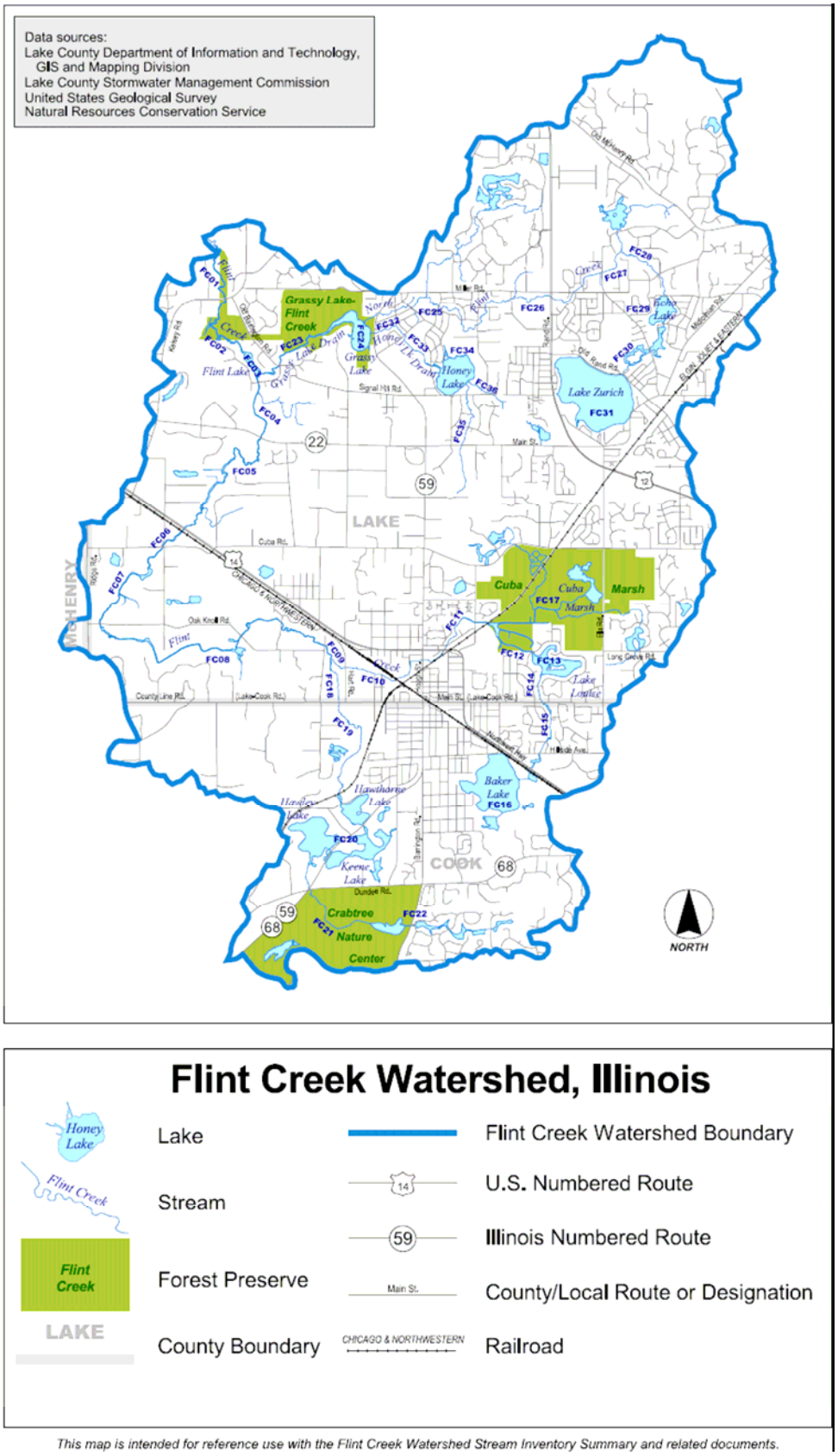
1. Channel conditions (physical dimensions, degree of bank erosion, sediment accumulation, debris load, pool/riffle development)
2. Hydraulic structures (bridges, culverts, dams and weirs)
3. Discharge points (pipes, drain tiles, stormsewers, tributary streams and swales)
4. Riparian corridor (floodplain and streambank land use and cover)
5. Aquatic habitat (substrate composition and in-stream cover)

Appendix A summarizes major reach characteristics for the Flint Creek watershed.

Although some quantitative data were collected such as channel, discharge point and hydraulic structure measurements, the condition of the river was largely assessed using a qualitative method that involved visually inspecting and rating each stream reach as low, moderate or high for the characteristic being evaluated. A copy of the stream inventory methodology can be found in the Methodology Supplement for this inventory (See Appendix E). The following terminology is used in the discussion of the stream inventory results.

- *None, low, moderate and high*: "none" refers to levels affecting less than 5% of the reach, "low" refers to levels affecting 5 to 33% of the reach; "moderate" means >33 to 66% was affected; and "high" indicates more than 66% of the reach was affected.

Map FC-1. The Flint Creek watershed.



This map is intended for reference use with the Flint Creek Watershed Stream Inventory Summary and related documents.

- *Point discharges:* refers to open channels and pipes that drain into the river. Open channels may include gullies, ditches or stream tributaries of the river.
- *Turbidity:* refers to the clarity of the water and is a function of how much material including sediment is suspended in the water. High degrees of turbidity make the river less hospitable to aquatic life.
- *Hydraulic structures:* low head dams, weirs, bridges, culverts and any other structures in conveying flow in the channel.

CHANNEL CONDITIONS: FLINT CREEK WATERSHED

A number of factors were assessed in order to determine and describe the condition of stream channels in the Flint Creek watershed. While streams are inherently dynamic systems, parameters such as degree of channelization, sinuosity, pool/riffle development, sediment accumulations, bank erosion, and debris loads suggest trends towards or away from relative stability. Physical measurements such as bank height, bank slope, channel width and water depth reflect the shape of the channel and the amount of water that is transported by the river under both high and low flow conditions. Streambank vegetation, canopy coverage and hydraulic structures affect the hydraulic capacity of the channel and floodway and are therefore also included in the stream condition inventory.

Table FC-2. Range of Channel Dimensions for Flint Creek watershed streams*

Stream	Bank Height (feet)		Bank Slope		Channel Width, Top (feet)		Channel Width, Bottom (feet)	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Mainstem	2.4	2.9	0.72	0.99	28.6	39.2	14.4	30
Flint Creek	1.5	9.5	0.29	1.34	13.33	42	8.3	33.5
Flint Creek, Flint Lake to Baker Lake	1.5	9.5	0.29	1.34	16.7	42	10.3	33.5
West Fork Flint Creek, Flint Creek to La Buys Lake	2.25	3.83	0.33	0.57	13.33	17.67	8.3	14.33
Grassy Lake Drain	1.46	7.6	0.35	0.83	10	42	5.3	31
North Flint Creek, including Echo Lake Drain	1.46	3.2	0.35	0.62	10	26	5.3	12.3
Honey Lake Drain, including tributaries	1.83	7.6	0.4	0.83	16.7	31	7.3	11.3

*Ranges of individual reach mean

The inventory suggests a diversity of stream channel characteristics throughout the watershed. The data gathered also suggest that a number of natural and anthropogenic processes are occurring throughout the watershed with both favorable and detrimental results. Table FC-2 summarizes channel shape parameters in the Flint Creek watershed. Additional information regarding overall reach and channel character is available in Appendix A. A brief summary of conditions and parameters inventoried for streams in the Flint Creek watershed is listed in the following sections.

POOL-RIFFLE DEVELOPMENT

Under baseflow conditions, pools are low-gradient areas of deeper water and slower velocity and riffles are high-gradient areas of shallow water and higher velocity. Pools represent localized deeper areas in the channel while riffles represent localized shallows. During periods of baseflow, sediments are eroded from riffles and deposited in pools. During floods, the relationship of relative velocity in riffles and pools is reversed and sediments are scoured from pools and deposited on riffles or bars. During periods of elevated flow when the velocity in pools exceeds that over riffles, deposition and bar formation tend to occur in areas adjacent to pools.

In a single-thalweg meandering channel, pools are typically associated with the outer portions of meander bends while riffles are typically located above or below pools. Bars typically form alongside pools or runs. Because pools and riffles exhibit very different physical conditions and are often adjacent to one another in the channel, they are important to ecological health of the stream channel. Because of their typically shallow depth, increased gradient and large sediment size, riffles cause turbulence throughout the water column and have the effect of aerating the stream, causing oxygen to dissolve from the air into the water. Pools, on the other hand, have slower velocities and increased depth, offering habitat to wide range of aquatic species for a variety of uses. Channelization often reduces the extent of pool-riffle sequences in a stream.

Most stream channels in the Flint Creek watershed exhibit some degree of pool-riffle development (see Table FC-3). Over the entire watershed, all but four of the assessed reaches exhibited some pool-riffle formation. Additionally, four reaches showed a high degree of pool-riffle development, although two of these are part of the Honey Lake Drain and are probably not perennial reaches (those that normally carry some flow all year). In the Flint Creek watershed, pool-riffle formation appears to be related to stream gradient (steepness of channel bottom) and elevated baseflow and/or stormwater runoff related to urban development. In high-gradient residential areas such as the Honey Lake Drain and North Flint Creek reaches in North Barrington, increased storm flows resulting from development in the contributing watershed probably scour pools and remove fine sediments, accentuating such characteristics. Channelization and dredging to create on-line ponds have likely reduced the amount of pool-riffle development in some lower-gradient reaches or created a defined channel where one would not have otherwise occurred.

Table FC-3. Pool-Riffle Development in Flint Creek Watershed Streams

Degree of Pool-Riffle Development*	Flint Creek Watershed		Flint Creek Mainstem		Flint Creek		Grassy Lake Drain	
	Reaches	%	Reaches	%	Reaches	%	Reaches	%
None	4	16	0	0	4	29	0	0
Low	13	52	0	0	7	50	6	67
Moderate	4	16	1	50	2	14	1	11
High	4	16	1	50	1	7	2	22

*Percentage of reach in pools/riffles (None: <5%, Low: 5-33%, Moderate: >33-66%, High: >66%)

STREAMBANK EROSION

Streambank erosion in the Flint Creek watershed tends to occur in developed areas, particularly residential neighborhoods and urban areas. Erosion is a function of the amount of runoff generated by a storm or flood event, the steepness of the banks, and the amount and type of vegetation growing on the banks. In some reaches (e.g. FC25 on North Flint Creek in North Barrington), increased runoff resulting from development has caused localized erosion problems. In other reaches (e.g. FC21 in the Crabtree

Nature Center), it appears that invasive plant species on the streambanks have shaded or crowded out any competition, leaving the soils exposed and susceptible to erosion.

Table FC-4 summarizes streambank erosion in the Flint Creek watershed. While some severe cases of localized bank erosion were found, no reach exhibited high erosion over its entire length. The Grassy Lake Drain and its tributaries (North Flint Creek and the Honey Lake Drain) suffer from the greatest erosion problems, with five of the nine reaches in that catchment characterized by moderate bank erosion. Interestingly, the only two reaches in the Flint Creek watershed where no bank erosion was evident were areas where Flint Creek flows through reed canary grass-dominated wetland preserves.

Table FC-4. Streambank Erosion in the Flint Creek Watershed

Extent of Erosion*	Flint Creek Watershed		Flint Creek Mainstem		Flint Creek		Grassy Lake Drain	
	Reaches	%	Reaches	%	Reaches	%	Reaches	%
None	2	8	0	0	2	14	0	0
Low	15	60	2	100	9	64	4	44
Moderate	8	32	0	0	3	21	5	56
High	0	0	0	0	0	0	0	0

*Percent of reach with erosion problems (None: <5%, Low: 5-33%, Moderate: >33-66%, High: >66%)

SEDIMENT ACCUMULATION

Sediment erosion, transport and deposition are naturally occurring processes in stream systems, but the magnitude of these processes can be amplified due to human modifications to the watershed. Typically a stream generates, suspends, and transports sediment through high-gradient reaches and deposits sediment in low gradient reaches and/or in areas where velocity decreases. These low-velocity areas may be naturally occurring areas such as pools or sloughs. They may also occur behind debris jams or beaver dams or upstream of channel constrictions (such as culverts) or dams.

All reaches in the Flint Creek watershed experience some sediment accumulation (see Table FC-5). In some cases, deposition is likely increased due to local or upstream increases in runoff and/or erosion. Eighty-four percent of Flint Creek watershed reaches experience moderate or high degrees of sediment accumulation, in spite of the fact that a number of on-line impoundments (e.g., Flint Lake, Lake Louise) are likely acting as sediment traps.

Table FC-5. Sediment Accumulation in the Flint Creek Watershed

Sediment Accumulation*	Flint Creek Watershed		Flint Creek Mainstem		Flint Creek		Grassy Lake Drain	
	Reaches	%	Reaches	%	Reaches	%	Reaches	%
None	0	0	0	0	0	0	0	0
Low	4	16	1	50	2	14	1	11
Moderate	19	76	1	50	10	71	8	89
High	2	8	0	0	2	14	0	0

*Percent of reach affected by sedimentation (None: <5%, Low: 5-33%, Moderate: >33-66%, High: >66%)

DEBRIS LOADS

Like sediment, most or all streams transport some amount of debris. Large organic debris such as tree limbs and branches can provide habitat, divert currents to create pools, bars, and slow-water habitat for aquatic organisms, and provide allochthonous energy inputs to the ecosystem that are not produced within the stream. *Allochthonous* inputs are those that enter the stream from some outside source, such as organic matter like leaves from terrestrial plants and trees that is washed into the stream). However, too much debris can be problematic and may result in debris jams. These debris jams may cause backwater flooding and sediment deposition and can divert current into one or both banks, leading to streambank erosion.

In the Flint Creek watershed, problematic or potentially problematic debris loads exist in nearly half of all stream reaches. Table FC-6 summarizes the reaches that failed the debris load test, and have either moderate or high instream and/or overbank debris loads. Debris in these reaches causes or has the potential to cause backwater flooding, sedimentation, and bank erosion. Reaches that "failed the test" contain multiple debris jams or overhanging obstructions extending across all or a significant portion of the channel and/or onto the banks. The Flint Creek mainstem below Flint Lake does not appear to have any significant problems with debris, although a very large decaying debris jam appears to have facilitated a meander cutoff and change of course in the channel at some point in the past. Upstream of Flint Lake, about 50% of reaches in both the Flint Creek and the Grassy Lake Drain systems experience debris-related problems. These are common in small channels as well as channels that have been highly modified and are overgrown with invasive vegetation. Dams and stormwater detention systems likely attenuate the downstream effects of large floods that would otherwise periodically flush debris from the system and break up debris jams.

Table FC-6. Instream and Overbank Debris Loads in the Flint Creek Watershed

Failed Debris Load Test*	Flint Creek Watershed		Flint Creek Mainstem		Flint Creek		Grassy Lake Drain	
	Reaches	%	Reaches	%	Reaches	%	Reaches	%
Instream	7	28	0	0	6	43	1	11
Overbank	0	0	0	0	0	0	0	0
Both	5	20	0	0	1	7	4	44

*Reaches that failed test for instream, overbank, or both types of debris loads

HYDRAULIC STRUCTURES

Hydraulic structures are any bridges, culverts, dams, weirs, levees, and fences in or across the stream channel. These structures modify the pattern or amount of flow and may act as constriction points causing backwater flooding. Additionally, dams and weirs can impede the movements of fish and other aquatic organisms within the stream network. Culverts may also act as temporary or permanent barriers if, over time, a plunge pool develops, causing the bottom of the culvert to become elevated above the water level of the pool. Hydraulic structures also require periodic maintenance and replacement. A complete summary table of the 136 hydraulic structures recorded in the stream inventory can be found in Appendix C.

The Flint Creek mainstem, largely surrounded by LCFPD property, contains only three functioning hydraulic structures (the fourth is a small defunct concrete structure in the channel that probably housed a pump at some point in time). Of these, only the Flint Lake dam appears to cause any significant problems upstream or downstream. The problems associated with the dam (and the lake) are enumerated in the Lake County

Health Department Lakes Management Unit 2003 report on Flint Lake (available at http://www.co.lake.il.us/health/ehs/lakes.asp).

Upstream of Flint Lake, Flint Creek and the Grassy Lake Drain contain similar numbers of hydraulic structures. Of the 89 bridges in the entire watershed, 43 are wooden footbridges. One such bridge on North Flint Creek in the Village of North Barrington has collapsed into the stream and could be removed to easily remedy some debris and hydraulic structure problems. There are a number of bridges throughout the watershed that do not appear to be in use and could be candidates for potential removal. Additionally, there are opportunities to remedy backwater flooding problems caused by undersized culverts on North Flint Creek in the Village of North Barrington; it appears that some of these culverts have been replaced. Most of the dams in the watershed maintain water levels on lakes or ponds for one or more (often recreational) uses. Therefore, the surface elevation of such water bodies is likely kept at an artificially high level. Table FC-7 summarizes numbers and types of hydraulic structures in the Flint Creek watershed.

Table FC-7. Hydraulic Structures in Flint Creek Watershed Streams

Hydraulic Structure	Flint Creek Watershed	Flint Creek Mainstem	Flint Creek	Grassy Lake Drain
Bridge	89	2	47	40
Culvert	27	0	10	17
Dam	12	1	6	5
Weir	2	0	1	1
Fence	5	0	3	2
Other	1	1	0	0
TOTAL	136	4	67	65

DISCHARGE POINTS

Discharge points are any outfalls to streams in the Flint Creek watershed, including drain tile outlets, sump pump pipes, stormsewer outfalls, drainage swales, open channels, and tributaries. The stream inventory documented 181 points of discharge into stream channels, of which 147 were pipes of some sort (see Table FC-8). The Flint Creek catchment above Flint Lake contained over two-thirds of the discharge points in the watershed, and also contained the highest numbers of both tributaries/swales and pipes. Discharge points are most common in urban and residential areas where sump pump and stormsewer outfalls are numerous. Problem discharge points in the Flint Creek watershed contribute to streambank erosion and/or transport excess sediment to the stream channel. Problematic discharges are most common in urban and residential areas. Another problem frequently noted during the stream inventory is the state of disrepair of some drain tiles, particularly those constructed of clay and concrete. As the streambank erodes, longer sections of the tile become exposed and eventually collapse under their own weight. This effectively shortens the pipe, causing the point at which runoff discharges from the pipe to retreat from the channel, further eroding the streambank.

Table FC-8. Discharge Points in the Flint Creek Watershed				
Discharge Points	**Flint Creek Watershed (24.3 miles)**	**Flint Creek Mainstem (1.7 miles)**	**Flint Creek (13.7 miles)**	**Grassy Lake Drain (8.9 miles)**
Tributaries, swales and gullies	34	2	24	8
Tributaries, swales and gullies per stream mile	1.40	1.17	1.76	0.89
Pipes (including storm sewers, culverts, and drain tiles)	147	1	99	47
Pipes per stream mile	6.04	0.59	7.24	5.26
Combined total discharge points	181	3	123	55
Discharge points per stream mile	7.44	1.76	9.00	6.15
Problem discharge points	39	0	26	13

RIPARIAN CORRIDOR/FLOODPLAIN

Vegetation and land use characteristics were visually assessed while walking the stream channel throughout the inventory process. In general, the riparian zone and streambanks are not intensively developed, although they are moderately to highly impacted by human activity in some reaches.

Table FC-9 summarizes land use in the riparian corridors of the Flint Creek watershed. This area is defined as extending 100 feet from the stream channel on either side and was visually estimated during the inventory. Approximately half of the riparian corridor area in the watershed is open space or vacant land (not including lakes and unassessed wetlands), much of it preserved in public or private ownership. An additional 12 percent of riparian corridors are considered recreational land uses and consist almost entirely of golf courses, although some athletic fields and parks are included. Such areas may have higher potential for restoration or naturalization projects than other more intensely-developed, diverse-use and mixed-use, and/or privately owned areas.

Table FC-9. Land Use in Riparian Corridors, Flint Creek Watershed				
Land Use	**Flint Creek Watershed %***	**Flint Creek Mainstem %***	**Flint Creek %***	**Grassy Lake Drain %***
Residential	38	13	24	65
Commercial/Industrial	1	0	1	1
Recreational	12	0	14	12
Agricultural	0	0	0	0
Open Space/Vacant	50	88	61	23
Other	0	0	0	0

*Due to rounding, percentages may not add up to 100%

Table FC-10 summarizes vegetation and land cover on streambanks, indicating the type of land cover existing in buffer areas along stream channels (generally within about 10 feet of the water). Shrubs, herbaceous plants and grasses, and wetland vegetation composed the majority of streambank vegetation, and significant portions were also covered by trees or were bare. Although streambanks in the watershed are vegetated, many are dominated by one or a few species, such as buckthorn and reed canary grass, which may limit the diversity of other riparian plant and animal species.

Table FC-10. Streambank Vegetation and Land Cover, Flint Creek Watershed

Vegetation/Land Cover	Flint Creek Watershed %*	Flint Creek Mainstem %*	Flint Creek %*	Grassy Lake Drain %*
Trees	16	14	16	15
Shrubs	21	21	20	23
Herbaceous	23	33	19	27
Wetland	20	31	23	14
Lawn	3	1	2	4
Crops	0	0	0	0
Unmowed Grass	2	0	2	1
None	15	0	17	16
Other	0	0	0	0

*Due to rounding, percentages may not add up to 100%

AQUATIC HABITAT

Substrate composition, instream vegetation, and instream cover for fish were assessed during the stream inventory to provide an indication of the quality of the aquatic habitat available in the Flint Creek watershed.

SUBSTRATE COMPOSITION

Flint Creek watershed streambeds are composed of a variety of sediment grains that range in diameter from extremely fine clays (<1/1000th of an inch) to relatively coarse cobbles and boulders (>1 foot). Generally, fine sediments are transported in suspension until velocity slows enough that they are deposited on the streambed. Larger sediments are not transported as readily and may only move during increased flows. Clays are typically regarded as cohesive sediments that naturally adhere to one another and are therefore more difficult to erode) while silts are more easily eroded. Sands and larger sediments (e.g., gravels and cobbles) are less cohesive. Clay and silt-dominated banks and beds, therefore, tend to be associated with narrow, incised channels while sand, gravel, and cobble-dominated channels are more often shallow and wide. Clay/silt channels tend to incise or deepen in response to increased flows while sand/gravel channels tend to widen. These relationships, however, are also contingent upon a number of other contributing factors such as gradient, bank slope, and bank vegetation.

Substrate is also an important measure of habitat quality. Extremely fine sediments, such as clays, adhere closely to one another and may bury the streambed. Coarse-grained sediments like gravels present abundant interstices, allowing water, oxygen, and other dissolved and suspended materials to infiltrate the hyporheic zone. The hyporheic zone refers to the area surrounding the stream channel that is saturated and through which there is some percolation or flow. Essentially, the hyporheic zone is the area where the surface water and groundwater interface and mix. These interstitial pores also provide habitat to benthic (bottom-dwelling) macroinvertebrates, which play

important roles in both aquatic food webs and ecosystem functioning. Excessive deposition of clays, silts, and fine particulate organic matter reduces the potential for infiltration and accessibility to the hyporheic zone. Excessive deposition also negatively effects filter feeders such as mussels, and may cause anoxia, or oxygen depletion, in the streambed as organic materials decompose.

In the Flint Creek watershed, most reaches contain a mixture of sediment types, although segments are often dominated by a combination of either:

- sands, gravels and cobbles, or
- silts, clays, and organic matter.

Table FC-11 summarizes the relationship of these two substrate types in the watershed. Across the entire watershed, sand, gravel and cobble compose a slightly higher percentage of substrate material than do clay, silt and organic material. Most reaches exceed 20% composition of both substrate groups, suggesting that throughout a reach neither association outrightly dominates, but that both likely occur. The only portion of the watershed that appears to be dominated by one type of substrate is the mainstem of Flint Creek below the Flint Lake dam, which is primarily composed of sand, gravel, and cobble. This is likely due to the "sediment trap" effect of Flint Lake as well as the higher flows in the mainstem, which probably erode and transport a relatively high amount of fine sediment through the lower reaches and into the Fox River.

Table FC-11. Substrate Composition in Flint Creek Watershed Streams

		Flint Creek Watershed	Flint Creek Mainstem	Flint Creek	Grassy Lake Drain
Sand, gravel & cobble					
Reaches exceeding % composition*	**≥ 20%**	22	2	11	9
	≥ 40%	18	2	8	8
	≥ 60%	13	2	7	4
	≥ 80%	6	1	3	2
Average % composition, all reaches**		54.6	85	48.6	57.2
Clay, silt & organics					
Reaches exceeding % composition*	**≥ 20%**	21	1	12	8
	≥ 40%	14	0	9	5
	≥ 60%	9	0	6	3
	≥ 80%	4	0	4	0
Average % composition, all reaches**		44.8	15	51.7	40.6

*Total number of reaches exceeding given substrate composition %

**Average of % composition for given substrate

WATER QUALITY

Visual inspections of several water quality indicators were made during the stream inventory. Turbidity and water color, the presence of grease and oil in the sediment or water column, and the abundance of algae were assessed. Table FC-12 summarizes water quality indicators.

Table FC-12. Water Quality Indicators in the Flint Creek Watershed

Indicator	Flint Creek Watershed		Flint Creek Mainstem		Flint Creek		Grassy Lake Drain	
	Reaches	%	Reaches	%	Reaches	%	Reaches	%
Turbidity, low	5	20	0	0	3	21.4	0	0
Turbidity, moderate	16	64	2	100	8	57.1	8	88.9
Turbidity, high	4	16	0	0	3	21.4	1	11.1
Grease and oil*	12	48	2	100	6	42.9	4	44.4
Algae score**	11.8		5		13.6		10.6	

*Reaches in which grease/oil was noted in sediment or water column

**Average of reach algae scores, equal to % of reach containing algae

TURBIDITY

In general, turbidity is not a significant problem in the Flint Creek watershed under baseflow conditions. It may become a problem, however, following rainfall or during spring snowmelt when discharge increases. Of the four reaches having high turbidity, three have abundant carp populations that may exacerbate conditions by stirring up sediments (FC05, FC06, and FC23). These reaches also contain extensive low gradient, depositional or backwater areas that collect fine sediment from upstream which may be re-suspended by minor disturbances (such as those caused by carp or increased flow from rain events).

GREASE AND OIL

Grease and oil were present in nearly half of all stream reaches in the Flint Creek watershed (see Table FC-12). Where grease and oil was present, it was detected in both the sediment and the water column. The presence of grease and oil bore no strong relationship to any particular land use, but is probably related urban runoff upstream.

ALGAE

Algae are an indicator of high nutrient loads. Algae were not a significant problem in Flint Creek watershed streams, but some areas contained extremely high populations. Excessive algae growth can negatively impact aquatic organisms and habitat by causing large daily fluctuations in dissolved oxygen levels. Algae are photosynthetic and therefore take up carbon dioxide during the day and release oxygen into the water column and the air. At night, algae respire, taking oxygen out of the water column and releasing carbon dioxide. Therefore, larger populations of algae have greater potential to cause large daily oxygen fluctuations. In addition, abundant algae populations are often aesthetically undesirable and typically detract from the visual quality of water resources.

Algae scores were calculated by totaling the percentage of the reach affected by both floating and attached algae, based on visual inspection. Higher algae scores suggest that a larger proportion of the reach is affected by algal growth of some sort. Six reaches in the Flint Creek watershed had algae scores above 20, but none

exceeded 50. Areas with high algae populations included golf courses, residential neighborhoods and urban areas.

INSTREAM FISH COVER

Instream fish cover availability was evaluated based on the presence of a number of structural elements and habitats, consisting of undercut banks, pools over 28 inches deep, aquatic macrophytes, logs, overhanging vegetation, rootwads, boulders, and backwaters. Fish utilize these various forms of habitat in a number ways, including spawning, rearing, foraging, predator avoidance, and resting. Tables FC-13 and FC-14 summarize cover availability and diversity in the Flint Creek watershed.

Macrophytes are the most abundant cover type, appearing in all but one of the assessed reaches, whereas boulders are least abundant, and do not occur in any channels during periods of baseflow (see Table FC-13). Logs and overhanging vegetation were also common in stream channels in the Flint Creek watershed, each occurring in more than three-quarters of the assessed reaches. The role of logs and other large woody debris (LWD) in stream systems and restoration has lately become a matter of consideration. In forested watersheds, logs and other LWD divert flow, create eddies (current reversals), and play an important role in pool, riffle, and bar development. The role of LWD in the Flint Creek watershed may be more difficult to assess, as some areas of Lake County have reforested over recent generations. Therefore there is more tree cover now and presumably, a higher population of trees, in the early 21st century than in the early 20th century. The attenuation of flood flows, drainage of riparian wetlands, conversion to non-agricultural land uses, reduction in beaver populations and spread of invasive riparian tree species are all factors that could result in an increase in riparian forest during the 20th century. Backwater areas have probably decreased over time and presently occur in wetlands and other low-lying areas and behind weirs, dams and debris jams. Backwater sloughs resulting from meander cutoffs (oxbows) occur only in the Flint Creek mainstem below Flint Lake and may only be accessible during high water periods.

Table FC-13. Instream Fish Cover in the Flint Creek Watershed

Cover type*	Flint Creek Watershed		Flint Creek Mainstem		Flint Creek		Grassy Lake Drain	
	Reaches	%	Reaches	%	Reaches	%	Reaches	%
Undercut banks	11	44	2	100	6	43	3	33
Pools over 28" deep	17	68	2	100	11	79	4	44
Macrophytes	24	96	2	100	13	93	9	100
Logs	21	84	2	100	12	86	7	78
Overhanging vegetation	19	76	2	100	11	79	6	67
Rootwads	9	36	2	100	5	36	2	22
Boulders	0	0	0	0	0	0	0	0
Backwaters	4	16	1	50	2	14	1	11

*Total number of reaches/% of reaches containing cover type. Percentages do not total 100.

Many fish species require multiple types of habitat over varying time spans to accommodate daily and seasonal requirements as well as life-cycle changes. Habitat diversity, therefore, can be as important as habitat abundance. Table FC-14 summarizes instream cover diversity by comparing the available cover types across reaches. Overall, the Flint Creek watershed offered about 4 types of cover per reach.

The Flint Creek mainstem below Flint Lake had the richest diversity of instream cover, averaging 6.5 forms per reach. In general, cover diversity in the Flint Creek watershed tends to increase downstream, with Flint Creek reaches below downtown Barrington and Grassy Lake Drain reaches immediately above and below Grassy Lake having greater diversity than headwater reaches.

Table FC-14. Instream Fish Cover Diversity in the Flint Creek Watershed

Cover types per reach*	Flint Creek Watershed		Flint Creek Mainstem		Flint Creek		Grassy Lake Drain	
	Reaches	%	Reaches	%	Reaches	%	Reaches	%
1	2	8	0	0	2	14	0	0
2	3	12	0	0	0	0	3	33
3	3	12	0	0	1	7	2	22
4	4	16	0	0	3	21	1	11
5	7	28	0	0	5	36	2	22
6	5	20	1	50	3	21	1	11
7	1	4	1	50	0	0	0	0
8	0	0	0	0	0	0	0	0
Average # of cover types/reach	4.2		6.5		4.3		3.6	

*All reaches contained at least one cover type

AQUATIC AND TERRESTRIAL ORGANISMS

Organisms were not specifically sampled during the stream inventory, but some animals were observed during the inventory. In particular, carp appear to be abundant in the lower reaches of the watershed and may be limiting plant growth, increasing turbidity, and re-suspending sediment.

Flint Creek Mainstem (below Flint Lake dam):

Mayflies, caddis flies, dragonfly and damselfly nymphs, snails, worms, water pennies, beetles, carp, black bullheads, sunfish, juvenile northern pike, ducks, geese, herons, frogs, water snake and mussels.

Flint Creek (upstream of Flint Lake, including Flint Creek and the east and west forks):

Mayflies, caddis flies, dragonfly and damselfly nymphs, snails, sowbugs, worms, water pennies, beetles, carp, sunfish, fathead minnows, shiners, ducks, geese, herons, sandpipers/plovers, frogs, painted turtles, beavers, muskrat, raccoon and mussels.

Grassy Lake Drain (including North Flint Creek and Honey Lake Drain):

Mayflies, caddis flies, dragonfly and damselfly nymphs, worms, carp, black bullheads, bluegill, fathead minnows, ducks, geese, herons and frogs.

APPENDIX A: SUMMARY OF FLINT CREEK STREAM REACH CHARACTERISTICS

Stream reaches are segments of a stream channel having fairly homogenous hydraulic, geomorphic, and land cover/land use characteristics. The Flint Creek stream network in Lake and Cook counties was divided into 36 reaches averaging 5,000 linear feet of waterway per reach; 11 of these reaches were lakes or wetland complexes that were not assessed. The 25 assessed reaches consisting of stream channels average 5,100 feet in length.

Reach identification and designation is based upon the topographic position of the reach relative to other reaches in the watershed as well as the stream network to which the reach belongs. All reaches have a designated four-digit alphanumeric identification number. In the Flint Creek inventory, all reaches begin with the alphabetic prefix "FC" to distinguish them from other stream inventories in Lake County. The suffix is a two-digit numeral that identifies the reach within the Flint Creek drainage network. Reaches FC01-FC03 refer to the Flint Lake and the Flint Creek mainstem below Flint Lake dam. Reaches FC04-FC17 refer to Flint Creek upstream of Flint Lake to its headwaters at Baker Lake and Cuba Marsh. Reaches FC18-FC22 refer to the west fork of Flint Creek, a tributary of Flint Creek from its confluence with the east fork of Flint Creek near the intersection of Hart and Lake Cook Roads upstream to its origin above LaBuys Lake in the Crabtree Nature Center in Cook County. Reaches FC23-27 refer to the Grassy Lake Drain upstream of Flint Lake to the head of North Flint Creek near Old McHenry Road, including Grassy Lake. Reaches FC28-FC31 refer to the Echo Lake Drain, from its confluence with North Flint Creek in Hawthorn Woods to Lake Zurich. Reaches FC32-FC36 refer to the Honey Lake Drain, from its mouth at Grassy Lake upstream to the origins of two Honey Lake tributaries.

During the Flint Creek stream inventory in the summer of 2006, SMC personnel assessed each reach for the following characteristics:

1. In-stream and over-bank debris loads
2. Substrate
3. Channelization and sinuosity (none, low, moderate, or high)
4. Bank erosion (9-10=none, 6-8=low, 3-5=moderate, 0-2=high)
5. Channel dimensions, including bank height and channel width

A summary of these data is listed in table A-1 below.

TABLE A-1. REACH CHARACTERISTICS, FLINT CREEK WATERSHED, LAKE AND COOK COUNTIES, ILLINOIS

Lake Co. ID	Downstream Reach Boundary	Upstream Reach Boundary	Approx. Length (ft.)	Pool (%)	Riffle (%)	Run (%)	Channelization	Bankfull Sinuosity	Baseflow Sinuosity	Erosion, Left Bank	Erosion, Right Bank	Mean Bank Height (ft.)	Mean Channel Width, Top (ft.)	Mean Channel Width, Bed (ft.)	Instream Debris Load	Overbank Debris Load	Substrate Stability	Substrate Embededdness
FC01	Mouth at Fox River	Kelsey Road bridge	4600	40	40	20	Low	Moderate	Moderate	8	8	2.9	28.6	14.4	Low	Low	High	Low
FC02	Kelsey Road bridge	Flint Lake Dam	4400	30	35	35	Low	Moderate	Moderate	7	8	2.4	39.2	30	Low	Low	Moderate	Moderate
FC03	Flint Lake dam	Flint Creek and Grassy Lake Drain inlets	1500	FLINT LAKE														
FC04	Flint Lake inlet	Illinois Route 22 bridge	3300	10	10	80	High	Low	Low	4	3	3.4	35	26.3	Moderate	Low	High	Low
FC05	Illinois Route 22 bridge	U.S. Route 14 bridges	9600	1	1	98	Low	High	High	10	10	2.09	36.25	26.3	Low	Low	Low	High
FC06	U.S. Route 14 bridges	Cuba Road bridge	1400	0	1	99	Low	Low	Low	8	8	1.5	38.3	26.67	Low	Low	Moderate	Moderate
FC07	Cuba Road bridge	Oak Knoll Road bridge (west)	6100	3	2	95	Moderate	Low	Low	7	7	1.96	42	33.5	Moderate	Low	Moderate	Moderate
FC08	Oak Knoll Road bridge (west)	Old Hart Road bridge	16100	15	15	70	High	Low	Low	6	6	2.77	34.83	27.33	Moderate	Low	Low	High
FC09	Old Hart Road bridge	Hart Road culvert	1900	35	35	30	Low	Moderate	Moderate	6	5	2.83	23.3	17.7	Moderate	Low	High	Low
FC10	Hart Road culvert	Illinois Route 58 (Hough St.) bridge	5000	25	15	60	High	Low	Low	7	7	6.75	28.7	13.3	Moderate	Low	High	Low
FC11	Illinois Route 58 (Hough St.) bridge	Lake Zurich Road culvert	4300	5	5	90	High	Low	Low	7	7	9.5	39.57	11	Moderate	Low	Moderate	Moderate

Table A-1 (Continued).

Lake Co. ID	Downstream Reach Boundary	Upstream Reach Boundary	Approx. Length (ft.)	Pool (%)	Riffle (%)	Run (%)	Channelization	Bankfull Sinuosity	Baseflow Sinuosity	Erosion, Left Bank	Erosion, Right Bank	Mean Bank Height (ft.)	Mean Channel Width, Top (ft.)	Mean Channel Width, Bed (ft.)	Instream Debris Load	Overbank Debris Load	Substrate Stability	Substrate Embededdness
FC12	Lake Zurich Road culvert	Lake Louise dam	3700	1		99	High	Low	Low	9	9	2.83	27.3	12	Low	Low	Low	High
FC13	Lake Louise dam	Lake Louise inlet	1400	LAKE LOUISE														
FC14	Lake Louise inlet	Lake Cook Road dam	1700	30	30	40	High	Low	Low	7	7	5.25	27.5	12.5	Low	Low	Moderate	Moderate
FC15	Lake Cook Road dam	Hillside Rd. culvert	3000	1	5	94	High	Low	Low	7	7	3.75	16.7	10.3	Moderate	Moderate	Low	High
FC16	Hillside Road	Baker Lake	13000	BAKER LAKE														
FC17	Citizens (Jewel) Park/Elgin, Joliet & Eastern R.R. culvert	Scoville Lake dam/Cuba Marsh headwaters	9000	CUBA MARSH WETLANDS														
FC18	Confluence Flint Creek	Lake Cook Road bridge	2700	0	5	95	High	Low	Low	7	8	2.25	17.3	8.3	Low	Low	Moderate	Moderate
FC19	Lake Cook Road bridge	Hawthorne Lake dam	7100	0	10	90	Moderate	Moderate	Moderate	7	7	3.83	13.33	10	Low	Low	Moderate	Moderate
FC20	Hawthorn Lake dam	Illinois Route 59 bridge	7300	HAWTHORNE, KEENE, AND HAWLEY LAKES														
FC21	Illinois Route 59 bridge	La Buys Lake dam	6300	1	1	98	High	Low	Low	4	4	2.42	17.67	14.33	High	Low	Low	High
FC22	La Buys Lake dam	Retention ponds east of Barrington Road (Inverness)	7200	LA BUYS AND BRAYMORE LAKES														

Table A-1 (Continued).

Lake Co. ID	Downstream Reach Boundary	Upstream Reach Boundary	Approx. Length (ft.)	Pool (%)	Riffle (%)	Run (%)	Channelization	Bankfull Sinuosity	Baseflow Sinuosity	Erosion, Left Bank	Erosion, Right Bank	Mean Bank Height (ft.)	Mean Channel Width, Top (ft.)	Mean Channel Width, Bed (ft.)	Instream Debris Load	Overbank Debris Load	Substrate Stability	Substrate Embededdness
FC23	Flint Lake inlet	Grassy Lake outlet	6000	5	15	80	High	Low	Low	3	4	4.17	42	31	Moderate	Moderate	Moderate	Low
FC24	Grassy Lake outlet (Grassy Lake Drain)	North Flint Creek and Honey Lake Drain inlets	2200	GRASSY LAKE														
FC25	Grassy Lake inlet	Rugby Lane culvert	10600	20	30	50	Moderate	Moderate	Moderate	4	4	2.8	19.5	12.3	Moderate	Moderate	Moderate	Moderate
FC26	Rugby Lane culvert	U.S. Route 12 bridge	4400	5	10	85	Moderate	Moderate	Moderate	7	7	2.75	13	7.33	Low	Low	Moderate	Moderate
FC27	US Route 12 bridge	Old McHenry Rd	10900	5	15	80	Moderate	Low	Low	5	5	3.2	26	10.75	Moderate	Moderate	Moderate	High
FC28	Confluence with North Flint Creek	Echo Lake dam (N. Lakewood Ln.)	4100	15	15	70	Moderate	Low	Low	7	7	1.46	10	5.3	Low	Low	Moderate	Moderate
FC29	Echo Lake dam (N. Lakewood Lane)	Echo Lake inlet (S. Lakewood Lane)	1500	ECHO LAKE														
FC30	Echo Lake inlet (S. Lakewood Lane)	Lake Zurich dam (Old Rand Road)	3700	LIONS PARK WETLANDS														
FC31	Lake Zurich dam (Old Rand Road)	Lake Zurich	3300	LAKE ZURICH														

Table A-1 (Continued).

Lake Co. ID	Downstream Reach Boundary	Upstream Reach Boundary	Approx. Length (ft.)	Pool (%)	Riffle (%)	Run (%)	Channelization	Bankfull Sinuosity	Baseflow Sinuosity	Erosion, Left Bank	Erosion, Right Bank	Mean Bank Height (ft.)	Mean Channel Width, Top (ft.)	Mean Channel Width, Bed (ft.)	Instream Debris Load	Overbank Debris Load	Substrate Stability	Substrate Embededdness
FC32	Grassy Lake inlet	Golfview Drive culvert	2200	40	40	20	High	Low	Low	4	4	7.6	25.3	9.67	High	Moderate	Moderate	Low
FC33	Golfview Road	Honey Lake Dam	2200	0	5	95	High	Low	Low	7	7	6.1	31	11	Low	Low	Moderate	Moderate
FC34	Honey Lake dam	East (Signal Hill) and west tributary inlets	2300	HONEY LAKE														
FC35	Honey Lake inlet	Illinois Route 22 culvert	4100	1	90	9	High	Low	Moderate	5	5	4.63	20	7.3	Low	Low	Moderate	Low
FC36	Honey Lake inlet	Headwaters NW of U.S. Route 12/Illinois Route 22	2700	5	10	85	High	Low	Low	6	6	1.83	16.7	11.3	Moderate	Low	Moderate	High

APPENDIX B: DISCHARGE POINTS IN THE FLINT CREEK WATERSHED

Discharge points are gullies, swales, tributaries and other channels, pipes, culverts, drain tiles and other outfalls that drain into streams in the Flint Creek watershed. As part of the 2006 Flint Creek stream inventory, SMC documented the locations and conditions of 181 outfalls discharging to streams in the Flint Creek watershed. These discharge points range from 2-inch PVC sump pump drainpipes to six-foot stormsewer outlets. Throughout the entire watershed, assessed reaches (excluding lakes) averaged 7.4 outfalls per mile. Of the 181 outfalls documented along assessed reaches, 3 are found along the mainstem of Flint Creek (below Flint Lake dam), 55 are located in the Grassy Lake Drain stream network (including North Flint Creek and the Honey Lake Drain) and 123 are located in the Flint Creek network upstream of Flint Lake. Discharge points were most numerous (33 total) and most frequent along Flint Creek between Hart Road and Illinois Route 59 (Hough Street) in downtown Barrington (reach FC10). Table C-1 summarizes the documented points of discharge in the Flint Creek watershed. "Lake Co ID" refers to the unique alphanumeric identification number assigned to each reach during the stream inventory. "Type" describes the structure of each discharge. "Diameter" lists the diameter of all circular and ovular pipes and culverts. "Width, Bottom," "Width, Top," and "Depth" describe the dimensions of swales, open channels, and tributaries. "Photo ID" refers to the unique numeric identification number assigned to each photograph taken during the stream inventory. General notes are also included where applicable. Shaded records indicate discharge points with associated erosion problems.

Table B-1. Discharge Points, Flint Creek Watershed, Lake and Cook Counties, Illinois

Lake Co ID	Type	Diameter	Width, Bottom	Width, Top	Depth	Photo ID	Notes
FC01	Concrete Pipe	24				1513	drains Kelsey Road at bridge
FC02	Open Channel		25	30	3	1522	meander cutoff
FC02	Open Channel		5	10	4	1523	swale
FC04	Plastic Pipe	4				1533	drainage of property
FC04	Open Channel	48				1534	tributary/culvert draining golf course
FC04	Steel Pipe	12				1535	drains golf course
FC04	Steel Pipe	15				1537	drainage from golf course
FC04	Steel Pipe	15				1538	drainage from golf course
FC04	Plastic Pipe	4				1540	drain tile from golf course
FC04	Steel Pipe	12				1542	drains golf course
FC04	Plastic Pipe	4				1545	drain tile from golf course
FC04	Steel Pipe	9				1549	drains golf course
FC04	Plastic Pipe	4				1550	drains golf course
FC04	Open Channel		3	5	1.5	1552	swale, drains IL 22
FC05	Open Channel		4	5	3	1561	swale, drains U.S. 14
FC05	Steel Pipe	24				1563	drains U.S. 14
FC07	Plastic Pipe	4				1569	drains residential
FC07	Plastic Pipe	4				1571	drains residential
FC07	Swale					1572	swale
FC07	Plastic Pipe	4				1573	pvc

Table B-1 (Continued).

Lake Co ID	Type	Diameter	Width, Bottom	Width, Top	Depth	Photo ID	Notes
FC07	Tributary					1580	channel draining Porter School wetlands
FC07	Steel Pipe	12				1581	culvert
FC07	Plastic Pipe	6				1582	drains residential
FC07	Concrete Pipe	6				1583	
FC07	Concrete Pipe	6				1586	drains residential
FC08	Swale		9		1.5	1590	swale
FC08	Concrete Pipe	24				1592	drains residential
FC08	Swale		3			1595	swale
FC08	Plastic Pipe	2				1597	drains Oak Knoll bridge
FC08	Steel Pipe	12				1600	culvert
FC08	Concrete Pipe	12				1601	culvert
FC08	Steel Pipe	12				1603	
FC08	Plastic Pipe	6				1606	
FC08	Swale		3	2		1607	swale, overflow from detention basin
FC08	Open Channel		10	13		1610	overflow from detention pond
FC08	Steel Pipe	6				1611	
FC08	Steel Pipe	36				1612	culvert
FC08	Plastic Pipe	6				1614	drains residential
FC09	Concrete Pipe	12				1617	probably not conveying flow
FC09	Swale		1	2		1619	swale and culvert draining Hart Rd. offices
FC09	Tributary		13	19		1620	confluence with West Fk. Flint Cr.
FC10	Swale		4	7		1624	swale on Hart Rd.
FC10	Plastic Pipe	6				1625	pvc
FC10	Concrete Pipe	24				1626	culvert
FC10	Concrete Pipe	12	12	12		1627	
FC10	Concrete Pipe	2				1628	from football field
FC10	Plastic Pipe	6 and 12				1630	2 pipes
FC10	Concrete Pipe	12				1632	culvert
FC10	Plastic Pipe	12				1633	filled in
FC10	Plastic Pipe	4				1636	drain tile
FC10	Concrete Pipe	12				1638	
FC10	Steel Pipe	36				1639	discharge from Barrington treatment plant
FC10	Clay Pipe	12				1640	possibly inactive
FC10	Concrete Pipe	12				1641	drains from Barrington PW
FC10	Concrete Pipe	24				1642	drains from Barrington PW
FC10	Plastic Pipe	8				1643	drains from Barrington PW
FC10	Plastic Pipe	2- 8 inch				1645	
FC10	Steel Pipe	6				1646	

Table B-1 (Continued).

Lake Co ID	Type	Diameter	Width, Bottom	Width, Top	Depth	Photo ID	Notes
FC10	Concrete Pipe	24				1649	2 culverts draining wetland area/bike path
FC10	Concrete Pipe	36				1651	under bike path
FC10	Plastic Pipe	4				1652	drain tile at Langendorf dam removal site
FC10	Steel Pipe	8				1656	from parking lot
FC10	Plastic Pipe	12				1657	drains from Langendorf Park grounds
FC10	Plastic Pipe	4				1658	drains commercial
FC10	Steel Pipe	6				1659	drains commercial
FC10	Swale	36				1660	swale, drains commercial
FC10	Steel Pipe	8				1662	drains Langendorf Park grounds
FC10	Concrete Pipe	12				1663	drains offices
FC10	Steel Pipe	12				1665	drains commercial
FC10	Steel Pipe	18				1666	drains commercial
FC10	Steel Pipe	18				1667	drains commercial
FC10	Concrete Pipe	12				1668	drains offices
FC10	Concrete Pipe	24				1669	drains offices
FC10	Concrete Pipe	60				1670	drains commercial
FC11	Steel Pipe	24				1675	drains from E, J & E Rairoad
FC11	Swale					1676	drainage ditch from railway
FC11	Concrete Pipe	12				1677	drains multi-family
FC11	Other	4				1678	gutter/downspout
FC11	Plastic Pipe	3				1679	drains multi-family
FC11	Plastic Pipe	2				1682	drains residential
FC11	Plastic Pipe	4				1683	drains residential
FC11	Clay Pipe	4				1685	drains residential
FC11	Plastic Pipe	4				1687	drain tile
FC11	Plastic Pipe	2				1688	drains residential
FC11	Concrete Pipe	12				1689	drains residential
FC11	Plastic Pipe	4				1690	drains residential
FC11	Plastic Pipe	2				1692	drains residential
FC11	Plastic Pipe	4				1693	drain tile
FC11	Plastic Pipe	4				1694	drain tile from residential
FC11	Steel Pipe	12				1695	drains residential
FC11	Plastic Pipe	4				1696	drains residential
FC11	Plastic Pipe	4				1697	drains residential
FC11	Tributary		6	23		1699	from subdivision
FC11	Steel Pipe	18				1700	
FC11	Open Channel		3	8		1701	from subdivision
FC12	Plastic Pipe	4				1707	2 drain tiles
FC14	Plastic Pipe	4				1714	drains residential

Table B-1 (Continued).

Lake Co ID	Type	Diameter	Width, Bottom	Width, Top	Depth	Photo ID	Notes
FC14	Plastic Pipe	4				1715	drain tile
FC14	Concrete Pipe	30				1716	drains residential
FC14	Concrete Pipe	24				1718	drains residential
FC15	Steel Pipe	12				1949	drains residential
FC15	Concrete Pipe	30				1951	drains residential
FC15	Plastic Pipe	4				1955	drain tile from residential
FC15	Tributary		9	18	3	1956	tributary draining area to east
FC15	Concrete Pipe	18				1957	drains residential
FC15	Steel Pipe	12				1959	drains residential
FC15	Plastic Pipe	12				1960	drains residential
FC15	Plastic Pipe	4				1962	drains residential
FC15	Plastic Pipe	4				1963	drain tile
FC15	Plastic Pipe	4				1964	overflow from detention pond
FC15	Plastic Pipe	3				1965	2-3 in. pipes
FC15	Concrete Pipe	18				1967	drains residential
FC19	Open Channel		10	15	5	1904	photo taken during rain event, swale likely conveying runoff from parking areas at Gatorade facility to east
FC19	Open Channel		5	15	2	1907	drains off of Gatorade facility
FC19	Steel Pipe	6				1908	flushed as photo was being taken
FC19	Open Channel		1	1	1	1909	drains open space area
FC19	Plastic Pipe	2				1910	drains residential
FC19	Concrete Pipe	12				1911	overflow for pond adjacent to right bank
FC19	Plastic Pipe	4				1915	drains residential
FC19	Plastic Pipe	12				1917	overflow for pond adjacent to left bank
FC19	Open Channel		5	10	2	1918	swale draining from private drive
FC19	Plastic Pipe	12				1920	overflow for pond
FC21	Open Channel		6	8	2	1972	swale
FC21	Tributary		7	10	3	1973	swale draining wetlands
FC21	Tributary		7	10	3	1974	swale draining wetlands
FC21	Steel Pipe	12				1975	defunct culvert/drain tile
FC23	Plastic Pipe	2				1741	pvc from residential
FC23	Plastic Pipe	4				1732	drain tile from residential
FC23	Plastic Pipe	4				1734	pvc from residential
FC23	Plastic Pipe	4				1735	pvc from residential
FC23	Plastic Pipe	4				1739	pvc from residential
FC23	Plastic Pipe	10				1742	drains residential
FC23	Steel Pipe	16				1744	drains from Old Barrington Rd.
FC23	Steel Pipe	12				1745	drains from Old Barrington Rd.
FC23	Plastic Pipe	2				1746	pvc from residential
FC23	Steel Pipe	4				1749	drains residential

Table B-1 (Continued).

Lake Co ID	Type	Diameter	Width, Bottom	Width, Top	Depth	Photo ID	Notes
FC25	Concrete Pipe	12				1777	drains Ill. 59
FC25	Steel Pipe	12				1782	drains residential
FC25	Plastic Pipe	4				1784	drains residential
FC25	Plastic Pipe	4				1785	drain tile
FC25	Concrete Pipe	12				1787	drains under Oxford Drive
FC25	Tributary		4	15		1792	Wynstone tributary
FC25	Plastic Pipe	4				1793	drain tile
FC25	Concrete Pipe	8				1797	drains from Biltmore Dr.
FC25	Steel Pipe	8				1798	drains residential
FC25	Concrete Pipe	4				1799	drains residential
FC25	Open Channel		3	7		1800	0-order tributary from residential area
FC25	Concrete Pipe	16				1806	drains from Kimberly Drive
FC25	Swale		1	1	1	1808	swale
FC25	Plastic Pipe	4				1809	drain tile
FC25	Plastic Pipe	4				1812	drain tile
FC26	Open Channel		12	17	3	1817	drains residential
FC26	Open Channel		2	8	2	1819	fence and stone-lined swale
FC26	Plastic Pipe	12				1826	drain tile
FC26	Other	6	3	5	1	1828	pipe and swale
FC26	Concrete Pipe	24				1833	drains multi-family
FC27	Open Channel		4	8	2	1836	
FC27	Steel Pipe	12				1837	former LZ treatment plant site
FC27	Concrete Pipe	18				1840	2 culverts, drains residential area
FC27	Plastic Pipe	4				1843	drain tile from residential
FC27	Concrete Pipe	18				1844	drains residential
FC27	Steel Pipe	18				1847	drains Miller Road
FC27	Concrete Pipe	24				1849	drains residential
FC27	Concrete Pipe	18				1850	drains residential
FC27	Concrete Pipe	18				1852	drains Manchester
FC27	Plastic Pipe	4				1853	drains residential
FC27	Plastic Pipe	4				1854	drains residential
FC27	Open Channel		5	10	2	1855	swale draining residential
FC27	Concrete Pipe	18				1857	
FC27	Plastic Pipe	6				1861	pipe with restrictor
FC28	Steel Pipe	18				1872	rusted out
FC28	Tributary	18	10	20	2	1876	tributary and steel pipe along Miller Road
FC28	Steel Pipe	12				1879	drains N. Lakewood Ln. at Echo Lake dam
FC30	Concrete Pipe	18				1867	drains Old Rand

Table B-1 (Continued).

Lake Co ID	Type	Diameter	Width, Bottom	Width, Top	Depth	Photo ID	Notes
FC32	Steel Pipe	12				1754	drains IL 59
FC33	Steel Pipe	24				1891	drainage from golf course
FC33	Plastic Pipe	4				1899	drains from golf course outbuildings
FC35	Concrete Pipe	3				1766	drains residential
FC35	Plastic Pipe	4				1767	drain tile
FC36	Steel Pipe	6				1888	drains residential
FC36	Concrete Pipe	8				1890	2 concrete pipes at head of Signal Hill tributary

APPENDIX C: HYDRAULIC STRUCTURES IN THE FLINT CREEK WATERSHED

Hydraulic structures were measured and recorded as part of the Flint Creek stream inventory. Hydraulic structures are any objects in or spanning the stream channel that could have the potential to constrict, divert, deflect, or impede flow, causing localized erosion problems and/or backwater flooding. These structures include bridges, in-stream culverts, dams, weirs, and fences. SMC personnel located 136 hydraulic structures, over half of which were bridges (89 in total, 43 wooden foot bridges). Additionally, the inventory found 27 in-stream culverts associated with roads, driveways, and railroads suggesting that a total of 116 hydraulic structures facilitate movement of people, animals, or vehicles across the stream channel. Twelve dams and two weirs were recorded, most of which serve to regulate water levels on lakes and ponds or provide for flood control and stormwater management. Including the Flint Lake dam, only four hydraulic structures are found on the mainstem of Flint Creek, and the remainder are distributed almost equally between streams in the Grassy Lake Drain system (65) and the Flint Creek system (67). However, because the Grassy Lake Drain catchment has fewer miles of stream channel, the density of hydraulic structures is about 1.5 times that of the Flint Creek catchment (7.3 structures per mile of stream channel in the Grassy Lake Drain catchment versus 4.9 structures per mile in the Flint Creek catchment). This also suggests that at the catchment scale, riparian zones in the Grassy Lake Drain are more developed than in the Flint Creek catchment. Reaches in the Flint Creek watershed with the highest concentrations of hydraulic structures generally flow through residential areas or golf courses, with the Honey Lake Drain and North Flint Creek downstream of U.S. 12 being representative.

Table D-1 lists the hydraulic structures of the Flint Creek watershed. “Lake Co ID” refers to the individual reach in which the hydraulic structure is located (for a complete explanation of the numbering system for the stream inventory, see Appendix A). “Type” refers to the nature of the hydraulic structure while “Material” describes dominant substance from which the structure is constructed. “Diameter” refers to the diameter (inches) of culverts while “Width” and “Height” (feet) refer to the dimensions of other hydraulic structures. “Hydraulic Structure Problem” lists those structures at which an existing or potentially problematic situation (such as) was noted. “Photo ID” refers to the unique identification number given to the photo of the hydraulic structure (in two instances, photos where not taken at a structure and Photo ID was recorded as “99999”). General notes are also included where applicable.

Table C-1. Hydraulic Structures, Flint Creek Watershed, Lake and Cook Counties, Illinois

Lake Co ID	Type	Material	Diameter (in.)	Width (ft.)	Height (ft.)	Hydraulic Structure Problem	Photo ID	Notes
FC01	Bridge	Concrete		30	4.8		1506	Foot bridge
FC01	Other	Concrete		2.5			1508	Concrete box in channel, no flow apparent
FC01	Bridge	Concrete		75	15		1512	Kelsey Road bridge (under construction)
FC02	Dam	Concrete		41	3		1529	Dam at Flint Lake
FC04	Bridge	Concrete		32	7.9		1532	Woodland Drive
FC04	Bridge	Concrete		12	9		1543	Both steel and concrete bridge on golf course
FC04	Bridge	Steel		24	7.25		1546	On golf course
FC04	Bridge	Steel		20	7.25		1548	Bridge on golf course
FC04	Bridge	Concrete		50	9		1553	Bridge on 22
FC05	Culvert	Steel	12				1556	In beaver dam
FC05	Bridge	Concrete		12	6.5		1557	Concrete bridge in Citizens for Conservation wetland
FC05	Bridge	Concrete		60	10.25		1559	Bridge on northbound U.S. 14
FC05	Bridge	Concrete		60	10.25	Yes	1562	Bridge on southbound U.S. 14; erosion/debris collection
FC05	Bridge	Steel		38	21		1564	Chicago & NW R.R.
FC06	Bridge	Concrete		31	10		1568	Cuba Road
FC07	Bridge	Steel		45	7.75		1579	Driveway off Ridge Road
FC08	Bridge	Concrete		20	9		1587	Oak Knoll bridge (west)
FC08	Bridge	Wood		45	5		1591	Foot bridge
FC08	Bridge	Wood		35	14		1593	Foot bridge
FC08	Bridge	Concrete		40	8		1596	Oak Knoll bridge (east)
FC08	Bridge	Concrete		30	6	Yes	1599	Driveway off Oak Knoll; erosion/debris collection
FC08	Bridge	Concrete		25	5		1604	Barrington Hills C.C.
FC08	Bridge	Wood		30	4		1605	Barrington Hills C.C.
FC08	Bridge	Concrete		22	11		1609	Paganica Drive
FC08	Bridge	Wood		15	4		1613	Foot bridge
FC08	Bridge	Concrete		18	7.5		1616	Old Hart Road
FC09	Culvert	Steel		10	6		1623	3-6 x 10 ft culverts
FC10	Bridge	Concrete		30	6		1631	Barrington H.S. footbridge
FC10	Bridge	Concrete		12	6		1644	Raymond Ave.
FC10	Bridge	Wood		55	15		1648	Defunct R.R. tracks
FC10	Bridge	Concrete		15	12		1650	Chicago & NW R.R.
FC10	Bridge	Wood		25	5		1654	Langendorf Park foot bridge
FC10	Fence	Steel		14	8		1655	
FC10	Fence	Steel		35	20		1664	
FC11	Bridge	Concrete		20	6		1671	Illinois 59 (Hough St.)
FC11	Bridge	Concrete		10	6		1672	Apartment parking area connection
FC11	Bridge	Concrete		21	7		1681	U.S. 14 (Northwest Highway)
FC11	Bridge	Concrete		40	4		1684	Elm St.
FC11	Culvert	Steel	84				1702	Lake Zurich Road
FC11	Bridge	Wood		22	4		99999	No photo available, between Elm and Lake Zurich Rd.

Table C-1 (Continued).

Lake Co ID	Type	Material	Diameter (in.)	Width (ft.)	Height (ft.)	Hydraulic Structure Problem	Photo ID	Notes
FC12	Culvert	Concrete		8	7		1703	E, J & E R.R.
FC12	Culvert	Concrete	3 - 4.5 ft				1708	Bridge/culvert at Lake Louise/Lake Shore Dr.
FC12	Dam	Concrete		15	3		1710	Lake Louise dam/spillway
FC14	Bridge	Concrete	72				1713	Surrey Ln.
FC14	Bridge	Steel		45	13		1719	Lake Cook Rd. foot bridge
FC14	Bridge	Concrete		10	9		1719	Lake Cook Rd.
FC14	Dam	Concrete		23	5		1720	Lake Cook Road dam
FC15	Bridge	Wood		20	4		1946	Head of Lake Cook Road pond
FC15	Bridge	Wood		15	4		1950	Foot bridge
FC15	Bridge	Wood		20	5		1953	Foot bridge
FC15	Bridge	Wood		20	5		1954	Foot bridge
FC15	Bridge	Wood		20	5		1956	Foot bridge
FC15	Weir	Steel		40	2		1958	Naturalized detention basin
FC15	Culvert	Concrete	36	0	0		1961	Fairfield Drive
FC15	Culvert	Concrete	48	0	0		1968	Hillside Rd.
FC16	Culvert	Steel	unknown	0	0		1978	Under Chicago & NW R.R. and U.S. 14, submerged at time of inventory
FC16	Dam	Concrete		7	4		1980	Baker Lake dam
FC17	Culvert	Concrete	48				1723	E, J & E R.R.
FC17	Dam	Concrete	12	10	3		1724	Dam/pipe at Scoville's Lake
FC18	Bridge	Concrete		30	3.5		1727	Foot bridge
FC18	Bridge	Concrete		20	3.5		1729	Lake Cook Road
FC19	Bridge	Wood		15	0	Yes	1906	Collapsed/washed into channel, causing debris jam and flow diversion into opposite bank
FC19	Bridge	Wood		15	4		1912	Wooden footbridge
FC19	Culvert	Steel	3	0	0		1914	Driveway, 2 culverts
FC19	Fence	Metal Wire		20	7		1916	Fence on propery line
FC19	Bridge	Wood		20	4		1921	Foot bridge
FC19	Bridge	Wood		20	0.5		1922	Foot bridge
FC19	Bridge	Concrete		15	15		1923	E, J & E R.R. bridge
FC19	Dam	Concrete		20	6.5		1924	Hawthorne Lake dam
FC21	Bridge	Concrete		15	7		1969	IL 59/IL68 bridge
FC21	Dam	Concrete		15	5		1977	La Buys Lake dam
FC23	Bridge	Wood		35	7		1737	Foot bridge
FC23	Bridge	Steel		15	10		1743	Old Barrington Road
FC23	Bridge	Wood		32	3		1747	Foot bridge
FC25	Bridge	Concrete		17	5		1776	Illinois 59
FC25	Bridge	Concrete		14	6		1778	Defunct bridge
FC25	Culvert	Concrete	24 and 36				1781	Woodland Drive
FC25	Culvert	Concrete	48				1788	Oxford Rd.

Table C-1 (Continued).

Lake Co ID	Type	Material	Diameter (in.)	Width (ft.)	Height (ft.)	Hydraulic Structure Problem	Photo ID	Notes
FC25	Bridge	Wood		17	3.5	Yes	1791	Causing debris jam
FC25	Bridge	Steel		17	4		1794	
FC25	Culvert	Concrete		6	5		1796	Biltmore Drive
FC25	Culvert	Steel	72				1802	Eton Rd. culvert
FC25	Bridge	Concrete		8	8		1805	Kimberly
FC25	Culvert	Steel		10	7		1807	Driveway off Kimberly
FC25	Bridge	Wood		20	6		1814	
FC25	Bridge	Wood		35	4		99999	No photo available, between Kimberly and Rugby
FC26	Culvert	Steel	72	0	0	Yes	1815	Rugby Drive; upstream erosion
FC26	Dam	Concrete		15	4		1818	Dam at Hidden Pond Ln.
FC26	Fence	Metal Wire		0	5		1819	Fence across swale
FC26	Bridge	Wood		15	5		1820	
FC26	Fence	Metal Wire		0	5		1821	
FC26	Bridge	Wood		15	4		1823	Foot bridge
FC26	Bridge	Wood		15	4		1824	Foot bridge
FC26	Culvert	Steel	60	0	0		1825	Clover Hill Lane
FC26	Bridge	Wood		15	5		1830	Foot bridge
FC26	Bridge	Wood		30	5		1831	Foot bridge (under construction)
FC26	Bridge	Wood		25	5		1832	Foot bridge/beam
FC27	Bridge	Concrete		20	5		1835	U.S. Rt. 12 (Rand Road)
FC27	Bridge	Steel		50	12		1838	Footbridge at park
FC27	Bridge	Concrete		15	6		1846	Miller Road
FC27	Culvert	Concrete	72	0	0		1851	Manchester Road
FC27	Bridge	Wood		20	5		1856	Foot bridge behind Seth Paine Elementary School
FC27	Bridge	Wood		20	4		1858	Foot bridge
FC27	Culvert	Concrete	60	0	0		1859	Brierwoods Lane
FC28	Dam	Steel		6	4		1863	Echo Lake dam/N. Lakewood
FC28	Bridge	Wood		10	2.5		1873	Foot bridge
FC28	Bridge	Concrete		18	7.5		1875	Miller Rd. bridge
FC30	Culvert	Steel	24	0	0		1864	Echo Lake tributary
FC30	Culvert	Concrete	18	0	0		1865	Lions Rd.
FC30	Bridge	Concrete		4	2		1866	Old Rand Road
FC31	Dam	Concrete		6	1		1868	Lake Zurich dam
FC32	Bridge	Concrete		13	15		1753	Illinois 59
FC32	Culvert	Steel		8	4		1758	Golfview Dr.
FC33	Bridge	Wood		35	6		1892	Bridge on golf course
FC33	Bridge	Wood		35	6		1894	Bridge on golf course
FC33	Bridge	Wood		35	6		1896	Bridge on golf course
FC33	Dam	Steel		18	4		1896	Dam on golf course
FC33	Bridge	Wood		40	3		1897	Bridge on golf course
FC33	Bridge	Concrete		5	3		1898	Bridge on golf course
FC33	Weir	Steel		5	2		1898	Dam/weir on golf course

Table C-1 (Continued).

Lake Co ID	Type	Material	Diameter (in.)	Width (ft.)	Height (ft.)	Hydraulic Structure Problem	Photo ID	Notes
FC33	Bridge	Wood		20	5		1900	Bridge on golf course
FC33	Dam	Concrete		5	2.5		1901	Honey Lake dam
FC35	Bridge	Wood		17	2.5		1760	Foot bridge
FC35	Bridge	Wood		20	2.5	Yes	1761	Foot bridge, in disrepair/collapsing
FC35	Bridge	Wood		15	3		1762	
FC35	Culvert	Concrete		20	20		1763	Signal Hill Rd.
FC35	Bridge	Wood		15	2		1765	
FC35	Culvert	Steel	12				1769	Driveway
FC35	Bridge	Wood		20	2.5		1771	
FC35	Culvert	Steel	36				1772	Pinewoods Dr.
FC35	Culvert	Concrete		7	4		1774	Illinois 22
FC36	Bridge	Wood		20	3		1880	
FC36	Bridge	Wood		10	2		1881	
FC36	Culvert	Concrete		3.5	2.5		1882	Private drive
FC36	Bridge	Wood		20	3		1885	Foot bridge
FC36	Bridge	Concrete		20	8		1887	Signal Hill Rd.

APPENDIX D: FLINT CREEK WATERSHED STREAM INVENTORY PHOTO LOG

Photographs were taken throughout the stream inventory to document conditions in the stream and river corridor. Representative conditions in each reach, as well as every point discharge and hydraulic structure, were photographed. In total, 469 photos were taken. Photos are listed and described in Table D-1 below and are organized by reach (for a complete explanation of the numbering scheme for the stream inventory, see Appendix B). "Lake Co ID" refers to the unique alphanumeric identification number assigned to individual reaches assessed in the stream inventory. "Photo ID" refers to the unique identification number assigned to each photo taken during the stream inventory.

Table D-1. Stream Inventory Photo Log, Flint Creek Watershed, Lake and Cook Counties, Illinois

Lake Co ID	Photo ID	Photo Description
FC01	1502	Representative reach at mouth downstream
FC01	1503	Representative reach 2/debris blockage
FC01	1504	Armoring
FC01	1505	Representative reach
FC01	1506	Foot bridge
FC01	1507	Representative reach
FC01	1508	Concrete structure
FC01	1509	Armoring
FC01	1510	Representative reach
FC01	1511	Representative reach check
FC01	1512	Kelsey Rd. bridge
FC01	1513	Concrete culvert draining Kelsey Road
FC02	1514	Representative reach
FC02	1515	Wall/structure on right bank
FC02	1516	Representative reach
FC02	1517	Erosion
FC02	1518	Erosion check
FC02	1519	Armoring
FC02	1520	Debris jam
FC02	1521	Duplicate of #1520
FC02	1522	Tributary from right bank
FC02	1523	Swale
FC02	1524	Representative reach
FC02	1525	Duplicate of #1525
FC02	1526	Representative reach
FC02	1527	High erosion
FC02	1528	Sea wall
FC02	1529	Dam at Flint Lake
FC02	1530	Representative reach

Table D-1 (Continued).

Lake Co ID	Photo ID	Photo Description
FC04	1531	Flint Lake inlet/representative reach 1
FC04	1532	Woodland Drive bridge
FC04	1533	Drainage pipe
FC04	1534	Stonehenge GC tributary and culvert
FC04	1535	Steel pipe
FC04	1536	Representative reach
FC04	1537	Drainage from golf course
FC04	1538	Drainage from golf course
FC04	1539	Erosion
FC04	1540	Drain tile
FC04	1541	Duplicate of #1540
FC04	1542	Culvert
FC04	1543	Foot bridge on golf course
FC04	1544	Duplicate of 1543
FC04	1545	Drain tile
FC04	1546	Foot bridge on golf course
FC04	1547	Armor
FC04	1548	Foot bridge on golf course
FC04	1549	9 in pipe
FC04	1550	4 in pvc pipe
FC04	1551	Representative reach
FC04	1552	Swale at Ill. Rt. 22
FC04	1553	Illinois Route 22 bridge
FC04	1554	Representative reach
FC05	1555	Representative reach
FC05	1556	Culvert in beaver dam
FC05	1557	Concrete bridge
FC05	1558	Representative reach
FC05	1559	Representative reach/north-bound U.S. 14 bridge
FC05	1560	Duplicate of #1559
FC05	1561	Swale
FC05	1562	Representative reach/south-bound U.S. 14 bridge
FC05	1563	Culvert
FC05	1564	Chicago & NW R.R. bridge
FC06	1565	Representative reach
FC06	1566	Representative reach
FC06	1567	Representative reach
FC06	1568	Cuba Road bridge
FC07	1569	Drain
FC07	1570	Representative reach
FC07	1571	Drain
FC07	1572	Swale

Table D-1 (Continued).

Lake Co ID	Photo ID	Photo Description
FC07	1573	PVC
FC07	1574	Duplicate of 1573
FC07	1575	Representative reach
FC07	1576	Duplicate of 1575
FC07	1577	Porter School Rd. pond outlet
FC07	1578	Representative reach
FC07	1579	Bridge (driveway off of Ridge Rd.)
FC07	1580	Tributary swale from wetlands on left (east) bank
FC07	1581	Culvert
FC07	1582	Drain
FC07	1583	Drain pipe
FC07	1584	Representative reach
FC07	1585	Errant photo
FC07	1586	Pipe
FC08	1587	Oak Knoll Road bridge (west)
FC08	1588	Representative reach
FC08	1589	Representative reach
FC08	1590	Swale
FC08	1591	Foot bridge
FC08	1592	Culvert
FC08	1593	Foot bridge
FC08	1594	Armor
FC08	1595	Swale
FC08	1596	Oak Knoll Road bridge (east)
FC08	1597	Drain pipe in Oak Knoll Road bridge (east)
FC08	1598	Representative reach
FC08	1599	Bridge (driveway off of Oak Knoll Road)
FC08	1600	Swale and culvert
FC08	1601	Swale and concrete culvert
FC08	1602	Representative reach at Barrington Hills C.C. boundary
FC08	1603	Pipe
FC08	1604	Footbridge on golf course
FC08	1605	Footbridge on golf course
FC08	1606	PVC pipe
FC08	1607	Swale draining pond west of Paganica Drive
FC08	1608	representative reach near Paganica Drive
FC08	1609	Paganica Drive bridge
FC08	1610	swale draining pond east of Paganica Drive
FC08	1611	Errant photo
FC08	1612	Steel culvert
FC08	1613	footbridge
FC08	1614	pvc pipe

Table D-1 (Continued).

Lake Co ID	Photo ID	Photo Description
FC08	1615	representative reach below Old Hart Rd.
FC08	1616	Old Hart Road bridge
FC09	1617	concrete pipe
FC09	1618	representative reach
FC09	1619	swale
FC09	1620	confluence with Flint Creek (Cook County) tributary
FC09	1621	representative reach
FC09	1622	representative reach
FC09	1623	Hart Road culvert
FC10	1624	swale and drain pipe on east side of Hart Road
FC10	1625	pvc
FC10	1626	culvert
FC10	1627	12 in concrete pipe
FC10	1628	2 ft concrete pipe
FC10	1629	a-jack armor
FC10	1630	2 plastic pipes
FC10	1631	bridge for Barrington H.S. athletic fields
FC10	1632	culvert
FC10	1633	drain tile
FC10	1634	representative reach 1
FC10	1635	a-jacks
FC10	1636	drain tile
FC10	1637	armor
FC10	1638	culvert
FC10	1639	Discharge from Barrington water treatment plant
FC10	1640	Drain pipe
FC10	1641	culvert
FC10	1642	concrete pipe
FC10	1643	pvc pipe
FC10	1644	Raymond Avenue bridge
FC10	1645	2 pvc pipes
FC10	1646	steel pipe
FC10	1647	representative reach 2
FC10	1648	Defunct railroad bridge
FC10	1649	Culverts under bike path draining pond/wetland on right (south)
FC10	1650	Chicago & NW R.R. bridge
FC10	1651	culvert
FC10	1652	drain tile
FC10	1653	duplicate of #1652
FC10	1654	foot/bike path bridge at Langendorf Park restoration site
FC10	1655	fence at Langendorf Park/commercial development boundary

Table D-1 (Continued).

Lake Co ID	Photo ID	Photo Description
FC10	1656	pipe
FC10	1657	plastic pipe
FC10	1658	steel pipe
FC10	1659	steel pipe
FC10	1660	concrete swale draining commercial development
FC10	1661	representative reach 3
FC10	1662	culvert
FC10	1663	pipe
FC10	1664	fence at commercial property boundary immediately downstream of Ill. Rt. 59 (Hough St.)
FC10	1665	pipe
FC10	1666	steel pipe
FC10	1667	steel pipe
FC10	1668	concrete pipe
FC10	1669	culvert
FC10	1670	culvert
FC11	1671	Ill. Rt. 59 (Hough St.) bridge
FC11	1672	bridge for apartment parking area
FC11	1673	representative reach 1
FC11	1674	erosion
FC11	1675	Pipe draining area SE of railroad
FC11	1676	drainage ditch from railway
FC11	1677	culvert
FC11	1678	gutter
FC11	1679	pvc
FC11	1680	representative reach 2
FC11	1681	U.S. Rt. 14 (Northwest Highway) bridge
FC11	1682	plastic pipe
FC11	1683	pipe
FC11	1684	Elm Street bridge
FC11	1685	ceramic pipe
FC11	1686	armor
FC11	1687	drain tile
FC11	1688	plastic pipe
FC11	1689	culvert
FC11	1690	pvc pipe
FC11	1691	erosion
FC11	1692	plastic pipe
FC11	1693	drain
FC11	1694	Drain tile
FC11	1695	steel pipe
FC11	1696	plastic pipe
FC11	1697	plastic pipe

Table D-1 (Continued).

Lake Co ID	Photo ID	Photo Description
FC11	1698	representative reach
FC11	1699	tributary from subdivision
FC11	1700	steel pipe
FC11	1701	open channel
FC11	1702	Lake Zurich Road culvert
FC12	1703	Elgin, Joliet & Eastern R.R. culvert
FC12	1704	Cuba Marsh outlet/Citizens Park lagoon
FC12	1705	representative reach
FC12	1706	Cuba Marsh wetland/representative reach 2
FC12	1707	drain tiles
FC12	1708	Lake Shore Dr. culvert at Lake Louise
FC12	1709	representative reach
FC12	1710	Lake Louise dam
FC14	1711	representative reach/Lake Louise inlet
FC14	1712	armor
FC14	1713	Surrey Lane culvert
FC14	1714	plastic pipe
FC14	1715	drain tile
FC14	1716	culvert
FC14	1717	representative reach
FC14	1718	culvert
FC14	1719	foot bridge and Lake Cook Road bridge
FC14	1720	dam at Lake Cook Road
FC15	1946	Foot bridge
FC15	1947	Representative Reach
FC15	1948	Errant
FC15	1949	Steel pipe
FC15	1950	foot bridge
FC15	1951	Concrete pipe
FC15	1952	representative reach
FC15	1953	Foot bridge
FC15	1954	Foot bridge
FC15	1955	Plastic pipe
FC15	1956	Foot bridge and tributary from east
FC15	1957	concrete pipe
FC15	1958	steel weir and naturalized detention basin
FC15	1959	Steel Pipe
FC15	1960	pipe
FC15	1961	Fairfield Dr. culvert
FC15	1962	Pipe
FC15	1963	drain tile
FC15	1964	plastic pipe

Table D-1 (Continued).

Lake Co ID	Photo ID	Photo Description
FC15	1965	2 pipes
FC15	1966	representative reach
FC15	1967	concrete pipe
FC15	1968	Hillside Rd. culvert
FC16	1978	Culvert under Chicago & NW, US 14 (submerged)
FC16	1979	overflow pipe for Baker Lake outlet
FC16	1980	Baker Lake dam
FC16	1981	Baker Lake outlet channel
FC16	1982	Baker Lake
FC17	1721	pond upstream from railway
FC17	1722	pond upstream from railway
FC17	1723	culvert under railway
FC17	1724	dam at Scoville Lake
FC18	1725	representative reach
FC18	1726	representative reach
FC18	1727	foot bridge
FC18	1728	representative reach
FC18	1729	Lake Cook Road bridge
FC19	1903	Representative reach
FC19	1904	swale draining Gatorade parking to east (conveying runoff)
FC19	1905	Representative reach
FC19	1906	defunct bridge causing debris jam behind Gatorade facility
FC19	1907	stone-lined swale draining Gatorade facility
FC19	1908	6 in aluminum pipe
FC19	1909	swale (conveying runoff)
FC19	1910	2 in. PVC
FC19	1911	12" concrete pipe (overflow for pond on other side of berm)
FC19	1912	wooden footbridge
FC19	1913	Errant photo
FC19	1914	pair of 3' metal culverts under driveway and wood/stone armor
FC19	1915	4" drain tile
FC19	1916	Fence
FC19	1917	12" drain tile
FC19	1918	swale
FC19	1919	Stone armoring
FC19	1920	12" drain tile
FC19	1921	footbridge
FC19	1922	Footbridge
FC19	1923	E, J & E R.R. bridge
FC19	1924	Hawthorne Lake dam
FC19	1925	Representative reach
FC21	1969	Illinois 59/68 Bridge

Table D-1 (Continued).

Lake Co ID	Photo ID	Photo Description
FC21	1970	Representative reach
FC21	1970	representative reach
FC21	1971	representative reach
FC21	1971	representative reach
FC21	1972	swale
FC21	1972	swale
FC21	1973	tributary
FC21	1973	swale
FC21	1974	tributary
FC21	1974	swale
FC21	1975	Steel pipe
FC21	1975	defunct drain tile
FC21	1976	Representative reach
FC21	1976	representative reach
FC21	1977	La Buys Lake dam
FC21	1977	La Buys Lake dam
FC23	1731	Flint Lake inlet of Grassy Lake Drain
FC23	1732	drain tile
FC23	1733	representative reach
FC23	1734	pvc
FC23	1735	pvc
FC23	1736	armor
FC23	1737	foot bridge
FC23	1738	representative reach
FC23	1739	pvc
FC23	1740	drain
FC23	1741	same as 1740
FC23	1742	pipe
FC23	1743	Old Barrington Road culvert
FC23	1744	steel pipe
FC23	1745	steel pipe
FC23	1746	drain
FC23	1747	Foot bridge
FC23	1748	erosion
FC23	1749	steel pipe
FC23	1750	representative reach/Grassy Lake outlet
FC25	1776	Ill. Rt. 59 bridge
FC25	1777	culvert draining Ill. Rt. 59
FC25	1778	defunct bridge
FC25	1779	representative reach
FC25	1780	armor-immediately downstream of Woodland Dr.
FC25	1781	Woodland Dr. culvert

Table D-1 (Continued).

Lake Co ID	Photo ID	Photo Description
FC25	1782	culvert from Woodland Dr.
FC25	1783	representative reach
FC25	1784	drain tile
FC25	1785	drain tile
FC25	1786	representative reach
FC25	1787	culvert at Oxford Rd.
FC25	1788	Oxford Road culvert
FC25	1789	Grassy Lake inlet
FC25	1790	representative reach
FC25	1791	footbridge and debris
FC25	1792	Tributary entering from left bank (north)
FC25	1793	drain tile
FC25	1794	foot bridge near Biltmore Dr.
FC25	1795	armor
FC25	1796	Biltmore Drive culvert
FC25	1797	Concrete culvert draining Biltmore Dr.
FC25	1798	steel pipe
FC25	1799	drain
FC25	1800	open channel
FC25	1801	armor
FC25	1802	Eton Drive culvert
FC25	1803	representative reach
FC25	1804	severe erosion
FC25	1805	Kimberly Road bridge
FC25	1806	culvert from Kimberly Rd.
FC25	1807	culvert for driveway off of Kimberly Rd.
FC25	1808	swale
FC25	1809	drain tile
FC25	1810	representative reach
FC25	1811	representative reach
FC25	1812	drain tile
FC25	1813	armor
FC25	1814	foot bridge
FC26	1815	Rugby Lane culvert
FC26	1816	Representative reach
FC26	1817	Swale draining residential on left (north)
FC26	1818	Dam and bridge on residential property
FC26	1819	Fence across swale entering from right (south)
FC26	1820	Footbridge
FC26	1821	Fence at parcel boundary across stream channel
FC26	1822	Representative reach
FC26	1823	Footbridge

Table D-1 (Continued).

Lake Co ID	Photo ID	Photo Description
FC26	1824	Footbridge
FC26	1825	Clover Hill Lane culvert
FC26	1826	Drain tile
FC26	1827	armor
FC26	1828	pipe and swale
FC26	1829	pipe and swale (same as 1828)
FC26	1830	Footbridge
FC26	1831	footbridge
FC26	1832	Footbridge
FC26	1833	culvert
FC26	1834	A-jack armor
FC27	1835	U.S. Route 12 (Rand Rd.) bridge
FC27	1836	swale
FC27	1837	Pipe
FC27	1838	footbridge
FC27	1839	armor
FC27	1840	2 concrete pipes
FC27	1841	A-jack armor
FC27	1842	representative reach
FC27	1843	drain tile
FC27	1844	Concrete pipe
FC27	1845	Miller Road bridge
FC27	1846	Miller Road bridge
FC27	1847	pipe draining Miller Rd.
FC27	1848	Representative reach
FC27	1849	culvert
FC27	1850	pipe
FC27	1851	Manchester Road culvert
FC27	1852	Culvert
FC27	1853	drain tile
FC27	1854	Drain tile
FC27	1855	Swale
FC27	1856	Footbridge
FC27	1857	Culvert
FC27	1858	Footbridge
FC27	1859	Brierwoods Lane culvert
FC27	1860	Errant Photo
FC27	1861	capped pipe
FC27	1862	pipe
FC27	1869	Representative reach upstream of 12 (former LZ WTP site)
FC27	1870	Representative reach downstream of Manchester Dr.
FC27	1871	Representative reach downstream of Bruce Circle

Table D-1 (Continued).

Lake Co ID	Photo ID	Photo Description
FC28	1863	Echo Lake dam and Lakewood Rd. bridge
FC28	1872	steel pipe
FC28	1873	Wood bridge
FC28	1874	Representative reach
FC28	1875	Miller Road bridge
FC28	1876	Tributary and culvert on left (east) along Miller Road
FC28	1877	Representative reach
FC28	1878	Representative reach
FC28	1879	culvert draining N. Lakewood Ln.
FC30	1864	Culvert/tributary to Echo Lake
FC30	1865	Pipe at Lions Rd.
FC30	1866	Old Rand Rd. bridge
FC30	1867	Culvert at Old Rand Rd
FC31	1868	Lake Zurich spillway/outlet (Old Rand Rd)
FC32	1751	Grassy Lake inlet
FC32	1752	representative reach
FC32	1753	Illinois Rt. 59 bridge
FC32	1754	steel pipe
FC32	1755	armor
FC32	1756	representative reach
FC32	1757	representative reach
FC32	1758	Golfview Drive culvert
FC33	1891	Steel pipe
FC33	1892	Wooden Bridge
FC33	1893	Representative reach
FC33	1894	Wooden bridge
FC33	1895	Representative reach
FC33	1896	Wooden bridge and dam
FC33	1897	Wooden bridge
FC33	1898	Concrete bridge and steel weir
FC33	1899	Drain tile
FC33	1900	Wood bridge
FC33	1901	Honey Lake dam
FC33	1902	Representative reach
FC35	1759	Honey Lake inlet
FC35	1760	foot bridge
FC35	1761	foot bridge
FC35	1762	foot bridge
FC35	1763	Signal Hill Rd. culvert
FC35	1764	representative reach
FC35	1765	foot bridge
FC35	1766	concrete drain

Table D-1 (Continued).

Lake Co ID	Photo ID	Photo Description
FC35	1767	drain tile
FC35	1768	representative reach
FC35	1769	culvert under driveway off of Duck Pond Lane
FC35	1770	Pond on Honey Lake Drain at end of Duck Pond Lane
FC35	1771	foot bridge
FC35	1772	Pinewoods Drive culvert
FC35	1773	representative reach
FC35	1774	Ill. Rt. 22 culvert
FC35	1775	same as 1774
FC36	1880	foot bridge
FC36	1881	Footbridge
FC36	1882	culvert for driveway off of Signal Hill Rd.
FC36	1883	armor
FC36	1884	Honey Lake inlet
FC36	1885	foot bridge
FC36	1886	representative reach
FC36	1887	Signal Hill Road culvert
FC36	1888	steel pipe
FC36	1889	representative reach
FC36	1890	concrete pipe, head of channel

APPENDIX E: STREAM INVENTORY METHODOLOGY AND FORM

E.1 STREAM INVENTORY PROCEDURE

During summer 2006, the Lake County Stormwater Management Commission conducted a stream inventory of channels in the Flint Creek watershed. Water quality sampling was not performed as part of the stream inventory, but the sources and causes of water quality impairment in the streams were investigated. An important component of the assessment process is the evaluation of current hydraulic, geomorphic, and aquatic stream characteristics. The major stream characteristics that were assessed and noted include:

- channel conditions such as bank height, erosion problems and bank vegetation
- hydraulic structures such as bridges and culverts in the river or floodplain
- point discharges into the river
- land use and vegetative cover in the riparian corridor
- channel substrate and degree of sedimentation.

These characteristics were identified for each stream reach using the stream inventory procedure described below. Several procedures were considered self-explanatory and were therefore not described. The discussion below is organized in the same order as the data was collected on the stream inventory report form (SIRF).

E.1.1 Stream Inventory Report Form

E.1.1.1 Reach Boundaries

A stream reach is defined as a stream segment having fairly homogenous hydraulic, geomorphic and riparian cover and land use characteristics (such as all ditched agriculture or all natural and wooded). Where possible, beginning and end stations should be established along the stream using permanent physical landmarks such as bridges that are readily recognized.

E.1.1.2 Channel Flow Status (Stream Stage)

The channel flow status is the degree to which the channel is filled with water. The flow status will change as the channel enlarges (e.g., aggrading stream beds with actively widening channels) or as flow decreases as a result of dams and other obstructions, diversions for irrigation, or drought. When water does not cover much of the streambed, the amount of suitable substrate for aquatic organisms is limited. In high-gradient streams, the decrease in water level exposes logs and snags, thereby reducing the areas of good habitat. Channel flow is especially useful for interpreting biological condition under abnormal or lowered flow conditions. This parameter becomes important when more than one biological index period is used for surveys or the timing of sampling is inconsistent among sites or annual periodicity.

E.1.2 Channel Conditions (SIRF Section A)

E.1.2.1 Channelization

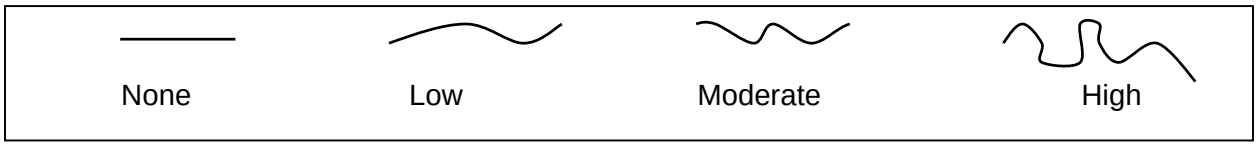
Channelization refers to channel modifications performed by humans. 'The one-third rule should be applied again where low means < 33% of the reach is channelized, moderate means 33 to 66% and high means
> 66% of the reach is channelized. The presence of a pilot channel should be noted under 'Pilot Channel Formed' for channelized streams. A narrow, meandering pilot channel may develop within the wide and flat trapezoidal ditch that was excavated during channelization. A pilot channel is indicative of recovery from channelization. Spoils piles refer to any excavated or dredged materials that have been deposited along the banks. If present identify which bank is affected.

E.1.2.2 Sinuosity

Sinuosity is dependent on the stream stage in many channelized reaches. For instance, in many cases a narrow, highly sinuous pilot channel has developed during low stream stage within a wider, non-sinuous channel that was excavated during channelization. Therefore, sinuosity should be estimated for both baseflow conditions (describing sinuosity in the pilot channel) and for the bankfull-flow events. However, if the stream inventory report form is completed during bankfull flow, then sinuosity during baseflow conditions will be difficult to estimate. Figure E-1 should be used for estimating the degree of sinuosity.

Figure F-1

SINUOSITY ESTIMATION GUIDE



E.1.2.3 Pool/Riffle Development

The proportion represented by riffles, runs, and pools should be noted to describe the morphological heterogeneity of the reach. Pools should be well-defined areas of deeper than average water. Pools generally do not extend in length more than three or four times the stream width. Pools should almost immediately be followed by a riffle environment for the stream to be characterized as having high pool/riffle development. A riffle is characterized by shallower water and higher velocities with rippling or disturbances to the surface water tension that allow turbulence and mixing to occur. Many streams in Lake County will have low or no pool/riffle development.

E.1.2.4 Bank Erosion

Severe bank erosion is a significant concern for Lake County's stream and rivers. Severely eroded banks have exposed soil on nearly vertical banks extending from the top of bank to the low water mark so erosion is constantly occurring. Highly eroded streambanks contribute heavy loads of sediment and erode during times of higher flows. Active slumping and sloughing may be apparent where fresh, moist, loose soil and other signs of recent bank movement such as exposed tree roots or suspended fences extending into the stream are found. Eroded areas are

most prevalent in the outer edges of bends and meanders. All cases of severe erosion should be photographed and noted on the form and the map or aerial photo. If the photo is taken looking up/down stream the aspect should be noted. Structures that are present and threatened by slumping should also be recorded. Right and left bank are determined by facing upstream.

On impounded areas of streams, the absence of bank or littoral vegetation along the normal water mark resulting in constant erosion would also be considered severe.

E.1.2.5 Armoring

Armoring refers to the placement of gabions, wood, metal, riprap or other similar artificial materials along the streambank to reduce bank erosion. The one-third rule should be applied again where low means < 33% of the reach is armored, moderate means 33 to 66% and high means > 66% of the reach is armored. Portions of armoring that are failing should be noted.

E.1.2.6 Sediment Accumulations

Sediment accumulations that affect the channel capacity and flow conveyance should be described. Sediment deposition measures the amount of sediment that has accumulated in pools and the changes that have occurred to the stream bottom as a result of deposition. Deposition occurs from large-scale movement of sediment. Sediment deposition may cause the formation of islands, point bars (areas of increased deposition usually at the beginning of a meander that increase in size as the channel is diverted toward the outer bank) or shoals, or result in the filling of runs and pools. In some cases, sediment accumulations may not impact channel conveyance.

E.1.2.7 Mid-Stream Bars and Islands

Record whether exposed mid-stream bars or islands are present. Although these structures may increase habitat availability for organisms, they also reduce the unobstructed stream width and may enhance the debris-accumulating potential of the stream reach.

E.1.2.8 Mean Water Depth

Water depth should be measured at the deepest portion of the channel cross section (known as the thalweg) with a sturdy 4- to 5-foot rod inscribed with depth marks in inches. The range of water depths should reflect the variation between the deepest and shallowest portions of the channel cross-section in the reach.

E.1.2.9 Mean Bank Height, Top Mean Channel Width and Bottom Mean Channel Width

Mean bank height should be measured from the top to the bottom of the streambank. The top of the bank occurs where there is a convex-shaped transition in bank slope between the streambank and the outlying floodplain. The bottom of the bank occurs where there is a concave-shaped transition in slope between the stream substrate and the streambanks, and it may be below the water level.

Top and bottom mean bank widths refer to the mean bank-to-bank width across the top and across the bottom of the banks. If the top of one bank is higher in elevation than the top of the opposite bank, the top mean channel width should be measured from the elevation of the lowest

bank. In estimating these and other values, the investigator should be conscious of longitudinal changes in bank dimensions in order to arrive at estimated values.

E.1.2.10 Beaver Activity

Low beaver activity includes an occasional bank slide or chewed stump within the reach. These features must become progressively more apparent to rate as moderate activity. High activity is characterized by almost constant activity in the wooded areas with felled trees in excess of 12 inches; slides and beaver cut brush being common in the stream. All dams and lodges should be noted and indicate high beaver activity.

E.1.2.11 Stream Debris Load

1. Instream Debris Load
Stream debris load refers to natural and man-made debris including leaves, sticks, logs, lumber, trash and sediment. The one-third rule should be applied again where low means < 33% of the reach contains debris obstructing or deflecting flow, moderate means 33 to 66% and high means > 66% of the reach is characterized by large accumulations of lodged and partially compacted debris spanning the entire stream width.
2. Overbank Debris Load
The overbank debris load refers to loosened, floatable materials that are prevalent enough to potentially cause debris jams at culverts and bridges during high flows events. The locations and types of debris as well as how it may impact the reach should be noted. Similarly to the instream debris load section, the one-third rule should be applied.

E.1.3 Hydraulic Structures (SIRF Section B)

Hydraulic structures include low head dams, weirs, bridges, levees, and culverts. Dimensions as well as construction materials should be measured and recorded. Structures should be photographed and their locations should be recorded by taking a GPS waypoint. Elevations will be determined from existing data or field survey dependent upon the approved scope of work. Notes should include condition, drop or change in elevation, blockages and other characteristics.

E.1.4 Point Discharges (SIRF Section C)

Point discharges include all sanitary, stormsewer and agricultural drainpipes greater than 4 inches in diameter. They also include open channels, swales, gullies and other significant tributaries. Locations of all point discharges should be recorded by taking a GPS waypoint. Check the problem column (see SIRF) if the condition of the discharge point is blocked, cracked, etc. The volume of flow should be noted in the appropriate column using the following categories: none, trickle, moderate, substantial, other. Notes should include comments on odors, sheens or high turbidity if present.

E.1.5 Vegetation and Land Use (SIRF Section D)

E.1.5.1 Floodplain Vegetation (within 100 ft of stream)
For the respective banks the land use and vegetative cover should be noted as percentages of the floodplain surface area (note: percentages should total 100%). The vegetated buffer is given a score from 0-10 (see SIRF for specific criteria).

E.1.5.2 Predominant Bank Vegetation (%) and Predominant Tree/Shrub Species

These measurements provide an indication of bank stability and the potential for the development of debris blockages in the channel. For the respective banks the predominant vegetation type should be noted as percentages of the bank surface area (note: percentages should total 100%). Due to the rapid colonization capabilities of some tree and shrub species, the presence or absence of tree and shrub types should be documented even if trees or shrubs were uncommon in the stream reach. Also, where possible, tree and shrub species included in the 'Other' category should be identified. Canopy cover should be estimated as a percentage of shaded coverage of the channel.

E.1.5.3 Aquatic Vegetation

The general type and relative dominance of aquatic plants are documented in this section. Besides being an ecological assemblage that responds to perturbation, aquatic vegetation provides a refuge and food for aquatic fauna. Filamentous algae can grow in fast or slow flowing streams over solid surfaces within the stream channel. Extensive filamentous algae coverage is indicative of excessive nutrient levels. Submergent, emergent, free floating, rooted floating or no vegetation should also be considered when estimating percentage of aquatic vegetation over the total area of the reach.

E.1.6 Substrate and Water Quality (SIRF Section E)

E.1.6.1 Substrates

The substrate in the stream channel should be classified using the following definitions:

1. *Claypan (Hardpan)*

Claypan is made up of particles less than 0.0002 inches in diameter, which forms a dense, gummy surface that is difficult to penetrate.

2. *Silt*

Silt particles are between 0.0002 to 0.002 inches in diameter. Silt is a fine material that generally feels "greasy" when rubbed between fingers.

3. *Sand*

Sand is made up of materials from 0.002 to 0.08 inches in diameter. Sand exhibits a gritty texture when rubbed between fingers.

4. *Gravel*

Gravel is a mixture of rounded coarse material from 0.08 to 2.5 inches in size.

5. *Cobble*

Cobble is made up of stones from 2.5 to 10 inches in diameter.

6. *Boulder*

Boulders are defined as rounded stones over 10 inches in diameter or large "slabs" over 10 inches in length.

7. Organic
Organic substrate refers to living or decaying plant material.

8. Concrete
Channels lined with concrete or other man-made materials should be noted.

E.1.6.2 Substrate Stability

Substrate stability will be assessed according to how well the stream substrate supports the weight of the observer walking within the stream. Assessing substrate stability requires that the observers walk through representative lengths of the stream channel in the reach. To help ensure the safety of the observers, waders should be worn at all times to prevent cuts and infections, and at least two observers should walk each reach together. Stream channels should not be walked if the safety of the recorder is in jeopardy at any time because of strong current, deep-water sections, soft substrate, or any other potential danger. Substrate stability classified as 'None' indicates that the substrate can't support the observer's weight and the observer quickly sinks into the substrate. These substrate types are usually deep silts that for obvious safety reasons must not be walked in. 'Low' substrate stability can be walked over, but the observer will sink several inches into the substrate if he stands for an extended time period. These substrates may include silts and loose sand or gravel. 'Moderate' substrate stability would describe substrate that can be walked over without sinking more than an inch or two into the substrate and may include coarse gravel, cobble, perhaps mixed with some boulders. 'High' substrate stability can be readily walked on without sinking into the substrate. 'High' substrate stability often occurs when cobble, boulders, shale or claypan covers the stream bottom.

E.1.6.3 Substrate Embeddedness

Substrates should be considered embedded if more than 50% of the surface of the substrates are surrounded, impacted in or covered by unnatural accumulations of fine material such as sand or silt. Embedded substrates can't be easily dislodged. Naturally silty or sandy streams are not considered embedded; however, if sedimentation has buried the natural coarse substrates with sand or silt then the stream reach should be considered embedded. The degree of embeddedness can often be determined by jabbing a sturdy rod into the stream bottom to determine whether the underlying stream substrate is coarse material, or sand and silt. Embeddedness is the extent to which cobbles, gravel, and boulder substrates are embedded. High embeddedness would occur if over 66% of the site area was embedded (as defined above), moderate embeddedness would occur if from 33 to 66% of the site area was embedded and low means less than 33% of the area was embedded. 'N/A' ratings should be applied to stream channels that are naturally composed of silt and sand, because in such channels embeddedness of coarse substrates is 'not applicable.'

E.1.7 Instream Cover (SIRF Section F)

All types of cover present should be noted. Cover should not be counted when it is in areas of the stream with insufficient depth. General comments on perceived abundance of various cover types should be reported.

E.1.8 Aquatic and Terrestrial Organisms (SIRF Section G)

Some measurements for the Aquatic and Terrestrial Organisms section (SIRF Section G) require that riffles be distinguished from runs and pools. Pools and riffles were defined in the pool/riffle development section of the main summary document. Runs are deeper than riffles, have relatively rapid, non-turbulent flow and are generally located downstream from riffles where the stream narrows. The streambed is often flat beneath a run and therefore the water surface is not visibly broken.

Biological information (versus chemical or physical information) is widely regarded as the most reliable type of data collection for evaluating the ecological conditions of stream reaches. For a very basic yet somewhat informative assessment of ecological conditions, the following procedures should be followed. For fish and macroinvertebrate sampling, the sample locations, the type of gear used for the sample collection and the approximate sample effort (in minutes or feet of stream reach) should be noted. Although SMC did not sample for fish, macroinvertebrates or birds in the Flint Creek watershed, their presence was noted when they were encountered in a stream reach.

E.1.8.1 Macroinvertebrates

If sufficient flow exists, macroinvertebrates should be sampled by kick net (approximately 3' x 3' screens) in riffle areas at least once per reach. The observer should stand upstream of the kick net and use one or both feet to disrupt the substrate and dislodge macroinvertebrates from the substrate so that they drift downstream into the kick net screen. If sufficient flow does not exist for the effective use of kick nets, macroinvertebrates should be handpicked from rocks in riffle areas. The presence should be noted of major groups of macroinvertebrates such as stonefly, mayfly and caddisfly larvae, snails, water pennies, riffle beetles, damselfly and dragonfly nymphs, isopods and sowbugs, leeches, and worms. If riffle areas and rocks do not exist such as in recently channelized streams, impounded streams, or under low-flow conditions, then macroinvertebrates should be sampled from vegetation, debris or other instream material.

E.1.8.2 Fish

Fish sampling should be performed with a seine (or ideally, electroshocking equipment) at three or more stream locations. The types and relative abundances (percent composition of the catch by species) should be noted for each fish species captured. However, high flow may in some circumstances not permit safe and effective seining. In such instances, visual observations of types of fish present should be made where water clarity permits. Based on past experience, some species or groups that can be tentatively identified by visual observation alone without sampling gear include carp, goldfish, minnows, panfish and bass. In all biological evaluations, presence of rare or threatened and endangered animal and plant species is of great interest.

E.1.8.3 Birds

During the field investigation, types and numbers of birds that utilize streams and adjacent aquatic habitat should also be noted. Such birds that are common to Lake County include ducks, geese, herons, kingfishers, sandpipers, plovers, gulls, terns, swifts and some swallows.

Note: Any reptiles, amphibians or mammals observed should be noted as specific as possible.

E.1.9 Additional Comments

Additional notes or comments should include any irregularities such as cars in the stream, floodplain construction activity, presence of livestock in the stream, foul smelling discharges, errors in existing mapping or other peculiarities. Opportunities and obstacles to access should also be noted on each form.

E.1.9.1 Suggested Equipment List

- waders (2 pairs)
- digital camera, waterproof recommended
- gps unit
- polarized sunglasses
- 100+ foot tape measure
- 4-foot wood rod with depth marks or metal yard stick
- watch with second hand
- sampling gear

E.1.9.2 Access

Approval for access on private property is important. In the Flint Creek watershed, SMC met with the Flint Creek Watershed Partnership, which informed landowners of the stream inventory in its newsletter. In addition, SMC staff prepared a permission letter for presentation to members of the public encountered during the stream inventory.

STREAM INVENTORY REPORT FORM

STREAM NAME:_____ REACH ID:_____ DATE:_____

REACH BOUNDARY- DOWNSTREAM:_____ GPS Ref. #_____

REACH BOUNDARY-UPSTREAM:_____ GPS Ref. #_____

APPROX. LENGTH (ft):_____ TEMP. (°F)_____ TIME:_____

INVESTIGATORS:_____ RECENT RAIN: (Now, 12, 24, 48 hours, week)_____

GAGE READING:_____

A. CHANNEL CONDITIONS:

CHANNEL FLOW (STREAM STAGE):

NONE	LOW	MODERATE	NORMAL	HIGH
Very little water in channel and mostly present as standing pools	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed	Water fills > 75% of the available channel; or <25% of channel substrate is exposed	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed	Water levels are higher than the base of both banks
0 1	2 3 4	5 6	7 8	9 10

CHANNELIZATION: NONE____ LOW____ MODERATE____ HIGH_____

PILOT CHANNEL FORMED (YES / NO)

SPOILS PILES ON BANKS (Left / Right / Both)

BANKFULL SINUOSITY: NONE____ LOW____ MODERATE____ HIGH____

BASEFLOW SINUOSITY: NONE____ LOW____ MODERATE____ HIGH____

POOL/RIFFLE DEVELOPMENT: % POOL ____ % RIFFLE ____ % RUN ____

DEGREE OF BANK EROSION:

NONE	LOW	MODERATE	HIGH
Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems; less than 5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over; 5-33% bank has areas of erosion.	Moderately unstable; 33-66% of bank has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 66-100% of bank with erosional scars.
Left Bank 10 9	8 7 6	5 4 3	2 1 0
Right Bank 10 9	8 7 6	5 4 3	2 1 0

TYPES AND LOCATIONS OF HIGH CASES:

GPS#	PHOTO #	Side of Channel (L/R)	NOTES (aspect of photo if applicable):

DEGREE OF ARMORING: NONE____ LOW____ MODERATE____ HIGH____

TYPES AND LOCATIONS OF HIGH CASES:_____

SEDIMENT ACCUMULATIONS:

NONE	LOW	MODERATE	HIGH
Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment depositions	Some new increase in bar formation, mostly from gravel, sand, or fine sediment; 20-50% of the bottom affected; slight deposition in pools	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected, sediment deposits at obstructions, constrictions and bends; moderate deposition of pools prevalent	Heavy deposits of fine material, increase bar development; more than 80% bottom changing frequently, pools almost absent due to substantial sediment deposition
10 9	8 7 6	5 4 3	2 1 0

TYPES AND LOCATIONS OF HIGH CASES:_____

MID-STREAM BARS AND ISLANDS: YES:_____ NO:_____

MEAN BANK HEIGHT	HEIGHT (FT)	GPS #	AVERAGE	RANGE
MEAN BANK SLOPE (RUN/RISE)	SLOPE	GPS #	AVERAGE	RANGE
MEAN WATER DEPTH	DEPTH (FT)	GPS #	AVERAGE	RANGE
TOP MEAN CHANNEL WIDTH (FT)	WIDTH (FT)	GPS #	AVERAGE	RANGE
BOTTOM MEAN CHANNEL WIDTH (FT)	WIDTH (FT)	GPS#	AVERAGE	RANGE
MEAN VELOCITY (FT/S)	TRAVEL TIME (sec/ 10ft)	GPS#	AVERAGE	RANGE

BEAVER ACTIVITY: NONE_____ LOW_____ MODERATE_____ HIGH_____

DAM/LODGE: YES (NUMBER OF DAMS)_____ NO_____

STREAM DEBRIS LOAD (as defined in methodology):

INSTREAM: LOW _____ MODERATE _____ HIGH _____

OVERBANK: LOW _____ MODERATE _____ HIGH _____

NOTES:_____

_____

IMPOUNDED: YES:_____ NO:_____

COMMENT:_____

SOURCE:_____

B. HYDRAULIC STRUCTURES:

(Note sizes & locations in channel or adjacent floodplain.)

TYPE & MATERIAL	DIMENSIONS (inches)	GPS #	PHOTO #	L/R or Center of Channel	P♣	ASPECT (up/down)	NOTES:

♣ **P= Problem (Check for Yes)**

C. DISCHARGE POINTS:

(Pipes, ditches, swales, tributaries; note numbers, sizes and locations of discharges with diameters of 4 inches or more.)

TYPE & MATERIAL	DIMEN-SIONS (inches)	GPS #	PHOTO #	L/R or Center of Channel	P♣	FLOW*	NOTES

NOTES (ex: suspicious effluent etc.):_____

D. VEGETATION & LAND USE:

♣ P= Problem (Check for Yes)

*** None, Trickle, Moderate, Substantial, Other**

FLOODPLAIN VEGETATION(within 100 ft of stream)

DOMINANT LAND USE (%):

LEFT: AGRICULTURAL:_____ OPEN SPACE:_____ RECREATIONAL: _____

COMMERCIAL/INDUSTRIAL:_____RESIDENTIAL:_____ OTHER:_____

RIGHT: AGRICULTURAL:_____ OPEN SPACE:_____ RECREATIONAL:_____

COMMERCIAL/INDUSTRIAL:_____ RESIDENTIAL:_____OTHER:_____

LAND COVER (%):

LEFT: TREES: _____ LAWN:_____ WETLANDS:_____ CROPS:_____ SHRUBS:_____

HERBACEOUS: _____ IMPERVIOUS:_____ WATER:_____OTHER: _____

RIGHT: TREES:_____ LAWN:_____ WETLANDS:_____ CROPS:_____ SHRUBS:_____

HERBACEOUS:_____ IMPERVIOUS:_____ WATER:_____OTHER:_____

WIDTH OF VEGETATED BUFFER:

NONE	LOW	MODERATE	HIGH
Width of riparian zone <20 feet; little or no riparian vegetation due to human activities	Width of riparian zone 20-40 feet; human activities have impacted zone a great deal	Width of riparian zone 40-60 feet; human activities impacted zone minimally	Width of riparian zone >60 feet; human activities (parking lots, roadbeds, lawns, crops) have not impacted zone
Left Bank 0 1 2	3 4 5	6 7 8	9 10
Right Bank 0 1 2	3 4 5	6 7 8	9 10

Notes_____
_____
_____

BANK VEGETATION (within 10 ft of stream):

PREDOMINANT VEGETATION (%)

LEFT BANK: UNMOWED GRASS:___ LAWN:___ WETLAND:___ TREES:___ SHRUB:___ CROP:___ HERBACEOUS: ___ NONE:___ OTHER:_____

RIGHT BANK: UNMOWED GRASS:___ LAWN:___ WETLAND:___ TREES:___ SHRUB:___ CROP:___ HERBACEOUS: ___ NONE:___ OTHER:_____

PREDOMINANT TREE/SHRUB SPECIES ON BANKS (CHECK ALL PRESENT)

WILLOWS_____ BOX ELDER_____ HONEYSUCKLE_____

BUCKTHORN_____ HARDWOODS_____ OTHER_____

CANOPY (PERCENT SHADED COVERAGE OF CHANNEL):_____

AQUATIC/INSTREAM VEGETATION

VEGETATION (%): ROOTED EMERGENT:_____ ROOTED SUBMERGENT:_____

ROOTED FLOATING:_____ FREE FLOATING:_____ FLOATING ALGAE:_____

ATTACHED ALGAE:_____ NO VEGETATION:_____

E. SUBSTRATE AND WATER QUALITY:

SUBSTRATE COMPOSITION (%): CLAYPAN_____ SILT_____ SAND_____ GRAVEL_____

COBBLE_____BOULDER_____ CONCRETE_____ ORGANIC MATTER_____

CATEGORIZE AS "NONE", "LOW", "MODERATE", OR "HIGH" (Locate worst cases.):

SUBSTRATE STABILITY OF ENTIRE REACH:_____

SUBSTRATE EMBEDDEDNESS OF ENTIRE REACH:_____

GREASE & OIL IN WATER COLUMN_____ GREASE & OIL IN SEDIMENT_____

TURBIDITY (including tributaries, point discharges; LOW, MODERATE, HIGH):_____

WATER COLOR: CLEAR_____ BROWN_____ GREEN_____ GRAY_____

COMMENTS/PROBABLE CAUSES:_____

F. INSTREAM COVER FOR FISH:

(Check all that apply.)

UNDERCUT BANKS_____ POOLS OVER 28" DEEP_____ MACROPHYTES_____ LOGS_____

OVERHANGING VEGETATION_____ ROOTWADS_____ BOULDERS_____ BACKWATERS_____

COMMENTS:_____

_____

G. AQUATIC AND TERRESTRIAL ORGANISMS:

(Check or note all that were observed.)

MACROINVERTEBRATES:

MAYFLIES:_____ CADDISFLIES:_____ DRAGONFLY/DAMSELFLY NYMPHS:_____

SNAILS:_____ SCUDS:_____ SOWBUGS:_____ LEECHES:_____ WORMS: _____

WATER PENNIES:_____ BEETLES:_____ OTHER:_____

FISH:

CARP:____ BLACK BULLHEADS:____ CREEK CHUBS:____ GREEN SUNFISH:____ BLUEGILL: ____

LARGEMOUTH BASS:____ JOHNNY DARTERS:___ FATHEAD MINNOWS:____ GOLDEN SHINERS:

OTHERS:_____

BIRDS:

DUCKS:___GEESE:___ HERONS:___ KINGFISHERS:___ SANDPIPERS/PLOVERS:___ GULLS/TERNS:_____

OTHERS:_____

REPTILES:_____

AMPHIBIANS:_____

MAMMALS:_____

MUSSEL BEDS: NO ___ YES ___ IF YES: GPS #'S ____ ____ ____

H. PHOTO LOG:

PHOTOGRAPHER:_____

GPS #	PHOTO #	L/R or Center of Channel	Aspect (Up/ Downstream)	Photo Description:

Appendix D: AFS Stream Obstruction Removal Guidelines

STREAM OBSTRUCTION REMOVAL GUIDELINES

I.A.F.W.A.

AFS

THE WILDLIFE SOCIETY

Agencies and organizations endorsing these guidelines:

American League of Anglers
American Forestry Association
Andrew Jackson Chapter of the
Soil Conservation Society of America
Izaak Walton League of America
National Wildlife Federation
Sport Fishing Institute
Tennessee Environmental Council
Trout Unlimited
U.S. Fish and Wildlife Service
U.S. Forest Service
U.S. National Marine Fisheries Service
Wildlife Management Institute

Copies of this publication are available from:

AMERICAN FISHERIES SOCIETY
5410 Grosvenor Lane
Bethesda, MD 20814

Single copies: $5.00 postpaid.
Three or more copies: $3.50 each postpaid.

Stream Obstruction Removal Guidelines

prepared by

Stream Renovation Guidelines Committee, The Wildlife Society and American Fisheries Society

in cooperation with

INTERNATIONAL ASSOCIATION OF FISH AND WILDLIFE AGENCIES

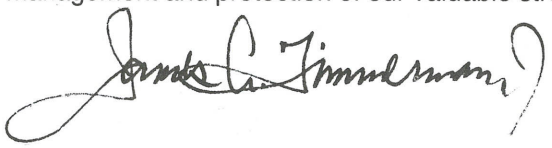
1983

These guidelines were prepared by the Stream Renovation Guidelines Committee, a joint committee of The Wildlife Society and the American Fisheries Society. They were prepared at the request of the International Association of Fish and Wildlife Agencies. Committee members who participated in the effort were:

Chester McConnell, Chairman, TWS and AFS, Tennessee
Allen Binns, AFS, Wyoming
Errol Claire, AFS, Oregon
Donald Duff, AFS, Utah
James Karr, TWS, Illinois
Gerald Montgomery, TWS, Tennessee
David Parsons, TWS, Tennessee
James Sedell, AFS, Oregon
Monte Seehorn, AFS, Georgia

The guidelines were patterned after similar versions that have been used successfully on projects in several states. The Stream Renovation Guidelines Committee revised, reorganized and expanded earlier versions to make them applicable on an international basis.

The International Association of Fish and Wildlife Agencies hopes that these "Stream Obstruction Removal Guidelines" will be appropriately used as guidance by agencies, organizations and landowners in the management and protection of our valuable stream ecosystems.



James A. Timmerman, Jr., PhD, President
International Association of Fish and Wildlife Agencies

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Introduction

The intent of these guidelines is to aid in correcting stream flow problems, caused by obstructions, in an environmentally sound manner and to maintain natural stream characteristics. They are a positive alternative, designed to protect natural resources, to be used when a government agency or other interests are considering channelization, clearing and snagging, or other severe stream modifications. The purpose is not to generate projects but to provide a sound alternative that will lessen adverse impacts when a decision has been made to correct stream flow problems.

Many important, interrelated factors that influence streams are not addressed in these guidelines. For example, they do not provide management suggestions for watershed, floodplain or riparian areas, nor do they provide instructions for development of specific instream fish habitat features. Information concerning these aspects is readily available in various publications.

Debris, sediment and channel structure play an important role in maintaining the integrity of aquatic ecosystems but sometimes excessive amounts cause problems that man seeks to correct. In cases where excessive debris and/or fine sediment have no significant impact on societal values, no work need be done. Persons interested in wild natural resources oppose destructive, structural stream modification practices and favor nonstructural measures in most instances. It is recognized, however, that unwise land use and abusive stream use practices often diminish the flow capacities of streams to the extent that corrective action is demanded. Development interests and flood-damaged communities often successfully promote drastic stream modifications to achieve some desired level of water conveyance or flood relief. When planners seek solutions to stream flow problems, nonstructural measures should always be used to correct the problems when practical. In cases where it is inappropriate or infeasible to address flow problems with no action or nonstructural alternatives, the obstruction removal alternative in accordance with these guidelines is recommended as the preferred alternative.

The guidelines shall be applied and monitored by an interdisciplinary team of experts knowledgeable about local conditions. This is essential to successful implementation. The team shall be responsible for classifying the various stream reaches and monitoring ongoing and completed work for compliance.

These guidelines are only applicable to situations where channel blockages result in unacceptable flow problems and where restoration of the natural or former flow capacity of the channel is desired. The combination of obstruction removal and various nonstructural alternatives should be thoroughly examined before it is determined that more drastic channel modification is the only feasible solution. In either case, natural resource agencies may seek mitigation of unavoidable ecological damages.

These guidelines have been designed for broad application and, by necessity, are quite general. Users are encouraged to adapt these concepts to specific local situations.

Application of these guidelines requires the following sequential actions:

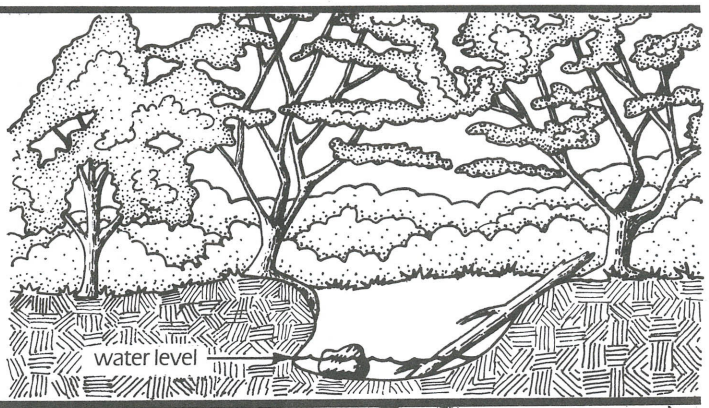
1. establish interdisciplinary team of experts,
2. classify stream reaches according to degree of flow problems and biological sensitivity,
3. specify extent and methods of removal for each flow condition,
4. monitor ongoing work to insure compliance, and
5. establish maintenance provisions.

Anyone considering work in streams should be aware that federal and/or state legal requirements may be applicable. In addition, use of guidelines, such as the Channel Modification Guidelines developed jointly by the U.S. Soil Conservation Service and the U.S. Fish and Wildlife Service and some state agency guidelines, may be required.

Definition of Stream Obstruction Conditions

Condition One

These stream segments have acceptable flow and no work would be required. They may contain various amounts of instream debris and fine sediment, such as silt, sand, gravel, rubble, boulders, logs and brush. In certain situations flow may be impeded, but due to stream and land classification or adjacent land-use, this is not a problem.



Condition Two

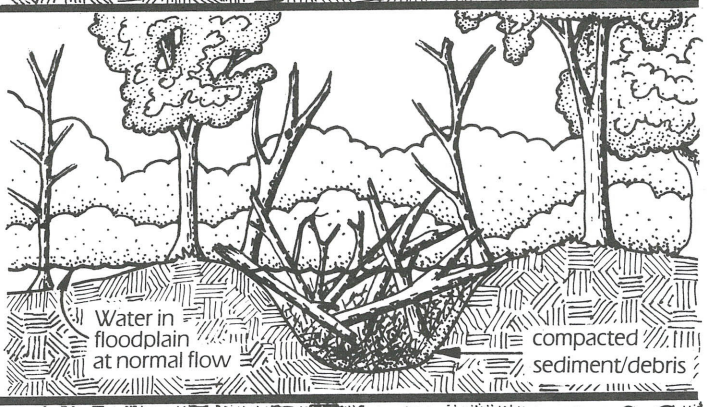
These stream segments currently have no major flow impediments, but existing conditions are such that obstructions are likely to form in the near future, causing unacceptable problems. This condition is generally characterized by small accumulations of logs and/or other debris which occasionally span the entire stream width. Accumulations are isolated, not massive and do not presently cause upstream ponding damages.

Condition Three

These stream segments have unacceptable flow problems. Obstructions are generally characterized by large accumulations of lodged trees, root wads, and/or other debris that frequently span the entire stream width. Although impeded, some flow moves through the obstruction. Large amounts of fine sediment have not covered or lodged in the obstruction.

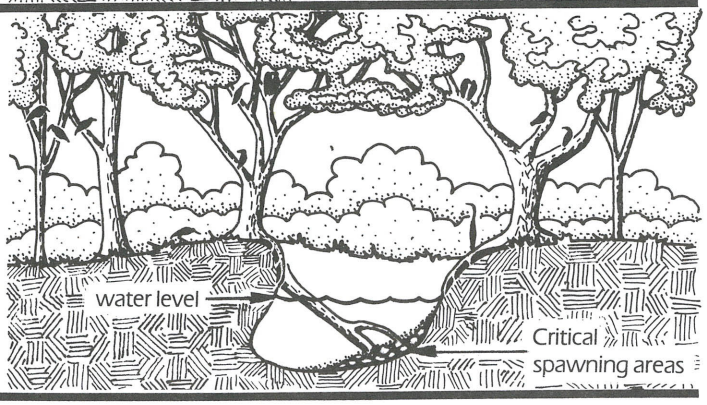
Condition Four

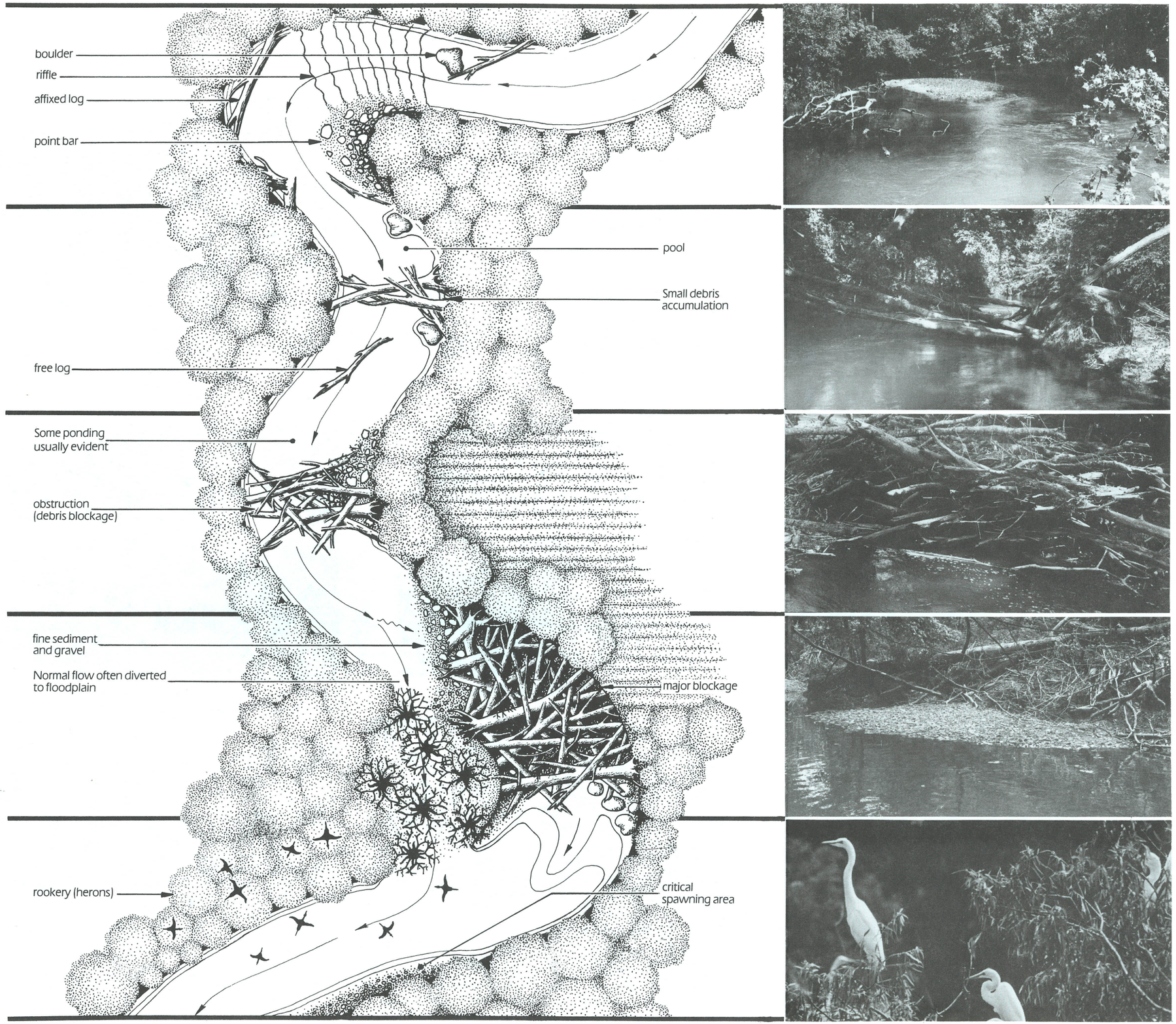
These stream segments are characterized by major blockages causing unacceptable flow problems. Obstructions consist of compacted debris and/or sediment that severely restricts flow.



Condition Five

These stream segments possess unique, sensitive, or especially valuable biotic resources and should be dealt with on a case-by-case basis. Examples include, but are not limited to: Areas harboring rare or endangered species, shellfish beds, fish spawning and rearing areas, and rookeries.




boulder
riffle
affixed log
point bar
pool
Small debris
accumulation
free log
Some ponding
usually evident
obstruction
(debris blockage)
fine sediment
and gravel
Normal flow often diverted
to floodplain
major blockage
rookery (herons)
critical
spawning area

Materials That May Be Removed

Fine Sediment

Only those fine sediment accumulations that are obstructing flows to a degree that results in unacceptable flow problems may be removed (Figure 1). Small accumulations of fine sediment generally do not cause problems and should be left undisturbed (Figure 2).

Debris Blockages

Only those debris accumulations that are obstructing flows to a degree that results in unacceptable flow problems, or are likely to cause problems in the near future, may be removed (Figure 3). Small accumulations of debris generally do not cause problems and should be left undisturbed (Figure 4).

Affixed logs that are crossways in the channel that are causing problems or are likely to cause problems in the near future should be moved to a more parallel orientation or may be removed (Figure 5). Isolated or single logs shall not be disturbed if they are embedded, lodged, or rooted in the channel and are not causing flow problems (Figure 6). Generally, embedded logs that do not span the channel are not considered to cause problems and should not be removed.

Free logs that are not rooted, embedded, or lodged should be left, repositioned, affixed, or may be removed (Figure 7).

Gravel, rubble, and boulders in isolated accumulations normally do not cause flow problems and should not be removed (Figure 8). Accumulations that are causing flow problems should be repositioned or may be removed.

Rooted Trees

Rooted trees (alive or dead) may be cut and repositioned or removed if they are likely to cause problems in the near future or if their removal is required to secure access and provide for practical operation of equipment (Figures 9, 10). Tree stumps with roots should be left in place to prevent bank erosion (Figure 11).

Figure 1. **Fine sediments (silt and sand) have completely filled this stream segment. About 98 percent of the stream water now flows across the floodplain on both sides of the stream and cannot be seen in this photograph. Such accumulations may be removed.**

Figure 2. **Small accumulation of silt, sand and gravel should be left undisturbed. It is not obstructing flow and it provides beneficial habitat for fish and other aquatic life.**

Figure 3. **Debris accumulation obstructing flow and is likely to cause additional problems. Such accumulations may be removed.**

Figure 4. **Small accumulation of debris on the inside of the stream channel bend is causing no flow problems. Such material is beneficial to fish and other aquatic life and should be left undisturbed. As a preventative measure, some of the debris could be cut above the water to keep other debris from becoming lodged.**

Figure 5. Log crossways of stream channel, trapping additional debris and restricting flow. Flow problems are likely to increase in the near future. Such accumulations may be removed.

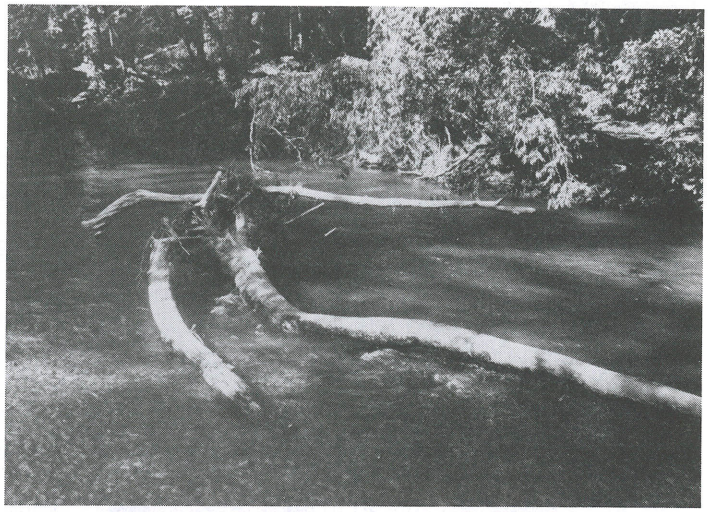


Figure 7. Free log in stream channel currently causing no flow problems. Such logs should be left, repositioned, affixed, or may be removed.

Figure 6. Single log with one end lodged on stream bank and the other embedded in the stream bottom. If no flow problems are associated with such logs they should be left in place.

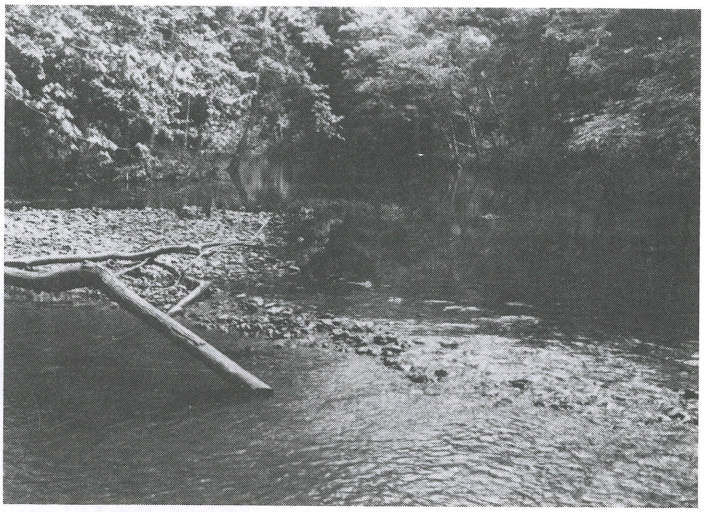


Figure 8. Isolated accumulation of gravel and rubble causing no flow problems. Such accumulations should be left in place. These areas are essential for some forms of aquatic life.

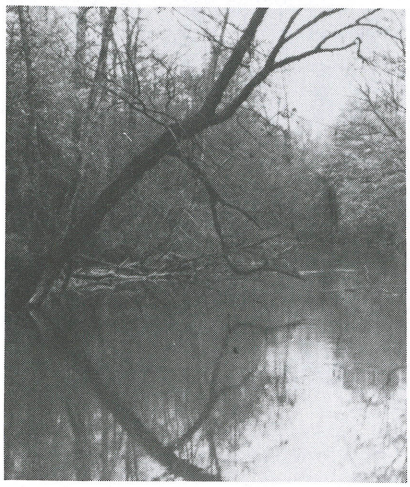


Figure 9. Dead tree leaning across stream is likely to fall in the near future and may be cut.

Figure 10. Cut tree repositioned along stream bank to aid in preventing bank erosion and to provide fish habitat.

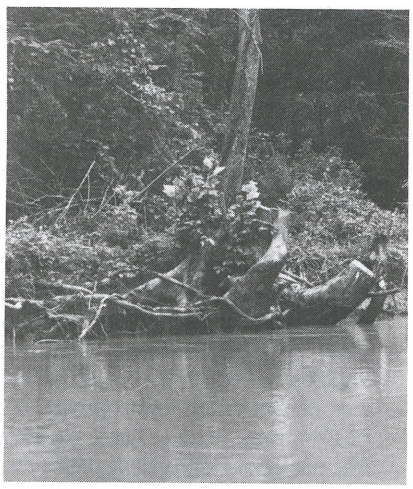


Figure 11. Tree stump with roots left in place to prevent bank erosion. Valuable fish habitat was also salvaged.

Material Removal

General Criteria

No stream work, including bank clearing, repositioning, or removal of material, should be allowed except at specific locations where unacceptable flow problems occur or may occur in the near future. Where stream work is needed, access routes for equipment should be selected to minimize disturbance to the floodplain and riparian areas (Figure 12). Channel excavation and debris removal also should be accomplished in a manner that minimizes clearing of vegetation. The smallest equipment feasible should be used. If tributaries or distributaries must be disturbed by the project, they shall be restored when the work is completed. All disturbed areas shall be reseeded or replanted with plant species which will stabilize soils and benefit fish and wildlife.

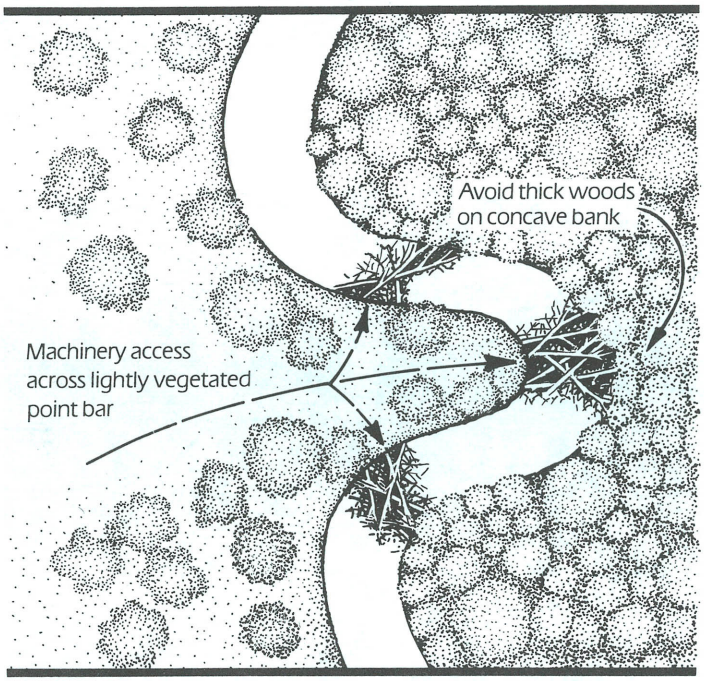


Figure 12. **Schematic plan for machinery access to selected debris blockages designed to protect stream bank vegetation.**

Specific Criteria

Condition One Segments. No work shall be conducted in Condition One Segments.

Condition Two Segments. Equipment that will cause the least damage to the environment shall be selected for performing the work. First consideration will be given to the use of hand operated equipment such as axes, chain saws, and winches to remove accumulations (Figure 13). Boats with motors may be used where needed (Figure 14). When the use of hand operated equipment is not feasible, heavier equipment may be used. Examples include: small tractors, backhoes, bulldozers, log skidders, and low PSI equipment (Figure 15). Equipment shall be operated in a manner that results in the least damage to vegetation and soils of the project area. In some cases explosives may be used resulting in less damage. Debris designated for removal from the stream or floodway should be removed or secured in such a manner as to restrict its re-entry into the channel. Generally, it should be positioned so as to reduce flood flow impediment.

Condition Three Segments. Equipment limitations will be the same as for condition two segments. Work shall be accomplished within the channel or from one side of the channel where possible (Figure 16). Selective tree clearing shall be limited to the minimum clearing necessary for equipment access and efficient operation of equipment on the worked side of the channel. Disposal of material may be accomplished by removing it from the floodplain or by burning, burying, or piling, as appropriate, with the minimum amount of disturbance to vegetation. Piled debris shall be gapped at frequent intervals and at all tributaries and distributaries.

Condition Four Segments. Blockage removal may employ any equipment necessary to accomplish the work in the least damaging manner (Figure 17). Work should be accomplished from one side of the channel, where practical. Material shall be disposed in accordance with guidelines presented above for condition three segments (Figure 18). Spoil piles should be constructed as high as sediment properties allow. The placement of spoil around the bases of mature trees should be avoided.

Condition Five Segments. Special provisions for protecting unique, sensitive, or productive biotic resources shall be developed by appropriate professionals on a case by case basis.

Subsequent Maintenance

Stream conditions shall be monitored on a regular basis and maintenance work shall be conducted in accordance with the guidance contained herein.

Figure 13. **Chainsaw being used to cut log so that it can be pulled with small hand winch and repositioned along stream bank.**

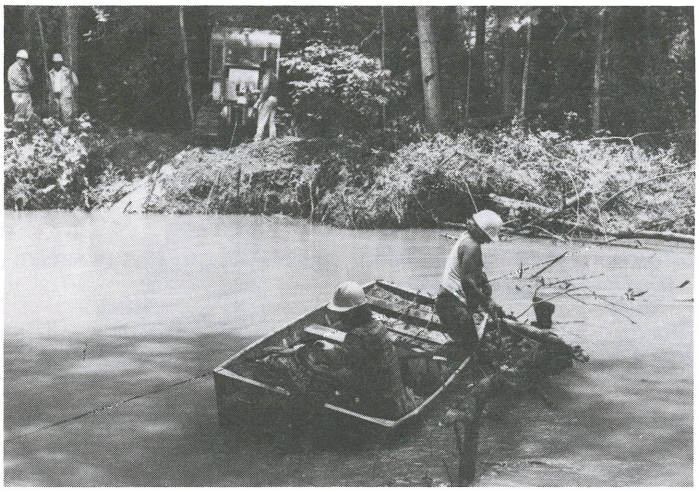


Figure 14. Hand labor crew in boat hooking cable to log. The small crawler tractor with winch will pull the log from the stream. Small equipment can be carefully maneuvered through the floodplain forest causing little damage.

Figure 17. Dragline being used to remove compacted debris and sediment at major blockage (Condition Four).

Figure 15. Hand labor crew hooking cable to log to be pulled from stream by small crawler tractor with winch. Only a narrow work zone along the stream was disturbed because of the small equipment. Note stump left in place to stabilize bank.

Figure 18. Large dead tree removed from stream, pulled onto the floodplain and positioned to prevent its re-entry into the channel.

Figure 16. Debris and sediment removal was accomplished by working from one side of the stream. Selected trees were cleared to allow equipment access and operation. Trees have now grown back on the cleared side.

Glossary

blockage Organic and inorganic materials which completely span or fill the channel causing water to pond or to be diverted onto the floodplain.

debris Includes gravel, cobble, rubble, and boulder-sized sediments as well as trees and other organic material.

distributary Any channel or outlet that conveys water away from a stream.

fine sediment Silt and sand-sized materials.

floodplain A plain along a stream that is covered by water when the stream overflows its bank.

flow impediment Any material in a channel which reduces the velocity of and retards flow, i.e. an obstruction.

interdisciplinary team A group of persons having expert knowledge in various disciplines including fish, wildlife, engineering, hydrology, and geomorphology.

low PSI equipment Equipment with wide tracks or large inflatable tires that lower the ratio of equipment weight to track surface. (PSI = pounds per square inch)

nonstructural measures Measures that reduce flood damages without altering the stream or its overflow characteristics. Nonstructural measures may include, but are not limited to: Land-use regulation, land acquisition, providing for the maintenance of aquatic areas, floodplain zoning, flood-proofing existing buildings, flood forecasting, flood warning, providing flood hazard information, flood insurance, tax adjustments, emergency assistance, and relocation of properties and people.

obstruction Any material which hinders the progress of stream flow, i.e. a flow impediment.

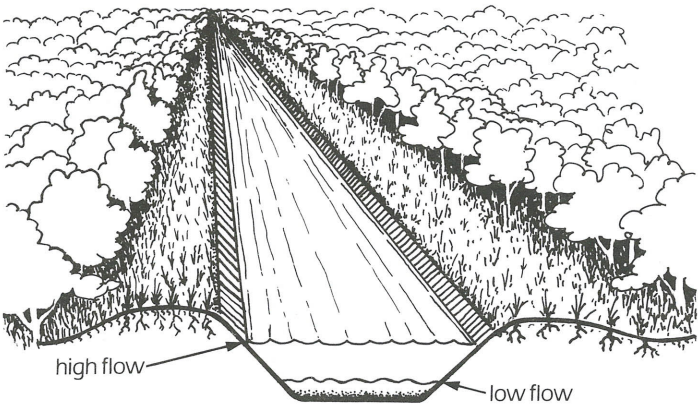
ponding An increase in water surface elevation upstream of a blockage or an obstruction.

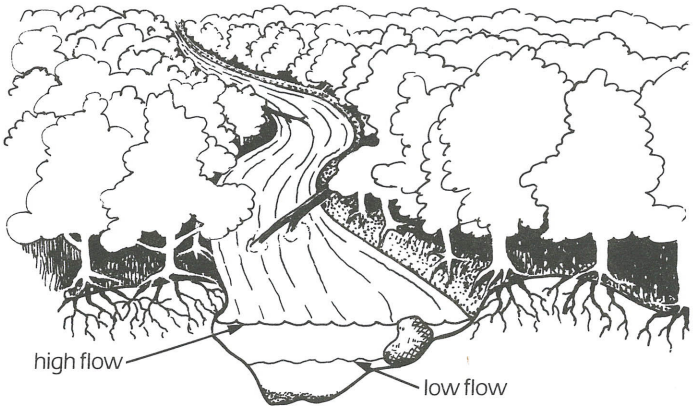
riparian Relating to or living on or near the bank of a watercourse. These zones range in width from narrow bands in desert or mountainous areas to wide bands which occur in the piedmont and gulf states.

structural measures Artificial measures designed to reduce flood damages by altering the stream and/or its overflow characteristics. Examples include: channelization, reservoirs, floodways, dikes, levees, floodwalls, pumping plants, and diversions.

tributary Any channel or inlet that conveys water into a stream.

Some Effects of Stream Modification





Channelized stream -

Water velocity and substrate uniform in channel and unsuitable for many forms of aquatic life.

No shrubs or trees near channel to provide shade, nutrient input or deep growing root structures to control bank erosion.

Little habitat diversity and thus fewer kinds and amounts of fish and other aquatic life.

During dry seasons and low flows, insufficient water depths support fewer aquatic life forms.

Aid in drainage of wetlands and lowering of water tables.

Encourages unwise development in frequently flooded areas of the floodplain.

May provide higher degree of flood relief in immediate area but peak flows surge downstream increasing flooding.

Tends to degrade water quality.

Obstruction removal from stream -

Water velocity and substrate diversified due to varied channel depths, meanders and instream features.

Trees and shrubs near channel provide shade which maintains suitable water temperature and provides wildlife habitat.

Leaves, wood and insects drop into stream providing nutrients for aquatic life.

Instream rocks and logs and bank undercuts provide cover.

Trees and shrubs have deep roots that curtail stream bank erosion.

Habitat diversity formed by pools, riffles and debris provides for numerous kinds and amounts of fish and other aquatic life.

During dry periods and low flows, sufficient water depth is maintained to support stream life.

Natural streams replenish water tables and aid in maintaining wetlands and bottomland forests.

May provide less flood relief in immediate area but retards increased flooding downstream due to slower water flow and temporary water storage in the floodplain.

Tends to preserve water quality.

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GRAPHICS - D. Bryan Stone III

Appendix E: Recommended Stream Channel Maintenance and Monitoring Methods

A regular stream maintenance and monitoring program should be standardized to the extent practicable, so observations performed by different personnel will result in similar maintenance recommendations. Stream reach information that is currently available in GIS should be supplemented with additional information following future stream inspections. Routine maintenance and monitoring should commence once all reaches have been inspected and existing conditions are known. The types of monitoring are summarized below:

- Initial – Conducted as the first inventory assessment of a watercourse segment or after the implementation of a watercourse improvement project.
- Routine – Conducted on a cyclical (every 2-3 years) basis to assess current conditions and needed maintenance.
- Event – Conducted after a significant flow or weather event that may have altered the existing conditions.
- Interim – Conducted upon the request of a concerned party or individual.

A significant flow event is defined as a flow that is great enough to potentially alter or damage the watercourse. Depending on the characteristics of a particular location in a watercourse, a significant flow event can be associated with different flows.Any stream reach inventory should include, at a minimum, the following items:

- Date of visit
- Name of inspection crew members
- Arrival / departure time
- Site Identification (major watershed, watercourse name, reach boundaries, length)
- Type of inspection / maintenance
- Weather conditions at time of visit
- Last rainfall date/depth/duration (mandatory for post-storm event)
- Photograph documentation
- Maintenance performed since last inspection
- Flow, Velocity, and Stage Characteristics
- Historic Data (known extremes)
- Channel and Floodplain Condition (Include numerical rating, see Table 47)
- Required Maintenance Needs or Alteration to Monitoring Frequency

To quantify the condition of each stream reach inspected and prioritize maintenance activities, Table 1 should be consulted to score the quality of each site. Table 2 provides more detail on the Recommended Action Options specified in Table 1.

Table 1. Channel and floodplain condition assessment ratings.

Rating	Condition	Description of Observations	Recommended Action Option
6	Good	Channels and floodplains do not exhibit erosion/scour, sediment accumulation, debris build-up, or resistance to flow. Structural controls may show minor deterioration, but all components are stable.	Routine Monitoring
5	Satisfactory	Channels and floodplains exhibit minor erosion/scour, sediment accumulation, debris buildup, or resistance to flow. Structural controls exhibit limited, minor defects or deterioration, such as corrosion, overstressing, and movement.	Routine Monitoring
4	Fair	Channels and floodplains exhibit increased scour, sediment accumulation, debris buildup, or resistance to flow. Minor deterioration may be observed to conveyance structures. Structural controls are sound and stable, but minor to moderate defects or deterioration is observed. Localized areas of moderate to advanced deterioration may be present but do not significantly reduce the ability of the structure to function as intended.	Increased Monitoring Frequency
3	Poor	Channels and floodplains exhibit scour, sediment accumulation, debris buildup, and resistance to flow. Moderate deterioration is observed to conveyance structures. Conveyance and flow structures not functioning as intended. Structural controls exhibit advanced deterioration or overstressing, but structure is functioning as intended. Maintenance/repairs may need to be performed with moderate urgency to avoid further deterioration or increased likelihood of flooding.	Maintenance /Repair
2	Serious	Channels and floodplains exhibit serious scour, sediment accumulation, debris buildup, and resistance to flow. Advanced deterioration is observed to conveyance structures. Conveyance and flow structures not functioning as intended. Structural controls exhibit advanced deterioration, overstressing, or breakage. Repairs may need to be performed on a high-priority basis with urgency. Conditions may result in flooding.	Redesign /Replacement
1	Critical	Channels and floodplains exhibit critical scour, sediment accumulation, debris buildup, and resistance to flow. Advanced deterioration is observed to conveyance structures. Conveyance and flow structures not functioning as intended. Structural controls exhibit extreme deterioration, overstressing, or breakage and have resulted in localized failure(s). Repairs may need to be performed on a very high priority basis. Flooding is imminent.	Redesign /Replacement

Table 2. Recommended stream monitoring and maintenance action option descriptions.

Action Options	Description
Routine Monitoring	Recommended when no further action is necessary until the next scheduled routine inspection.
Increased Monitoring Frequency	Recommended when no further action is necessary, but shorter inspection schedule is warranted to monitor potential problems.
Maintenance/ Repair	Recommended whenever monitoring deems necessary. The Project Manager will determine and notify the responsible party for maintenance.
Redesign/ Replacement	Recommended whenever monitoring deems necessary. The Project Manager will determine priority and implement action. Depending on the specific conditions, several phases may be utilized, such as: *Engineering Evaluation:* Recommended whenever significant damage or defects are encountered that require an evaluation to quantify the existing condition, determine whether repairs are required, or determine which method of repair is appropriate. This may include underwater inspection, in-depth inspection, etc. *Special Investigation:* Recommended to determine the cause or significance of a typical deterioration, before designing repairs. Special analysis, monitoring, or field data gathering is typically required. This may include surveys, soil borings, etc. *Repair Design Inspection:* Recommended immediately prior to, or during the preparation of necessary design documents. *Develop Design Documents:* Recommended after all evaluations, investigations, and inspections have been completed. Indicates that the field data has been collected and that the watercourse is ready to have repair documents prepared.
Emergency Action	Recommended whenever an unsafe condition is observed. If the situation is life threatening or if significant property damage or environmental damage may occur, appropriate Project Manager or owner representation should be contacted immediately.

Stream Channel Maintenance/Monitoring Recommendations

First, the governing body of a stream reach should consult the Stream Assessment and Action Plan sections of this report to locate stream reaches needing maintenance. Then, the stream reach should undergo an initial survey by the governing body (municipality or township) to document channel conditions following the procedures listed above and then the recommended monitoring action schedule should be followed. This survey provides the baseline condition and it gives insight on the problem locations to monitor more frequently. The assessment ratings listed above should be completed as often as needed by the governing body staff responsible for stream, bridge and culvert maintenance. This provides a chronological history of the stream conditions, repairs completed, and repairs required. An overall reassessment of the stream channel conditions should be completed every five years.

Appendix F: Flint Creek Detention Basin Inventory

Detention Basin Inventory Methods

1 DETENTION BASIN INVENTORY PROCEDURE

Although primarily designed for flood reduction, well-designed and properly functioning detention basins can provide multiple benefits. Properly designed detention basins control release rates from developed sites to help reduce streambank erosion and flooding problems downstream. In addition to flood reduction, with proper design and maintenance, detention basins can also: absorb and filter pollutants from stormwater; provide plant and animal habitat; and be used for recreation and educational activities.

When properly designed and maintained, detention basins can be an effective tool for improving the water quality of runoff from streets, sidewalks and rooftops before it is discharged into a river or lake. The Flint Creek watershed detention basin inventory was undertaken to identify maintenance and design problems within existing basins. The problems that were discovered included shoreline erosion, clogged inlets and outlets, short-circuiting, and the presence of a concrete low-flow channels. Based on the field inspection, SMC also attempted to describe potential retrofit opportunities to rectify design and maintenance problems as well as to increase the water quality functions and pollutant removal effectiveness of the existing basins. The characteristics were identified for each basin using the detention basin inventory procedure outlined below. Portions of the procedure that were considered self-explanatory were not described.

1.1 BASIN INFORMATION AND LOCATION

The basin numbers were assigned by SMC. Information on the basin names, maintenance responsibilities, contact names, contact phone numbers and nearest cross streets was collected from the municipalities where the basins are located. The township and quarter section were determined using the USGS topographic quad maps.

1.2 BASIN SIZE AND DRAINAGE AREA CHARACTERISTICS

This information was generally not available since most of the basins were permitted by the municipalities where they are located rather than by SMC. Predominant landuse was determined during the field inspection.

1.3 BASIN DESIGN FEATURES

1.3.1 Type

An online detention basin is defined in the WDO as any detention facility that has off-site tributary area. That is, the basin also collects runoff from outside of the site where it is located. Sediment basins are pools at the detention basin inlet(s) that allows the velocity of the water to slow and large sediment particles to drop out.

1.3.2 Side Slopes

Side slopes should be estimated using a plumb bob and a yardstick or other applicable technique. The buffer width is the distance from the basin to the surrounding landuse. Native vegetation buffers should be established around the outside of all basins where possible because they are particularly effective for removing nutrients from runoff.

1.3.3 Number of Inlets

The numbers, types and locations of inlets were documented. Inlets and outlets were distinguished between by using such clues as elevations and presence or absence of restrictors. The presence of a manhole or of a restrictor generally indicated an outlet.

1.3.4 Outlet Types and Dimensions

The numbers, types and locations of outlets were documented. Inlets and outlets were distinguished between by using such clues as elevations and presence or absence of restrictors. The presence of a manhole or of a restrictor generally indicated an outlet.

1.4 MAINTENANCE/DESIGN PROBLEMS

1.4.1 Inlet Problems or Outlet Problems

Problems with the inlets and outlets were documented. The primary problems identified were erosion, scouring, clogging or failure of inlets or outlets and the lack of trash racks on outlets.

1.4.2 Short-Circuiting

The orientation of the inlets and outlets may cause the detention basin to short-circuit. This means that rather than runoff staying in the basin for an extended period of time, the water runs directly from the inlet to the outlet. This does not allow water quality of the runoff to be improved through settling, filtration by plants or other means. A low flow bypass is a channel that connects the inlet(s) and outlet(s) of the basin so that during lower flows, as with orientation problems, water runs into the basin and then flows through the low-flow bypass directly to the outlet.

1.4.3 Wet Basins

High, moderate and low were defined in the same way as the stream inventory procedure. High means that 66 to 100% of the basin was impacted by the problem; moderate means 33 to 66% and low refers to less than 33%.

1.4.4 Dry or Wetland Basins

Stilling basins are deeper pools at the inlet(s) of a detention basin that allow the velocity of the water to slow down and large sediment particles to drop out. Stilling basins should be 3+ feet deep and should be located at all inlets.

1.4.5 Other

Excess litter or debris refers to material that could ultimately exit the basin and end up in the waterway especially if a trash rack is not present. Excess sediment accumulation is defined as amounts of sediments that significantly lessen the storage capacity of the basin or could potentially become re-suspended when the detention basin fills with rainfall. The sediment, once re-suspended could then end up in the waterway. Excess woody vegetation refers to trees or shrubs that can have a negative impact on the basin in three ways. Given sufficient quantities, the woody vegetation could reduce/restrict runoff storage in the basin. The number of trees and shrubs could also lead to excess leaf litter and corresponding nutrient loading as the leaves decay. Finally, excess woody vegetation could shade out other vegetation in the basin and lead to erosion of the basin slopes and bottom.

1.5 OTHER OBSERVATIONS

1.5.1 Potential Safety Problems

Note issues such as the lack of a safety ledge in wet basins, steep side slopes or other problems that could impact human safety.

1.5.2 Potential Nuisance Problems

Nuisance problems include large geese populations (and corresponding high nutrient loading) and excessive amounts of algae

1.5.3 Evidence of Upstream Illicit Connection

Note any suspicious discharges such as those with an oily sheen, milky colors or other strangely colored discharges.

1.6 PRELIMINARY RETROFIT OPPORTUNITIES

The water quality functions of poorly designed or maintained detention basins can be improved in a number of ways including:

- convert dry basins to wet or wetland basins;
- repair short-circuiting using berms or other measures;
- remove concrete and other low flow channels to allow flow to spread out and be filtered;
- replace turf grass with native vegetation for improve filtration and habitat;
- repair inlets/outlets;
- replace riprap with native vegetation where possible;
- remove excess woody vegetation;
- stabilize eroding shorelines with native vegetation of other measures;
- improve buffers around basin using native vegetation.

1.7 PHOTOS

At minimum, photos should be taken of all inlets, outlets and basin problems where applicable. A photo showing the overall configuration of the basin should also be taken.

1.8 BASIN SKETCH

The basin should be sketched to show the relative locations of inlets, outlets, stilling basins and other components of the basin.

DETENTION BASIN INVENTORY FORM

Basin Information: Basin # :_____

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility:_____

Contact Name:_____ Phone Number:_____

General Information:

Date/Time _____ Temperature _____ Rainfall (now, 12, 24, 48 hours, week) _____

Location:
Political Jurisdiction:_____ Township:_____ Quarter Section:_____

Nearest Cross Streets:_____

Basin Size and Drainage Area Characteristics (based on permit records, if available):
Active Storage Volume (acre-feet):_____ Design Storm:_____
Permanent Pool Volume (acre-feet):_____ Release Rate (cfs/acre)_____
Estimated Tributary Area (Acres), and upstream area if online:_____
Land Use Served:_____ Year Constructed:_____

Basin Design Features:
Type: Wet_____ Dry_____ Wetland_____ Online_____

Sediment basin present (Y/N)?_____

Basin Bottom – Vegetation: Turf Grass_____ Native Vegetation/Wetland_____

Concrete Lined Channel_____ Other_____

Side Slopes: Turf Grass Rip Rap_____ Native Vegetation_____ Other_____

Slope (Horizontal:Vertical)_____ Buffer Width:_____

Number of Inlets: Stormsewer_____ Size_____ Channel/Swale_____ Size_____

Outlet Type(s) and Dimensions: Culvert:_____ Restrictor (Y/N) Size_____

Surface Weir:_____ Size_____ Perforated Riser_____ Size_____

Overflow Structure and Design/Material:_____

Other (describe):_____

Maintenance/Design Problems:
Inlet Problems (e.g. erosion, scour) – describe_____

_____

Outlet Problems (e.g. clogging, erosion) – describe_____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass_____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion_____ Algae _____
Turbidity___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Not Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe):_____

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

Other:_____

Preliminary Retrofit Opportunities (describe):_____

_____

_____

Photos:

Roll #	**Photo #**	**Description**

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):

DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 3

Basin Name (subdivision and/or property owner): Thornfield

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-22-07 / 705 Temperature 65 Rainfall (now, 12, 24, 48 hours, (week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Pheasant Rn & Thornfield Ln.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass ✓ Native Vegetation/Wetland (channels) ✓

Concrete Lined Channel _____ Other ✓ dirt & algae

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation (basin itself) ✓ Other sand

Slope (Horizontal:Vertical) 12in : 2in Bank Height ~5in Buffer Width: NONE

Number of Inlets: Stormsewer inlet A 4in inlet B 14in inlet C 14in Size inlet D 16in (really here) inlet E 4in inlet F 4in Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet A has sedimentation inside the opening inlet C has vegetation blocking it

Outlet Problems (e.g. clogging, erosion) – describe none found

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae moderate

Turbidity moderate (very thick @ shoreline)

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____

Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____✓_____ Excess Sediment Accumulation_____

Excess Woody Vegetation_____✓ willows & a lot of brush around channel area

Other Observations:

Aquatic Life/ Wildlife (describe):_____

Potential Safety Problems: erosion all banks, sink holes

Potential Nuisance Problems: thick clumpy algae @ shoreline

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc): boating / beaches

Other:_____

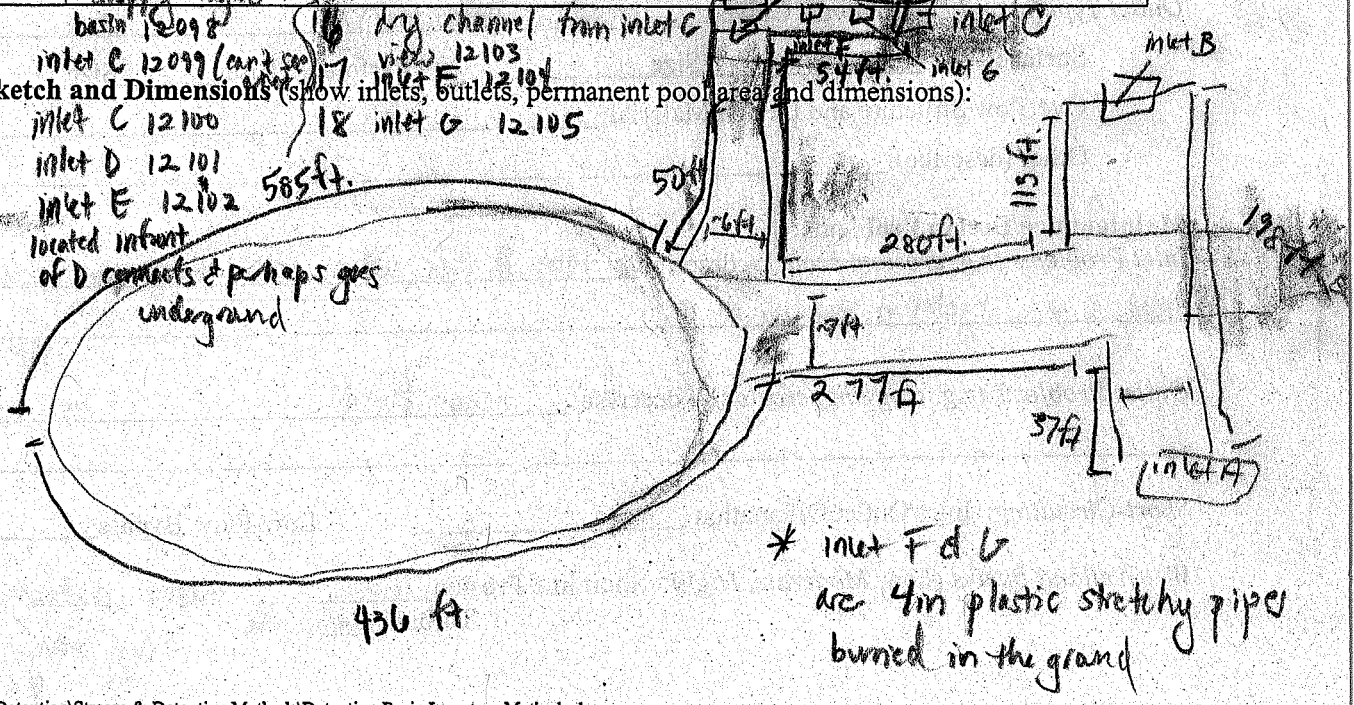
Preliminary Retrofit Opportunities (describe): in basin plant more native vegetation, do something about stagnation and thick brownish algae, channel area

native vegetation @ break off from basin, cannot reach channel area b/c of brush on banks

Photos: channel @ outlet A ~ 3ft across & 2 ft deep area from inlet C dry but resident! says when it rains water sits there.. all turf grass in this area.

Photo #	Description
1	algae @ shoreline 12088
2	basin 12089
3	brown mastey in channel area 12090
4	inlet A 12091
5	view from inlet A 12092
6	pic of veg. on channel structure 12093
7	inlet B 12094
8	view from inlet B 12095
9	point where 2 channels connect @ basin 12096
10	shaggy algae 12097
11	basin 12098
12	inlet C 12099 (can't see)
13	inlet C 12100
14	inlet D 12101
15	inlet E 12102 located infront of D connects & perhaps goes underground
16	my channel from inlet C
17	view 12103
18	inlet G 12105

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



* inlet F & G are 4in plastic stretchy pipes buried in the ground

DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 2

Basin Name (subdivision and/or property owner): Walnut Creek

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-21-07 / 1553 Temperature 75 Rainfall (now, (12), 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Bridle Path & North Trail

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: _____ Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓ submerged macrophytes

Concrete Lined Channel _____ Other ✓ dirt, rip rap

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other Sand

Slope (Horizontal:Vertical) 1 ain : 6 in Bank Height 3 ft. Buffer Width: NONE

Number of Inlets: Stormsewer inlet A 18in inlet B Size 18in Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 16 in. Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe Clogged w/ debris & algae very little flow capacity

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae moderate

Turbidity low

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation ✓ woody bushes

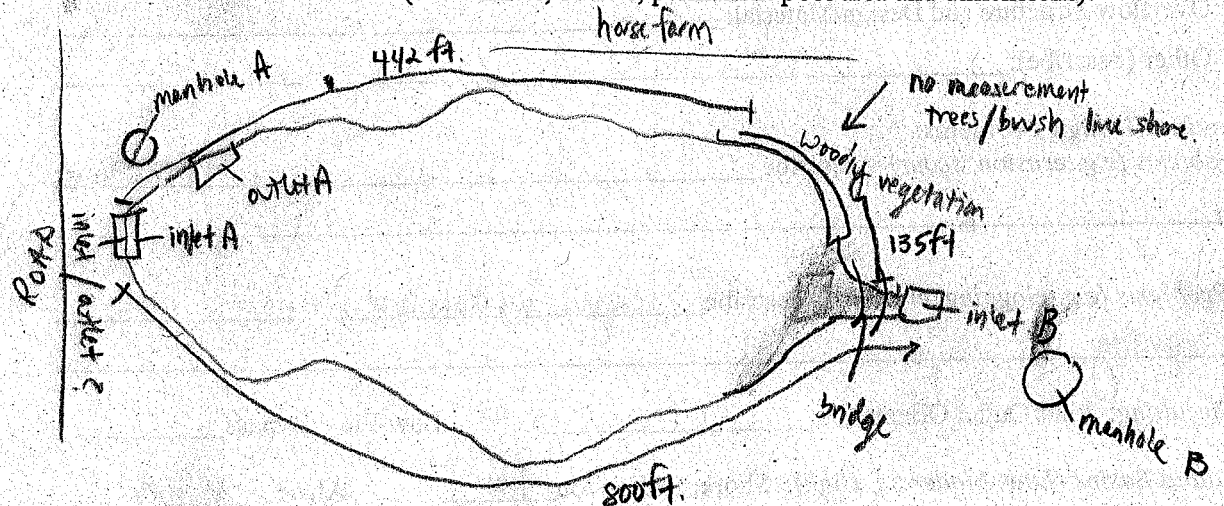
Other Observations:
Aquatic Life/ Wildlife (describe): canada geese
Potential Safety Problems: dangerous gaps/holes in ground near manhole
Potential Nuisance Problems: canada geese / horse farm on one bank (manure runoff), lots of algae @ edges
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc): recreation. (boat & beach)
Other:_____

Preliminary Retrofit Opportunities (describe): remove stone around edges / cut back bushes and trees, plant native vegetation around basin & banks, fix holes near manhole

Photos:

Photo #	Description
1	basin 12072 B basin from view of inlet B 12087
2	inlet A? 12073, 12074
3, 4	inlet B + manhole 12075, 12077 manhole
~~inlet A~~	
4	outlet A blocked by glare/debris 12078
5	depth pole located near outlet A 12079
6	outlet A 12080
7	transition turf - dirt - stone bank - basin 12081
8	woody veg. lining banks near horse farm 12082
9	bank erosion 12083 10 inlet B 12084
11	bridge located near inlet B 12085
12	erosion around manhole B 12086

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



inlet / outlet depending on basin levels

DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 1

Basin Name (subdivision and/or property owner): Walnut Creek

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-21-07 / 1444 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Fremont Quarter Section: _____

Nearest Cross Streets: Bridle Path & North Trail

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other ✓ dirt

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other sand

Slope (Horizontal:Vertical) 2in:4in Bank Height 3.5ft Buffer Width: NONE

Number of Inlets: Stormsewer inlet A 18in, inlet B 4in plastic, inlet C 4in plastic, inlet D 4in black plastic, inlet E 4in, inlet F 4in, inlet G 4in plastic Channel/Swale Channel A, Channel B Size 10in wide x 11in deep

Outlet Type(s) and Dimensions: Culvert: 28in. Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe algae & litter clogging grate area

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae moderate

Turbidity _____

12117
11964

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

42+
110

Other: Excess Litter/Debris ✓ Excess Sediment Accumulation_____
Excess Woody Vegetation ✓ pines

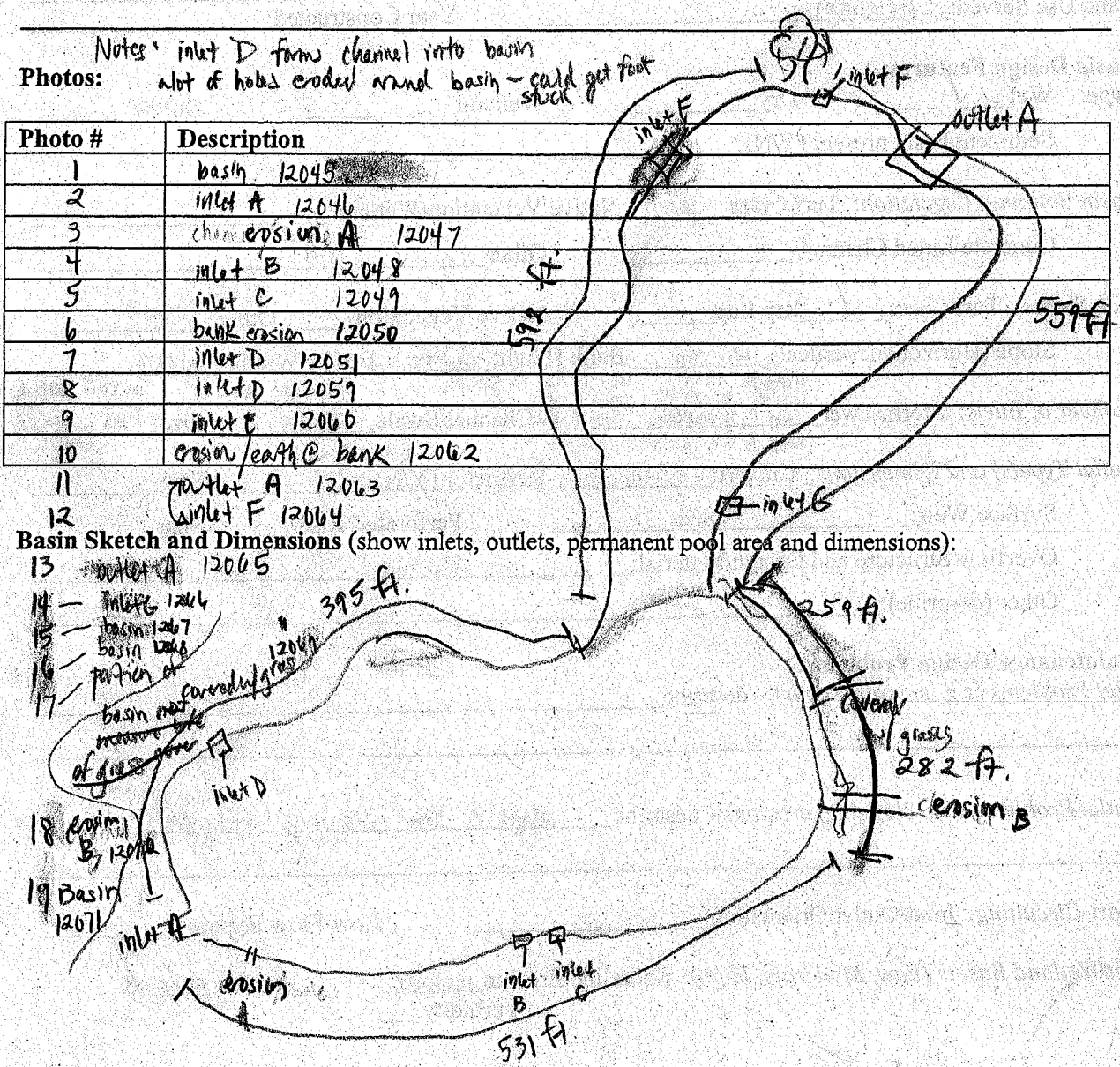
Other Observations:
Aquatic Life/ Wildlife (describe): fish, mallards
Potential Safety Problems: eroded holes on banks of basin
Potential Nuisance Problems: geese poop
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc): boats along banks, beaches
Other:_____

Preliminary Retrofit Opportunities (describe): remove turf grass & replace w/native vegetation
Stabilize banks

Notes: inlet D forms channel into basin
Photos: alot of holes eroded around basin - could get foot stuck

Photo #	Description
1	basin 12045
2	inlet A 12046
3	ch... erosion A 12047
4	inlet B 12048
5	inlet C 12049
6	bank erosion 12050
7	inlet D 12051
8	inlet D 12059
9	inlet E 12060
10	erosion/earth @ bank 12062
11	outlet A 12063
12	inlet F 12064
13	outlet A 12065
14	inlet G 12066
15	basin 12067
16	basin bank
17	portion of basin mostly covered by grass
18	erosion B, 12070
19	Basin 12071

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 5

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-17-07 / 1420 Temperature 60 Rainfall (now, (12), 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: _____ Quarter Section: _____

Nearest Cross Streets: Lochanora Dr. & Bonnyrigg Ct.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? N

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12 : 0-5in. Bank Height 1 ft. Buffer Width: NONE

2. PVC 2. size

Number of Inlets: Stormsewer inlet A 12in. inlet B/C Size 6in. inlet D 14in inlet E 12in. Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 6in. outlet B 12in. – rank fell Restrictor (Y/N) Y Size _____

inlet F - 6in. inlet G - buried in algae & plastic

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): outlet A grate & 1in. holes

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet A ~25ft. from detention and drains over turf grass causing erosion. inlet F has erosion @ pipe connection

Outlet Problems (e.g. clogging, erosion) – describe inlet A clogged w/ algae & plant debris

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae low

Turbidity low

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ Excess Sediment Accumulation_____
Excess Woody Vegetation ✓ - willows

Other Observations:
Aquatic Life/ Wildlife (describe): fish, frogs
Potential Safety Problems: erosion on banks
Potential Nuisance Problems: algae at edges, lots of geese poop
Evidence of Upstream Illicit Connections (describe):
Other Basin Uses (rec. field, etc): boating ?
Other:

Preliminary Retrofit Opportunities (describe): remove turf grass / rip rap border inplace put native marsh grasses to give stability and buffer from streets, reinforce earth around inlet A to prevent further erosion / or change location

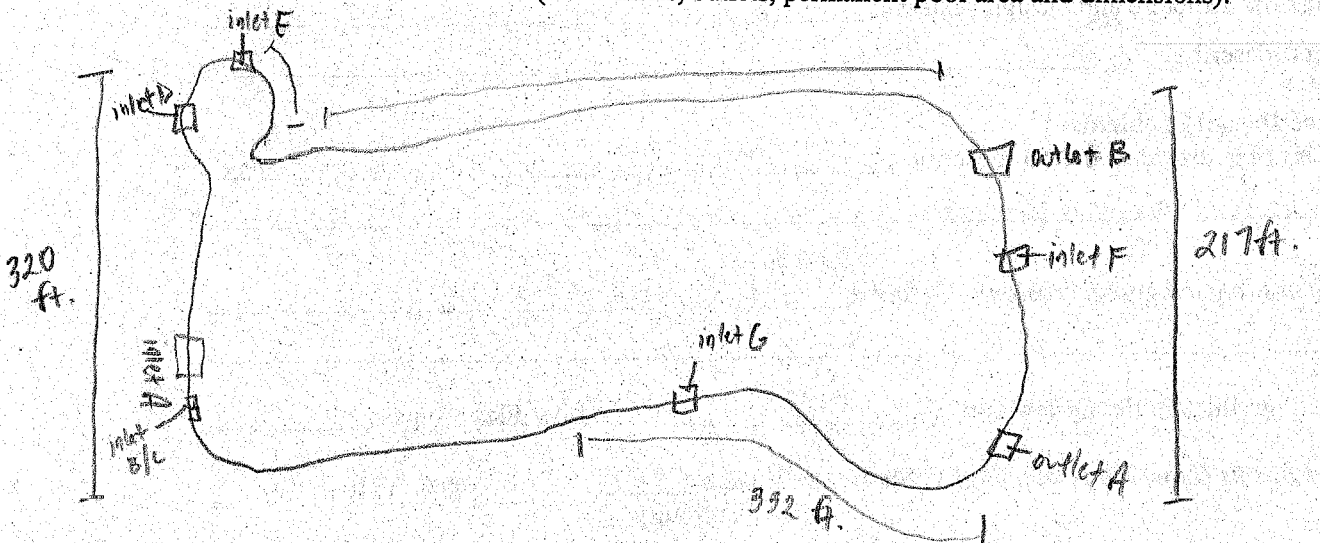
Photos:

Photo #	Description
1	inlet A 11962
2	inlet B/C 11963
3	bank erosion 11964
4	inlet A's erosion 11965
5 10	outlet A 11971
6 11	outlet A cover 11972
7 12	inlet F 11973
8 13	outlet B 11974
9 14	inlet G 11975
10 15	basin 11976
16	outlet A ~clogged 11977

inlet D 55 11966
inlet E → 6 11967
basin 7 11968
basin 8 11969
9 11970

could only measure portion of basin - some home owners prefered I not be on their property!

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



2.

DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 4

Basin Name (subdivision and/or property owner): Thornfield

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-18-07 / 100 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Moorgate Trail & Thornfield Ln.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in:6in Bank Height 2.5ft. Buffer Width: NONE - 30 ft.

Number of Inlets: Stormsewer inlet A Size 18 in 36×2 + 14 - grate inlet B 18 in inlet C - buried underground Channel/Swale _____ Size 5in : 8in plastic culvert pipe w/fin ft:w

2 *Outlet Type(s) and Dimensions*: Culvert: 2 Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe Plant matter clogging entrance & reed grass directly in front of inlet A.

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae high

Turbidity high

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ Excess Sediment Accumulation_____
Excess Woody Vegetation ✓ ~overhanging trees

Other Observations:
Aquatic Life/ Wildlife (describe): frogs
Potential Safety Problems: erosion around manhole
Potential Nuisance Problems: thick algae
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

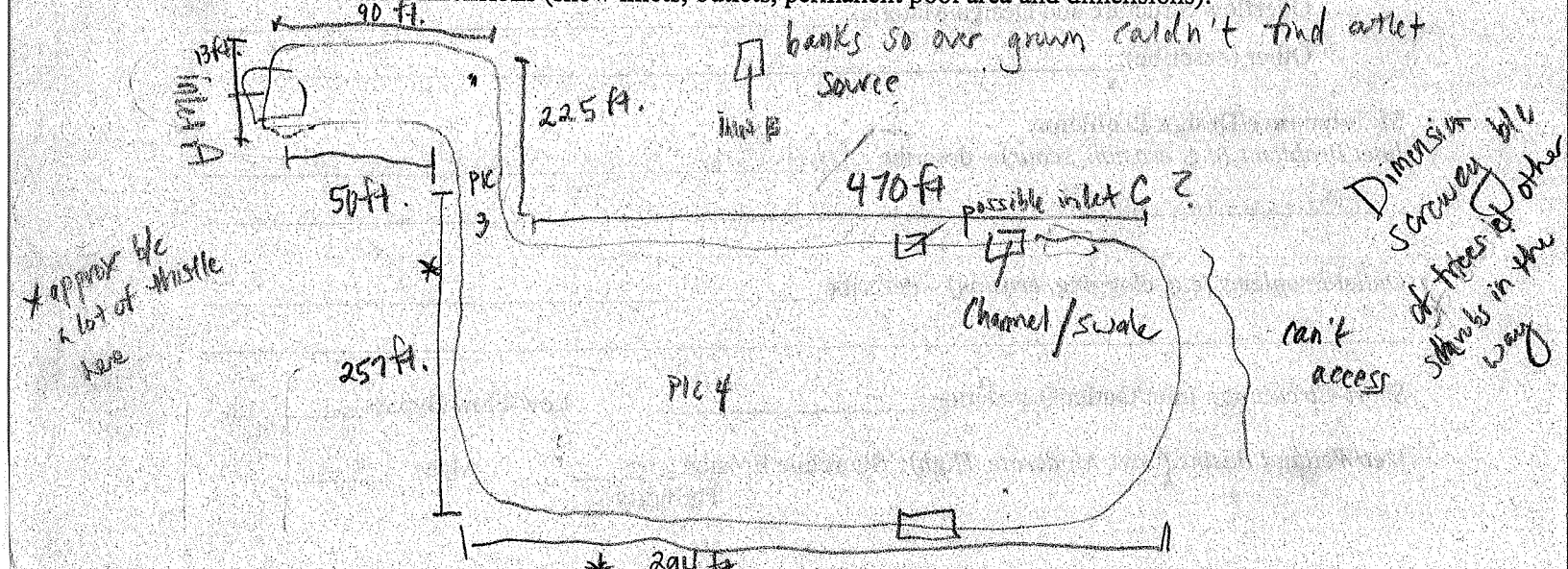
Preliminary Retrofit Opportunities (describe): plant native vegetation, remove turf grass. Do something to take care of stagnant water. Need to plant vegetation that can stablize banks

Photos:

Photo #	Description			
1	inlet A	12027	13 more of basin	12039
2	inlet A	12028	14 inlet C?	12040
3	basin	12029	15 swale/channel	12041
4	basin	12030	16 yucky algae	12042
5	nasty algae	12031		
6	Dam 2	not sure if wood debris or what 12032		
7	eroding banks	12033		
8	manhole w/ erosion	12034		
9	outflow gate	12035		
10	pipe inside outflow gate	12036		
11	position of gate to road — possibly inlet ?	12037		
12	drain aimed @ basin ~ no evidence of water	12038		

might be inflow ?

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 184

Basin Name (subdivision and/or property owner): The Oaks of Barrington

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-21-07 / 932 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Barrington Quarter Section: _____

Nearest Cross Streets: Cascade Ln cul de sac

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other dirt, rip rap

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation ✓ Other bark mulch, landscape plants

Slope (Horizontal:Vertical) 12in : 3in Bank Height 8-12 ft. Buffer Width: 10 ft.

Number of Inlets: Stormsewer inlet A 10in inlet B 14in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A - unk Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae _____

Turbidity _____ blue-green anti-algae treated w/ chemical

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): frogs, mallards, muskrats

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

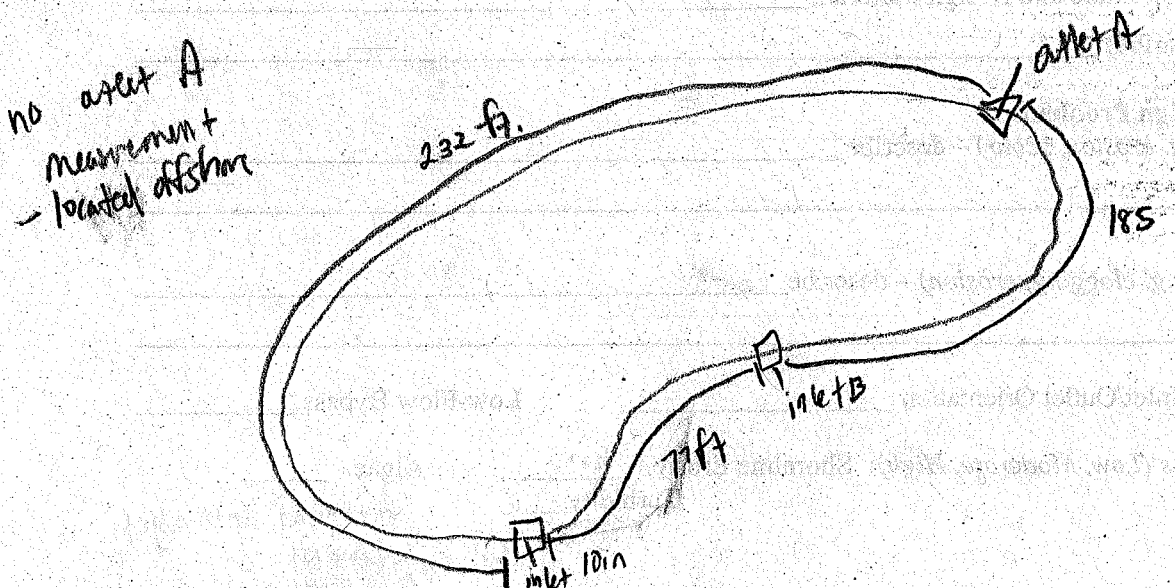
Other:_____

Preliminary Retrofit Opportunities (describe): Replace any turf grass w/ native veg.

Photos:

Photo #	Description
1	basin 13368
2	inlet A 13369
3	inlet B 13370
4	outlet A 13371
5	basin 13372
6	
7	
8	
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 183

Basin Name (subdivision and/or property owner): Glen Crest

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-21-07 / 1352 Temperature 80 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Barrington Quarter Section: _____

Nearest Cross Streets: Newcastle Ct. cul de sac

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass _____ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 4in Bank Height 4 - 15ft. Buffer Width: 10 - 30 ft

stone channel 35ft x 5ft.

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: metal 8in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae _____

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

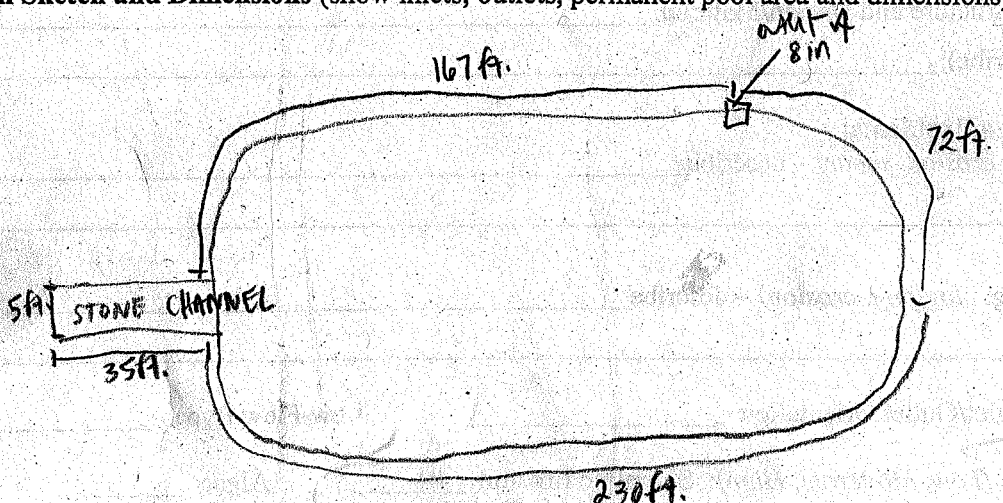
Other Observations:
Aquatic Life/ Wildlife (describe): frogs
Potential Safety Problems: bank erosion
Potential Nuisance Problems:_____
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): Fix erosion on banks. Replace stone channel with native vegetation

Photos:

Photo #	Description
1	basin 13436
2	stone channel into wetland basin 13437
3	basin 13438
4	where stone channel enters basin 13439
5	outlet 13440
6	
7	
8	
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 182

Basin Name (subdivision and/or property owner): Glencrest

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-21-07 / 1313 Temperature 80 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Palatine Quarter Section: _____

Nearest Cross Streets: New Castle Ct cul de sac

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass _____ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 6in Bank Height 8 - 10ft. Buffer Width: 15 - 40ft.

Number of Inlets: Stormsewer inlet A Size 18 in Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 10in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): spillway or overflow

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet A clogged w/ grasses

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae low

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

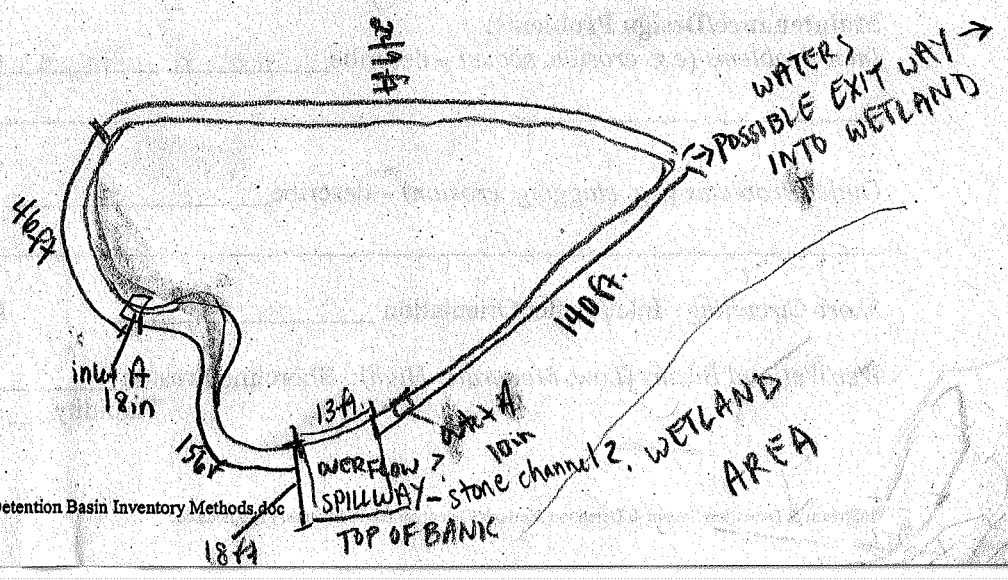
Other Observations:
Aquatic Life/ Wildlife (describe): frogs
Potential Safety Problems: erosion holes along banks covered by dense vegetation
Potential Nuisance Problems:_____
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): Clear vegetation away from opening of inlet A

Photos:

Photo #	Description			
1	basin	13422	12	channel or spillway looking into wetland area 13435
2	basin	13423	13	
3	inlet A	13424	14	
4	inlet A	13425		
5	basin	13426		
6	overflow / spillway channel	13427		
7	"	13428		
8	"	13429		
9	part of outlet manhole & weir controlling water out of basin into nearby wetland			13430
10	outlet A	13434		13431
				13432
				13433

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 181

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-22-07 / 1216 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Barrington Quarter Section: _____

Nearest Cross Streets: Barrington Rd. & Braymore Dr.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 6-20ft Buffer Width: none - 15ft.

Number of Inlets: Stormsewer inlet A 8in inlet B 6in inlet C 4in Size inlet D 22in Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: weir A 14in weir 1ft Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet D broken, pipe seperated from opening

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation ✓ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion high Algae _____

Turbidity _____

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ garbage Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): frogs
Potential Safety Problems:_____
Potential Nuisance Problems:_____
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

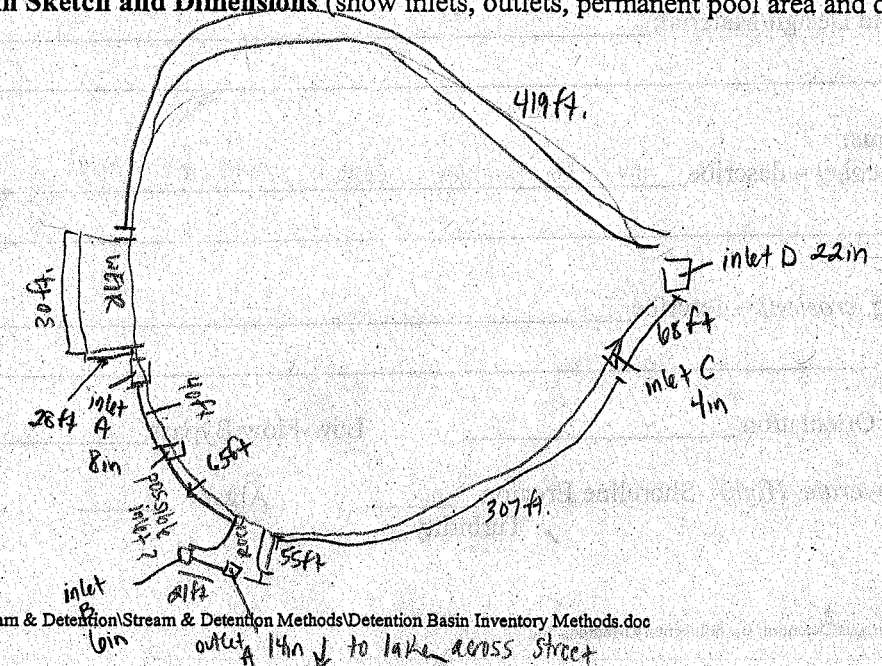
Preliminary Retrofit Opportunities (describe): Replace surrounding turf grass and rip rap with native vegetation. Fix inlet D & inlet C

Photos:

Photo #	Description
1	weir looking into basin 181, 13552
2	basin 13553
3	inlet A - erosion beneath pipe, held up by concrete block
4	" 13554, 13555
5	weir 13556
6	possible inlet - submerged and opening entirely clogged w/ sediment (looks like 4in) 13557
7	outlet A 13558, 13559
8	inlet B - clogged w/ garbage 13560
9	view from across road to outlet A 13561
10	inlet C - crumpled & buried in grass 13562
11	inlet D 13563
12	inlet D 13564
13	inlet D opening seperated from pipe. 13565
14	Basin 13566

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):

FOR WEIR DIMENSIONS SEE SHEET FOR BASIN 180



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 180

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-22-07/ 1152 Temperature 75 Rainfall (now, (12), 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Barrington Quarter Section: _____

Nearest Cross Streets: Barrington Rd. & Braymore Dr.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 6 - 20ft. Buffer Width: none

inlet A 32in

Number of Inlets: Stormsewer inlet B 32in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

see back

Surface Weir: ✓ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe erosion around side & top of inlets A & B

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae low

Turbidity high

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

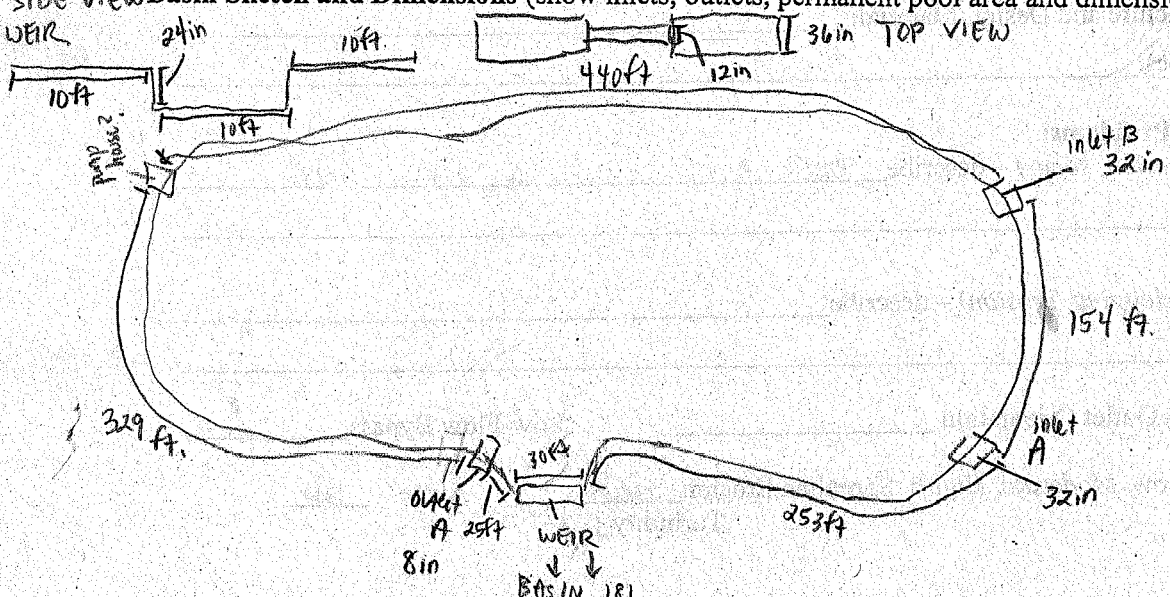
Other Observations:
Aquatic Life/ Wildlife (describe): frogs
Potential Safety Problems:_____
Potential Nuisance Problems:_____
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): Remove unstable riprap around inlet A & B.
Replace turf grass on banks w/ native vegetation.

Photos:

Photo #	Description
1	basin 13540 ll. pump house of some sort ? for irrigation 13551
2	basin 13541
3	weir 13542
4	outlet A 13543
5	weir 13544
6	weir 13545, 13546
7	inlet A 13547
8	basin 13548
9	inlet B 13549
10	erosion around sides & top of inlet B b/c of Rocks 13550

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 179

Basin Name (subdivision and/or property owner): Braymore Hills

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-22-07 / 1032 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Barrington Quarter Section: _____

Nearest Cross Streets: MaCalpin Dr. & Bishop Ct.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residintal Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 2-6 ft. Buffer Width: none

inlet A 10in see rest on back

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: ✓ see back Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet C & E covered by turf grass

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion high Algae low

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe):_____

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe): shimmery substance on bank

Other Basin Uses (rec. field, etc):_____

Other:_____

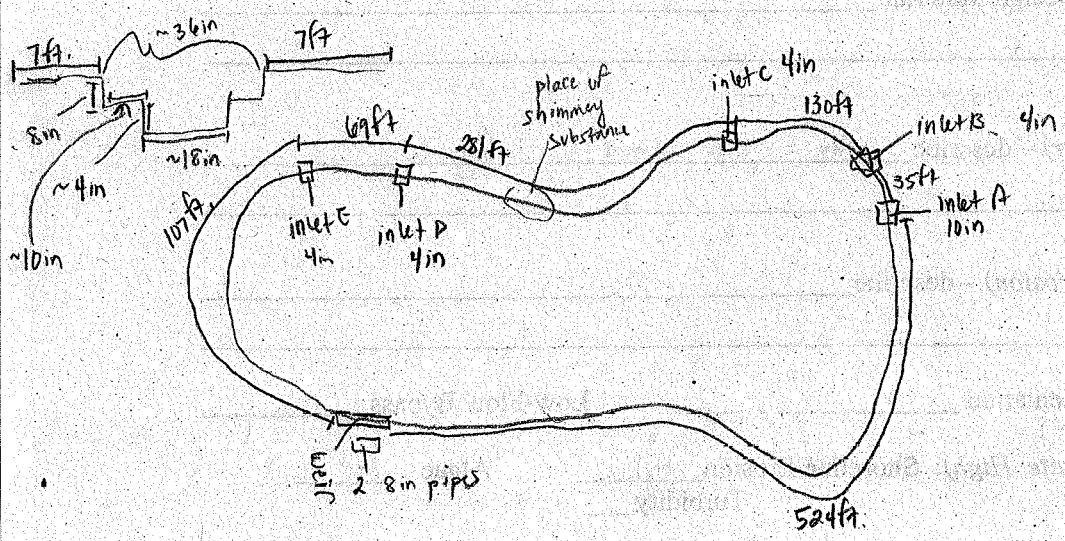
Preliminary Retrofit Opportunities (describe): Replace turf grass with native vegetation
Remove vegetation from infront of inlets C & E. Stabilize banks

Photos: ignore previous 6 photos

Photo #	Description			
1	basin	13494	11. inlet B * has cover over end	13505
2	weir	13495	12. inlet C - hidden by grasses	13506
3	"	13496	13. shimmery substance on bank	13507
4	"	a lot more pics of weir here	14. inlet D	13508
5	"		15. inlet E	13509
6	"	→ 13500		
7	view from weir into nearby lake	13501		
8	beam	13502		
9	basin	13503		
10	inlet A	13504		

weir includes 2 8in outlet pipes that drain into nearby lake

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 178

Basin Name (subdivision and/or property owner): Chevriot Hills

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-22-07 / 750 Temperature 65 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Palatine Quarter Section: _____

Nearest Cross Streets: North of Abbotsford Dr. cul de sac

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 2in Bank Height 2ft Buffer Width: none - wetland

inlet A 4in

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae low

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): frogs, white crane

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

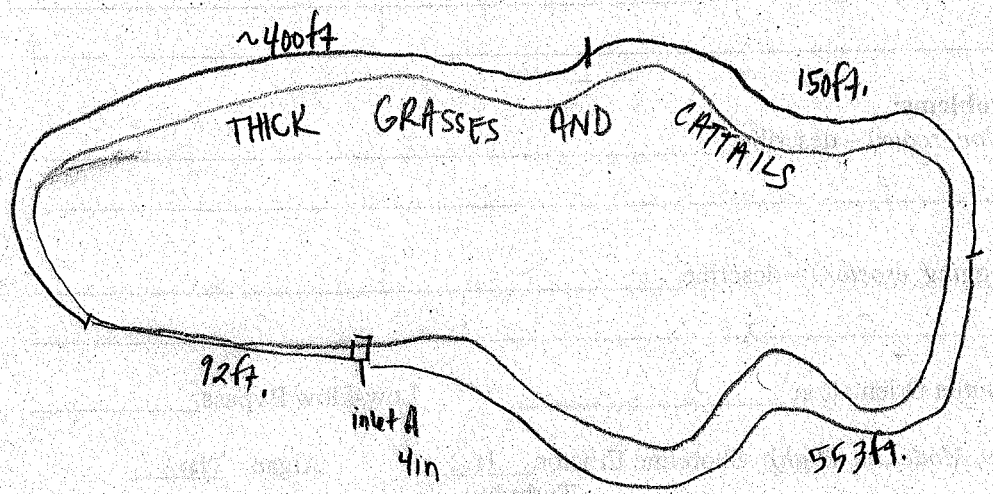
Other:_____

Preliminary Retrofit Opportunities (describe): Replace turf grass with native vegetation.

Photos:

Photo #	Description
1	basin 13450
2	basin 13451
3	" 13452
4	inlet A 13453
5	basin 13454
6	" 13455
7	" 13456
8	
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions): 1



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 177

Basin Name (subdivision and/or property owner): Cheviot Hills

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-22-07/715 Temperature 65 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Palatine Quarter Section: _____

Nearest Cross Streets: Skye Ln & Selkirk Ct.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other dirt & stone

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 3in inlet A & B 12in inlet D 4in Bank Height 1 - 8 ft. Buffer Width: none

Number of Inlets: Stormsewer inlet C 24in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet D covered in algae.

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae low

Turbidity low

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ (garbage) Excess Sediment Accumulation_____
Excess Woody Vegetation_____

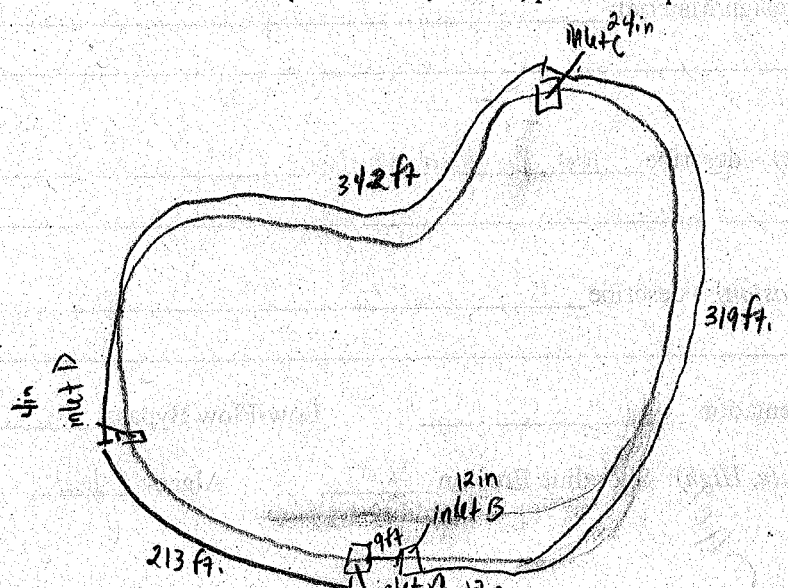
Other Observations:
Aquatic Life/ Wildlife (describe): canada geese, frogs
Potential Safety Problems:_____
Potential Nuisance Problems: bird poop
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): Replace turf grass w/ appropriate native vegetation

Photos:

Photo #	Description
1	inlet A 13441
2	inlet B 13442
3	basin 13443
4	basin 13444
5	inlet C 13445
6	inlet D 13446
7	oil slick material nearshore line 13447
8	basin 13448
9	" 13449
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 176

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-22-07/841 Temperature 70 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Barrington Quarter Section: _____

Nearest Cross Streets: Colony Dr. off Bradwell Rd.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 2in Bank Height 1.5ft. Buffer Width: none

Number of Inlets: Stormsewer inlet A 10in inlet B 6in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 10in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet B clogged w/ grass

Outlet Problems (e.g. clogging, erosion) – describe outlet A clogged w/ grass

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae moderate Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): frogs

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

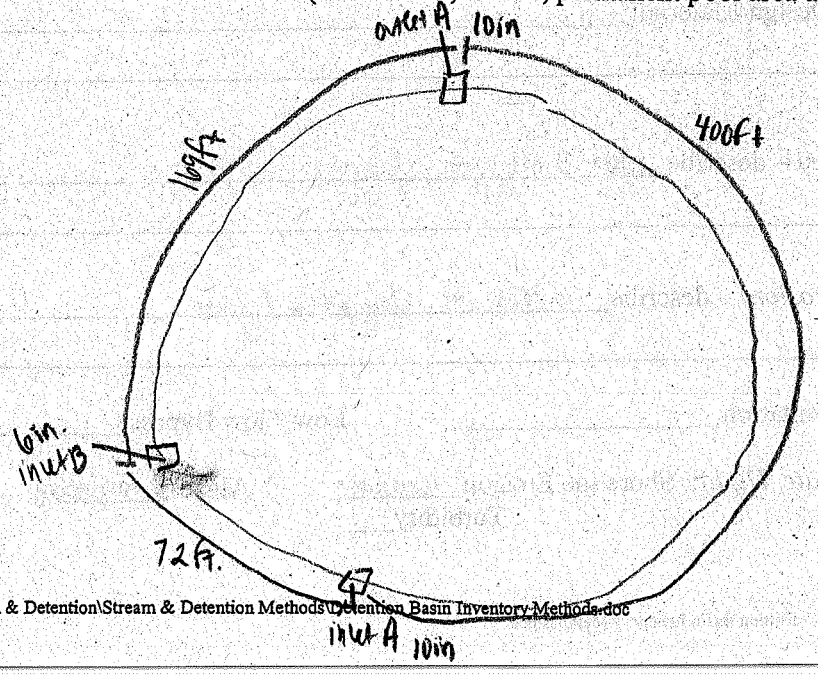
Other:_____

Preliminary Retrofit Opportunities (describe): Replace surrounding turf grass with native vegetation. Stabilize banks. Clear grass from inlets & outlets

Photos:

Photo #	Description
1	basin 13457
2	basin 13458
3	basin 13459
4	inlet A 13460
5	outlet A 13461
6	inlet B 13462
7	
8	
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 175

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-22-07 / 1107 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Barrington Quarter Section: _____

Nearest Cross Streets: Braymore Dr. & Knox Ct.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 1-2ft. Buffer Width: none

Number of Inlets: Stormsewer see back Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation ✓ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae low

Turbidity low

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris 1 garbage Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): fish

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

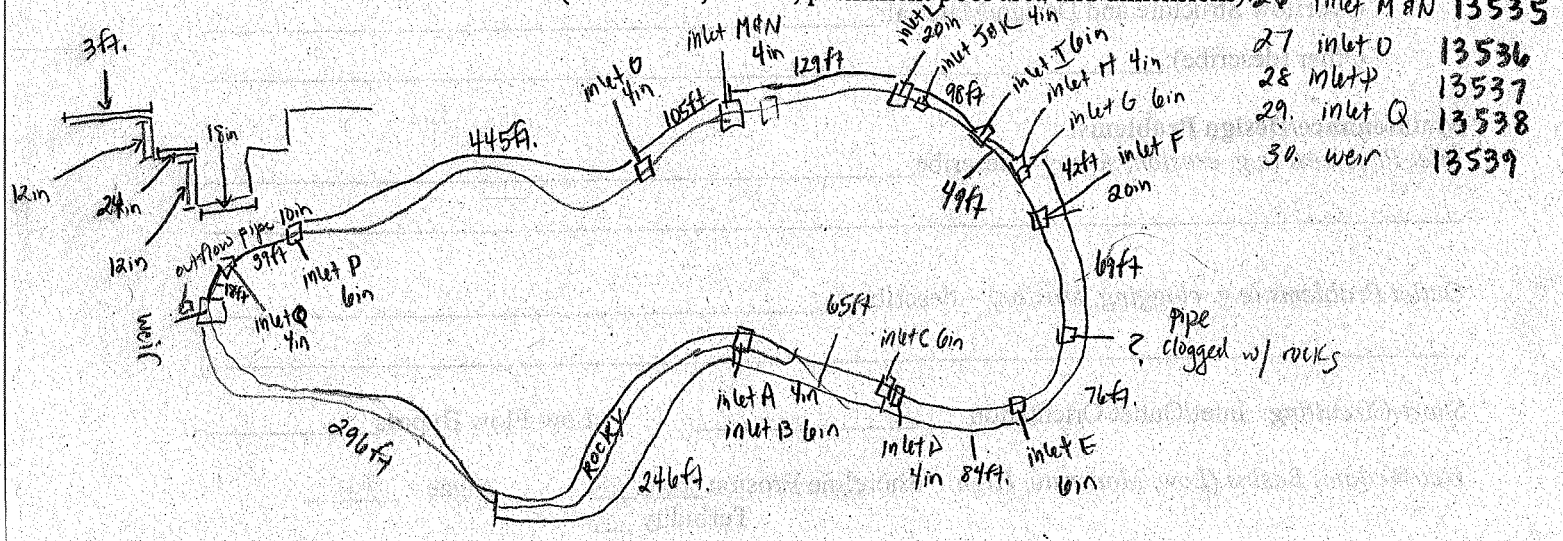
Other:_____

Preliminary Retrofit Opportunities (describe): Fix inlet I pipe. Remove turf grass & rocks and replace w/ native vegetation. Repair broken inlets.

Photos:

Photo #	Description
1	basin 13510
2	basin 13511
3	weir 13512
4	" 13513
5	" 13514
6	outflow pipe @ weir 13515
7	basin 13516
8	inlet B & B 13517
9	inlet A 13518
10	inlet A & B 13519
11	inlet A & B stone drainage to basin 13520
12	inlet C 13521
13	inlet D 13522
14	inlet C & D - drain over grass to basin 13523
15	inlet E - drains over grass to basin 13524
16.	not sure if inlet or outlet rocks lodged in pipe 13525
17.	inlet F 13526
18.	inlet G & H (inlet G white & broken, inlet H blue) drain across grass 13527
19.	inlet I 13528
20.	crack in inlet I pipe 13529
21.	basin 13530
22	inlet J & K 13531
23	inlet L 13532
24	inlet M - blue 13533
25	inlet N - white 13534
26	inlet M & N 13535
27	inlet O 13536
28	inlet P 13537
29.	inlet Q 13538
30.	weir 13539

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 174

Basin Name (subdivision and/or property owner): Sanctuary of Inverness II

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-22-07/ 910 Temperature 70 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Barrington Quarter Section: _____

Nearest Cross Streets: Bradwell Rd. & Lochbrook Ln.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other dia & rip rap

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other bark mulch

Slope (Horizontal:Vertical) 12in : 4in Bank Height 5ft. Buffer Width: none

Number of Inlets: Stormsewer inlet A 26in inlet B 4in Size inlet C 6in inlet D 4in Channel/Swale inlet E 4in inlet F 6in inlet G 4in Size inlet H 4in Inlet I 10in

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlets B -> H run across stone banks to basin.

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae _____

Turbidity high

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): frogs

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

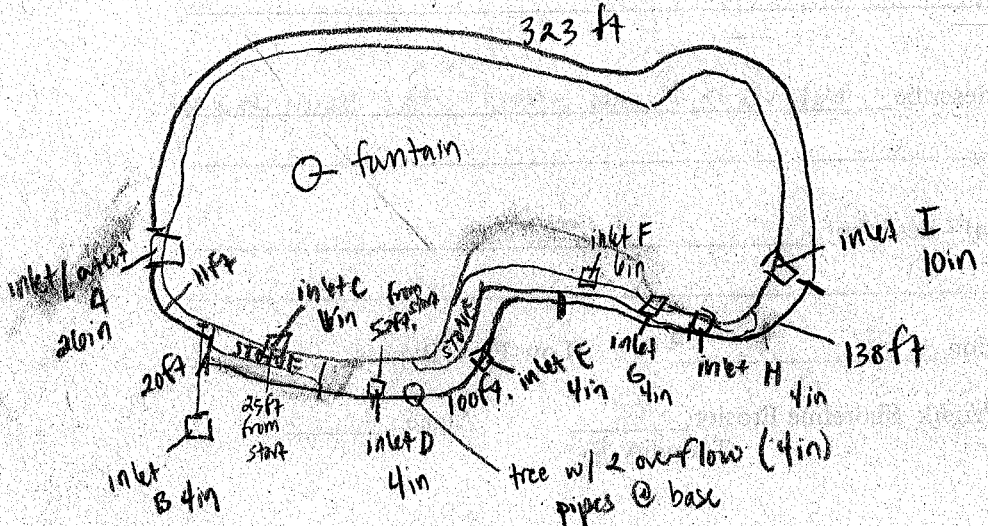
Other:_____

Preliminary Retrofit Opportunities (describe): Replace rip rap & turf grass with native vegetation.

Photos:

Photo #	Description				
1	basin 13463	13464	11	inlet H	13473
2	inlet/outlet A - connects to basin	173	12	inlet I	13474
3	inlet B - along brick wall	13465	13	basin	13475
4	inlet B 13466		14	basin	13476
5	inlet C 13467		15		
6	inlet D 13468				
7	2 overflow @ base of tree 13469				
8	inlet E flows down stone wall 13470				
9	inlet F 13471				
10	inlet G 13472				

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 193

Basin Name (subdivision and/or property owner): Sanctuary of Inverness II

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-22-07/ 940 Temperature 70 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Barrington Quarter Section: _____

Nearest Cross Streets: Bradwell Rd & Lochbrook Ln.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other dirt & rip rap

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12m : 3in Bank Height 4-6 ft. Buffer Width: none

Number of Inlets: Stormsewer _____ Size inlet/outlet A 24in, others on bank Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 8in outlet B 12in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlets flow over rip rap to basin.

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae _____

Turbidity high

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): frogs
Potential Safety Problems:_____
Potential Nuisance Problems:_____
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

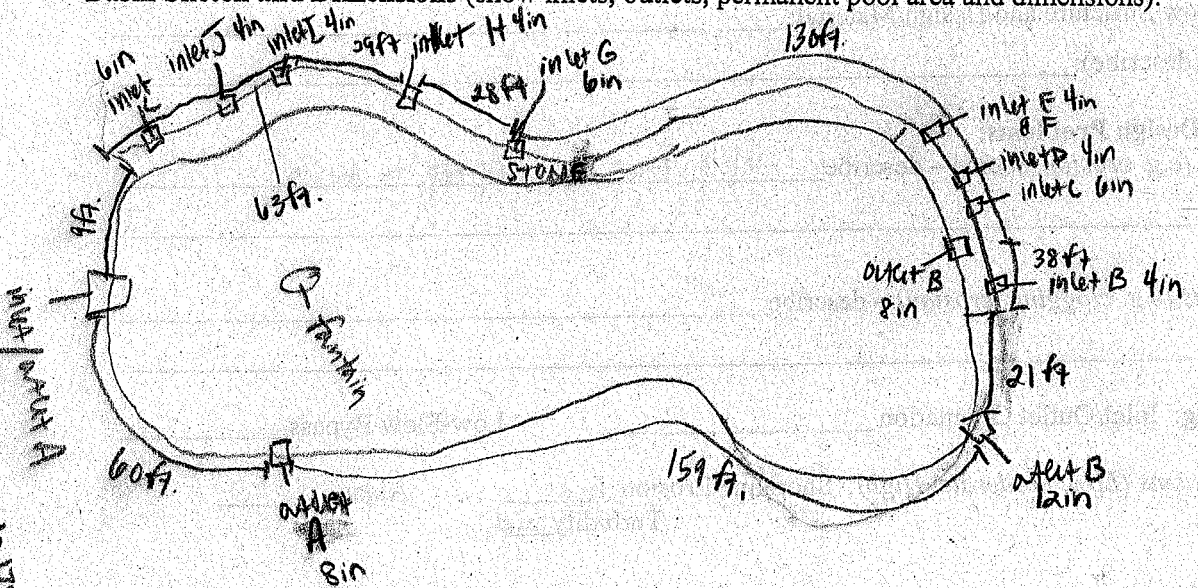
Preliminary Retrofit Opportunities (describe): Replace riprap and turf grass w/ native vegetation

Photos:

Photo #	Description		Photo #	Description	
1	basin	13477	11	inlet D	13487
2	basin	13478	12	inlet E & F	13488
3	inlet / outlet A	13479	13	inlet G	13489
4	outlet A	13480	14	inlet H	13490
5	outlet B	13481	15	inlet I	13491
6	inlet B	13482	16	inlet J	13492
7	outlet B	13483	17	inlet K	13493
8	basin	13484	18		
9	basin	13485	19		
10	inlet B	13486	20		

w/ 174 & 173 connected - looks like all water from both basin exits through basin 173's outlets.

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 172

Basin Name (subdivision and/or property owner): Fair Meadow Estates

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-21-07 / 1204 Temperature 80 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Barrington Quarter Section: _____

Nearest Cross Streets: Unnamed subd. rd. off old Dundee Rd.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓ very few

Concrete Lined Channel _____ Other dirt, rip rap

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in:3in Bank Height 5-10ft. Buffer Width: none

inlet A 18in

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A ~12in (clogged w/sediment) outlet B ~10in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe outlet A clogged w/ sediment & culvert not get accurate size of pipe. Outlet B clogged w/ sediment.

Short-Circuiting: Inlet/Outlet Orientation ✓ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae _____

Turbidity _____

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

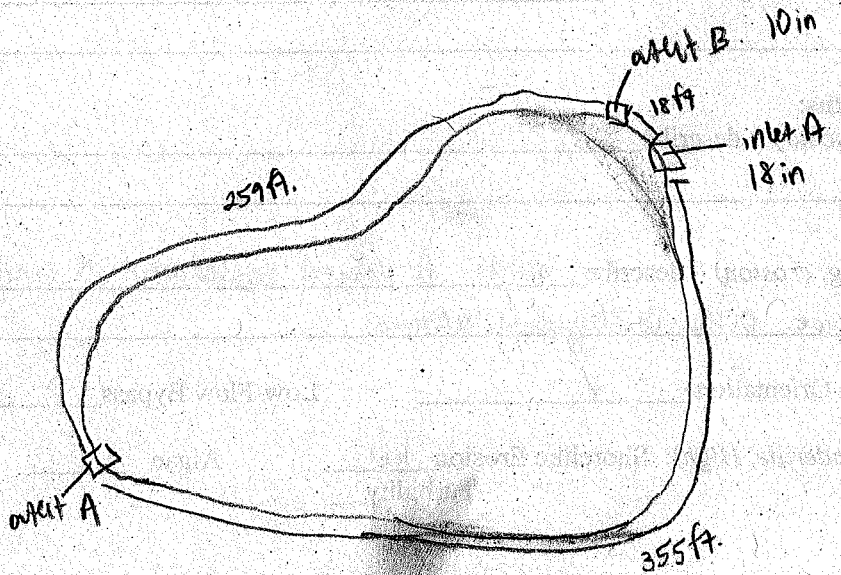
Other Observations:
Aquatic Life/ Wildlife (describe): frogs
Potential Safety Problems:_____
Potential Nuisance Problems:_____
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): Plant native vegetation on banks to replace turf grass and stabilize banks. Do something about shed crawling. Remove sediment from both outlets. Remove rip rap

Photos:

Photo #	Description
1	basin 13409
2	outlet A - Clogged w/ sediment 13410
3	writing on outlet A pipe, mean 24" pipe ? 13411
4	inlet A 13412
5	outlet B 13413
6	basin 13414
7	
8	
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 171

Basin Name (subdivision and/or property owner): Fair Meadow Estates

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-21-07 / 1145 Temperature 80 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Barrington Quarter Section: _____

Nearest Cross Streets: SE Hawley Woods & Rand

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass ✓ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other dirt, rip rap

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 3-6 ft Buffer Width: none

Number of Inlets: Stormsewer inlet A 10in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet B 26in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation ✓ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae low

Turbidity _____ not much vegetation bare ground many banks

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): frogs

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

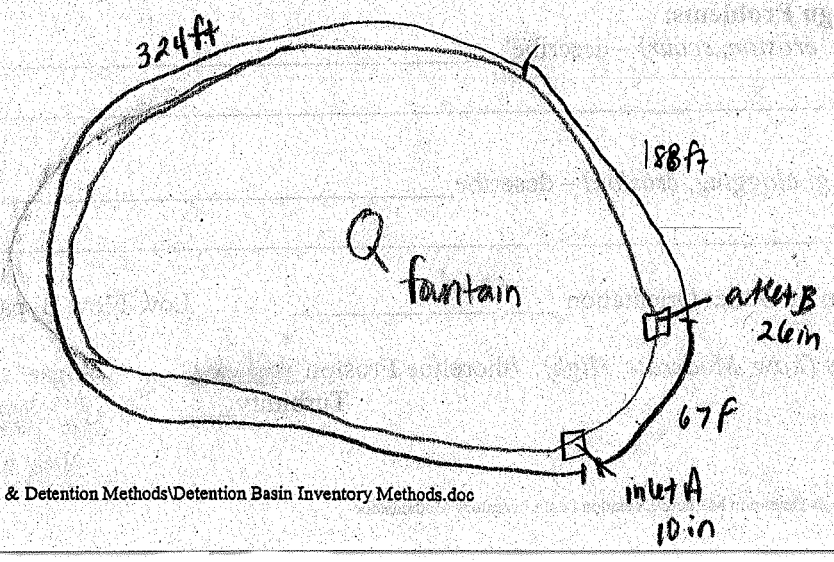
Other:_____

Preliminary Retrofit Opportunities (describe): Replace any turf grass with native vegetation and rip rap. Stabilize banks. ~~Fix shm circulating~~.

Photos: NEW DEVELOPMENT, EMPTY LOTS, UNPLANTED GROUND AROUND BASIN

Photo #	Description
1	basin 13402
2	basin 13403
3	shoreline 13404
4	design to be basin bank? water @ one time possible reached black mesh 13405
5	inlet A 13406
6	basin 13407
7	outlet B 13408
8	
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 170

Basin Name (subdivision and/or property owner): Canty Side School

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-11-07 / 758 Temperature 75 Rainfall (now, 12, 24, 48 hours, (week)) _____

Location:

Political Jurisdiction: _____ Township: Barrington Quarter Section: _____

Nearest Cross Streets: Lake Cook Rd & Bunker Rd.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: Institutional Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry ✓ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass ✓ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other rip rap

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 3.5in Bank Height 5-6 ft Buffer Width: none

Number of Inlets: Stormsewer inlet A 18in inlet B 10in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 10in outlet B 10in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe grated cover missing from outlet B

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae _____

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ garbage Excess Sediment Accumulation_____
Excess Woody Vegetation_____

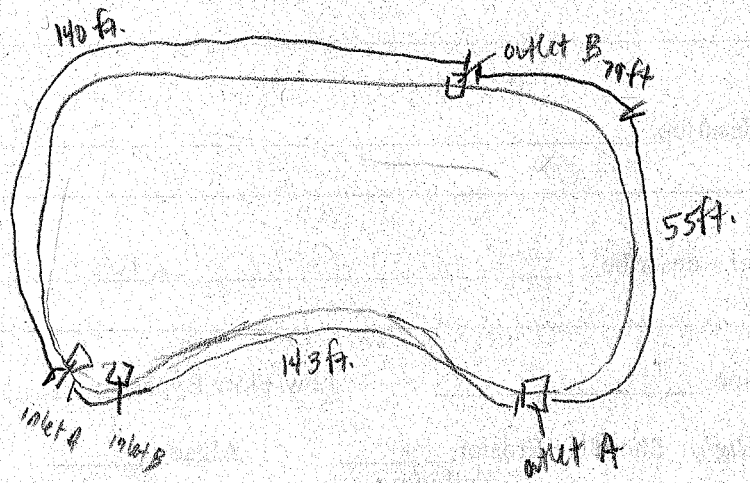
Other Observations:
Aquatic Life/ Wildlife (describe):_____
Potential Safety Problems: grated cover missing from outlet B, rock unstable @ inlets A & B
Potential Nuisance Problems:_____
Evidence of Upstream Illicit Connections (describe): oil sheen in puddles @ openings of inlet A & B
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): replace turf grass within basin/on slopes with more native vegetation. Replace grate over outlet B

Photos:

Photo #	Description
1	basin 12764
2	inlet A 12765
3	inlet B 12766
4	inlet A&B 12767
5	oil sheen @ inlet B 12768
6	outlet A 12769
7	basin 12770
8	outlet B 12771
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 169

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-11-07 / 828 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: Paganica Dr. & Dorny Ln

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other ✓

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 1in Bank Height 1-2 ft. Buffer Width: none - wooded area

Number of Inlets: Stormsewer inlet A 30in inlet B 10in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet A is beginning to rust inside the pipe

nasty brown water w/ oil slick @ inlet B

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion high Algae _____

Turbidity high

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation ✓

Other Observations:
Aquatic Life/ Wildlife (describe):_____

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe): oil sheen @ inlet B

Other Basin Uses (rec. field, etc):_____

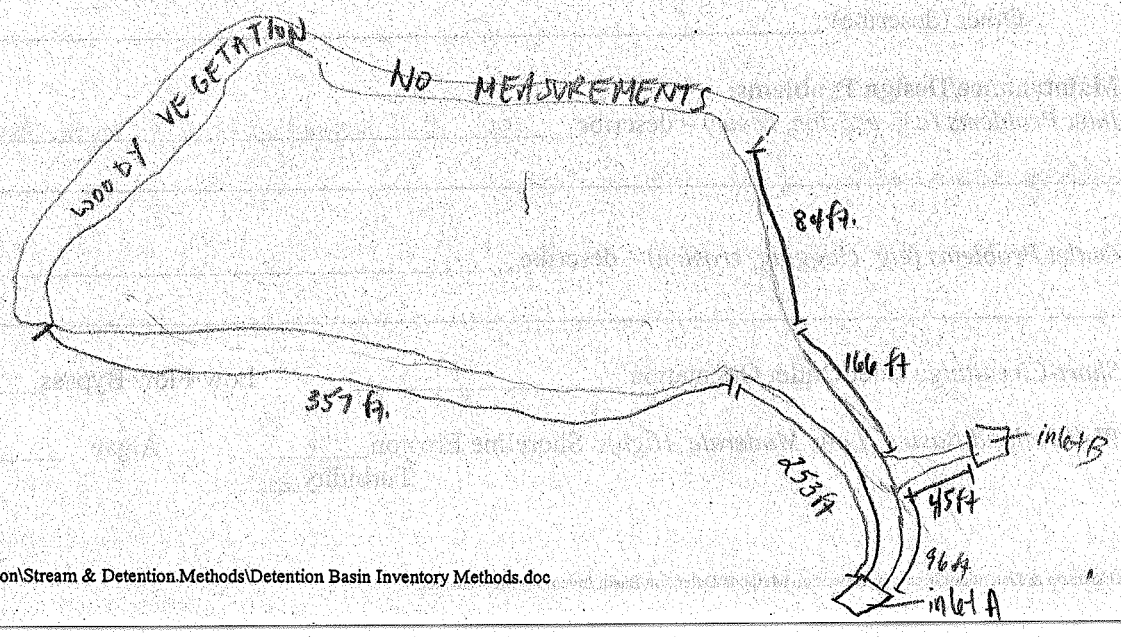
Other:_____

Preliminary Retrofit Opportunities (describe): Replace turf grass w/ native vegetation
Remove some of the woody vegetation from banks. Stabilize banks.

Photos:

Photo #	Description
1	basin 12772
2	basin 12773
3	basin 12774
4	shoreline erosion 12775
5	inlet A 12776
6	inlet A 12777
7	inlet B 12778
8	inlet B 12779
9	inlet B 12780
10	view from basin - path H_2O takes from inlets A & B to basin 12781

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 168

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-11-07 / 853 Temperature 80 Rainfall (now, 12, 24, 48 hours, (week)) _____

Location:

Political Jurisdiction: _____ Township: Ciba Quarter Section: _____

Nearest Cross Streets: Bisque Dr. & Rvb of the Green

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

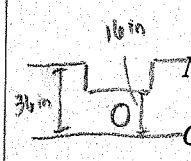
Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 1in Bank Height 2-4ft Buffer Width: none



Number of Inlets: Stormsewer inlet A ~36in (but has be dissheped) inlet B 4in Size inlet C ~8in Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: ✓ Size hole 12in Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet B buried in the grass, inlet C opening clogged w/ grass, weeds & dirt.

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion high Algae _____

Turbidity high

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation ✓

Other Observations:
Aquatic Life/ Wildlife (describe): blue heron
Potential Safety Problems:
Potential Nuisance Problems:
Evidence of Upstream Illicit Connections (describe):
Other Basin Uses (rec. field, etc):
Other:

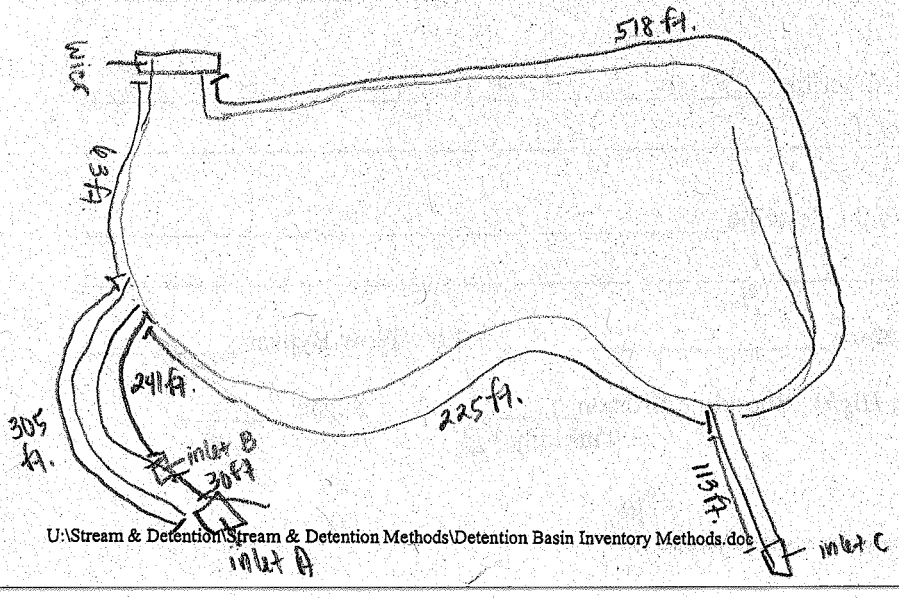
Preliminary Retrofit Opportunities (describe): replace surrounding turf grass with native vegetation. Fix break in Weir. Remove rip rap/ black plastic from pathways

Photos: Note: inlet B buried in grass could not get exact size

Photo #	Description			
1	basin	12782	inlet C	12792
2	basin	12783	basin	12793
3	weir	12784	basin	12794
4	weir (crack @ bottom)	12785		
5	weir	12786		
6	shoreline erosion	12787		
7	inlet A - stone path	12788		
8	inlet A	12789		
9	inlet B	12790		
10	inlet C	12791		

Note: water might be flowing into basin from Weir b/c of crack in the base

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 167

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-11-07 / 942 Temperature 80 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Cibola Quarter Section: _____

Nearest Cross Streets: BHS fields Hart Rd. north of Flint

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: institutional Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry _____ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other rip rap

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 2in Bank Height 1-3ft. Buffer Width: none

Number of Inlets: Stormsewer inlet A - buried no size Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 10in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet A pipe eroded away and opening buried almost completely by sediment

Outlet Problems (e.g. clogging, erosion) – describe outlet A clogged w/ sediment and vegetation

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae low

Turbidity high

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ ✓ garbage Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): birds, turtle, frogs, muskrat

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

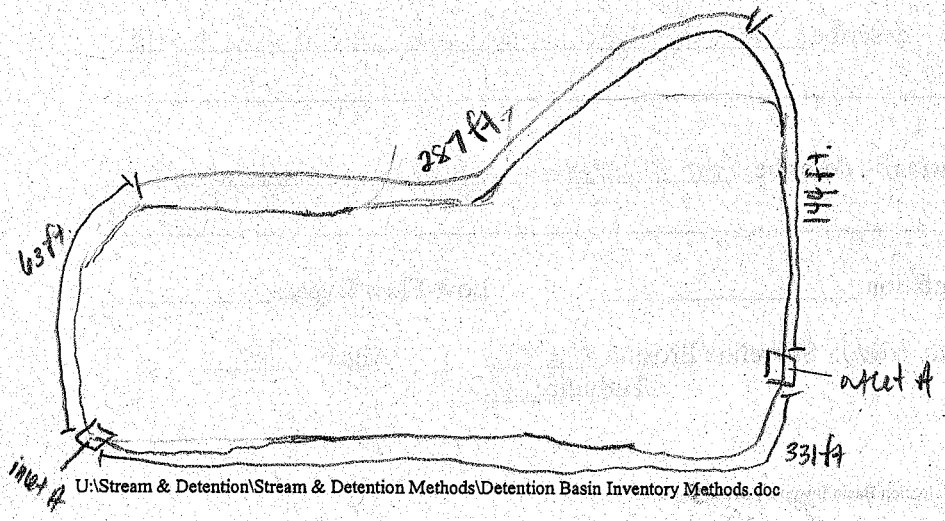
Other:_____

Preliminary Retrofit Opportunities (describe): replace turf grass with native vegetation
fix inlet A pipe ? Fix earth around otlet A

Photos:

Photo #	Description
1	basin 12795
2	inlet A 12796
3	inlet A 12797
4	inlet A 12798
5	inlet A 12799
6	basin 12800
7	basin 12801
8	otlet A 12802
9	otlet A 12803
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 166

Basin Name (subdivision and/or property owner): GE Healthcare

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-11-07 / 1042 Temperature 80 Rainfall (now, 12, 24, 48 hours, (week)) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: Northwest Hwy. & Western Ave.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: Commercial Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry ✓ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass ✓ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other rip rap

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 1-6ft. Buffer Width: none

Number of Inlets: Stormsewer inlet A 16in inlet B 16in Size _____ Channel/Swale stone channel 4ft x 8ft. Size

Outlet Type(s) and Dimensions: Culvert: outlet A 12in outlet B 20in Restrictor (Y/N) _____ Size

Surface Weir: _____ Size _____ Perforated Riser _____ Size

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet A is clogged w/ garbage

Outlet Problems (e.g. clogging, erosion) – describe outlet B clogged w/ sediment & grass clippings

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass ✓

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae _____ Turbidity _____

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ garbage Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe):_____

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

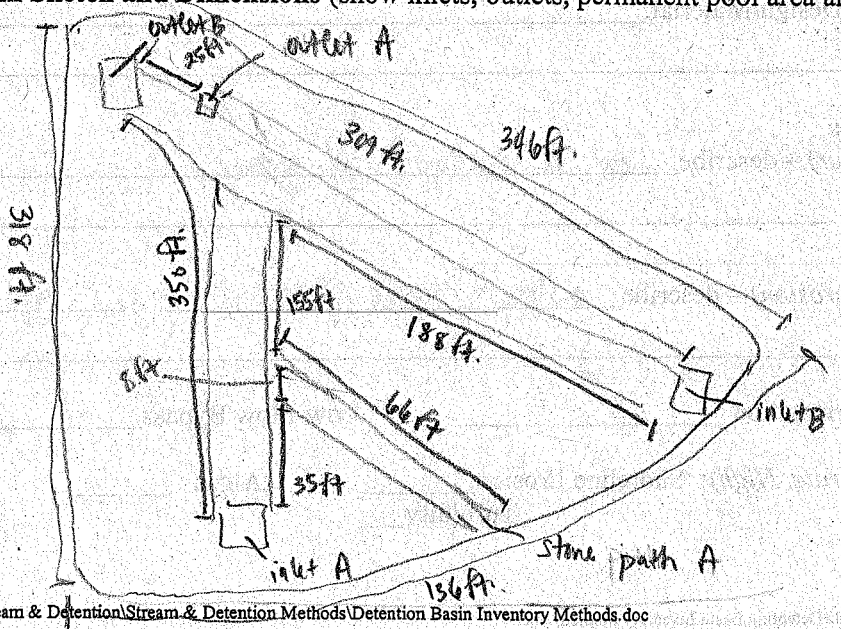
Other:_____

Preliminary Retrofit Opportunities (describe): remove riprap channels between inlet/outlet and turf grass. In their place plant native vegetation.

Photos:

Photo #	Description
1	basin 12812
2	basin 12813
3	Stone paths along parking area that channel water basin 12814
4	inlet A 12815
5	Stone path A connects w/ path of inlet A 12816
6	inlet B 12817
7	basin view from inlet B 12818
8	outlet A 12819
9	outlet B 12820
10	view of basin from outlet B 12821

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 165

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-11-07 / 1021 Temperature 80 Rainfall (now, 12, 24, 48 hours, (week) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: Bldg. © end of Western Ave.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 0-12in : 1in Bank Height 1ft Buffer Width: none - 20ft.

inlet A - no size measured

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet A is rusted, broken & underwater

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae _____

Turbidity high

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation ✓

Other Observations:
Aquatic Life/ Wildlife (describe): frogs

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

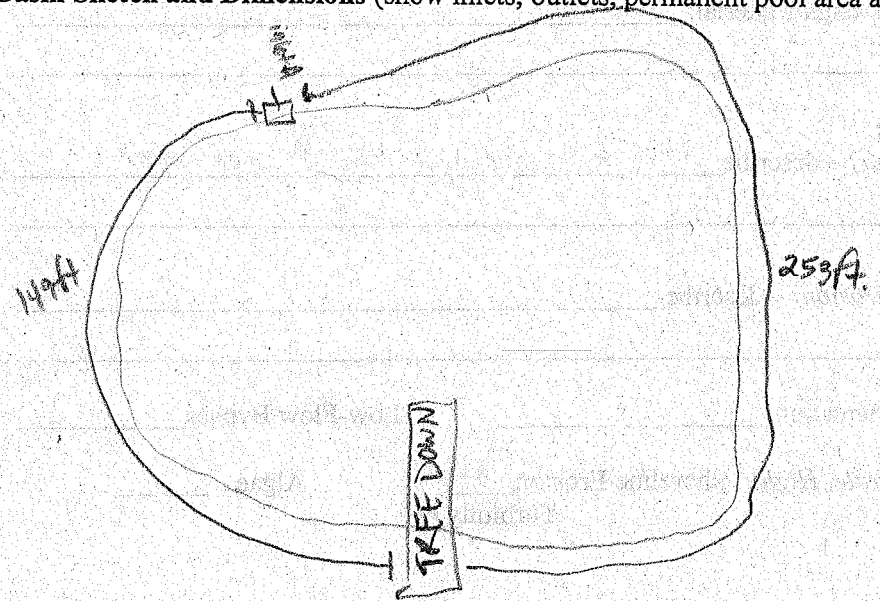
Other:_____

Preliminary Retrofit Opportunities (describe): fix inlet A, remove down tree and other woody vegetation floating in basin. Replace turf grass with native vegetation

Photos:

Photo #	Description
1	basin 12804
2	basin 12805
3	inlet A 12806
4	inlet A rusted 12807
5	basin 12808
6	water vegetation 12809
7	big tree down on banks and into basin 12810
8	" 12811
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



✓

DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 164

Basin Name (subdivision and/or property owner): The Foundry of Barrington

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-8-07 / 750 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: Northwest Hwy. & Hart Rd.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: Commercial Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other dia

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in: 3in Bank Height 0-4 ft. Buffer Width: NONE

Number of Inlets: Stormsewer inlet/outlet A 20in inlet B 16'9 Size _____ Channel/Swale _____ Size _____

outlet A 10in

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe erosion @ inlet B pipe

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae _____

Turbidity high

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ grass clippings Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): frogs

Potential Safety Problems: erosion @ inlet B

Potential Nuisance Problems: geese poop

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

Other:_____

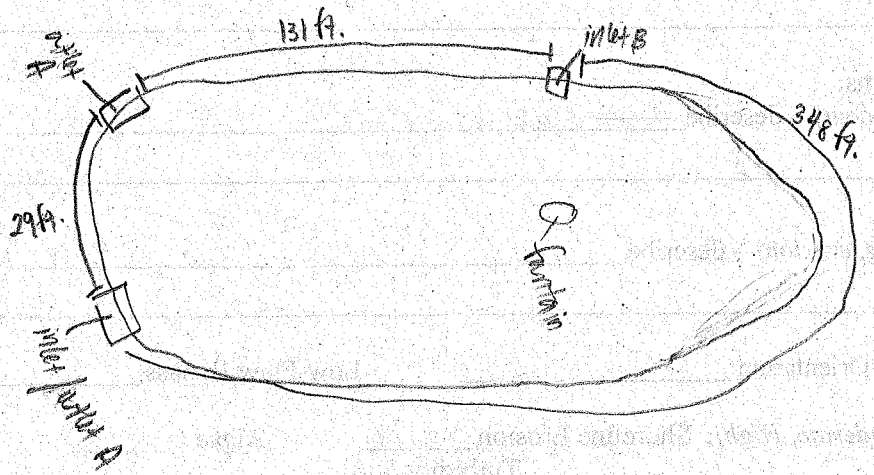
Preliminary Retrofit Opportunities (describe): replace turf grass around basin with native vegetation. Fix erosion @ inlet B

Photos:

Photo #	Description
1	basin 12656
2	outlet A 12657
3	inlet A * inlet/outlet A connect to basin 163 12658
4	inlet A * " 12659
5	basin 12660
6	inlet B 12661
7	erosion @ inlet B 12662
8	" 12663
9	
10	

*remnant stream leading from inlet A to basin (only way could tell it was an inlet)

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 163

Basin Name (subdivision and/or property owner): infront of Nathan Trust Bank the foundry of Barrington

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-8-07 / 816 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: Northwest Hwy. & 20th St.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: Commercial Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 2in Bank Height 1-3ft. Buffer Width: none

Number of Inlets: Stormsewer inlet A 10in inlet B 8in Size inlet C 10in inlet/outlet D 20in Channel/Swale _____ Size inlet/outlet E 20in

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe erosion around inlet A, inlet C has pipe separation and erosion, inlet/outlet E has grass growing into the opening.

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae _____

Turbidity high

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

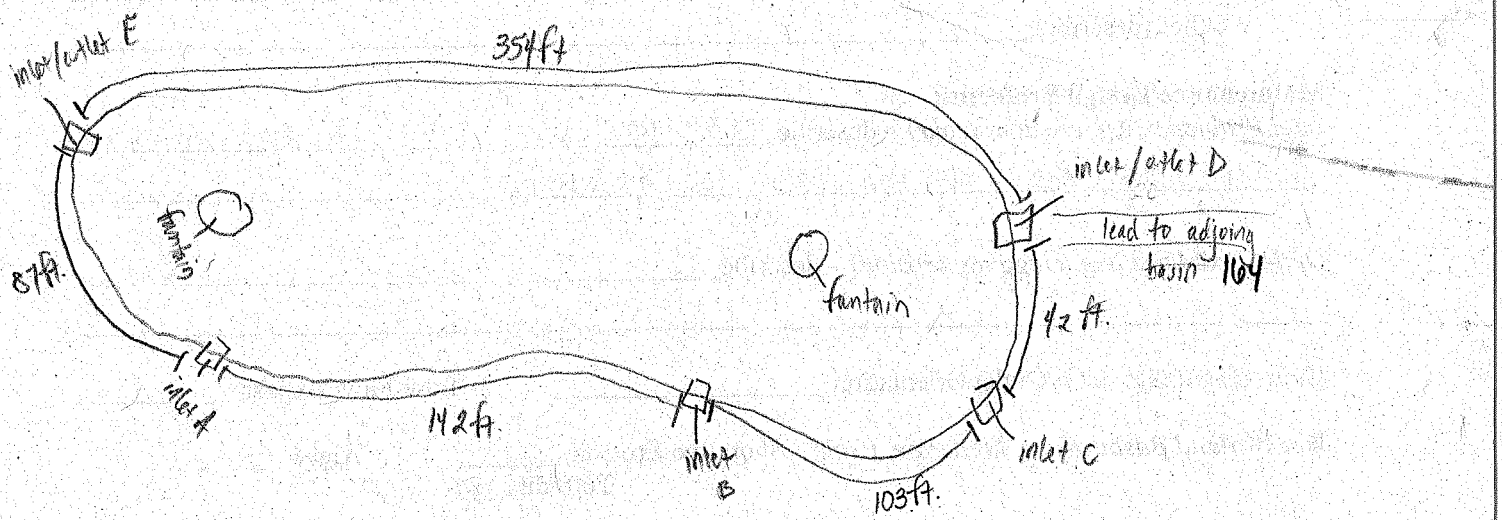
Other Observations:
Aquatic Life/ Wildlife (describe): frogs, fish
Potential Safety Problems: erosion/hole @ inlet C
Potential Nuisance Problems: geese poop
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): Replace turf grass with native vegetation. Fix erosion and pipe gap at inlet C & inlet/outlet D

Photos: Note: inlet A & B are in standing water when none of the other inlets are covered by water.

Photo #	Description
1	inlet A 12664
2	inlet A 12665
3	erosion around inlet A & manhole grate 12666
4	inlet B 12667
5	inlet C 12668
6	erosion and break in pipe at inlet C 12669
7	inlet/outlet D - goes between basin 164 12670
8	w/in pipe that leads to basin 164 12671
9	break in pipe @ inlet/outlet D 12672
10	basin 12673
11	inlet/outlet E connects to basin 164 12674
12	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 162

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-8-07/ 900 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: North west Hwy & 20th St.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential/ commercial Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓ macro aquatic / some grasses

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 5-7 ft. Buffer Width: 5.5 ft

Number of Inlets: Stormsewer inlet A 11oin inlet B 20in Size inlet C 10in Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 20in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae _____

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ garbage Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): crayfish

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

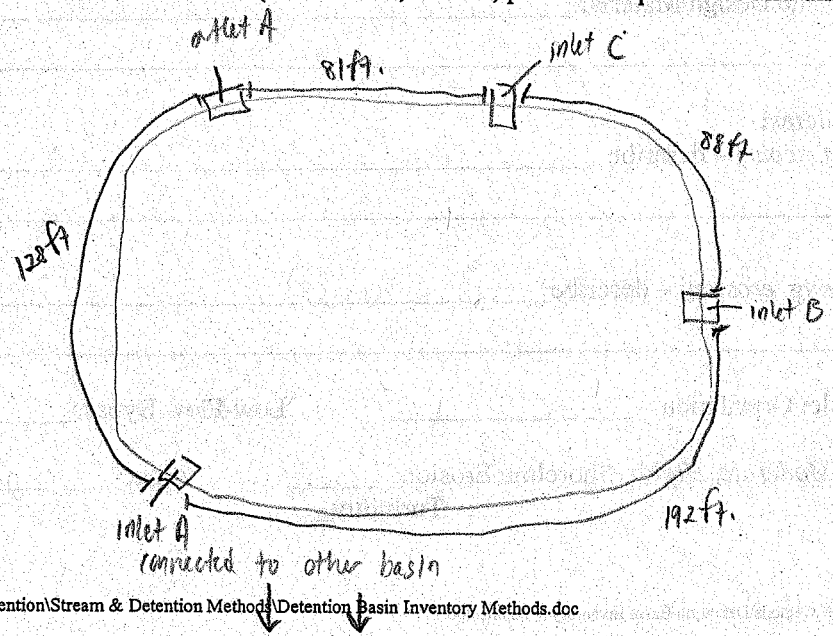
Other:_____

Preliminary Retrofit Opportunities (describe): replace turf grass with native vegetation
Fix inlets & outlets that have pipe separation and erosion

Photos:

Photo #	Description
1	basin 12679
2	basin 12680
3	inlet A (connected to other basin) 12681
4	gap in pipe / erosion at inlet A 12682
5	inlet B 12683
6	" 12684
7	inlet C 12685
8	outlet A 12686
9	gap in pipe on outlet A - hard to see b/c of thick vegetation 12687

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 161

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-8-07 / 935 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: Taylor Rd. & 19th St.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland macrophytes

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 0 - 12in : 1in Bank Height 1ft Buffer Width: none - 20ft.

Number of Inlets: Stormsewer inlet A Size 8in Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 18in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe rocks in front of and in opening of inlet B

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae low

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ grass clippings/garbage Excess Sediment Accumulation_____
Excess Woody Vegetation ✓ willows

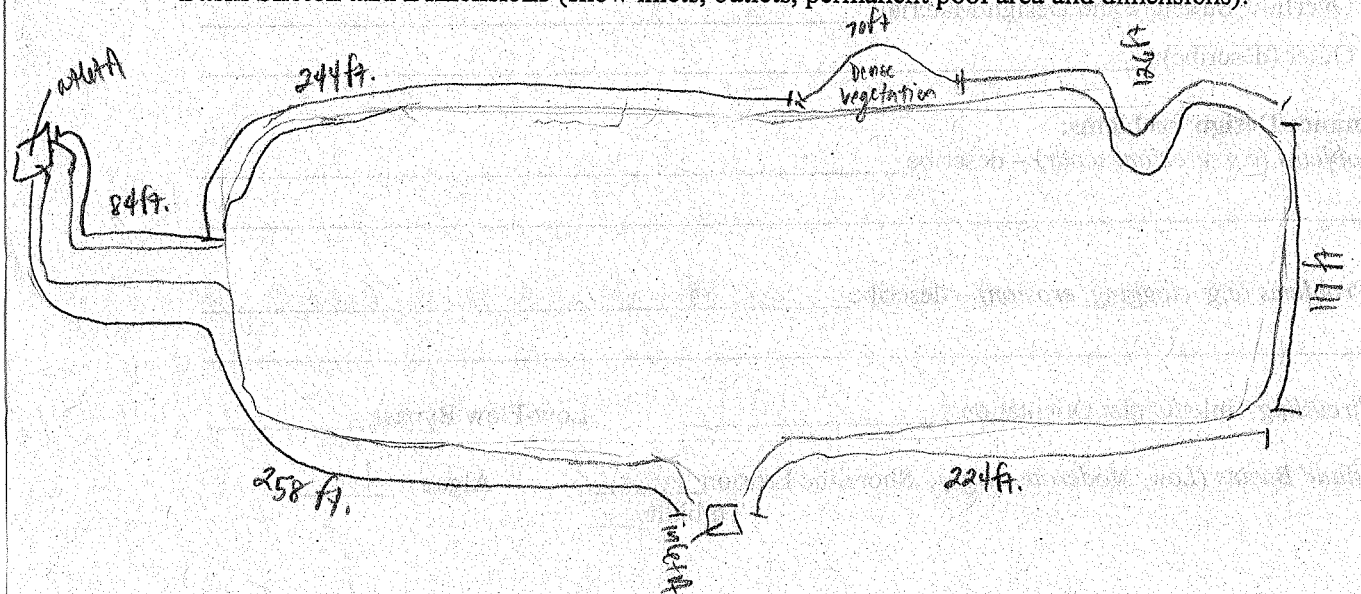
Other Observations:
Aquatic Life/ Wildlife (describe): mallards, frogs
Potential Safety Problems: erosion / sink holes along banks
Potential Nuisance Problems: bird poop
Evidence of Upstream Illicit Connections (describe):
Other Basin Uses (rec. field, etc):
Other:

Preliminary Retrofit Opportunities (describe): Replace surrounding turf grass with native vegetation, [illegible]

Photos:

Photo #	Description
1	inlet A 12688
2	basin 12689
3	basin 12690
4	basin 12691
5	nasty yellow-green chunky algae 12692
6	exit channel for outlet A from basin 12693
7	outlet A 12694
8	stone channel leading up to outlet A 12695
9	outlet A 12696
10	basin 12697

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 160

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-8-07 / 1010 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: Highland Rd. & 21st St.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) none Bank Height 1ft Buffer Width: 0 – 30ft

Number of Inlets: Stormsewer inlet A 18in metal Size _____ Channel/Swale _____ Size _____

inlet B 18in metal

Outlet Type(s) and Dimensions: Culvert: 2 @ 30in metal Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe No

both covered by vegetation

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae _____

Turbidity _____

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

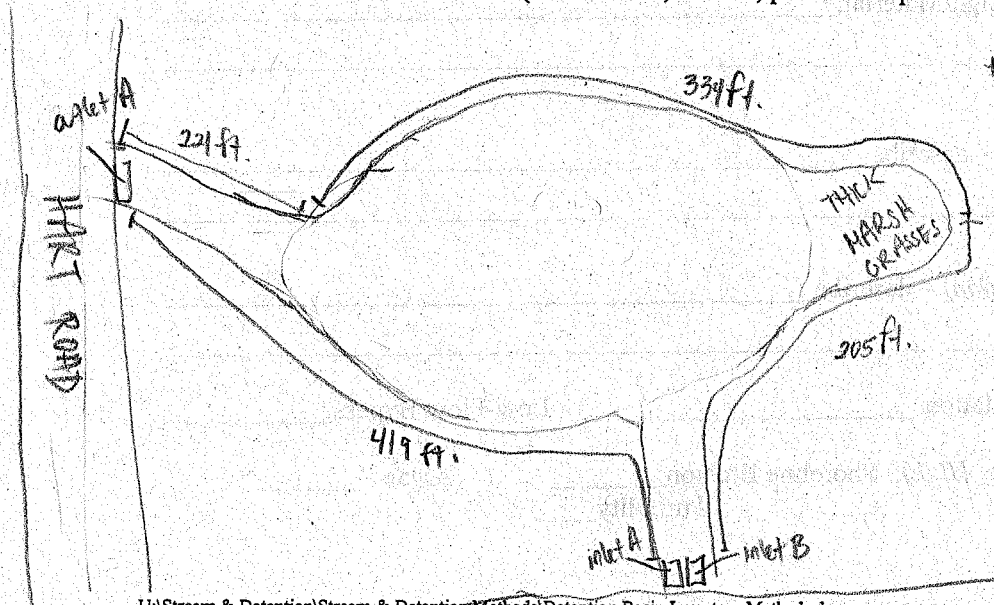
Other Observations:
Aquatic Life/ Wildlife (describe): canada geese
Potential Safety Problems:_____
Potential Nuisance Problems:_____
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): Replace turf grass with native vegetation
Remove vegetation covering inlets/outlet.
Note: very thick grasses around half of basin

Photos:

Photo #	Description
1	basin 12698
2	wetland area w/ thick marsh grasses 12699
3	inlet A 12700
4	inlet B 12701
5	inlet A 12702
6	inlet A & B 12703
7	basin 12704
8	outlet A 12705
9	outlet A 12706
10	H2O path to outlet A 12707
11	outlet A 12708

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



(21st St)
water flows in from stream under road into the basin thru the basin then exits storm sewer @ hart road.

DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 159

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-8-07 / 1116 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: Highland Rd. & 21st St.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 2in Bank Height 1-3ft. Buffer Width: 0 - ~50ft.
inlet A 30in

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____
outlet A 30in

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae low in basin but high in wetland

Turbidity high

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation ✓ maples & willows

Other Observations:
Aquatic Life/ Wildlife (describe): fish

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

Other:_____

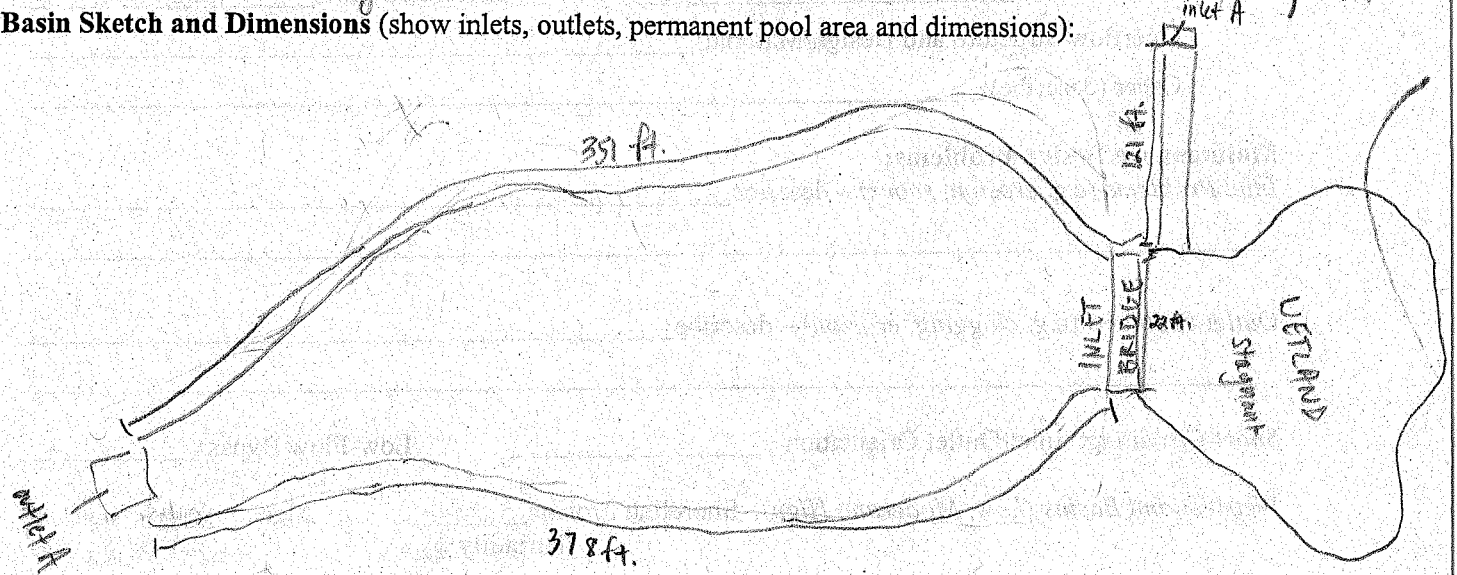
Preliminary Retrofit Opportunities (describe): Remove some trees, replace turf grass with native vegetation, remove rip rap from bank.

Photos:

Photo #	Description
1	outlet A 12716
2	basin 12717
3	basin 12718
4	basin 12719
5	wetland area, cattails, willow, algae and much more 12721
6	bridge 12720
7	wetland 12722
8	wetland 12723
~~9~~	~~wetland~~
10	inlet A 12724
11	from inlet to basin 12725
12	where water flowing from inlet A meets basin 12726
13	basin 12727

Note: could not get dimensions of wetland area, all sides were either cattails or thick tree/brush

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 158

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-8-07 / 1100 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: Highland Rd. & 24th St.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 0 → 12in: 1in Bank Height 1.5ft. Buffer Width: none
inlet A 8in

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____
outlet A 8in

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe plants blocking inlet A

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion high Algae _____
Turbidity low

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): fish

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe): foamy substance @ inlet A opening

Other Basin Uses (rec. field, etc):_____

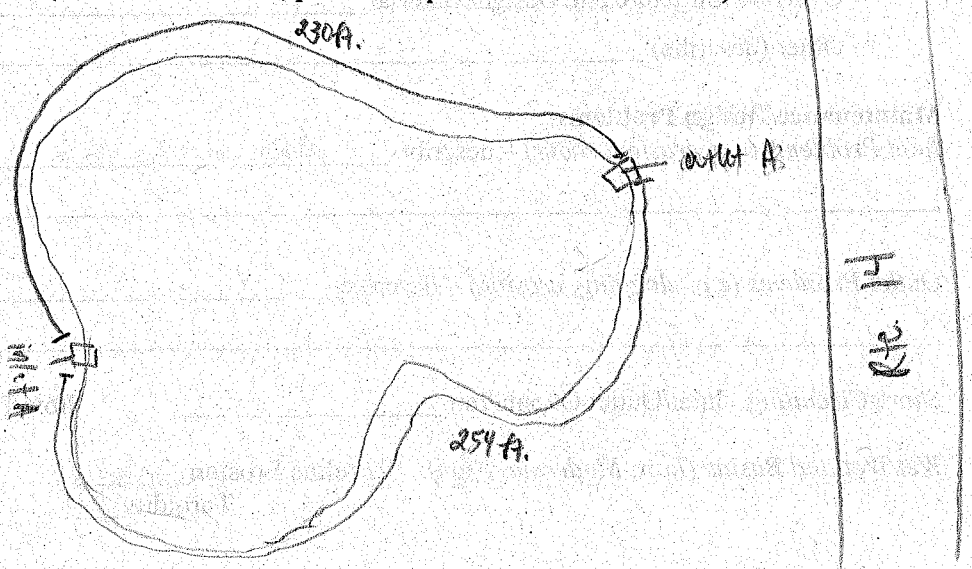
Other:_____

Preliminary Retrofit Opportunities (describe): replace turf grass with native vegetation

Photos:

Photo #	Description
1	basin 12709
2	inlet A 12710
3	inlet A 12711
4	bank erosion 12712
5	outlet A 12713
6	outlet A 12714
7	basin 12715
8	
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 157

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-8-07 / 1210 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: Pepper Rd. & Industrial Ave.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: commercial Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry ✓ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass ✓ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation _____ Other bark mulch

Slope (Horizontal:Vertical) 12in : 3in Bank Height 3ft. Buffer Width: none

Number of Inlets: Stormsewer Inlet A 10in Inlet B 14in Size _____ Channel/Swale _____ Size _____

Inlet C 10in

Outlet A 10in

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae _____

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe):_____

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc): recreation, near a day care center

Other:_____

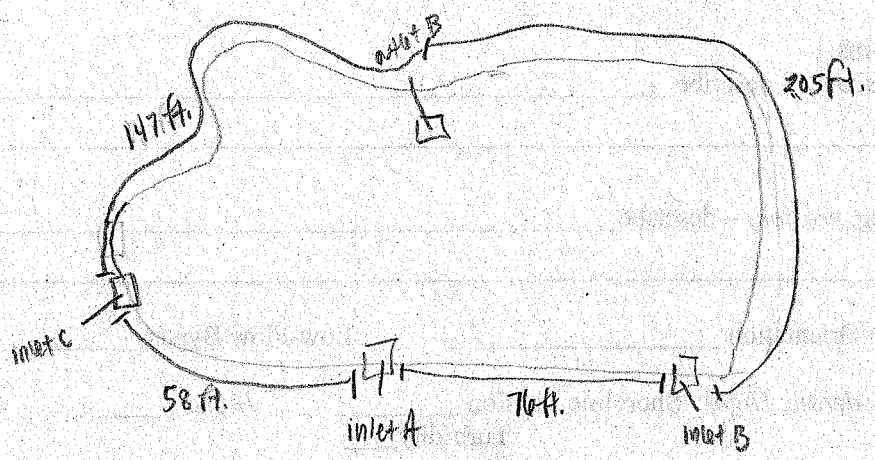
Preliminary Retrofit Opportunities (describe): put grates over inlets to protect kids
plant native veg in place of turf grass if possible.

Photos:

Photo #	Description
1	inlet A 12728
2	inlet B 12729
3	basin 12730
4	basin 12731
5	outlet A 12732
6	inlet C 12733
7	basin 12734
8	
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):

3/4 of basin bank lined w/ bark mulch.



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 156

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-6-07 / 930 Temperature _____ Rainfall (now, 12, (24), 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: Good Shepherd Hosp. back lot

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: _____ Year Constructed: _____

Basin Design Features: Not able to get to basin - left fence w/ barb wire

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass _____ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) _____ Bank Height _____ Buffer Width: _____

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae _____

Turbidity _____

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe):_____

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

Other:_____

Preliminary Retrofit Opportunities (describe):_____

Photos:

Photo #	Description
	12587
	12588
	12589 general basin pic able to get thru fence
	12590
	12591

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):

DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 155

Basin Name (subdivision and/or property owner): Smith Proffesional Center

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-6-07/ 1420 Temperature 70 Rainfall (now, 12, (24), 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: Office Bldg. Rt 22 west of Flint Creek

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: commercial Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry _____ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass _____ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) none Bank Height none Buffer Width: 100+ feet

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe NONE FOUND low lying area in which everything drains

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae low

Turbidity _____

citizens for conservation

Tom Vanderpool

Luke Thominet

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): birds, frogs
Potential Safety Problems:_____
Potential Nuisance Problems:_____
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): NONE

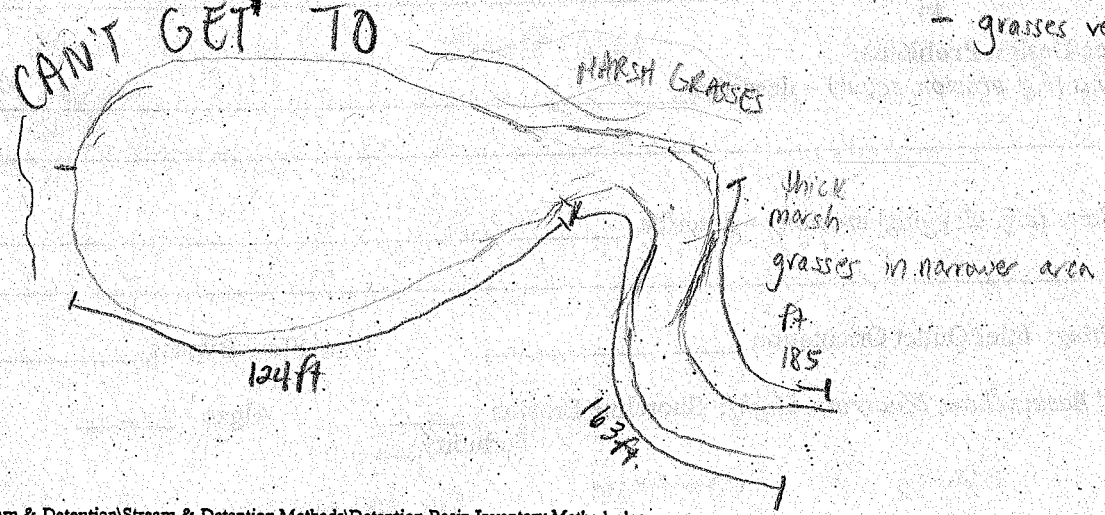
Photos: NOTE: might be used as a basin but definately more of a wetland; Couldn't reach one side b/c of mud & dense grasses

Photo #	Description
1	wetland 12635
2	wetland 12636
3	narrower area with marsh grasses 12637
4	" 12638
5	" looking E from Pt. 22 direction 12639
6	wetland 12640
7	wetland 12641
8	wetland 12642
9	
10	

Note: Area sits very low w/ not much elevation

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):

measured to areas where it appeared water could reach - grasses very dense



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 154

Basin Name (subdivision and/or property owner): Swannah

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-6-07 / 1303 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: Swannah Ct. cul de sac

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry _____ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass _____ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 2in Bank Height 0 - 5ft Buffer Width: 30 - 100 ft

Number of Inlets: Stormsewer _____ Size inlet A 4in inlet B, C, D 22in inlet E - 10in Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet B, C, D have nasty algae & openings

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae moderate

Turbidity _____

Contact Citizens for conservation

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): Sandhill cranes, plovers, mallards, frogs

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

Other: Called a wildlife refugee - spoke to someone from Citizens for conservation (NFP)

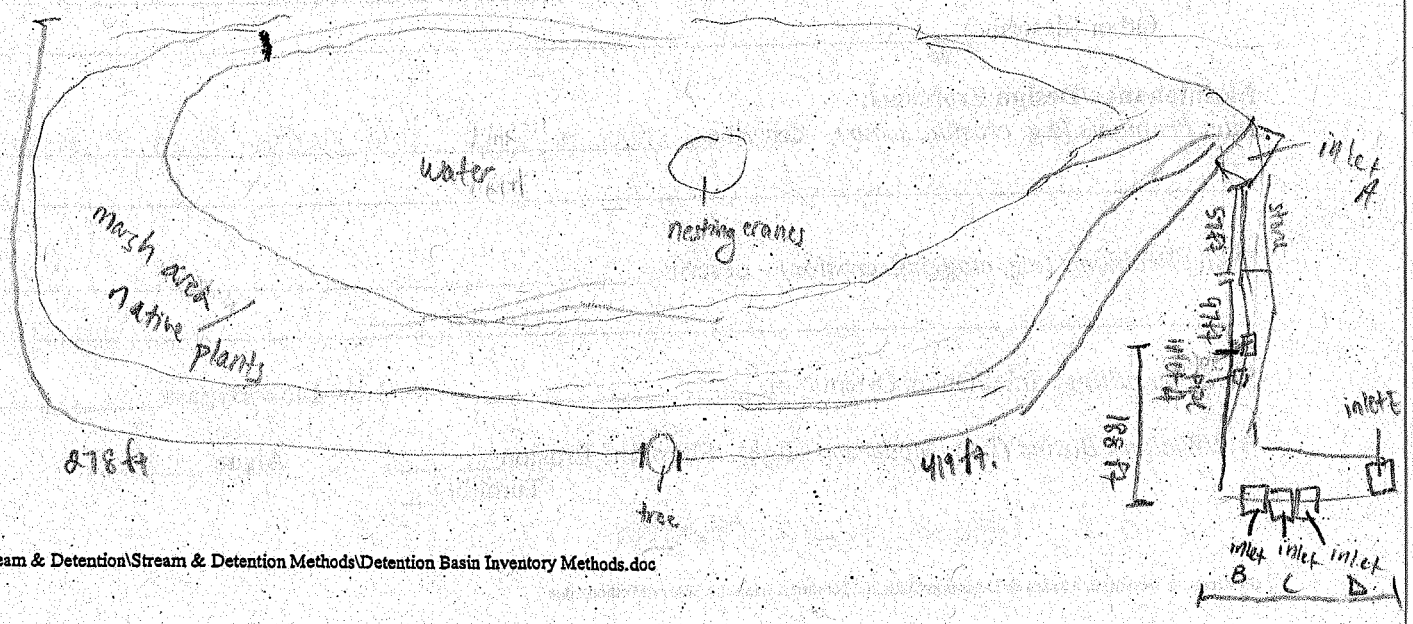
Preliminary Retrofit Opportunities (describe): Clean up inlets. Remove rip rap from inlet areas and replace with native vegetation.

Photos: Note: could not complete basin dimensions - nesting Sandhill Crane nests & other nesting birds. Wetland conservation area

Photo #	Description
1	basin 12617
2	basin/surrounding wetland area 12618
3	basin 12619
4	wetland grasses 12620
5	basin 12621
6	channel - stone 12622
7	channel stone path looking towards road 12623
8	channel stone path looking toward basin 12624
9	inlet grass path leading toward road 12625
10	inlet A 12626
11	pipe - perhaps to swimming pool, doesn't seem to drain 12627
12	" - close up 12628 (didn't think drains any H_2O to basin)
13	inlet B 12629
14	inlet C 12630
15	inlet D 12631
16	inlets B, C, & D 12632
17	inlet E 12633
18	drainage from street to basin 12634
19	12635

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):
NO DIMENSIONS THIS SIDE

stone path width ~32 in



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 153

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-6-07 / 930 Temperature _____ Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: Good Shepherd Hosp. Back lot

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: _____ Year Constructed: _____

NOT ABLE TO GET TO BASIN - 6ft fence w/ barb wire

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass _____ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) _____ Bank Height _____ Buffer Width: _____

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae _____

Turbidity _____

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe):_____

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

Other:_____

Preliminary Retrofit Opportunities (describe):_____

_____

_____

Photos:

Photo #	Description
	12587
	12588
	12589
	12590
	12591

general basin pic able to get thru fence

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):

DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 152

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-6-07 930 Temperature _____ Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: Good shepherd Hosp. Back lot

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: _____ Year Constructed: _____

NOT ABLE TO GET TO BASIN - 6ft. fence w/ barb wire

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass _____ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) _____ Bank Height _____ Buffer Width: _____

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae _____

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe):_____

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

Other:_____

Preliminary Retrofit Opportunities (describe):_____

_____

_____

Photos:

Photo #	Description
	12587
	12588
	12589 general basin pic able to get thru fence
	12590
	12591

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):

DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 151

Basin Name (subdivision and/or property owner): Deer Run Field

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-5-07 / 940 Temperature 70 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: Fieldstone Ct. cul de sac

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry ✓ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass ✓ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 2in Bank Height 5.5ft Buffer Width: none

Number of Inlets: Stormsewer inlet A 14in inlet B 4in inlet C 12in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 12in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae _____

Turbidity _____

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

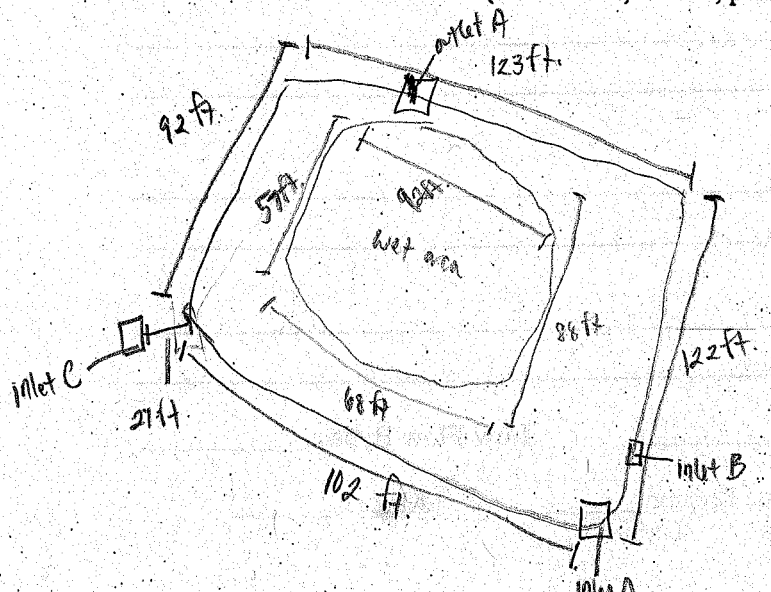
Other Observations:
Aquatic Life/ Wildlife (describe):_____
Potential Safety Problems: uncovered sewer / culvert
Potential Nuisance Problems:_____
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): replace turf grass with native vegetation
put grate covers over inlets to protect nearby kids

Photos: Note: not sure if this would be considered wetland or dry, or both?

Photo #	Description
1	basin 12491
2	basin 12492
3	inlet A 12493
4	inlet A 12494
5	basin while standing in basin 12495
6	inlet B 12496
7	outlet A 12497
8	inlet C 12498

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



measured along edge of basin

DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 150

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-5-07 / 900 Temperature 65 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: River Rd & Cranberry Ct.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) none 12in : 3in Bank Height Ht. 5ft Buffer Width: bfy. - 30ft * different on different sides of basin

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe channels erode, dirt or mow across turf grass into basin

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae low

Turbidity _____

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

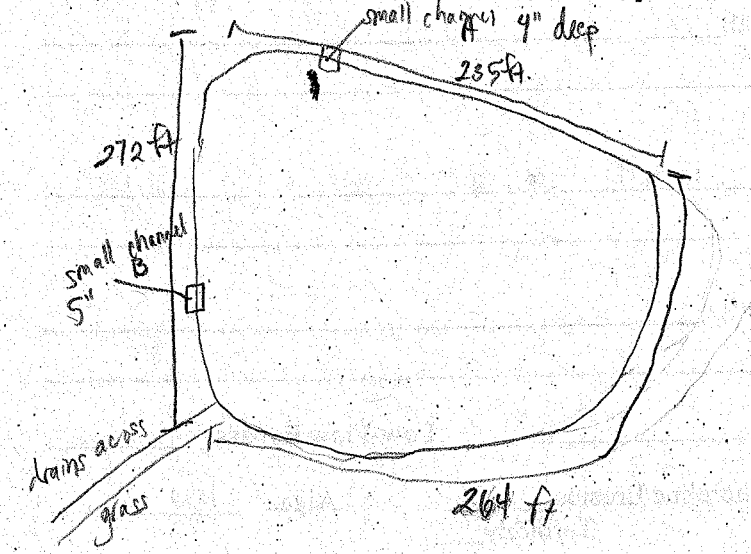
Other Observations:
Aquatic Life/ Wildlife (describe): birds, frogs
Potential Safety Problems:_____
Potential Nuisance Problems:_____
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): replace turf grass with native vegetation

Photos: - small channels lead to basin, some barely noticeable, some just across turf grass
NO INLETS OR OUTLETS FOUND

Photo #	Description
1	basin 12484
2	basin 12485
3	basin 12486
4	basin 12487
~~5~~	~~basin?~~
6	small channel A 4" deep 12488
7	small channel B 5" deep 12489
8	draining across grass to basin (difficult to see) 12490

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 149

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: Wynstone

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-22-07 / 1400 Temperature 85 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Avon Quarter Section: _____

Nearest Cross Streets: Haversham Ln. cul de sac

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other ✓ dirt

Side Slopes: Turf Grass ✓ Rip Rap J Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12 in : 3in Bank Height 2 Buffer Width: NONE

Number of Inlets: Stormsewer inlet G — 10 in. concrete inlet A - F Size 4in plastic Channel/Swale _____ Size _____

12in concrete

Outlet Type(s) and Dimensions: Culvert: outlet A Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe covered w/ stringy algae (esp inlet G)

Outlet Problems (e.g. clogging, erosion) – describe leaf litter algae @ opening of outlet A

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae Moderate (wood clumpy stringy algae)

Turbidity moderate

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

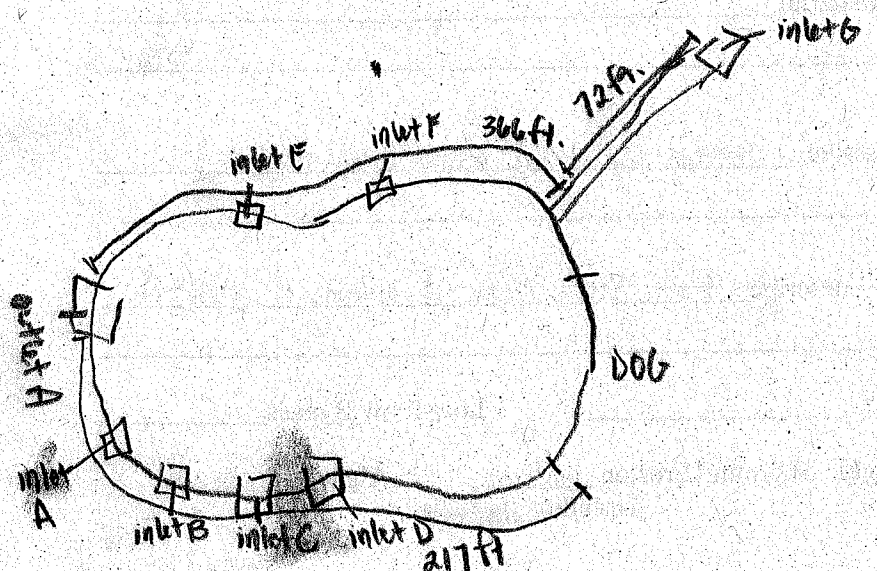
Other Observations:
Aquatic Life/ Wildlife (describe): frogs, fish
Potential Safety Problems: bank erosion
Potential Nuisance Problems: weird algae, geese poop
Evidence of Upstream Illicit Connections (describe): algae looks unnatural
Other Basin Uses (rec. field, etc):
Other:

Preliminary Retrofit Opportunities (describe): replace all surrounding turf grass with native species

Photos: Note: DOG kept me from small portion of basin

Photo #	Description
1	basin 12175
2	basin 12176
3	outlet A 12177
4	erosion 12178
5	inlet A 12179
6	outlet B 12180
7	nasty weird looking algae 12181
8	inlet C 12182
9	inlet D 12183
10	inlet E 12184
11	inlet F 12185
12	inlet G path 12186
13	inlet G - lots of algae 12187
14	algae @ inlet G 12188
15	basin 12189

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 148

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: Wynstone

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-22-07 / 1500 Temperature 85 Rainfall (now, 12, 24, 48 hours, (week) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: Stratham Circle cul de sac

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other rip rap

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other bark mulch

Slope (Horizontal:Vertical) 2in : 1in Bank Height 1.5 Ft. Buffer Width: none

Number of Inlets: Stormsewer inlet A 12 in concrete inlet B Size 12 in concrete Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: NONE Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet A has bark mulch in it.

Outlet Problems (e.g. clogging, erosion) – describe None found

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae low

Turbidity high

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation ✓ big hanging willows

Other Observations:
Aquatic Life/ Wildlife (describe): fish

Potential Safety Problems: erosion on banks

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

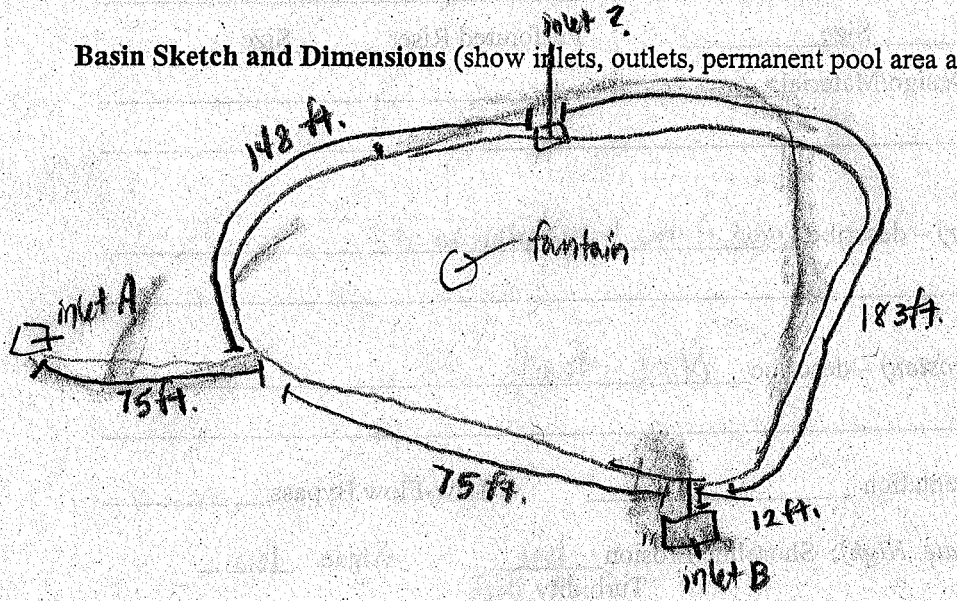
Other:_____

Preliminary Retrofit Opportunities (describe): remove turf grass & riprap banks replace with native vegetation. Cut back willows and other overhanging trees

Photos: Note: inlet A flows across grass to get to basin & B

Photo #	Description
1	basin 12190
2	basin 12191
~~3~~	~~oops!~~
~~4~~	~~basin~~
5	grass turf leading up to inlet A — dry 12194
6	inlet A 12195
7	inlet B 12196
8	inflow of some kind — no source comes out of ground 12197
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 147

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-11-07 / 1335 Temperature 85 Rainfall (now, 12, 24, 48 hours, (week)) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: Crestview Dr. & Woodland Ave.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass _____ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 2in Bank Height 1-2 ft Buffer Width: 6-50+ (surrounded by woods on 3 sides)

Number of Inlets: Stormsewer inlet A 12in inlet B 12in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae high

Turbidity low

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation ✓ abundance

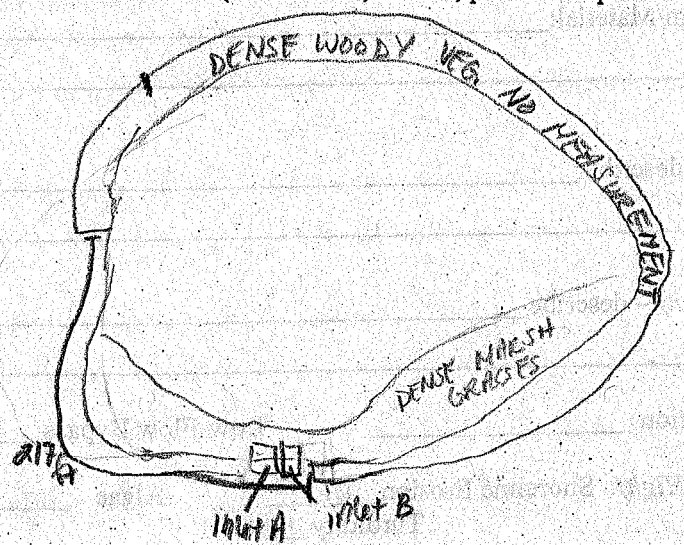
Other Observations:
Aquatic Life/ Wildlife (describe): frogs, birds
Potential Safety Problems: rocks around inlet area
Potential Nuisance Problems:_____
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): remove rip rap from above inlets. Cut back woody vegetation and brush

Photos: Note: More than 3/4 of basin was dense woody veg & brush. Could not access these areas for measurements.

Photo #	Description
1	basin 12853
2	basin 12854
3	inlet A & B 12855
4	inlet A 12856
5	inlet B 12857
6	basin 12858
7	dense woody vegetation on bank 12859

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 14b

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-11-07 / 1243 Temperature 85 Rainfall (now, 12, 24, 48 hours, (week)) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: Lake Zurich Rd & Lake Shore Dr.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 0 - 12in : 3in Bank Height 1 - 3 ft Buffer Width: 0-30ft

Number of Inlets: Stormsewer inlet A - 2 inlet B - 10 inlet C 20in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A - look @ pics Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe thick algae @ inlet C, inlet A is buried in sediment and plants

Outlet Problems (e.g. clogging, erosion) – describe outlet A has plants blocking opening

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae high

Turbidity moderate

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation ✓

Other Observations:
Aquatic Life/ Wildlife (describe): geese, ducks, frogs, fish
Potential Safety Problems:_____
Potential Nuisance Problems: geese / duck poop
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): Remove turf grass on banks & replace with native vegetation. Remove some trees that are overhanging the banks.

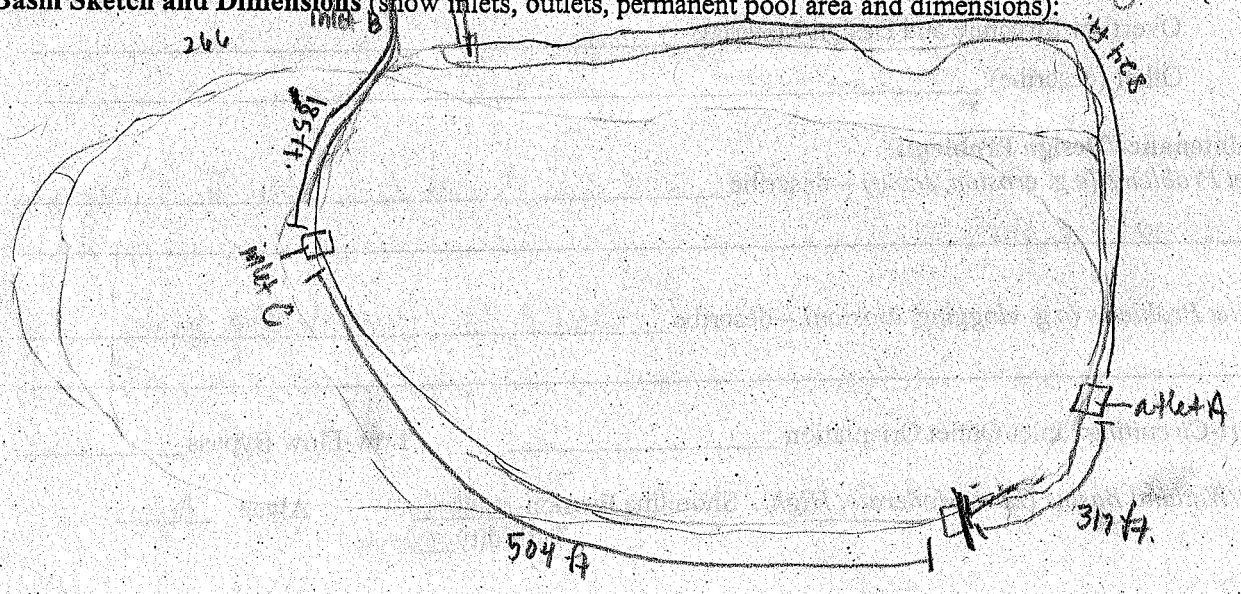
Photos: Note: inlets A & B are in a thickly vegetated wetland area draining into basin

Photo #	Description			
1	basin	12839	10 inlet A	12848 / 12849
2	basin	12840	11 inlet B	12850 / 12851
3	basin	12841	12 inlet B	12851
4	basin	12842	13 inlet C - note thicky algae	12852
5	outlet A	12843	14	
6	"	12844	15	
7	"	12845		
8	top of outlet A	12846		
9	basin	12847		
290 A		266 ft	inlet A	

Note: could not get close enough to outlet A to measure b/c of unstable ground

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):

457
266
290



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 145

Basin Name (subdivision and/or property owner): Chippendale

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-11-07 / 1217 Temperature 85 Rainfall (now, 12, 24, 48 hours, (week)) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: Oak Rd. Cul de Sac

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other ✓ dirt

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 3.5in → 12in : 5in Bank Height 5.5ft. Buffer Width: none

Number of Inlets: Stormsewer inlet A > 36in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: ✓ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae high

Turbidity low

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation ✓ willows

Other Observations:
Aquatic Life/ Wildlife (describe):_____

Potential Safety Problems: erosion holes covered by grass

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

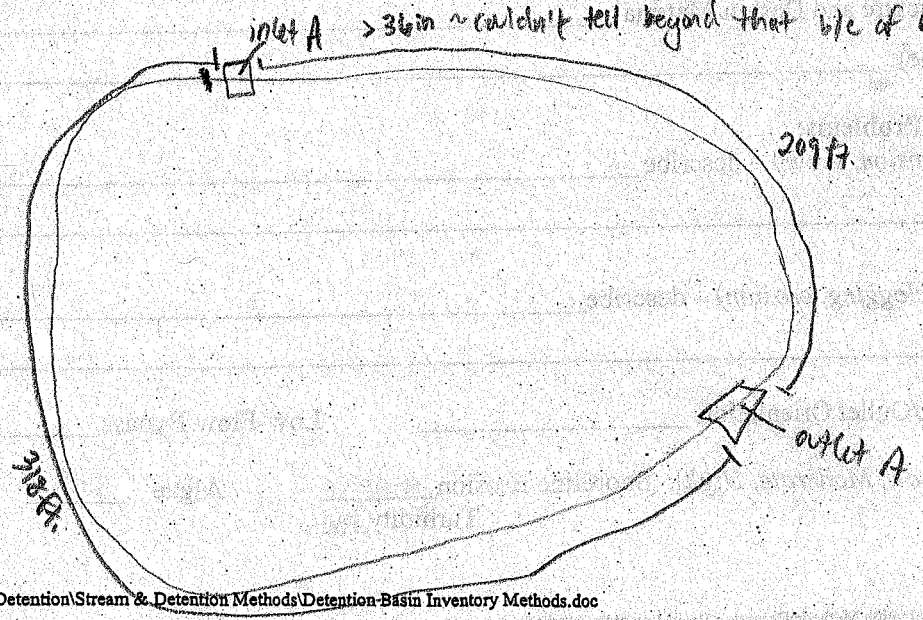
Other:_____

Preliminary Retrofit Opportunities (describe): remove turf grass from banks & replace with native vegetation

Photos:

Photo #	Description
1	basin 12829
2	basin 12830
3	inlet A 12831
4	inlet A 12832
5	weir outlet A - flows directly out thru open side 12833
6	weir outlet A 12834
7	weir outlet A 52 inches across top 12835
8	weir outlet A - inside 12836
9	" 12837
10	basin ~ outlet 12838

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 144

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-11-07 / 1138 Temperature 85 Rainfall (now, 12, 24, 48 hours, (week)) _____

Location:

Political Jurisdiction: _____ Township: Alba Quarter Section: _____

Nearest Cross Streets: Carriage Trail north of cul de sac

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry ✓ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass ✓ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other rip rap

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 4in Bank Height 4-6 ft. Buffer Width: none

Number of Inlets: Stormsewer inlet A 8in inlet B 8in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 8in outlet B 4in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe both inlets have grass clogging opening

Outlet Problems (e.g. clogging, erosion) – describe outlet B drains directly into outlet A

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae _____

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): frogs

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

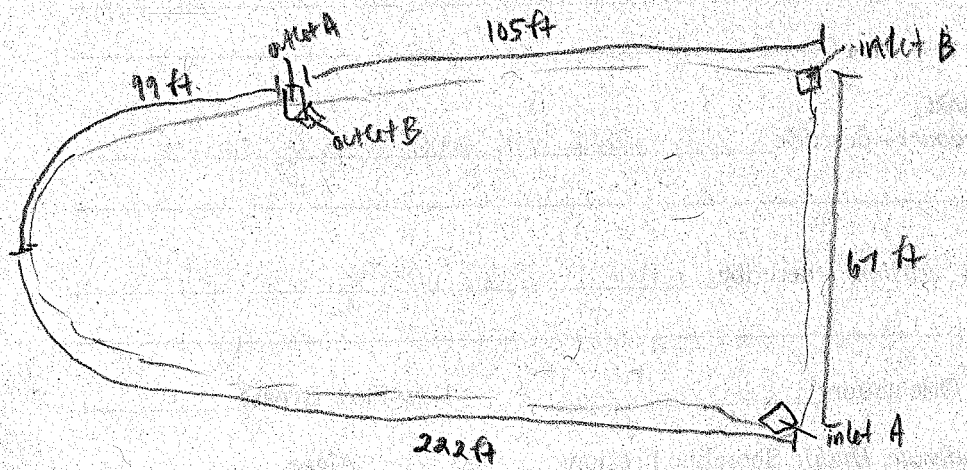
Other:_____

Preliminary Retrofit Opportunities (describe): remove outlet B, b/c it dumps directly into outlet A rather than allowing for settling in basin. Remove turf grass and riprap and replace with native vegetation. Remove grass and sediment from all inlets & outlets.

Photos: - black pipe dumps directly into outlet A

Photo #	Description
1	basin 12822
2	basin 12823
3	inlet A 12824
4	inlet B 12825
5	basin 12826
6	outlet A 12827
7	outlet A + black pipe (outlet B) 12828
8	
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 143

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-13-07 / 1220 Temperature 85 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Old Farm Rd & Hummingbird Ct.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other dirt, rip rap

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 2in Bank Height 3 ft. Buffer Width: 0 to 2 ft.

Number of Inlets: Stormsewer inlet B 12in Size inlet D 4in Channel/Swale _____ Size inlet A 24in inlet C 4in inlet E unk inlet F 4in. inlet G & H 4in inlet I 22in inlet J 4in inlet K 4in inlet L 4in inlet M & N 4in inlet O 4in

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: yes Size 12in Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet D is below surface of water, rocks infront of inlet I. Algae on all inlet pipes found underwater (~4in pipes)

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion high Algae low

Turbidity moderate

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation ✓

Other Observations:
Aquatic Life/ Wildlife (describe):_____

Potential Safety Problems:_____

Potential Nuisance Problems: bird poop

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

Other:_____

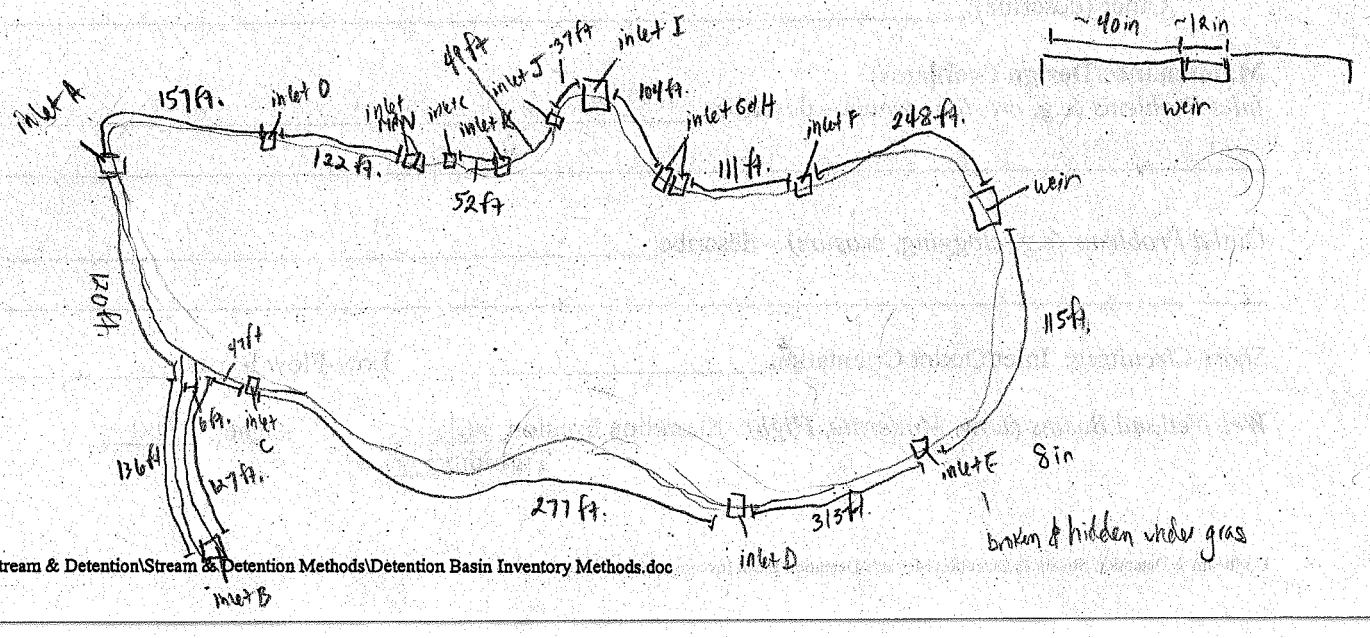
Preliminary Retrofit Opportunities (describe): replace turf grass with native vegetation. Remove riprap from along shoreline. Fix inlet E (weir). Remove some of overhanging trees

Photos:

Photo #	Description						
1	basin	12899	11.	broken off part of inlet E	12909	21 inlet I	12919
2	inlet A	12900	12	basin	12910	22 inlet J underwater	12920
3	inlet A	12901	13	weir	12911	22 inlet K underwater	12921
4	stone path	12902	14	"	12912	23 inlet L	12923
5	inlet B	12903	15	"	12913	24 inlet M & N	12922
6	inlet C	12904	16	" broken shelf ?	12914	25 inlet O	12924
7	basin	12905	17	weir	12915		
8	inlet D	12906	18	inlet F	12916		
9	inlet F	12907	19	inlet G & H	12917		
10	inlet E	12908	20	"	12918		

36
36
32
104

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 142

Basin Name (subdivision and/or property owner): The Garlands of Barrington

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-21-07 / 742 Temperature 70 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: Valencia Ave & Garlands Ln.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other dia / rip rap

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other flowers

Slope (Horizontal:Vertical) 12in : 3in Bank Height 3-6ft. Buffer Width: none - 25ft.

Number of Inlets: Stormsewer inlet A 12in inlet B 8in Size inlet C 16in Channel/Swale _____ Size _____

outlet A 16in

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae low

Turbidity low

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

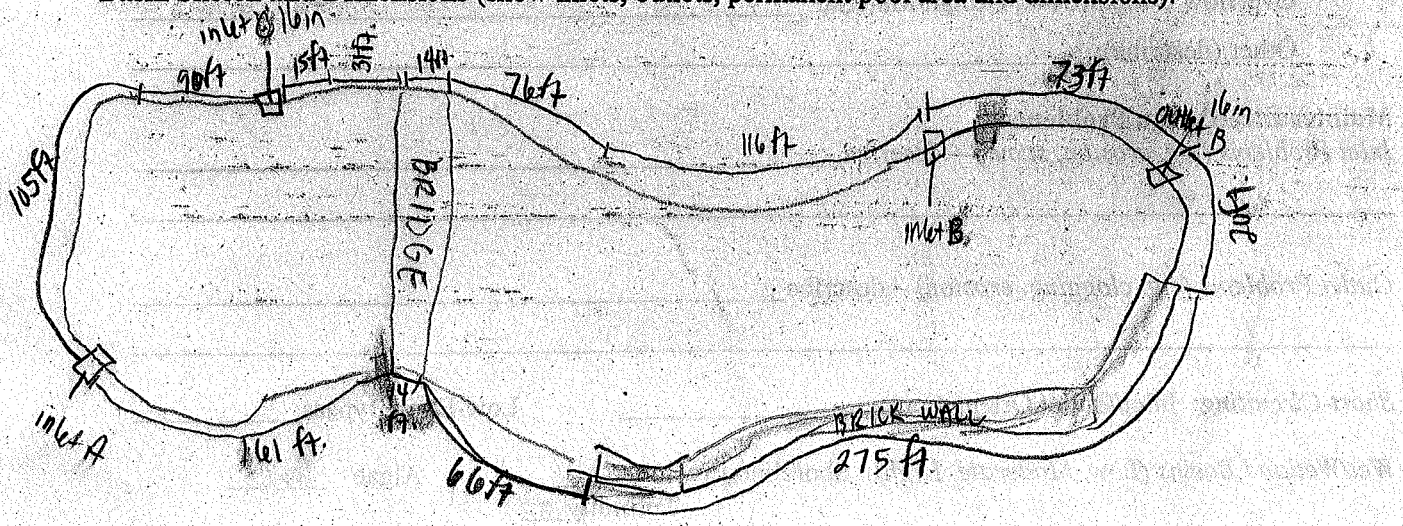
Other Observations:
Aquatic Life/ Wildlife (describe): frogs
Potential Safety Problems:_____
Potential Nuisance Problems:_____
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): Replace surrounding vegetation and rip rap shoreline with native vegetation.

Photos:

Photo #	Description	
1	basin	13354
2	inlet A	13355
3	basin	13356
4	inlet A	13357
5	basin	13358
6	inlet B	13359
7	basin	13360
8	inlet B	13361
9		
10		

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 141

Basin Name (subdivision and/or property owner): The Garlands

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-20-07/901 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: Northwest Hwy & Valencia Ave

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other dia

Side Slopes: Turf Grass _____ Rip Rap ✓ Native Vegetation ✓ Other flowers/bushes

Slope (Horizontal:Vertical) 12in : 3in Bank Height 4-6ft Buffer Width: 20 - 40ft

Number of Inlets: Stormsewer inlet A 2in inlet B 2in Size inlet C 14in inlet D 8in Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 10in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae _____

Turbidity high

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): frogs

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

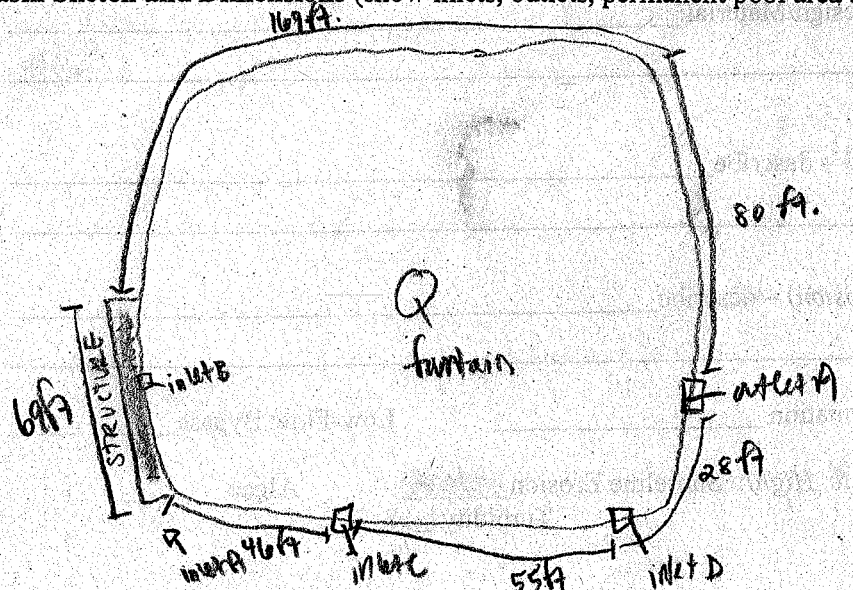
Other:_____

Preliminary Retrofit Opportunities (describe): Replace surrounding vegetation and riprap with native vegetation.

Photos:

Photo #	Description
1	basin 13272
2	design structure 13273
3	inlet A - on hillside amongst bushes 13274
4	inlet B - underneath structure could not reach 13275
5	inlet D 13276
6	outlet A 13277 & 13278
7	basin 13279
8	basin 13280
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 140

Basin Name (subdivision and/or property owner): Barrington Public Safety

Maintenance Responsibility: City

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-20-07 / 806 Temperature 75 Rainfall (now, 12, 24, (48) hours, week) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: Northwest Hwy & Valencia Ave

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: Institutional Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other DA, rip rap

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 3in inlet A 22in Bank Height 4ft. Buffer Width: 8ft. - 95ft.

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 8in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet A completely submerged

Outlet Problems (e.g. clogging, erosion) – describe outlet A has plants growing up into opening

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae _____

Turbidity high

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation ✓

Other Observations:
Aquatic Life/ Wildlife (describe):_____

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

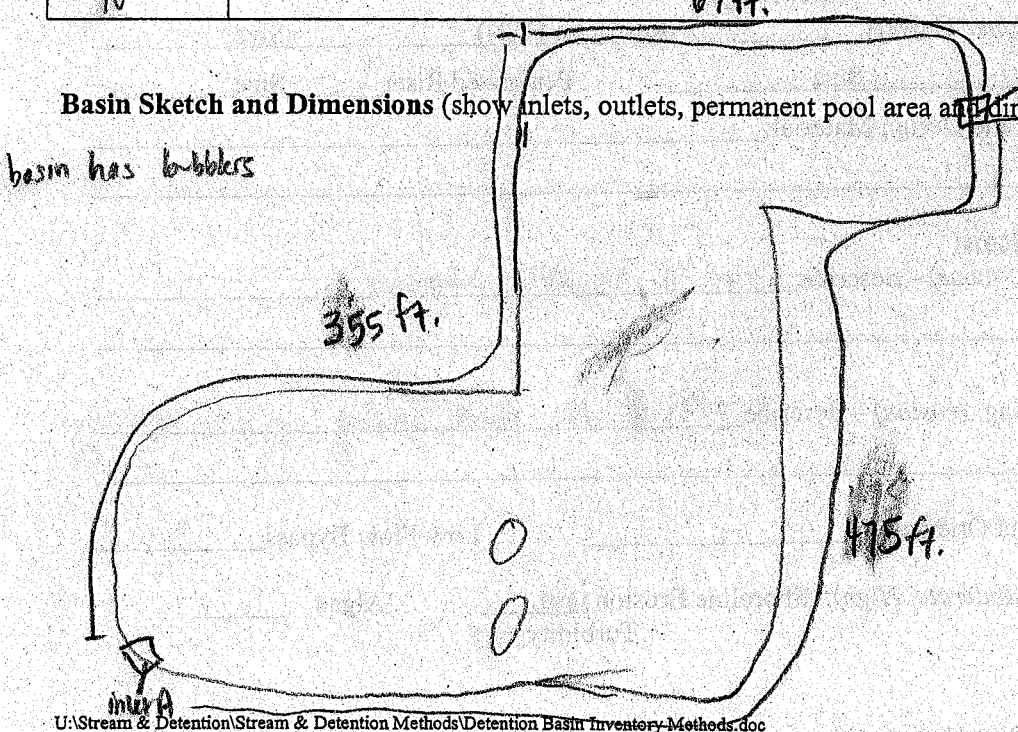
Other:_____

Preliminary Retrofit Opportunities (describe): Replace any surrounding turf grass and rip rap w/ more native vegetation. Cut back some of woody vegetation. Remove some of vegetation from infront of outlet B

Photos:

Photo #	Description
1	basin 13267
2	inlet A 13268
3	outlet A 13269
4	basin 13270
5	basin 13271
6	
7	
8	
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 139

Basin Name (subdivision and/or property owner): The Garlands

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-20-07/1030 Temperature 80 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: Whitney Dr. & Verne Circle

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass _____ Rip Rap _____ Native Vegetation _____ Other dirt

Slope (Horizontal:Vertical) _____ Bank Height _____ Buffer Width: none

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 12in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems: BASIN FILLED IN DURING CONSTRUCTION OF

Inlet Problems (e.g. erosion, scour) – describe NEW NEARBY HOUSES COMPLEX

WILL BE REWORKING BASIN ONCE CONSTRUCTON IS DONE

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion high Algae _____

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris____ ✓ construction litter Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe):_____

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

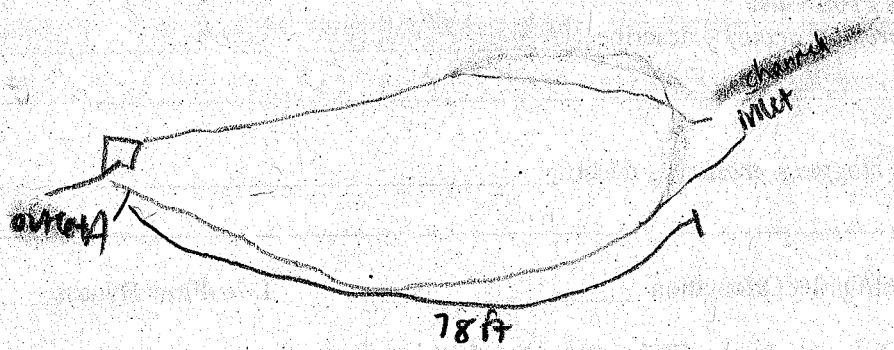
Other:_____

Preliminary Retrofit Opportunities (describe): NEEDS TO BE REDONE after construction is completed.

Photos:

Photo #	Description
1	basin 13292
2	outlet 13293
3	basin 13294
4	channel inlet 13295
5	basin 13296
6	
7	
8	
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 138

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-20-07 / 740 Temperature 70 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: Whitney Dr. & Verne Circle

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland dirt

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in:3in Bank Height 5-6ft Buffer Width: none

Number of Inlets: Stormsewer inlet A 8in inlet B 12in Size inlet C 20in inlet D 20in Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 8in outlet B 10in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet A & C flows over grass and eroding grass.

Outlet Problems (e.g. clogging, erosion) – describe outlet B has sediment & grass growing @ opening

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae low

Turbidity high

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation ✓ willows

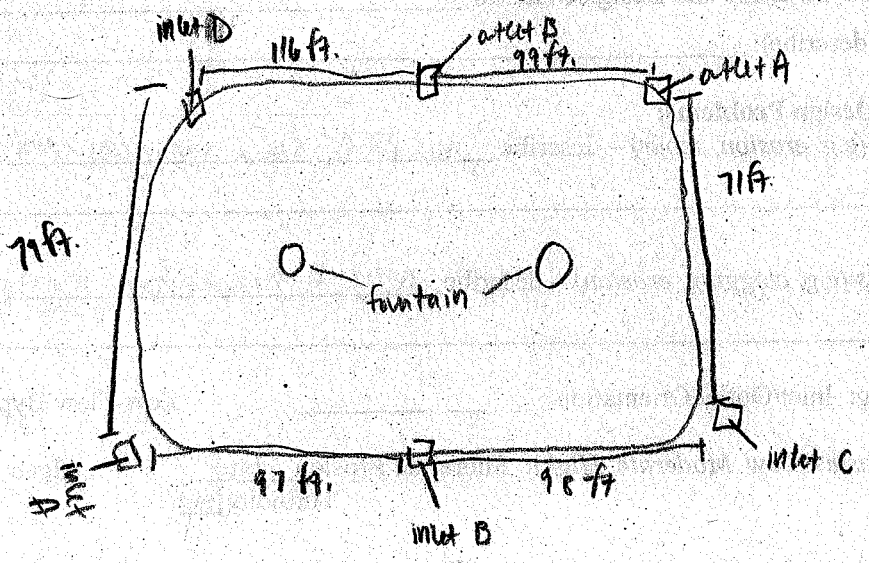
Other Observations:
Aquatic Life/ Wildlife (describe): mallards, blue heron
Potential Safety Problems:_____
Potential Nuisance Problems:_____
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): Replace turf grass w/ native vegetation. Remove some willow trees from bank

Photos:

Photo #	Description
1	basin 13259
2	inlet A 13260
3	inlet B 13261
4	inlet C 13262
5	basin 13263
6	outlet A 13264
7	outlet B 13265
8	inlet D 13266
9	~~inlet~~ 30
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 137

Basin Name (subdivision and/or property owner): The Garlands

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-20-07 / 940 Temperature 80 Rainfall (now, 12, 24, 48 Hours, week) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: Garlands Ln.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: _____ Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland dirt

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation ✓ Other brick wall

Slope (Horizontal:Vertical) 12in : 2in Bank Height 3-5ft. Buffer Width: 12ft. wall ~8ft high

Number of Inlets: Stormsewer inlet A unk inlet B 32 Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: ✓ corr. plastic 12in

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae _____

Turbidity high

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation ✓

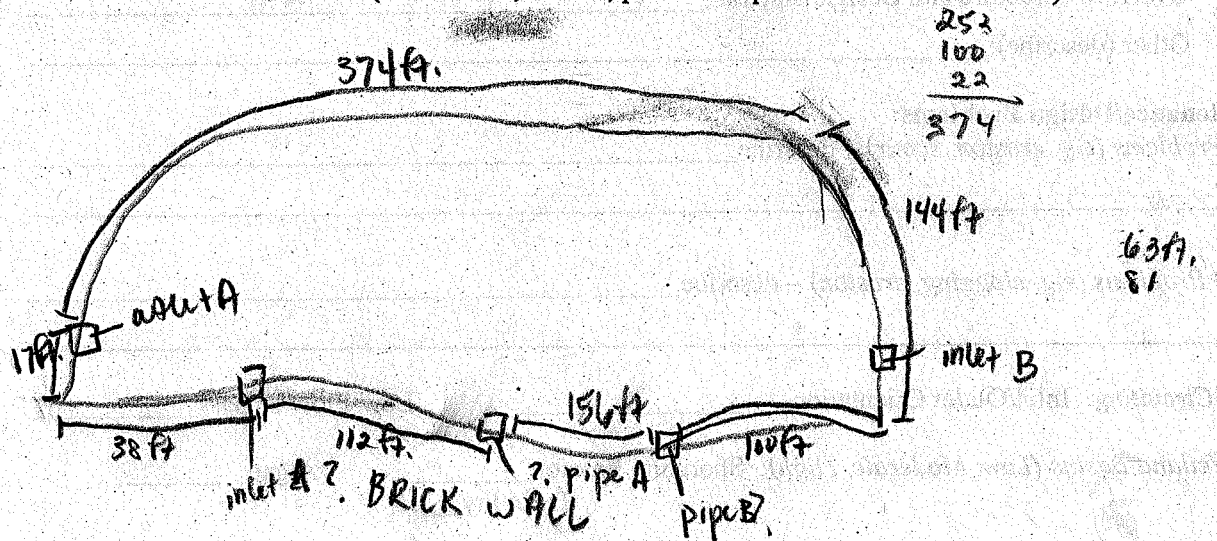
Other Observations:
Aquatic Life/ Wildlife (describe): frogs, mallards, heron
Potential Safety Problems:_____
Potential Nuisance Problems:_____
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): Remove some of woody vegetation. Do something about brick wall?

Photos:

Photo #	Description
1	basin 13281
2	inlet A ? along wall 13282
3	inlet A ? " 13283
4	pipe A? along wall 13284
5	pipe B ? " 13285
6	inlet B 13286
7	basin 13287
8	pipe B ? from opposite side of basin 13288
9	inlet A overflow structure 13289
10	" 13290
11	" 13291

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



6317.81

DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 136

Basin Name (subdivision and/or property owner): behind Church

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-20-07/ 1147 Temperature 80 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Castle Ct. cul de sac

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: Institutional Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry ✓ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass ✓ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation _____ Other concrete

Slope (Horizontal:Vertical) 12in : 5in. Bank Height 5-6ft. Buffer Width: none

Number of Inlets: Stormsewer inlet A 4in inlet B 4in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): manhole - look @ pic

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet A crushed

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae _____

Turbidity _____

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris √ garbage Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe):_____

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

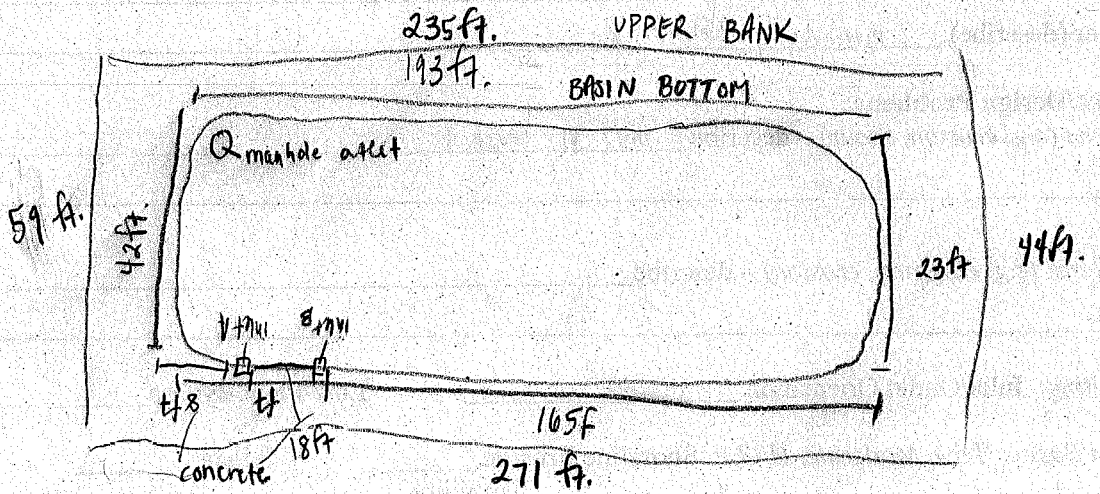
Other:_____

Preliminary Retrofit Opportunities (describe): replace turf grass w/ native vegetation
Remove cement block w/ inlet A & B - redo.

Photos:

Photo #	Description
1	basin 13305
2	basin 13306
3	manhole outlet 13307
4	" 13308 ⇒ 13309 Basin
5	inlet A 13309
6	inlet B 13310
7	inlet A & B 13311
8	basin 13312
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 135

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-20-07/1105 Temperature 80 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Tall Trees Dr. & Birchwood Dr.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry ✓ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass ✓ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 4in Bank Height 5-12ft Buffer Width: none

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 8in outlet B 20in Restrictor (Y/N) _____ Size 5

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe outlet B is clogged with plants growing inside opening.

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae _____

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe):_____

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

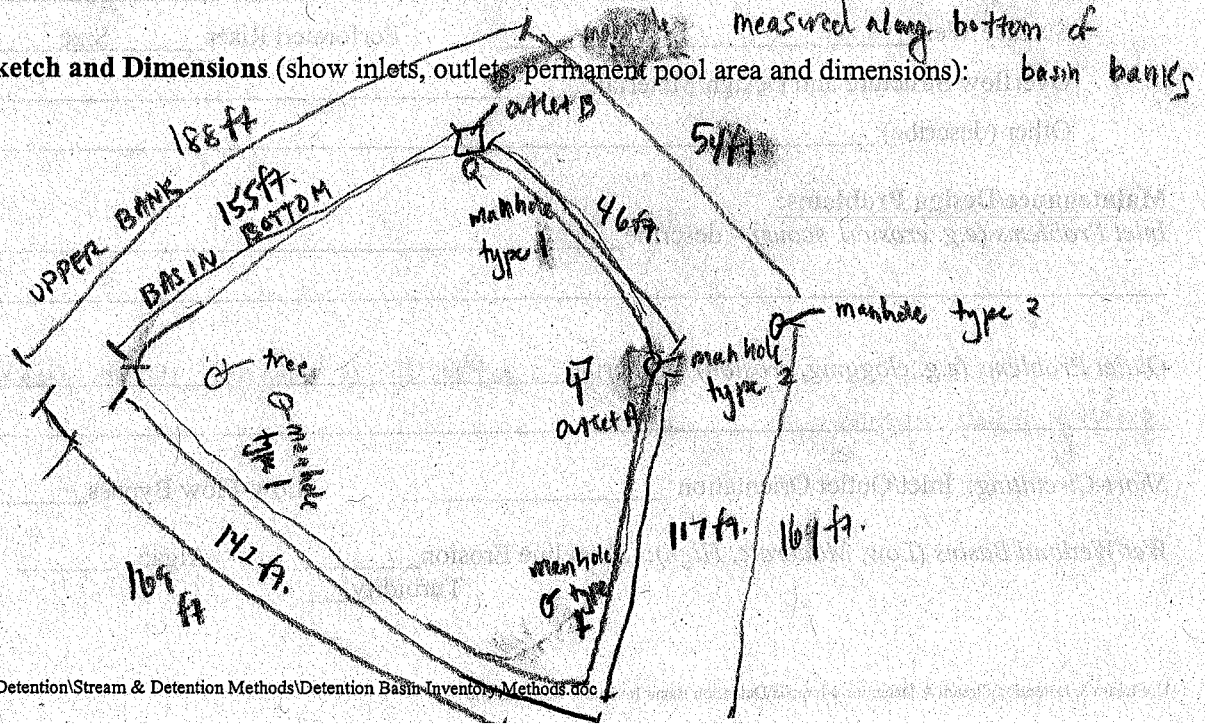
Other:_____

Preliminary Retrofit Opportunities (describe): Replace turf grass with native vegetation
Clean out plants in opening of outlet B, & fix erosion.

Photos:

Photo #	Description
1	basin 13297
2	" 13298
3	" 13299
4	outlet A 13300
5	outlet B 13301
6	erosion @ top of outlet B 13302
7	manhole type 1 13303
8	manhole type 2 13304
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions): measured along bottom of basin banks



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 134

Basin Name (subdivision and/or property owner): Deer Chase

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-19-07 / 1430 Temperature 80 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Deerchase Ct cul de sac

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry _____ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 4 - 7ft. Buffer Width: none

Number of Inlets: Stormsewer inlet A Size 12in Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 10in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe outlet A has plants growing up into opening

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae _____

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ garbage Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): birds, frogs

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

Other:_____

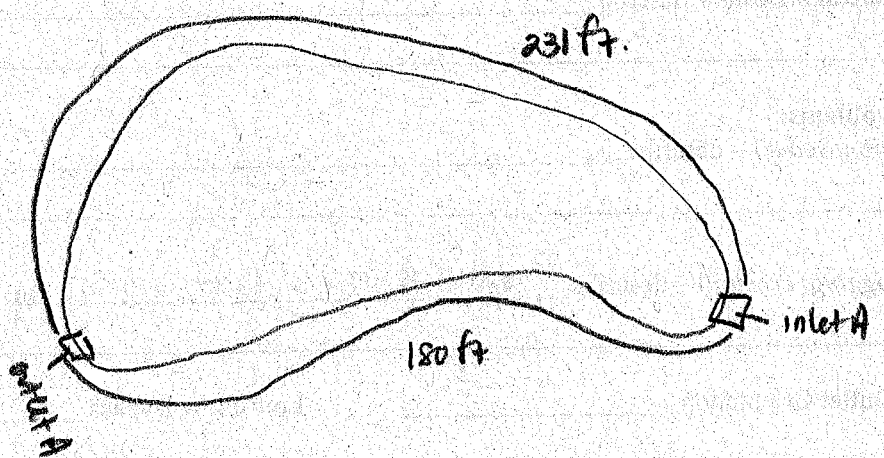
Preliminary Retrofit Opportunities (describe): Replace turf grass with native vegetation

Photos:

Photo #	Description	
1	basin	13255
2	outlet A	13256
3	inlet A	13257
4	basin	13258
5		
6		
7		
8		
9		
10		

very thick grasses

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 133

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: Amherst

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-19-07 / 1351 Temperature 80 Rainfall (now (12) 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Long Grove Rd & Amherst Ln.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in:3in - 12in:5in Bank Height 3 - 6ft Buffer Width: none

Number of Inlets: Stormsewer inlet A 4in inlet B 4in Size inlet C 6in inlet D 12in Channel/Swale inlet E 4in inlet F 4in inlet G 4in Size inlet H & I 4in inlet J 4in

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe thick algae infront of inlet A & B

inlet J buried in sediment, most of opening clogged w/ sediment

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae _____

Turbidity moderate

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____

Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ ~ leaf litter Excess Sediment Accumulation_____

Excess Woody Vegetation ✓ willows

Other Observations:

Aquatic Life/ Wildlife (describe): frogs

Potential Safety Problems: erosion holes along banks

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

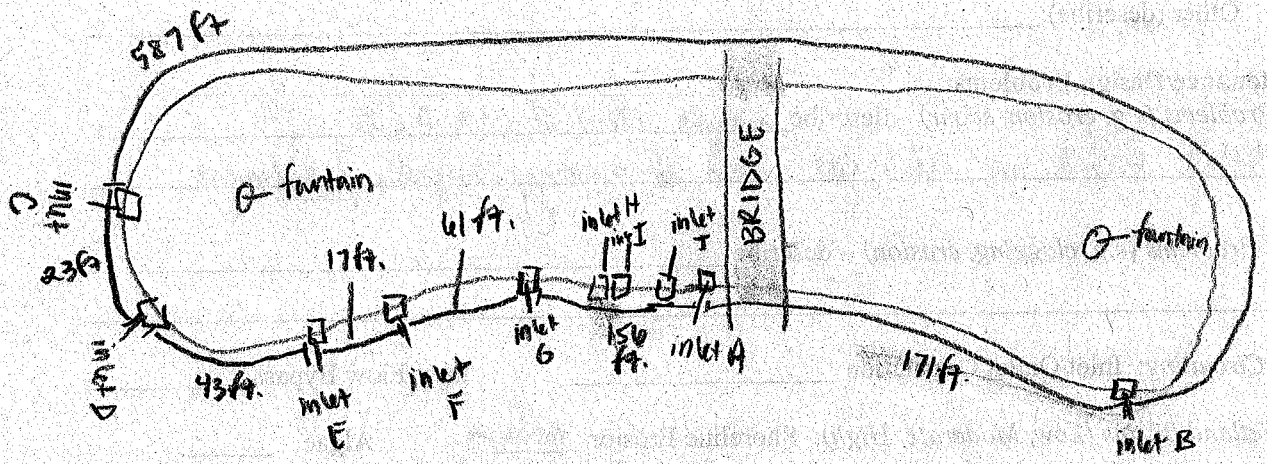
Other:_____

Preliminary Retrofit Opportunities (describe): Replace turf grass w/ native vegetation. Stabilize banks. unclog inlet J. Remove willows

Photos:

Photo #	Description
1	inlet A 13242
2	basin } taken from bridge 13243
3	basin } 13244
4	inlet B 13245
5	basin 13246
6	basin 13247
7	inlet C has 6 in pipe cemented into 12 in pipe, only 6 in is available for water to flow into basin 13248
8	inlet D 13249
9	inlet E 13250
10	inlet F 13251
11	inlet G 13252
12	inlet H & I 13253
13	inlet J 13254

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 132

Basin Name (subdivision and/or property owner): Deer Lake Meadows

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-19-07 / 1200 Temperature 80 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Meadow Ln & Waddington Ct.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 2in Bank Height 2-4ft Buffer Width: 25ft

Number of Inlets: Stormsewer inlet A 12in inlet B 10in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet 8in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae high

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris__✓ garbage__ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe):_____

Potential Safety Problems:__erosion holes along bank.__

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

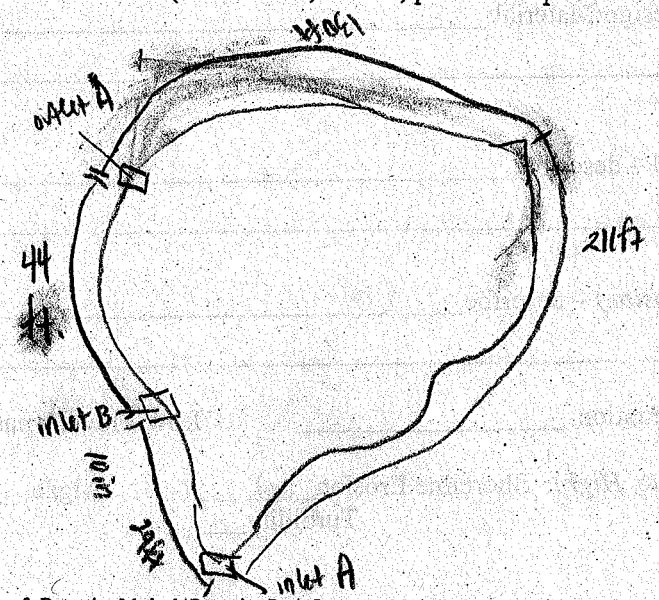
Other:_____

Preliminary Retrofit Opportunities (describe):__Replace any turf grass with native vegetation. Clean out vegetation infront of inlet A & outlet A. Stabilize banks and fill in erosion holes.

Photos:

Photo #	Description
1	basin 13200
2	inlet B 10in 13201
3	inlet A 13202
4	" 13203
5	basin 13204
6	erosion holes on bank 13205
7	outlet A 13206
8	" 13207
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 13

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-14-07 / 1253 Temperature 85 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Laurel Dr. & Wildrose Dr.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other sand

Slope (Horizontal:Vertical) 0 - 12in : 3.5in Bank Height 0 - 3ft Buffer Width: none

Number of Inlets: Stormsewer inlet A Min, inlet B 14in Size inlet C 16in, inlet D 6in, inlet E 8in, inlet G 4in, inlet I 4/in, outlet A 16in Channel/Swale Inlet F 12in Size inlet H 4in stone channel 19ft x 3ft

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet F runs over grass to get to basin

~~clean algae off smaller pipes~~ along basin.

Outlet Problems (e.g. clogging, erosion) – describe stagnant, smelly water in front of outlet pow drainage?

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae low

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

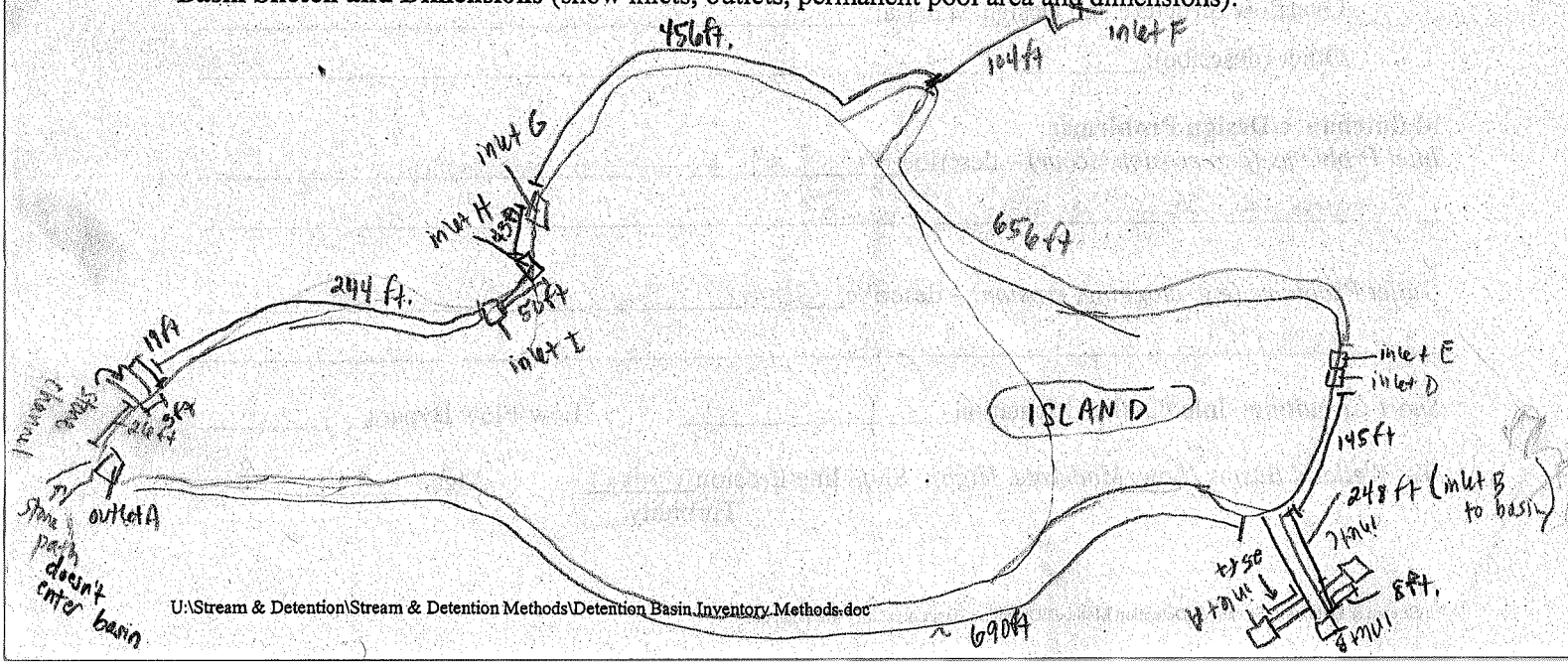
Other Observations:
Aquatic Life/ Wildlife (describe): Frogs, Canada geese, fish
Potential Safety Problems:_____
Potential Nuisance Problems: bird poop
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc): beaches
Other:_____

Preliminary Retrofit Opportunities (describe): Replace turf grass with native vegetation. Clean algae off smaller inlet pipes. Do something about stagnant water @ otlet A ~ plant water vegetation. Replace rip rap & sand w/ native vegetation
NOTE: BASIN STINKS! Stagnation near otlet

Photos:

Photo #	Description		
1	basin 13011	11	inlet D & E (E is the larger) 13021
2	Stone channel 13012	12	inlet F 13022
3	otlet A 13013	13	path of inlet F to basin 13023
4	basin 13014	14	inlet G 13024
5	island 13015	15	inlet H 13025
6	inlet A 13016	16	inlet I 13026
7	inlet B 13017	17	
8	inlet C 13018	18	
9	inlet path to basin 13019	19	
10	basin 13020	20	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 130

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-14-07 / 1402 Temperature 85 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Meadow Ln & Deer Lake Dr.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other dirt, rip rap

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 3.5in Bank Height 4ft. Buffer Width: none

Number of Inlets: Stormsewer inlet A 12in inlet B 4in inlet C 4in inlet D ? ~possibly 4in Size Channel/Swale inlet E 4in inlet F 14in inlet G 4in inlet H 12in inlet I 4in inlet J 12in inlet K-M 4in inlet N 12in inlet O 4in inlet P 4in inlet Q 14in Size

Outlet Type(s) and Dimensions: Culvert: outlet A 14in outlet B 14in Restrictor (Y/N) Size

Surface Weir: Size Perforated Riser Size

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet B & C drains over grass to basin

inlet C has plastic, wire, and stones @ opening, inlet L & M blocked, rocks & garbage in inlet J

inlet Q blocked by plants / plant debris

Outlet Problems (e.g. clogging, erosion) – describe outlet B - mesh covered w/ leaf litter

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae _____

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): fish

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

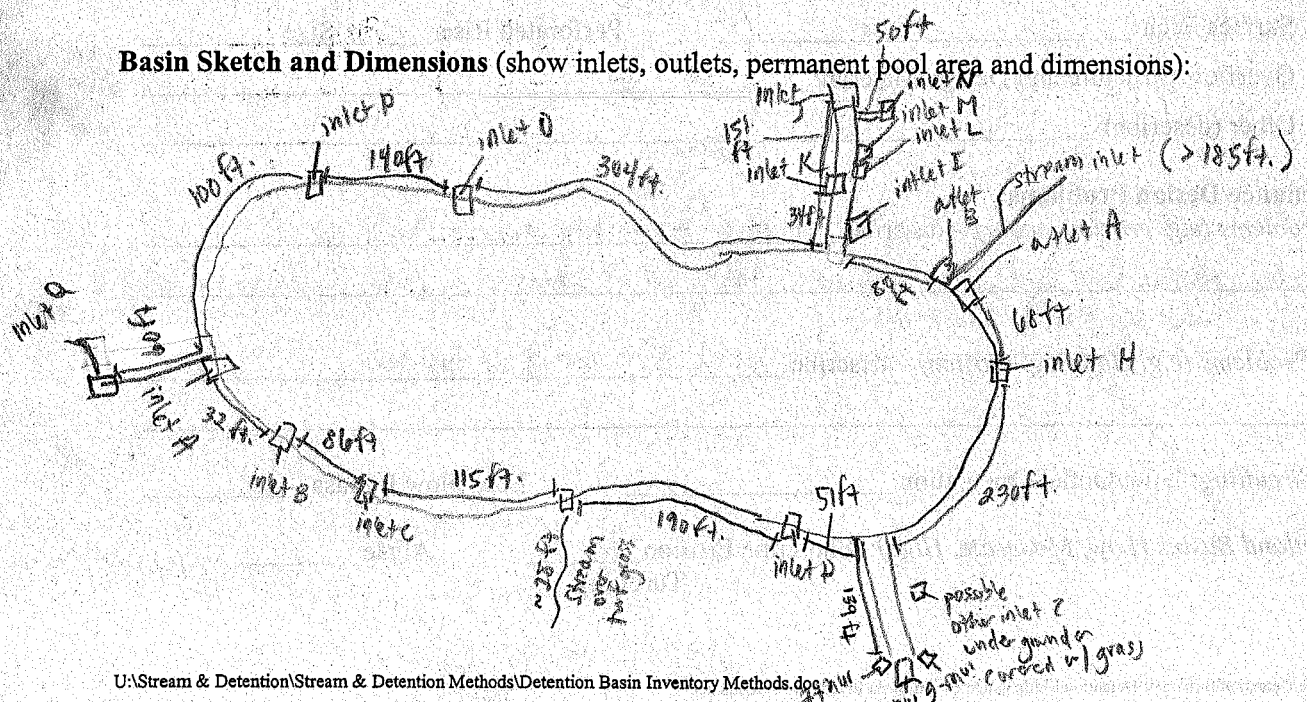
Other:_____

Preliminary Retrofit Opportunities (describe): replace turf grass & riprap with native vegetation
Remove metal mesh from outlet A & B

Photos:

Photo #	Description
1	basin 13027
2	inlet A 13028
3	inlet A 13029
4	inlet B 13030
5	inlet C 13031
6	small stream leading into basin, can't find source it's buried in turf grass
7	" 13033
8	inlet D hidden under algae & grasses, inlet is under water 13034
9	inlet D pipe showing thru grass on bank 13035
10	view up to inlet stone/metal path 13036
11	inlet E 13037
12	inlet F 13038
13	inlet G 13039
14	inlet E-G 13040
15 & 16	stone dams in path to basin 13041, 13042
17	basin 13043
18	inlet H 13044
19	stone/metal structures 13046
20	outlet B 13047
21	inlet I 13048
22	path to inlet J 13049
23	inlet K 13050
24	inlet L 13051
25	inlet M 13052
26	inlet J 13053
27	inlet N 13054
28	inlet O 13055
29	inlet P 13056
30	inlet Q 13057

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 129

Basin Name (subdivision and/or property owner): Deer Lake Meadows

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-19-07 / 1220 Temperature 80 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Meadow Ln & Glengarry Circle

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other lilies pads / dirt

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 2in Bank Height 2 ft. Buffer Width: none

Number of Inlets: Stormsewer inlet A 4in inlet B 12in Size inlet C 4in inlet D 4in Channel/Swale _____ Size inlet E 18in

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae _____

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

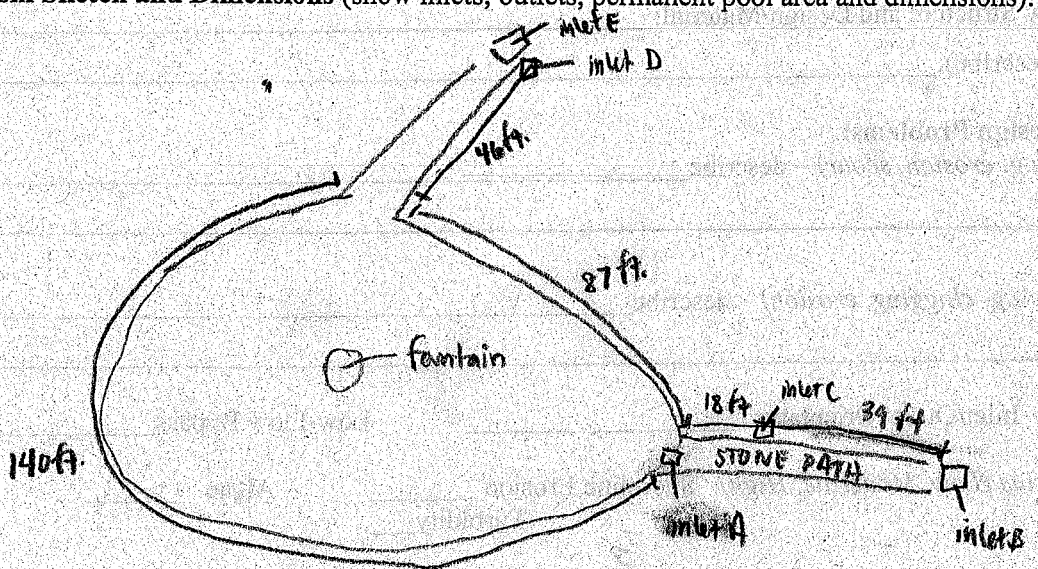
Other Observations:
Aquatic Life/ Wildlife (describe): frogs
Potential Safety Problems:_____
Potential Nuisance Problems:_____
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): Replace turf grass and rip rap with native vegetation.

Photos: Note: has the teal blue algae water treatment

Photo #	Description
1	basin 13208 II basin 13218
2	inlet A - in stone path that connects inlet B to basin 13209
3	inlet C 13210
4	stone path to inlet B 13211
5	inlet B - has 2 pipes w/in opening possibly inlet A (4in pipes) 13212
6	view from inlet B to basin 13213
7	lily pads 13214
8	inlet D 13215
9	inlet E 13216
10	view from inlet E to basin 13217

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 128

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-19-07 / 1245 Temperature 80 Rainfall (now, (12), 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Meadow Ln & Glengarry Circle

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other dirt, rip rap

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 3-4ft. Buffer Width: none - nearby wetland

Number of Inlets: Stormsewer inlet A 12in inlet B 4in Size inlet C 18in inlet D 4in Channel/Swale inlet E 4in inlet F 4in inlet G 4in inlet H 4in inlet I 4in inlet J 4in inlet K 4in Size inlet M - ?

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: plastic 4in

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe major erosion of bank where inlet A enters

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion high Algae low

Turbidity high

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation ✓

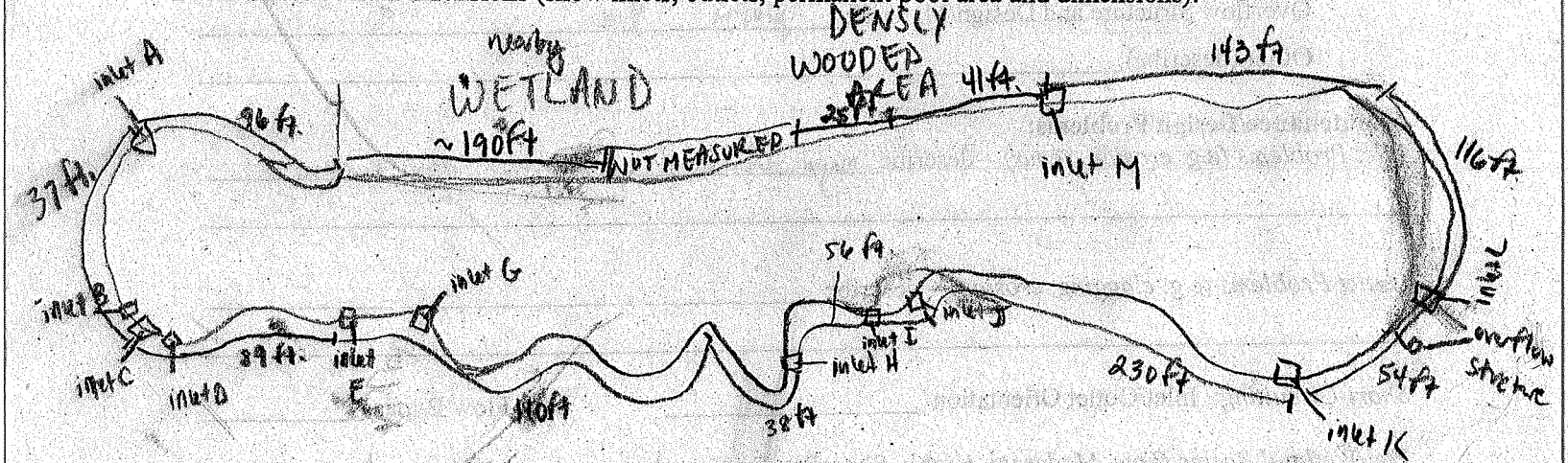
Other Observations:
Aquatic Life/ Wildlife (describe): fish (carp!), turtle
Potential Safety Problems: erosion of banks
Potential Nuisance Problems: bird poop
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): Replace turfgrass & rip rap with native vegetation. Stabilize banks. Cut back some woody vegetation.

Photos:

Photo #	Description
1	basin 13219
2	high erosion along banks 12
3	nearby wetland 13221 13
4	inlet A 13222 14
5	inlet B 13223 15
6	inlet C 13224 16
7	inlet D 13225 17
8	inlets B, C, & D. 13226 18
9	inlet E 13227 19
10	inlet G 13228 20
	21 basin 13239
11	inlet H 13229
	22 inlet M 13240
	23 " 13241
	basin 13230
	basin 13231
	stabilization of bank w/ use of bricks 13232
	inlet I 13233
	inlet J 13234
	inlet K 13235
	overflow structure in grass (4in plastic) 13236
	inlet L 13237
	basin 13238

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 127

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-14-07 / 1140 Temperature 85 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Pheasant Trail and Mallard Ct.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓ aquatic macrophytes

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other concrete

Slope (Horizontal:Vertical) 12in:3in - 12in:5in Bank Height 7ft. Buffer Width: none - 2ft. (narrow part of basin)

Number of Inlets: Stormsewer inlet A - 4in ? inlet B 4in Size inlet C 4in inlet D 4in Channel/Swale inlet E 4in inlet F 10in inlet G 18 Size inlet H 6in inlet I 4in inlet J 4in inlet K 6in inlet L 4in

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: ✓ Size ~ 180in across Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe plants growing where concrete channels ends into basin inlets B & C go under concrete channel rather than over, Erosion around edges of concrete channel inlet F drains across grass to channel Inlet G is rusting. Algae in front of inlets K & L

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae moderate

Turbidity _____

algae high @ narrow portion of basin

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation ✓

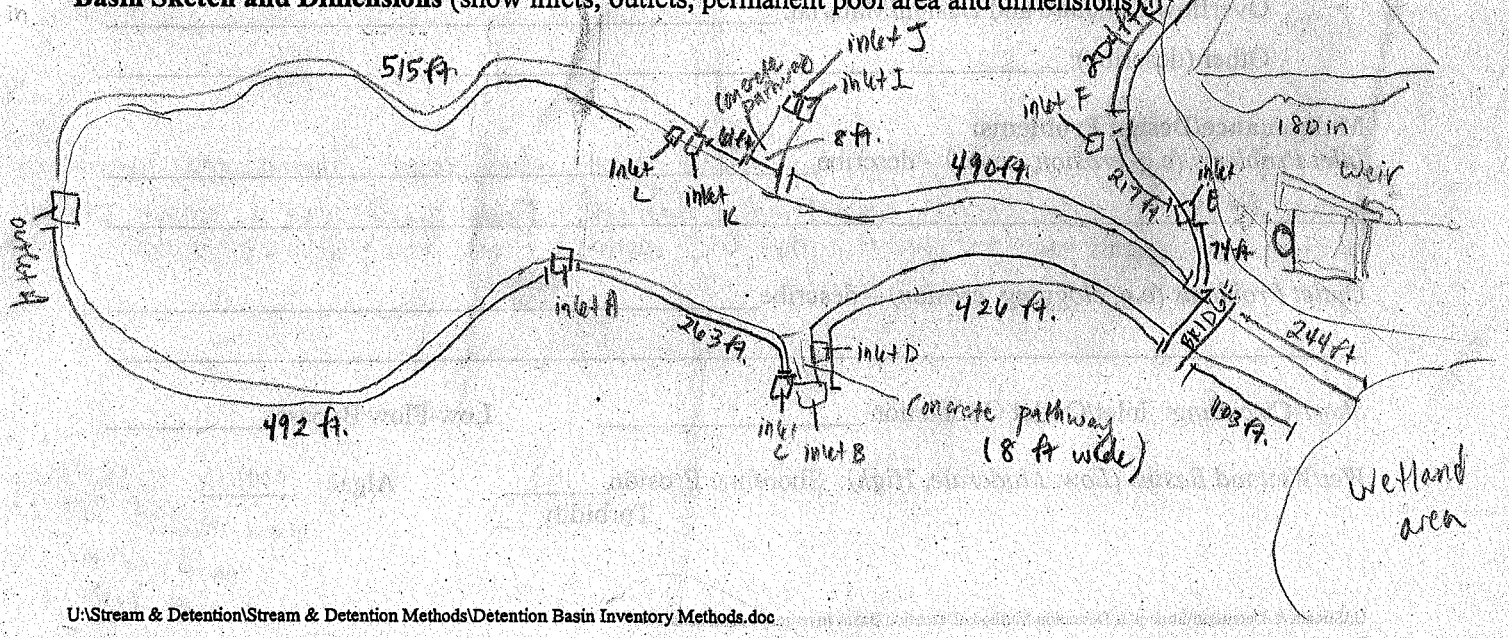
Other Observations:
Aquatic Life/ Wildlife (describe): frogs, fish, canada geese
Potential Safety Problems:_____
Potential Nuisance Problems: bird poop
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): Replace turf grass with native vegetation. Fix mats C & B. Remove willows. Clean algae from openings of inlet A, K & L. Remove rip rap and concrete from shoreline

Photos:

Photo #	Description		
1	basin 12989	11	inlet D 12998
2	basin 12990	12	erosion around edges of concrete channel 12999
3	inlet A 12991	13	path to inlet E 13000
4	12992	14	inlet E 13001
5	12993	15	inlet F 13002 inlet H 13004
6	12994	16	inlet G 13003
7	"	17	basin (looking towards outlet A) 13005
8	inlet A 12995	18	basin (narrower portion) 13006
9	concrete channel 12996	19	inlet I, J and concrete pathway 13007
10	inlet B & C 12997	20	inlet I & J 13008
	inlet A opens below the surface	21	inlet K 13009
		22	inlet L 13010.

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions)



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 126

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-31-06 / 1430 Temperature 90 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Regency Dr. & Colonial Ct.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry ✓ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass ✓ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height ~ 15ft. Buffer Width: none

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: at A 14in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae _____

Turbidity _____

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe):_____

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

Other:_____

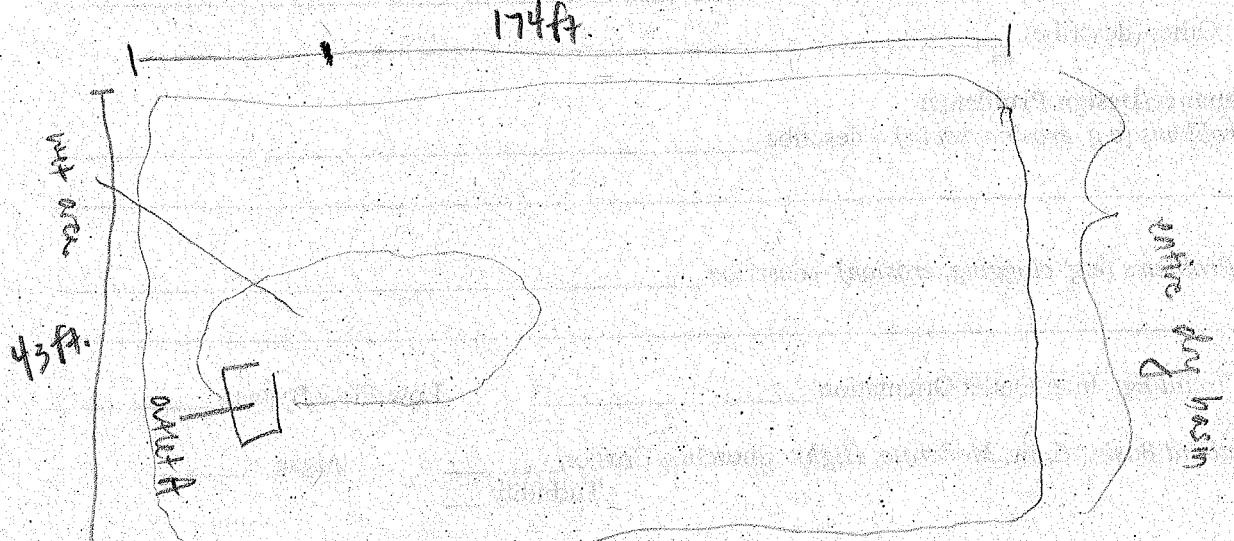
Preliminary Retrofit Opportunities (describe): replace turf grass with native vegetation.
~~Look into outlet modification~~

Photos:

Photo #	Description
1	basin 12479
2	inlet A 12480
3	inlet A 12481
4	inlet A 12482
5	~~outlet B 12483~~
6	basin 12483

Note: couldn't tell for sure if this was an inlet or outlet. Culvert slopes downward

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information:

Basin # : 125

Basin Name (subdivision and/or property owner): Sonoma

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-31-07 / 1240 Temperature 80 Rainfall (now, 12, 24, 48 hours, week) @ present

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Memory Ln. cul de sac

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓ aquatic macrophytes

Concrete Lined Channel _____ Other ✓ dirt, rip rap

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 15ft Buffer Width: none near houses ~ banks up to woods

Number of Inlets: Stormsewer inlet A 10in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 10in outlet B 10in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe erosion of dirt around inlet A, debris clogging inlet opening.

Outlet Problems (e.g. clogging, erosion) – describe outlet B has a lot of sediment & plant debris in it.

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae low

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

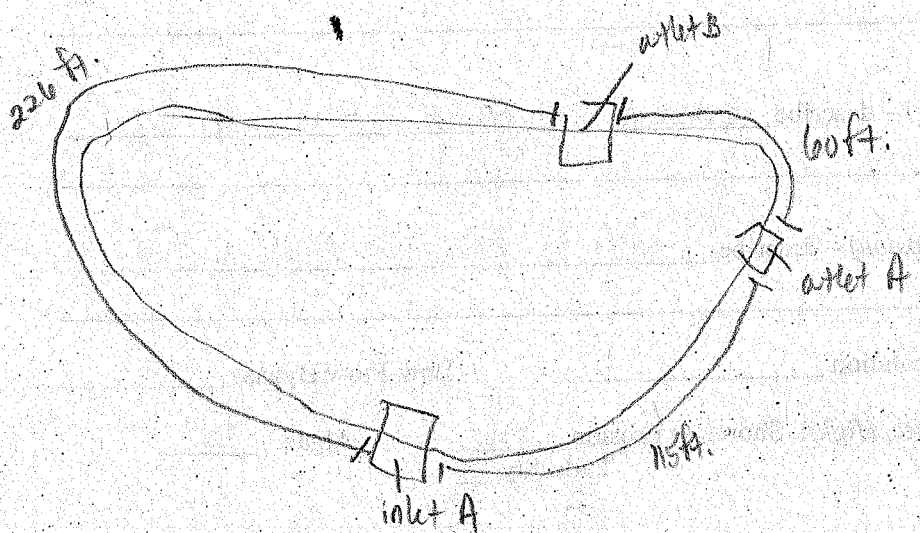
Other Observations:
Aquatic Life/ Wildlife (describe): frogs, turtles
Potential Safety Problems:_____
Potential Nuisance Problems:_____
Evidence of Upstream Illicit Connections (describe): oil slick @ inlet A
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): replace turf grass w/ native vegetation

Photos:

Photo #	Description
1	basin 12473
2	inlet A 12474
3	outlet A 12475
4	outlet B 12476
5	basin 12477
6	basin 12478

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 124

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-13-07 / 830 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Applegate Ln & Peachtree Ln.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: Commercial Year Constructed: _____

Basin Design Features: NOT A BASIN - WETLAND

Type: Wet _____ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass _____ Rip Rap _____ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) _____ Bank Height _____ Buffer Width: _____

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae _____

Turbidity _____

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe):_____

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

Other:_____

Preliminary Retrofit Opportunities (describe):_____

_____

_____

Photos:

Photo #	Description
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):

DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 123

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-13-07 / 845 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Rand Rd. & Ela Rd.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: _____ Year Constructed: _____

Basin Design Features: NOT A BASIN - WETLAND

Type: Wet _____ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass _____ Rip Rap _____ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) _____ Bank Height _____ Buffer Width: _____

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae _____

Turbidity _____

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe):_____

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

Other:_____

Preliminary Retrofit Opportunities (describe):_____

_____

_____

Photos:

Photo #	Description
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):

DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 121

Basin Name (subdivision and/or property owner): Target Plaza

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-13-07 / 807 Temperature 70 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Rand Rd. & Ela Rd.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: Commercial Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry _____ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass _____ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 4in Bank Height 4 - 15ft Buffer Width: 20 ft.
inlet A 32in

Number of Inlets: Stormsewer inlet B 32in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet A gate cover broken & lying @ opening

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae _____
Turbidity high

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ garbage Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): birds

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

Other:_____

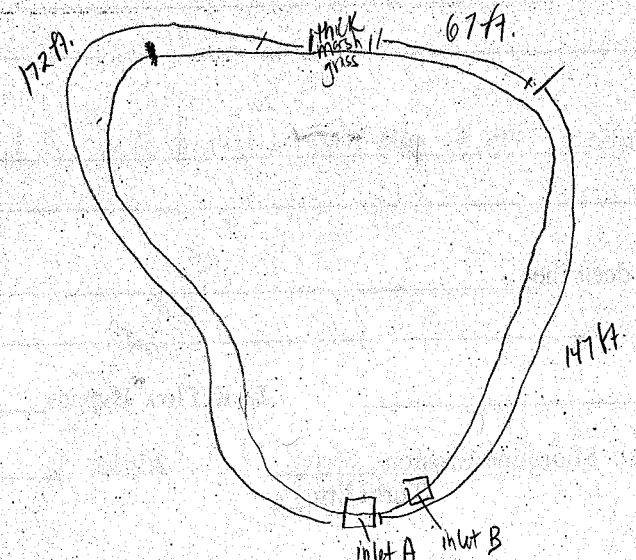
Preliminary Retrofit Opportunities (describe): stabilize bank by planting native vegetation where no veg. is present. Clean up garbage. Fix grate cover of inlet A

Photos:

Photo #	Description
1	basin 12860
2	inlet A 12861
3	basin 12862
4	basin 12863
5	basin 12864
6	inlet B 12865
7	
8	
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):

go back



J 5

DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 120

Basin Name (subdivision and/or property owner): Lozzis adventure Golf parking lot

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-30-07 / 1000 Temperature 85 Rainfall (now, 12, 24, (48 hours) week) _____

Location:

Political Jurisdiction: Elm Township: _____ Quarter Section: _____

Nearest Cross Streets: Rand Rd & Ravinia Terrace

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: Commercial Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other ✓ dirt

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 5in Bank Height 2ft Buffer Width: 20 - 100ft

Number of Inlets: Stormsewer inlet A 10in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 10in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation ✓ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae moderate

Turbidity high

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris / garbage Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): tadpoles

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

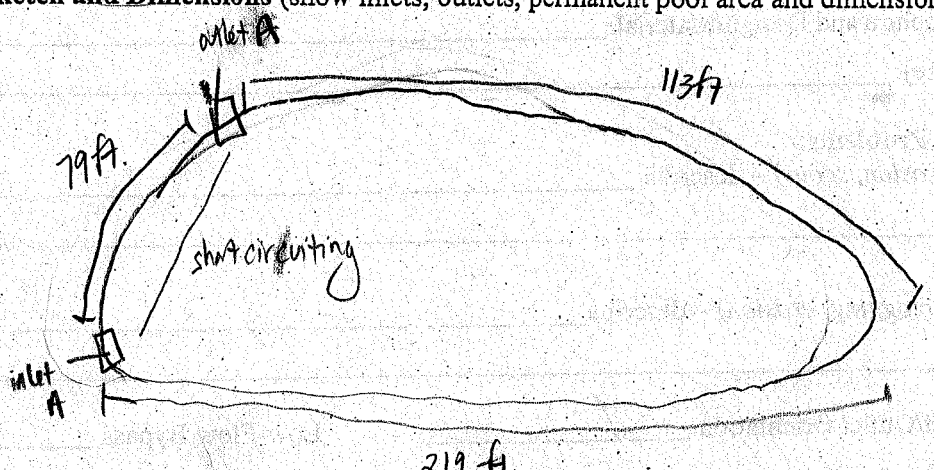
Other:_____

Preliminary Retrofit Opportunities (describe): plant native vegetation to replace turf grass and other weeds on banks

Photos:

Photo #	Description
1	basin 12351
2	basin 12352
3	inlet A 12353
4	outlet A 12354
5	basin 12355

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



1 6

DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 119

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time _____ Temperature _____ Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Rand Rd. & Ravinia Terrace

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: commercial Year Constructed: _____

NOT A BASIN ~ partial wetland / strip mall possibly developed since satelite photos

Basin Design Features:

Type: Wet _____ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass _____ Rip Rap _____ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) _____ Bank Height _____ Buffer Width: _____

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae _____

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe):_____

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

Other:_____

Preliminary Retrofit Opportunities (describe):_____

_____

_____

Photos:

Photo #	Description

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):

4

DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 118

Basin Name (subdivision and/or property owner): Hackney's Restaurant

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-30-07 / 1130 Temperature 85 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: Ela Township: _____ Quarter Section: _____

Nearest Cross Streets: Rand Rd & Old Rand Rd

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

backs up to houses

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland Murphy fcs

Concrete Lined Channel _____ Other ✓ dirt

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other ✓

Slope (Horizontal:Vertical) 12in: 1in Bank Height 8 in Buffer Width: none

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

channel connecting 2 basins

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae high

Turbidity low

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): geese, fish, frogs

Potential Safety Problems:_____

Potential Nuisance Problems: geese poop

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

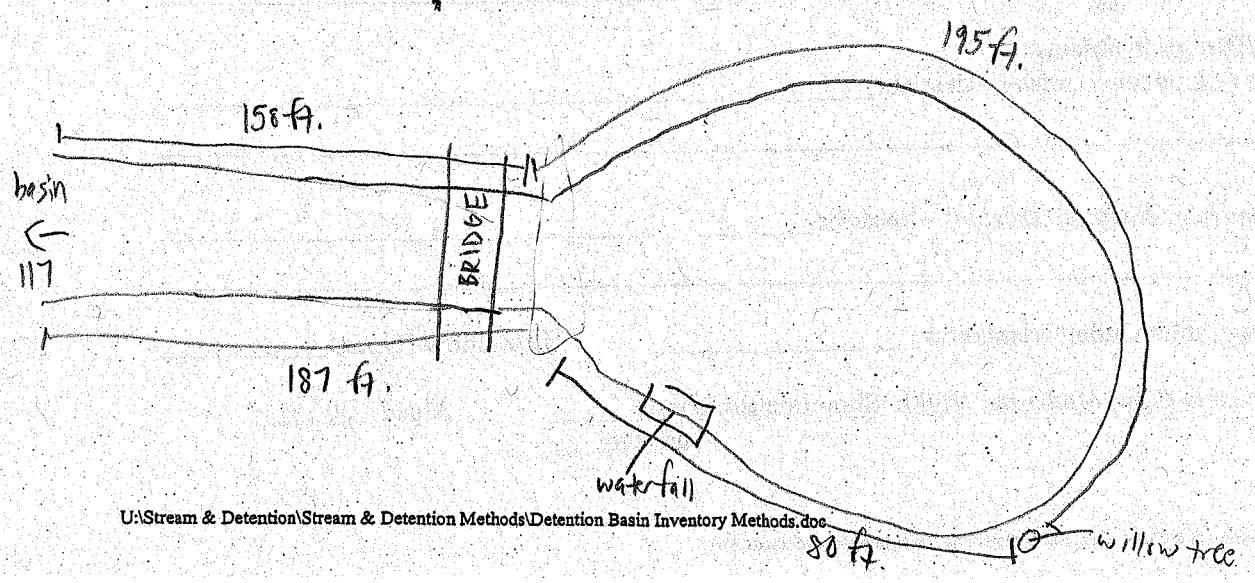
Other:_____

Preliminary Retrofit Opportunities (describe): plant native vegetation

Photos: NOTE: channel covered w/ algae, pond is decorative for nearby restaurant dining patio

Photo #	Description
1	channel 12364
2	basin 12365
3	basin 12366
4	basin 12367
5	channel looking back at basin 117 12368

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



J 3

DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 117

Basin Name (subdivision and/or property owner): Hackney's Restaurant 2

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-30-07 / 1110 Temperature 85 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Rand Rd & Old Rand Rd.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

backs up to houses

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other ✓ dirt

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) none Bank Height 5in Buffer Width: none

Number of Inlets: Stormsewer inlet A 4in plastic inlet B 2in metal Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): channel leading into basin #118 (~20 ft. wide @ basin 117 connection)

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet A points upward, out of alignment, inlet B is rusted at ~ holes in pipe

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion high Algae low

Turbidity moderate

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ garbage Excess Sediment Accumulation_____
Excess Woody Vegetation ✓ - pines

Other Observations:
Aquatic Life/ Wildlife (describe): fish, geese
Potential Safety Problems:_____
Potential Nuisance Problems: geese poop
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

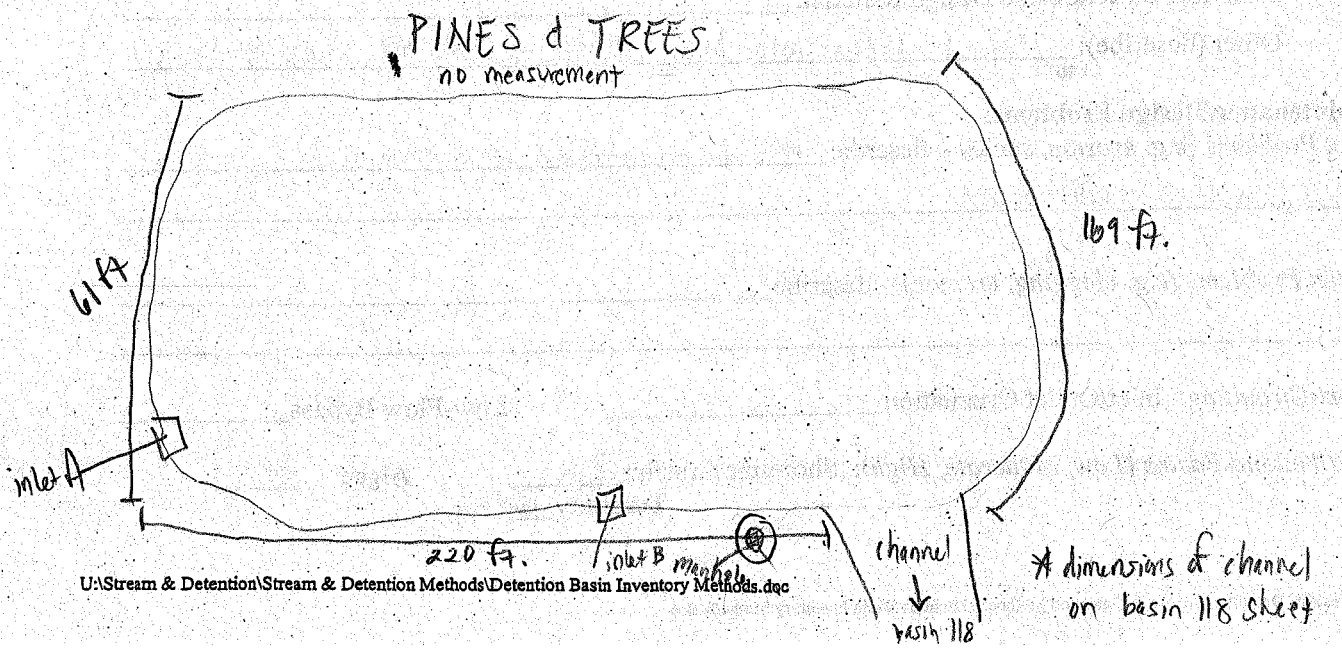
Preliminary Retrofit Opportunities (describe): plant native vegetation in basin to replace turf grass, strengthen banks

NOTE: Connects to basin 118

Photos:

Photo #	Description
1	basin 12358
2	side of basin lined w/ pines & other trees 12359
3	inlet A 12360
4 inlet B 12361 → 5	channel outlet connecting to basin 118 12362
6	channel looking towards basin 118 12363

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



7

DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 116

Basin Name (subdivision and/or property owner): Flint Creek

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-30-07 / 845 Temperature 85 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Samantha Ln & Reed Rd

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: _____ Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry _____ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in:5in Bank Height 6.5ft. Buffer Width: 15ft. - 50ft.

Inlet A 16in

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: PVC 12" width

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe overflow broken @ bottom

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae _____

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ debris from cattails Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): frogs, birds

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

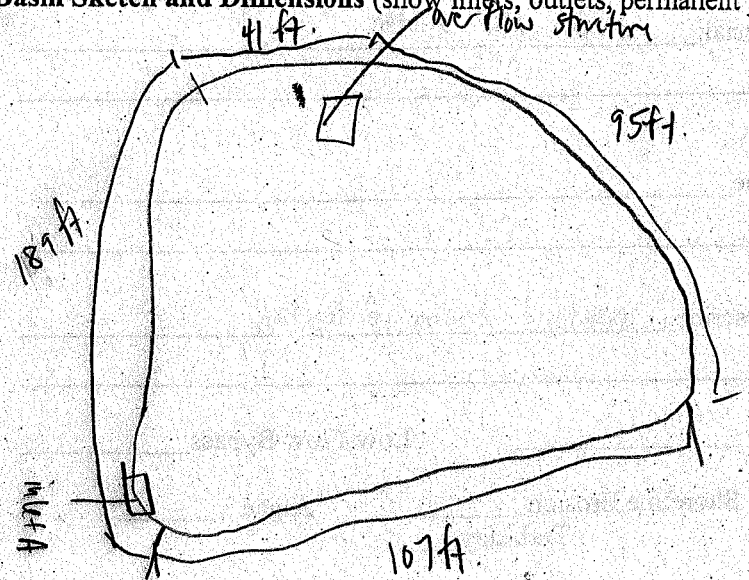
Other:_____

Preliminary Retrofit Opportunities (describe): add native vegetation to banks
fix overflow structure

Photos:

Photo #	Description
1	basin 12339
2	basin 12340
3	inlet A 12341
4	overflow structure 12342
5	overflow 12343
6	overflow structure broken @ base 12344
7	basin bank 12345

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 115

Basin Name (subdivision and/or property owner): Wystone

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-22-07 / 1310 Temperature 85 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: S. Wynstone Dr. & Wynstone Way

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass ✓ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other ✓ dirt, rip rap

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

one side flat the other → Slope (Horizontal:Vertical) 12in: 2in Bank Height 6in Buffer Width: NONE - 50ft.

Number of Inlets: Stormsewer inlet A 18in concrete, inlet B 4in plastic, inlet C _____ Size _____ Channel/Swale ✓ Size 24in → 10in. see pics

inlet D 6in black plastic, inlet E 4in plastic, inlet F 18in plastic, inlet G 4in plastic, inlet H 4in plastic

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): Channel ~6in across grass

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe below the surface, dense algae on pipes

Outlet Problems (e.g. clogging, erosion) – describe channel is full of algae and runs across turf grass

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae moderate

Turbidity high

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation ✓ willows

Other Observations:
Aquatic Life/ Wildlife (describe): birds, frogs, fish, turtles

Potential Safety Problems: unstable bank w/ the turf grass edging

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe): near inlet A in basin something that looks like an oil slick → from @ inlet D

Other Basin Uses (rec. field, etc):_____

Other:_____

Preliminary Retrofit Opportunities (describe): remove turf grass & riprap and replace w/ native vegetation.

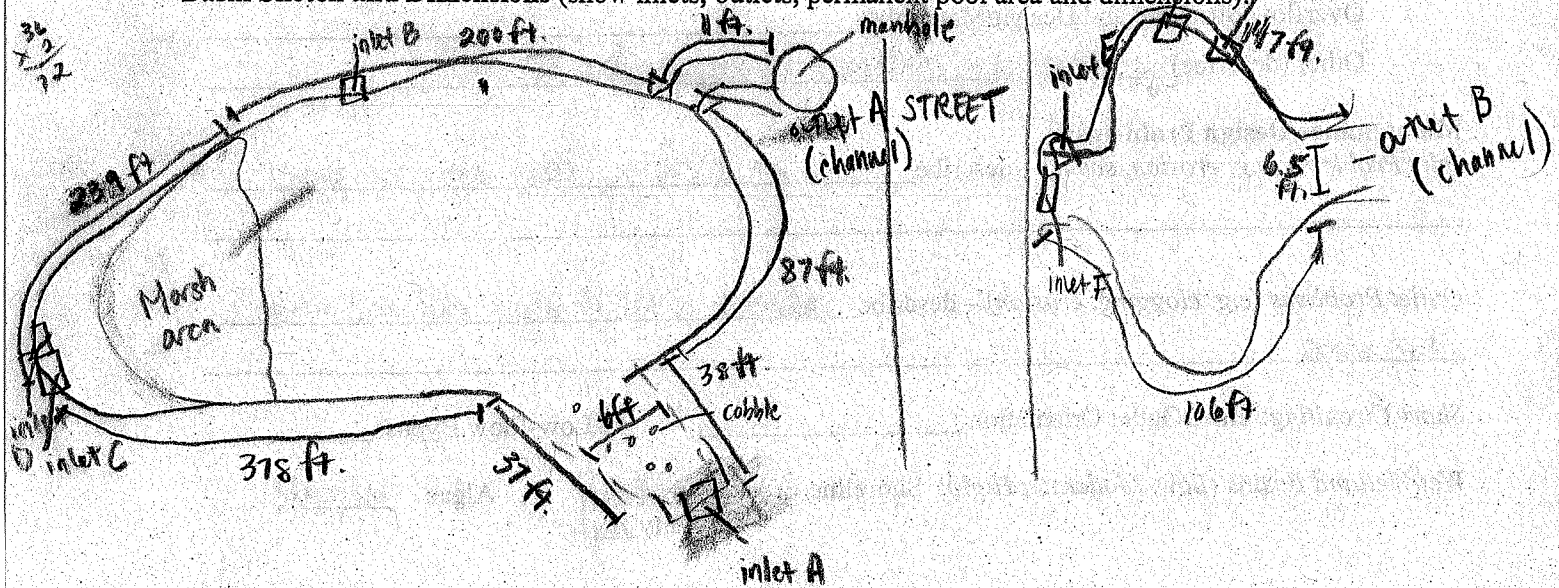
Photos:

Photo #	Description		
1	wetland portion of basin 12154	11	inlet B 12164
2	inlet A 12155	12	eroded turf grass ~ channel formed 12165
3	inlet A 12156	14	2nd basin on otherside of street 12167
4	oil sheik 12157	15	inlet E 12168
5	basin 12158	16	inlet F 12169
6	basin 12159	17	possible outlet → drains to wooded area 12170
7	pic of outlet and manhole from road 12160	18	" 12171
8	outlet 12161	19	erosion of bank in 2nd basin 12172
9	outlet channel 12162	20	inlet G 12173
10	erosion of bank 12163	21	inlet H 12174

13. inlets C&D 12166

width of cobble channel @ inlet A is 6 ft.

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 114

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: Wynstone

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-24-07 / 715 Temperature 65 Rainfall (now, 12, 24, 48 hours, (week)) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Rand Rd. & Wynstone Park Dr.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: commercial/office complex Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other ✓ dirt

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation _____ Other ✓ wall on one side

Slope (Horizontal:Vertical) 12 in : 4 in Bank Height 30ft Buffer Width: NONE

Number of Inlets: Stormsewer inlet A ~ possible 12 in accurate measure not possible b/c of sedimentation inlet B - 18 in inlet C - 12 in Size inlet D ~ 12 in (could reach b/c of water) Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A ~ 22 in concrete outlet B ~ 22 in conc. Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet A clogged w/ sediment & inlet B

Outlet Problems (e.g. clogging, erosion) – describe a lot of sediment built up @ outlets

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion high Algae _____

Turbidity high

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris garbage ✓ Excess Sediment Accumulation ✓
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe):_____
Potential Safety Problems: eroding slopes
Potential Nuisance Problems: geese poop
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

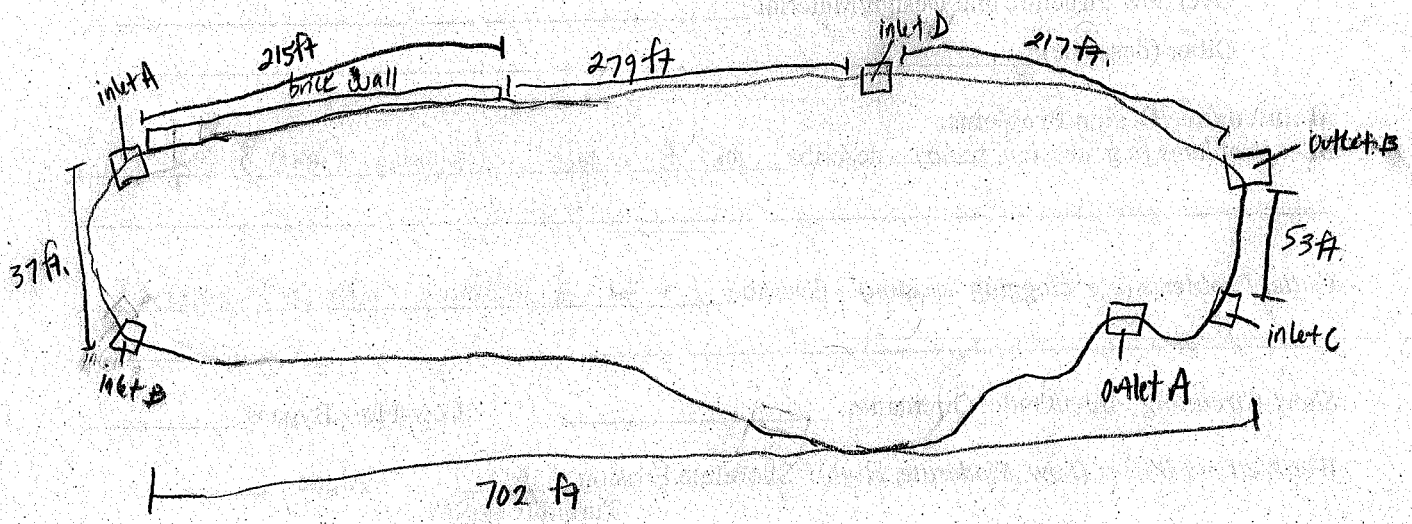
Preliminary Retrofit Opportunities (describe): put native vegetation on all sides instead of turf grass. Stabilize all sides of the basin

NOTE: recently created ~ all sides are still dirt but seeding is occuring

Photos:

Photo #	Description
1	basin 12198
2	inlet A a lot of sedimentation around it / in it 12199
3	erosion on bank w/ at grass 12200
4	inlet B 12201
5	outlet A 12202
6	inlet C 12203
7	outlet B 12204
8	basin 12205
9	inlet D 12206
10	brick wall 12207

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 113

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: Wynstone

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-22-07 / 1230 Temperature 80 Rainfall (now, 12, 24, 48 hours (week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Rand Rd. & Wynstone Ln.

golf course & gated community

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: _____ Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other ✓ riprap & dirt

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12 in : 1in Bank Height 3in. Buffer Width: None

Number of Inlets: Stormsewer inlet A 4in plastic inlet B pvc submerged inlet C Size 4in plastic Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: NONE Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): manhole

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe algae on outside and around opening of pipes

Outlet Problems (e.g. clogging, erosion) – describe NONE

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae moderate

Turbidity low

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation ✓ willows

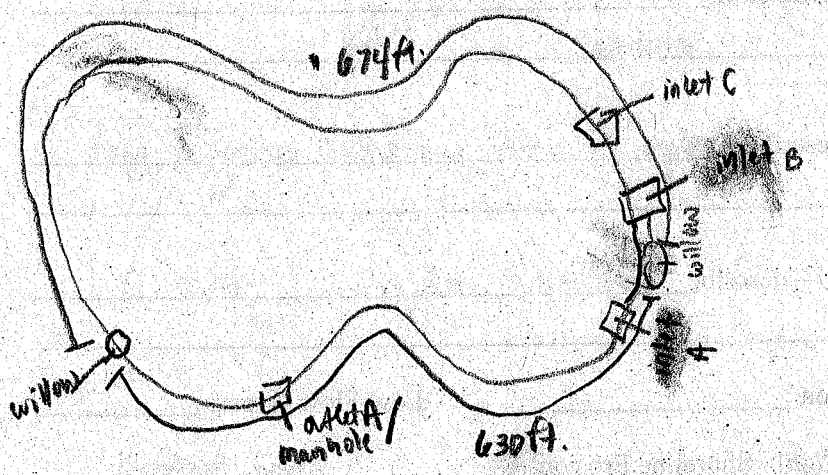
Other Observations:
Aquatic Life/ Wildlife (describe): fish, birds, mallards, great blue heron
Potential Safety Problems:_____
Potential Nuisance Problems: dog/geese poop
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): remove willow trees, replace turf grass with native wetland grasses

Photos: Note: inlets A & B are under water
no outlets found

Photo #	Description
1	basin 12145
2	basin 12146
3	basin 12147
4	inlet A 12148
5	inlet B 12149
6	inlet C 12150
7	basin 12151
8	outlet/manhole 12152
9	outlet/manhole 12153

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 112

Basin Name (subdivision and/or property owner): Wystone

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-22-07 / 1200 Temperature 80 Rainfall (now, 12, 24, 48 hours, (week)) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Wynstone Dr. & Graystone Ct.

golf course gated community - aesthetic design of ponds

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other ✓ not sure

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height _____ Buffer Width: None

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe Couldn't find any

Outlet Problems (e.g. clogging, erosion) – describe Couldn't find any

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae _____

Turbidity low

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ a lot of leaf litter Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): fish, frogs

Potential Safety Problems: bank w/ turf grass is unstable

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

Other:_____

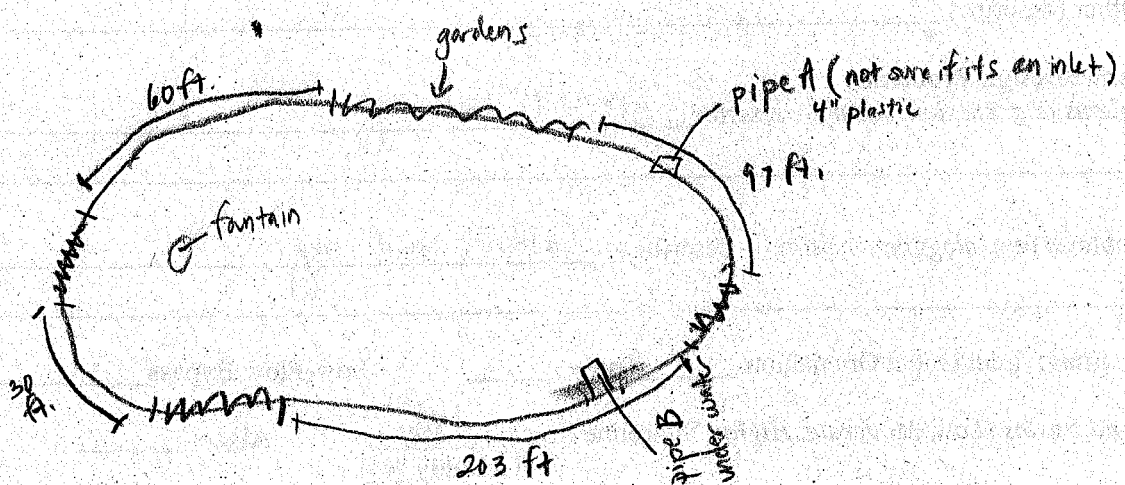
Preliminary Retrofit Opportunities (describe): add native grasses to basin bank, make it more natural looking.

Photos: Note: surrounding flower beds prevented complete dimensions on sketch

Photo #	Description
1	basin 12137
2	Shoreline erosion b/c of turf grass edge 12138
3	pipe A 12139
4	pipe A 12140
5	black lining 12141
6	basin 12142
7	pipe B large & metal & submerged 12143
8	" 12144

- no inlet/outlet pipes visible, fountain in pond and water teal color
- looks like edge is lined with black plastic (maybe whole basin)

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 111

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-17-07 / 1520 Temperature 60 Rainfall (now, (12), 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Somerset Ct. cul de sac

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

constructed by home owners ~ brought in private engineers

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other ✓ dirt (mucus algae)

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other sand

Slope (Horizontal:Vertical) 12in : 1in. Bank Height 1 ft. Buffer Width: NONE

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale channel/stream Size 5in.

inlet A, B, C 4in. plastic pipes

Outlet Type(s) and Dimensions: Culvert: outlet A 10in Restrictor (Y/N) N Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe channel draining down grass between 2 houses with inlet pipes along the way

Outlet Problems (e.g. clogging, erosion) – describe clogging by algae

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae moderate

Turbidity high ~ bluish hue to water not natural

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): fish

Potential Safety Problems:

Potential Nuisance Problems: algae around edges

Evidence of Upstream Illicit Connections (describe):

Other Basin Uses (rec. field, etc):

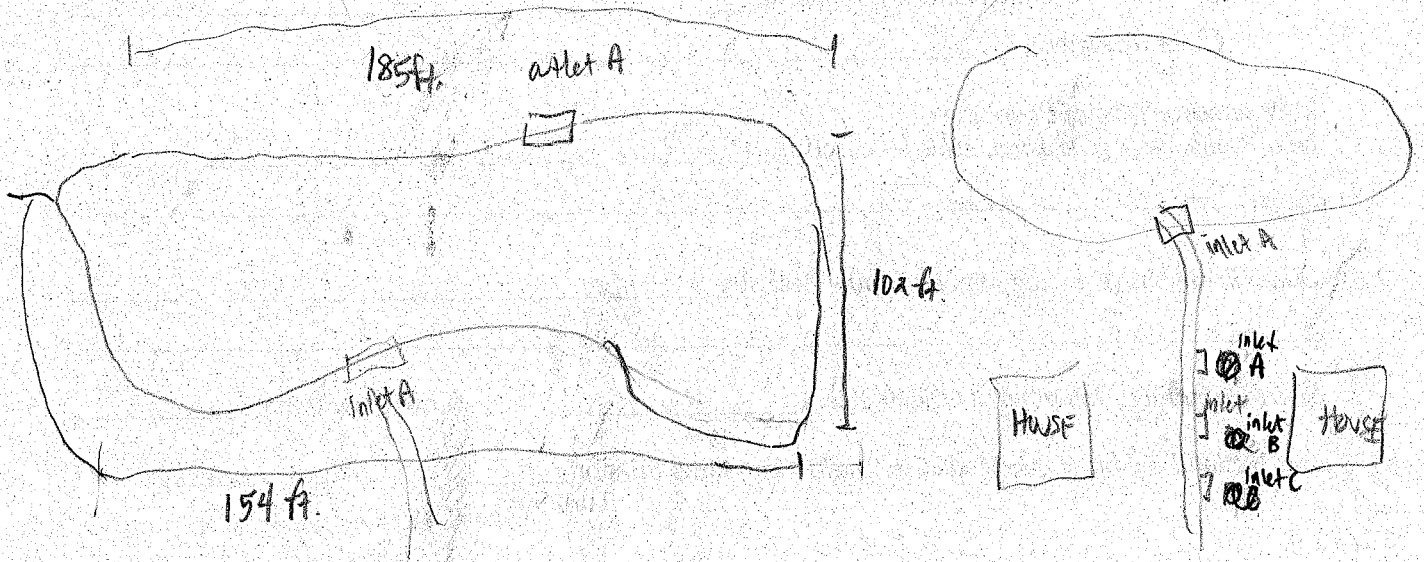
Other:

Preliminary Retrofit Opportunities (describe): built up basin w/ native grasses, maybe add more inlet/outlet pipes

Photos:

Photo #	Description
1	basin 11978
2	basin 11979
3	outlet - completely clogged w/ algae 11980
4	inlets - connects w/ basin 11981
5	inlets - channels between houses w/ inlets pipes spilling into channel 11982
6	inlet pipes w/in channel 11983
7	inlet A plastic pipes spilling into channel 11984
8	inlet B 11985
9	inlet C 11986
10	view of channel downward slope from road 11987

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 110

Basin Name (subdivision and/or property owner): Abbey Glenn Estates

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-18-07 / 900 Temperature 65 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Monticello Ln. South of Row

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

Basin Design Features: NOT A BASIN ~ inlet drains into a wetland

Type: Wet _____ Dry _____ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass _____ Rip Rap _____ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) _____ Bank Height _____ Buffer Width: _____

Number of Inlets: Stormsewer Inlet A Size 14 in. Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae _____

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe):_____

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

Other:_____

Preliminary Retrofit Opportunities (describe):_____

Photos:

Photo #	Description
1	wetland area 11988
2	inlet A 11989
3	path of inlet A 11990
4	inlet A 11991

Wetland

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):

DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 109

Basin Name (subdivision and/or property owner): [illegible]

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-18-07/1130 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Fla Quarter Section: _____

Nearest Cross Streets: Old McHenry Rd. & Abbey Glen

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: _____ Year Constructed: _____

Basin Design Features: NOT A BASIN WETLAND MARSH

Type: Wet _____ Dry _____ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass _____ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) _____ Bank Height _____ Buffer Width: _____

Number of Inlets: Stormsewer inlet A Size unk. Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe clogged w/ litter & sediment

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae _____

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): birds, frogs
Potential Safety Problems:_____
Potential Nuisance Problems:_____
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe):_____

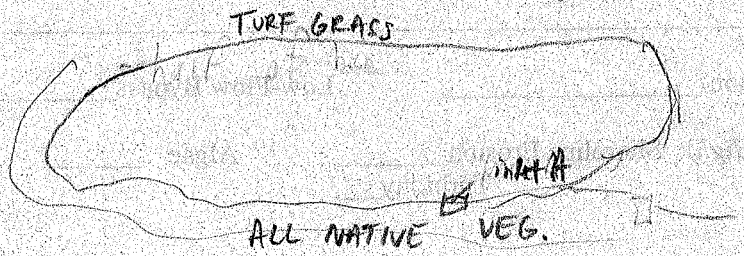
Photos:

Photo #	Description	see basin 108 for pic list
1	inlet A	12008
2	wetland	12009
3	wetland	12010
4	wetland	12011

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):

- no defined shape ~ not measured

very dense native vegetation throughout w/ trees throughout



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 108

Basin Name (subdivision and/or property owner): Lake Wood Estates

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-18-07 / 1055 Temperature 70 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Old McHenry Rd & Abbey Glenn

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential / institutional Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass ✓ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass _____ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 5.5in Bank Height 5ft. Buffer Width: NONE

Number of Inlets: Stormsewer inlet A Size 18in Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 10in Restrictor (Y/N) N Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe clogged w/ litter / dead vegetation & sedimentation vegetation directly infront of it.

Outlet Problems (e.g. clogging, erosion) – describe clogged w/ litter

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae low

Turbidity mod

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): frogs, turtles, birds

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

Other:_____

Preliminary Retrofit Opportunities (describe): Replace turf grass with native vegetation

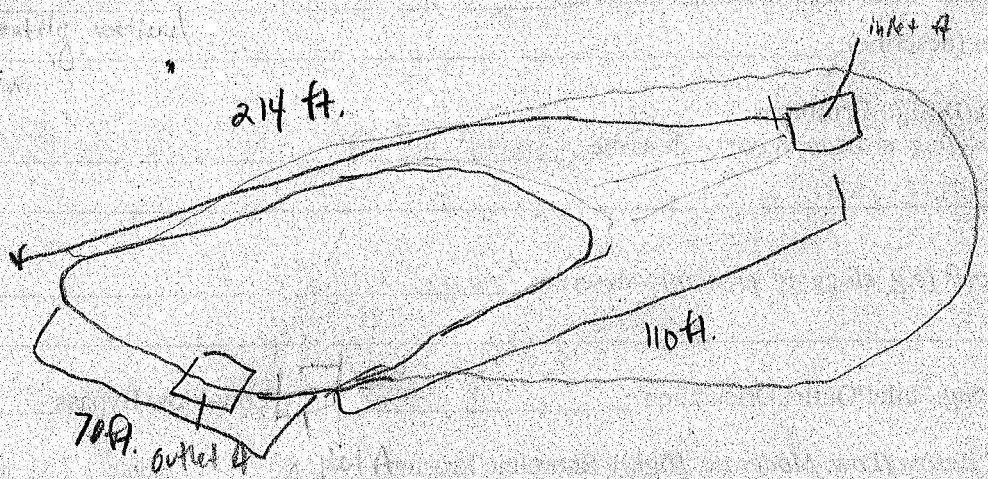
Photos:

Photo #	Description
1	inlet A
2	wetland
3	wetland
4	wetland
5	outlet A 12012
6	inlet A 12013
7	path to detention basin (water path) 12014
8	pic of basin 12044

basin 109 — nearby wetland

A end or rd

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 107

Basin Name (subdivision and/or property owner): Lake Wood Estates

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-18-07/1200 Temperature 75 Rainfall (now, 12, 24, (48) hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Sycamore Dr. & Middletree Ln.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass ✓ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in: 6in Bank Height 3ft Buffer Width: NONE

Number of Inlets: Stormsewer inlet A, inlet B, inlet C Size 4in, 4in, 4in (8:3) Channel/Swale — channels to basin Size 18in M:W

36x3 + 16 = grate

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) Y Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet A flows over grass to basin, inlet B has eroded a sinew channel to the basin.

Outlet Problems (e.g. clogging, erosion) – describe litter built up @ grate of outlet, grate that covers outlet still has big enough slots to capture small

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae _____

Turbidity high

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation ✓ – willows

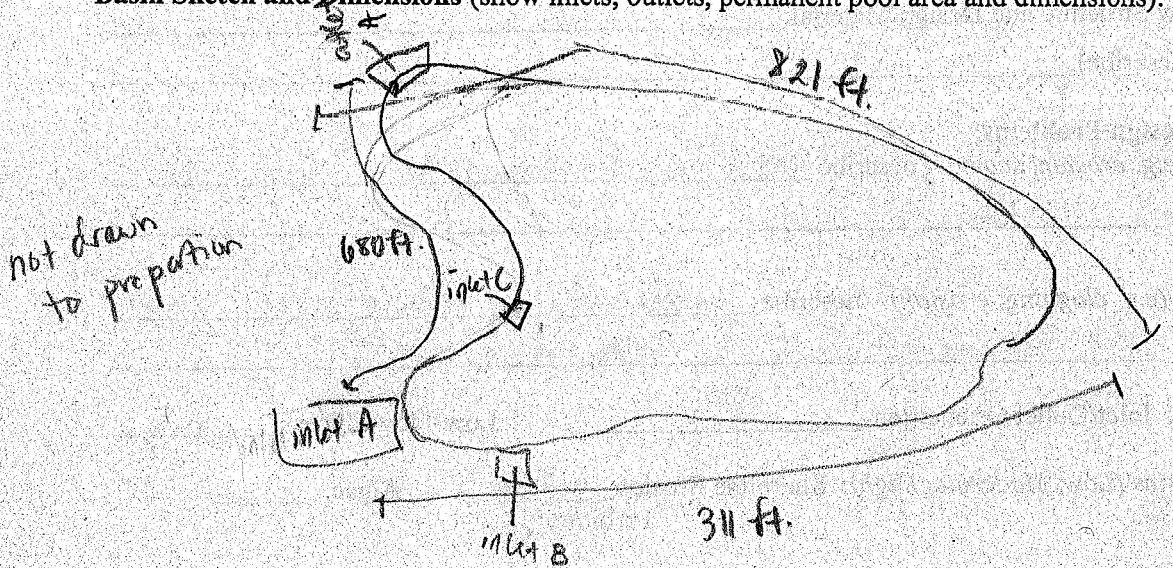
Other Observations:
Aquatic Life/ Wildlife (describe): birds, fish, frogs
Potential Safety Problems:_____
Potential Nuisance Problems: canada geese & their poop
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc): fishing & boating
Other:_____

Preliminary Retrofit Opportunities (describe): change positioning of inlet A to be closer to basin, plant native vegetation in place

Photos:

Photo #	Description	
1	inlet A	12015
2	basin	12016
3	basin	12017
4	inlet A	12018
5	inlet B	12019
6	inlet B	12020
7	Bank erosion	12021
8	basin	12022
9	outlet A	12023
10	outlet A – question of restrictor & couldn't measure width of outlet pipes	12024
11	outlet A	12025
12	inlet C	12026

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 106

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-27-07/ 1227 Temperature _____ Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Echo Lake Rd & Lakewood Ln.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass _____ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 3in - 12in : 4in Bank Height 6-10ft, Buffer Width: 30ft.

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 8in outlet B 6in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe sediment & debris @ outlet A

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae moderate

Turbidity high

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ garbage Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): frogs

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

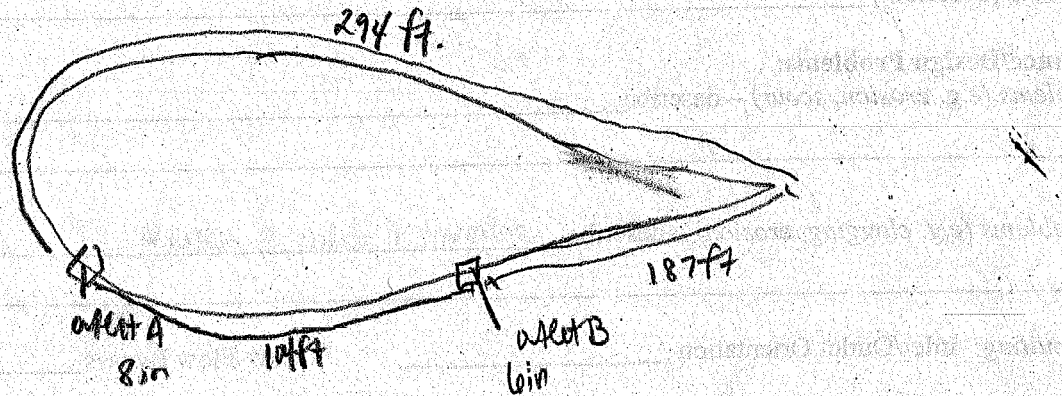
Other:_____

Preliminary Retrofit Opportunities (describe): Stabilize banks.

Photos:

Photo #	Description
1	basin 13743
2	" 13744
3	outlet A 13745
4	outlet B 13746
5	basin 13747
6	" 13748
7	
8	
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



Original data sheet went into basin N/E of wind

DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 105

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-24-07 1240 Temperature _____ Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Interlaken Dr. & Ben Ct.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other ✓ dirt

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 1 Buffer Width: NONE

Number of Inlets: Stormsewer inlet A, C - 12in Size 4in plastic Channel/Swale _____ Size _____

outlet A & B 14in

Outlet Type(s) and Dimensions: Culvert: outlet C wier Restrictor (Y/N) N Size _____

Surface Weir: ✓ Size look @ diagram on back Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion Moderate Algae low

Turbidity high

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation ✓ willows

Other Observations:
Aquatic Life/ Wildlife (describe): ducks
Potential Safety Problems:_____
Potential Nuisance Problems: algae @ inlet/ olet pipes
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): remove turf grass and replace with native vegetation
Stabilize banks. Maybe put grated covers on outlet A & B.

weir

Photos:

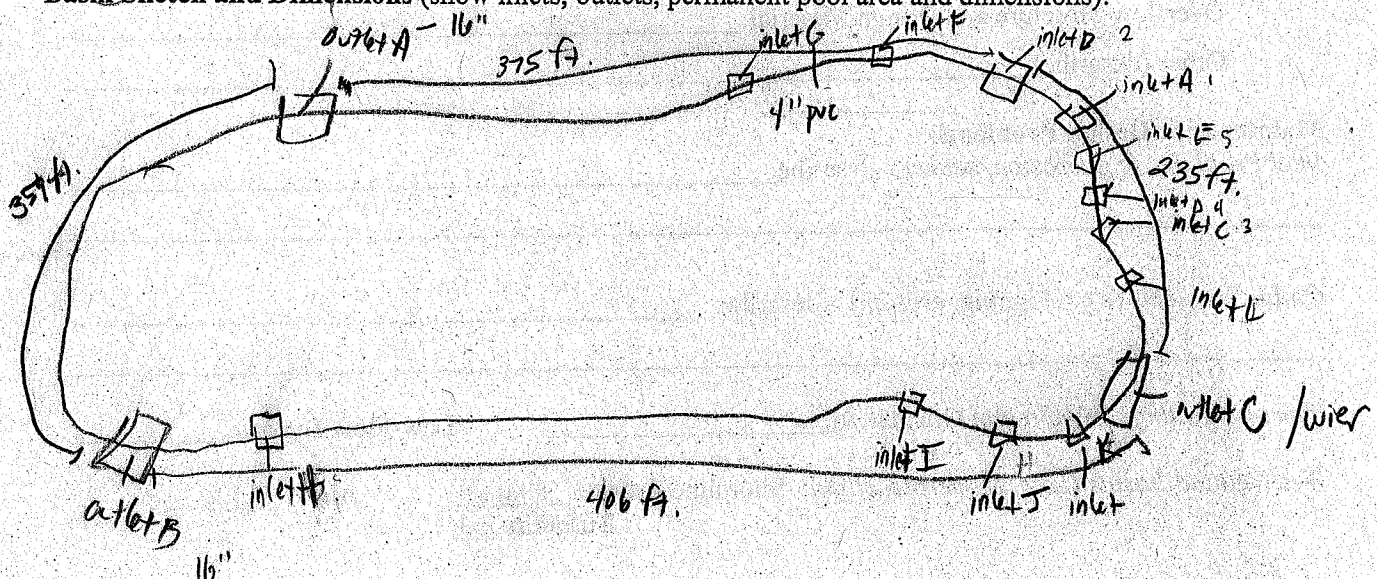
Photo #	Description
basin	12264
basin	12265
inlet A	12266
inlet B	12267
inlet C	12268
inlet D	12269
inlet E	12270
inlet F	12271
outlet B	
inlet G - 4in	
inlet H - 4in	
inlet I - 4in	

inlet G 12272
outlet A

12264	basin	12276	basin
12265	basin	12277	outlet B
12266	inlet A	12278	inlet H
12267	inlet B	12279	inlet H
12268	gap @ end of inlet B	12280	inlet I
12269	inlet C	12281	inlet J
12270	inlet D	12282	inlet K
12271	inlet E	12283	outlet C
12272	inlet F	12284	outlet C weir
12273	inlet G	12285	inlet L
12274	erosion	12286	outlet C from across basin
12275	outlet A		

12264 - 12286

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 104

Basin Name (subdivision and/or property owner): The Landings of Lake Zurich

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-25-07 / 1205 Temperature 85 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Carolyn Ct. cul de sac

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential / commercial Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 3.5in Bank Height 4-6ft. Buffer Width: 0-2ft.

inlet A 22in

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size 6in

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae _____

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): frogs

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

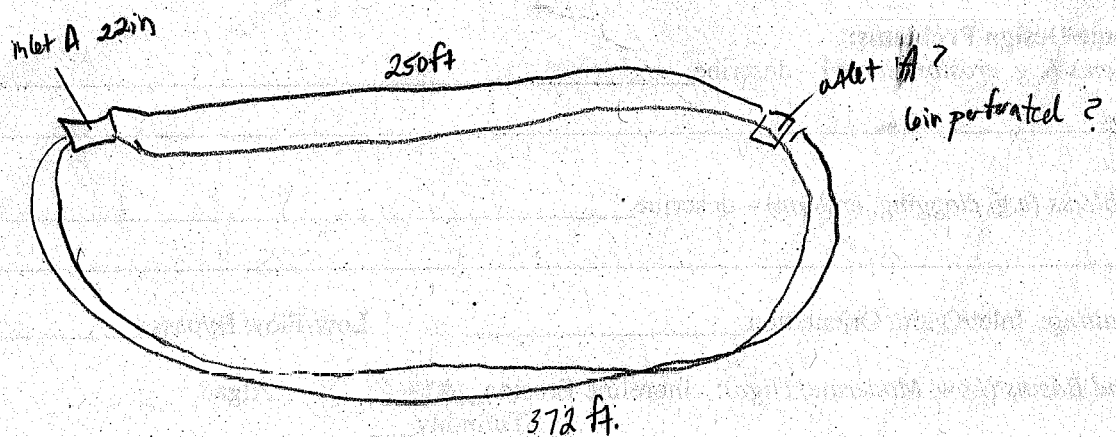
Other:_____

Preliminary Retrofit Opportunities (describe): Replace any surrounding turf grass with native vegetation. Stabilize erosion on banks. Fix outlet A ? B.

Photos:

Photo #	Description
1	basin 13632
2	inlet A 13633
3	basin 13634
4	basin 13635
5	outlet A 13636
6	" 13637
7	" 13638
8	bank erosion w/ turf grass 13639
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 103

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-15-07 / 715 Temperature 70 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: SE Rand Rd & Ela Rd.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: commercial Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 5in Bank Height 3-4ft. Buffer Width: 3 - 10 ft.

Number of Inlets: Stormsewer _____ Size inlet A 22in Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 10in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe Inlet A is completely clogged w/ debris and has plants growing infront of it.

Short-Circuiting: Inlet/Outlet Orientation ✓ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae low

Turbidity moderate

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

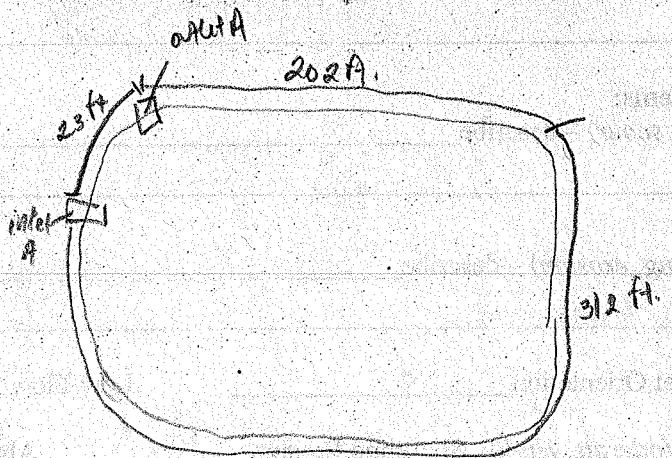
Other Observations:
Aquatic Life/ Wildlife (describe): fish, frogs
Potential Safety Problems: steep banks, erosion hidden by tall plants
Potential Nuisance Problems:_____
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): Replace any surrounding turf grass and rip rap native vegetation. Clean out material around outlet A

Photos:

Photo #	Description
1	basin 13058
2	inlet A 13059
3	basin 13060
4	outlet A 13061
5	" 13062
6	" after pulling some debris off 13063
7	
8	
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 102

Basin Name (subdivision and/or property owner): infront of Costco

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-15-07 / 848 Temperature 85 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: SE Rand Rd. & Ela Rd.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: Commercial Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other dia

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 4in (inlet A 10in) Bank Height 6ft. Buffer Width: none - 2 ft.

Number of Inlets: Stormsewer inlet B 18 Size (outlet A 10in) Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe debris & plants clogging opening of outlet A

Short-Circuiting: Inlet/Outlet Orientation ✓ inlet B & outlet A Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae _____

Turbidity low

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

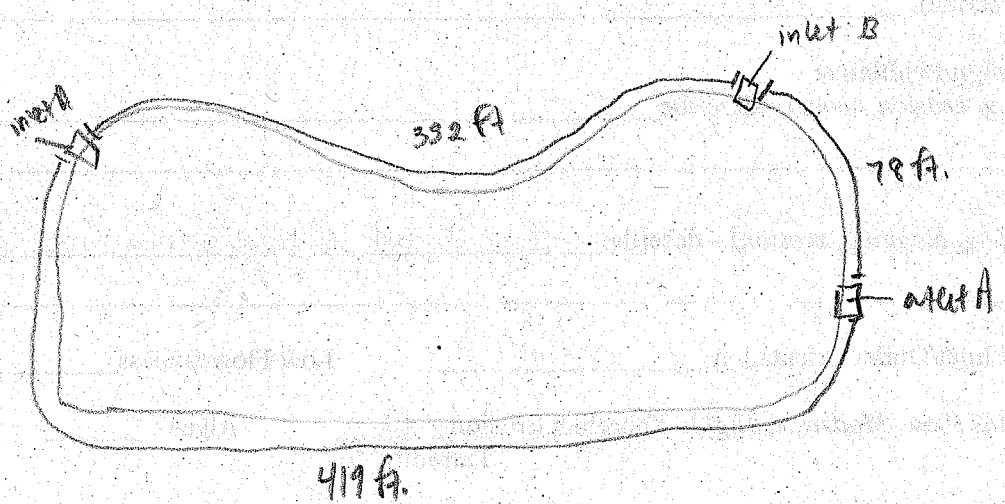
Other Observations:
Aquatic Life/ Wildlife (describe): birds (red-winged black bird), frogs
Potential Safety Problems:_____
Potential Nuisance Problems:_____
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): Replace turf grass w/ native vegetation and rip rap
Clean out outlet A

Photos:

Photo #	Description	
1	basin	13080
2	inlet A	13081
3	outlet A	13082
4	basin	13083
5	inlet B	13084
6		
7		
8		
9		
10		

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 101

Basin Name (subdivision and/or property owner): ~~Ranch Villa Homes~~ Mews Townhouses

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-19-07/ 822 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Genessee St. & June Terrace

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry _____ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 3-6 ft Buffer Width: 8-10 ft.

Number of Inlets: Stormsewer inlet A 6in inlet B 10in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 14in outlet B 10in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe plants clogging inlet B

Outlet Problems (e.g. clogging, erosion) – describe plants clogging outlet B

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae _____

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ wetland grasses Excess Sediment Accumulation_____
Excess Woody Vegetation_____

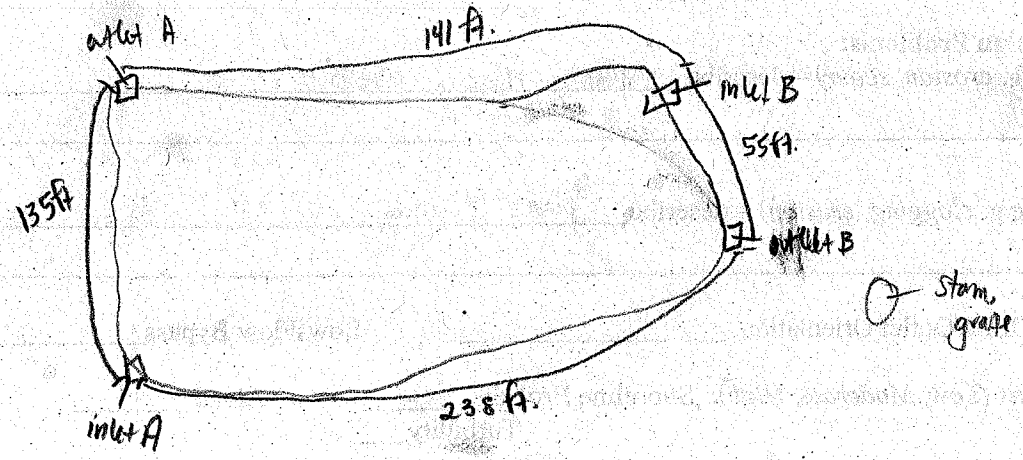
Other Observations:
Aquatic Life/ Wildlife (describe): frogs
Potential Safety Problems:_____
Potential Nuisance Problems:_____
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): Replace any turf grass along banks with native vegetation. Clean inlet B & outlet B of plant material

Photos:

Photo #	Description
1	basin 13150 11 inlet B 13160
2	basin 13151
3	outlet A 13152
4	outlet A 13153
5	inlet A 13154
6	basin 13155
7	outlet B 13156
8	storm grate 13157
9	" 13158
10	inlet B 13159

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 100

Basin Name (subdivision and/or property owner): Mew Townhouses

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-19-07/ 851 Temperature 75 Rainfall (now, (12), 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: June Terrace & Seaton Ct.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other lin, rip rap

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 2in Bank Height 6-8ft Buffer Width: 4-6ft

inlet A 22in

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

outlet A 8in

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe debris clogging / covering trash rack on outlet A

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae low

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ trash & plant Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): frogs, mallards, red-wingred black birds

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

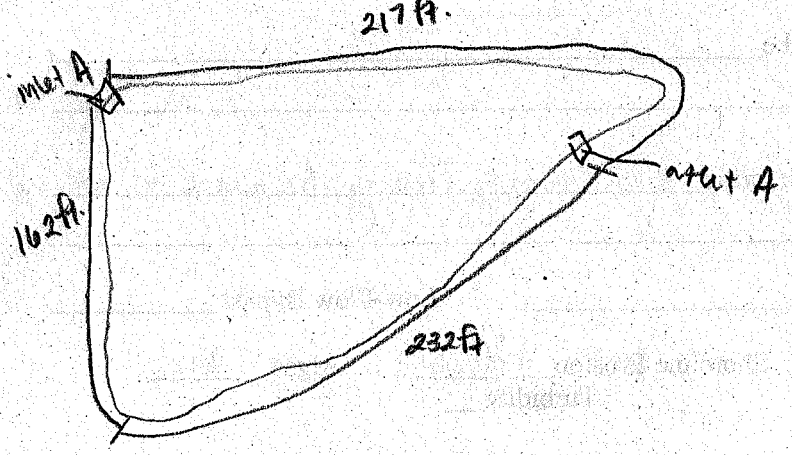
Other:_____

Preliminary Retrofit Opportunities (describe): Replace any surrounding turf grass with native vegetation. Clean outlet A of debris

Photos:

Photo #	Description
1	basin 13161
2	basin 13162
3	inlet A 13163
4	basin 13164
5	outlet A 13165
6	" 13166
7	basin 13167
8	erosion of bank 13168
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 99

Basin Name (subdivision and/or property owner): Mews Townhomes

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-19-07/ 920 Temperature 75 Rainfall (now, (12), 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Rosehall Dr.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry ✓ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 4in Bank Height 2- 8 ft Buffer Width: 4-10 ft.

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae _____

Turbidity _____

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): birds

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

Other:_____

Preliminary Retrofit Opportunities (describe): Replace any surrounding turf grass with native vegetation. Add storm sewers to connect nearby parking areas to basin?

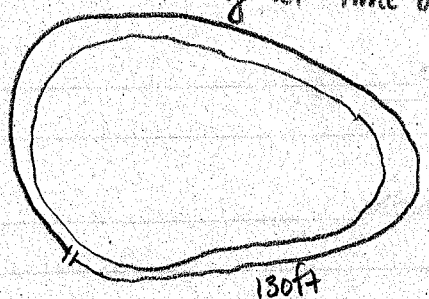
Photos:

Photo #	Description
1	basin 13169
2	basin bottom 13170
3	basin 13171
4	wetland between basin 99 & 98 13172
5	
6	
7	
8	
9	
10	

both basins 99 & 98 located near wetland but seperated by banks

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):

Small basin - no inlets/outlets. Seems like water probably runs down banks. Basin dry at time of inventory after big rain last night.



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 98

Basin Name (subdivision and/or property owner): Mews Townhouses

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-19-07 / 931 Temperature 75 Rainfall (now (12), 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Rosehall Dr.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 4in Bank Height 2 - 6ft. Buffer Width: 2 - 16ft.

Number of Inlets: Stormsewer inlet A 16in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A eroded channel into nearby wetland Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae low

Turbidity moderate

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): birds, muskrat ?

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

Other:_____

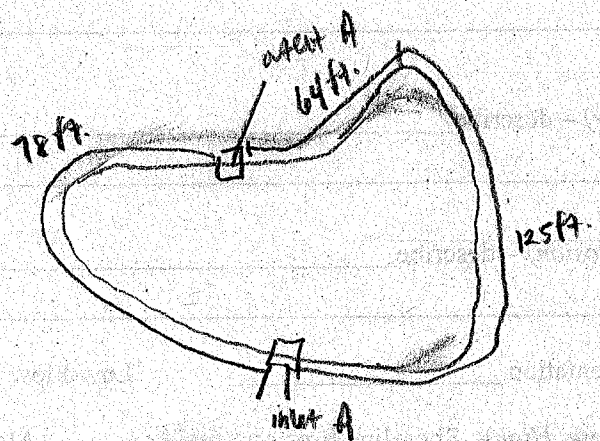
Preliminary Retrofit Opportunities (describe): Replace any surrounding turf grass with native vegetation. Stabilize or reconstruct outlet A that drains into wetland.

Photos:

Photo #	Description
1	wetland between basin 99 & 98 13173
2	basin (note bank separating it from wetland) 13174
3	basin bottom staCKed at 0 13175
4	inlet A 13176
5	basin 13177
6	nearby wetland (different view from photo #1) 13178
7	outlet A 13179
8	" 13180
9	
10	

eroded
outlet A is an channel that drains into nearby wetland

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



2-38in wide
width varies
~10 ft. long
basin to wetland

DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 97

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-15-07 / 803 Temperature 80 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: SE Rand Rd & Ela Rd.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: (commercial) Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other concrete bricks

Slope (Horizontal:Vertical) 12m : 4in Bank Height 6ft Buffer Width: none

Number of Inlets: Stormsewer inlet A 36in inlet B 36in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 8in outlet B 10in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation ✓ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae low

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ garbage Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): red-winged blackbird

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe): outlet A & B ~~evidence of~~ oil slicks @ openings

Other Basin Uses (rec. field, etc):_____

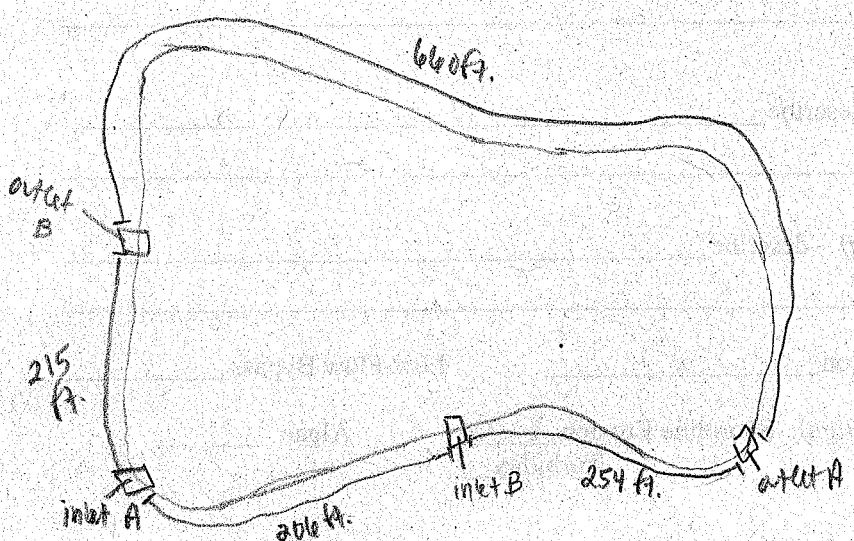
Other:_____

Preliminary Retrofit Opportunities (describe): Replace turf grass with native vegetation.

Photos:

Photo #	Description
1	basin 13064
2	basin 13065
3	inlet A 13066
4	inlet B 13067
5	outlet A 13068
6	basin 13069
7	outlet B 13070
8	oil slick @ outlet B 13071
9	basin 13072
10	basin 13073

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 96

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-19-07 / 1050 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Main St. / Rt. 22 & Lake St.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in:1in - 12in:3in inlet A 18in Bank Height 2 - 5ft Buffer Width: none - 16ft.

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

outlet A 8in

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe outlet clogged w/ sediment & grasses

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae _____

Turbidity high

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ garbage Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): fish

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

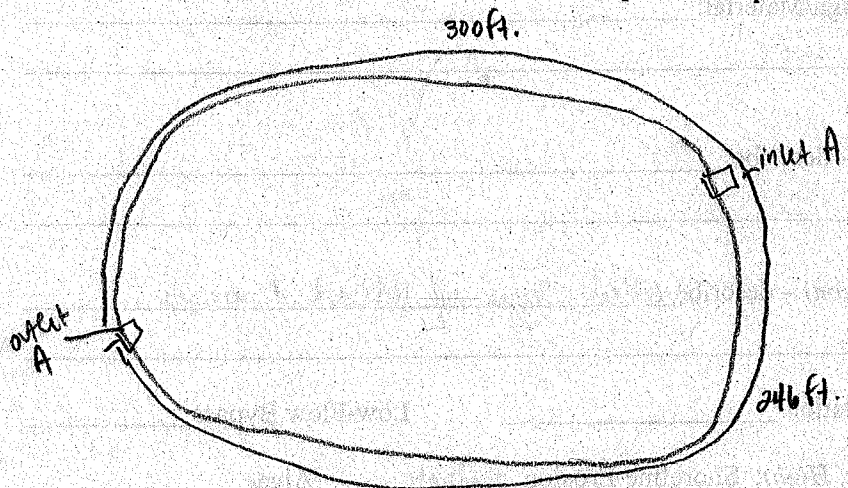
Other:_____

Preliminary Retrofit Opportunities (describe): Replace turf grass with native vegetation. Cut back some of the overhanging trees. Clean at outlet A

Photos:

Photo #	Description
1	basin 13192
2	basin 13193
3	outlet A 13194
4	" 13195
5	inlet A 13196
6	path inlet A takes to basin 13197
7	" 13198
8	basin 13199
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 95

Basin Name (subdivision and/or property owner): Fetco

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-25-07 / 1331 Temperature 85 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Rose Rd & Buesching Rd.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: industrial Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass _____ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 4-5ft. Buffer Width: 25-50ft.

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 8in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae low

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation ✓ dead woody veg along banks.

Other Observations:
Aquatic Life/ Wildlife (describe): frogs

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

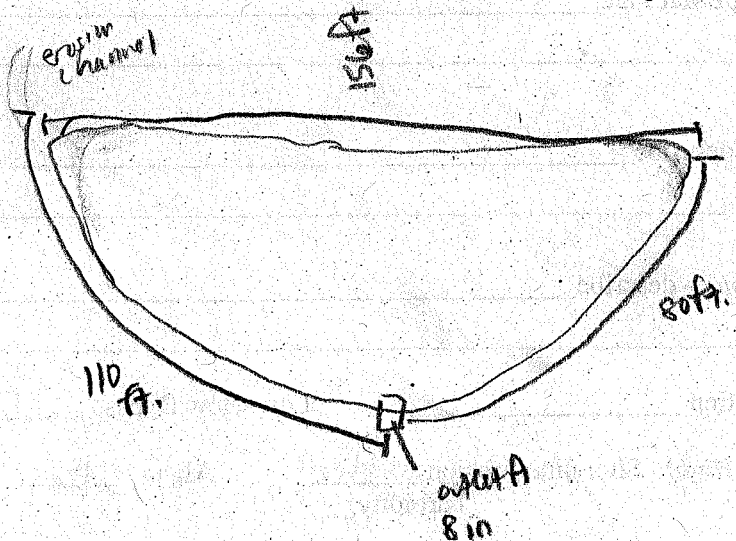
Other:_____

Preliminary Retrofit Opportunities (describe): Fix an erosion on banks. Remove rip rap from around outlet A.

Photos:

Photo #	Description
1	basin from outlet A 13654
2	" 13655
3	outlet A 13656
4	" 13657
5	basin 13658
6	" 13659
7	erosion channel leading to basin 13660
8	
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 94

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-27-07 / 831 Temperature 80 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: West of Oakwood Rd @ Ensell Rd

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: industrial Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry ✓ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass _____ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in:2in Bank Height 3-4ft. Buffer Width: 3-500ft

Number of Inlets: Stormsewer inlet A Size 18in Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser ✓ Size 12in

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae low

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe):_____

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

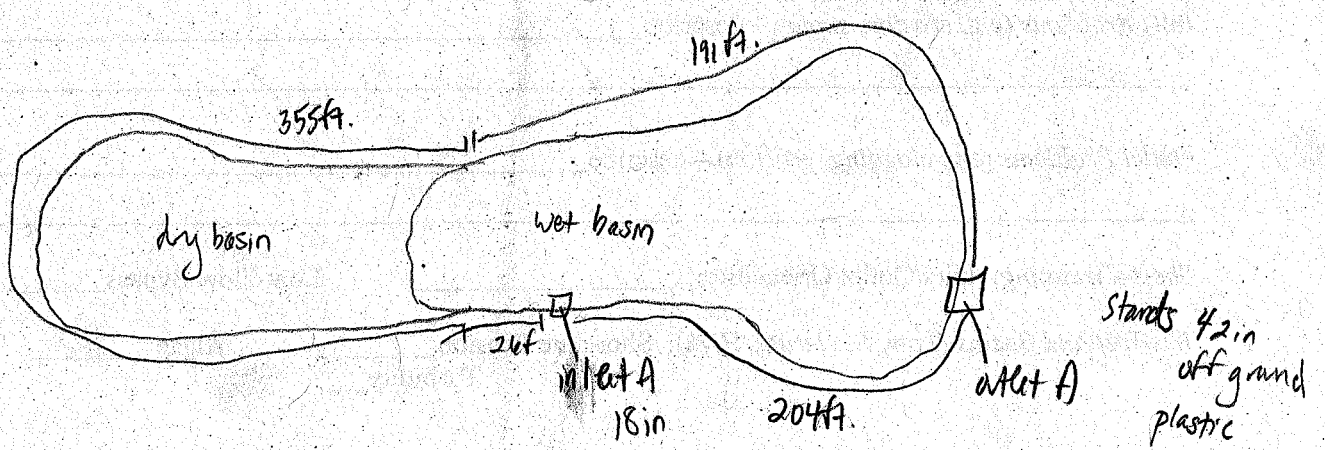
Other:_____

Preliminary Retrofit Opportunities (describe): Clean out near outlet A

Photos:

Photo #	Description
1	wet portion of basin 13668
2	dry portion of basin 13669
3	" 13670
4	inlet A 13671
5	outlet B 13672
6	" 13673
7	" 13674
8	
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 93

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-27-07 / 755 Temperature 80 Rainfall (now, (12), 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: West of Oakwood Rd & Ensell Rd.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: Industrial Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry ✓ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass _____ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 3in. Bank Height 3ft Buffer Width: 20 - 500ft

Number of Inlets: Stormsewer inlet A 4in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 12in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet A caved w/ grasses

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae moderate

Turbidity low

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): blue heron, frogs
Potential Safety Problems: erosion hidden by grasses along wet basin
Potential Nuisance Problems:_____
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

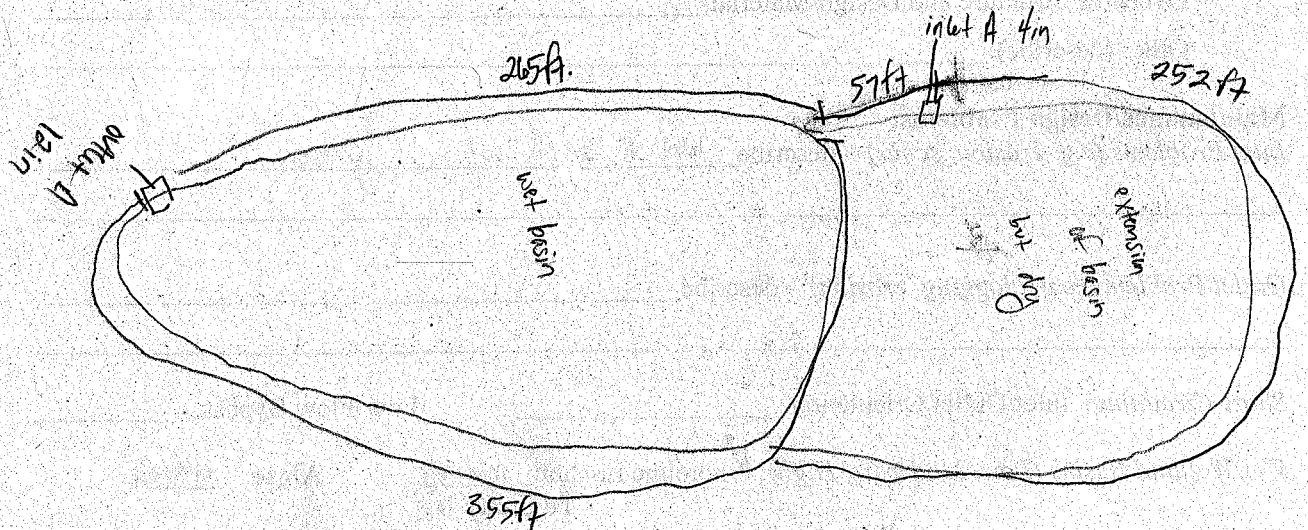
Preliminary Retrofit Opportunities (describe): stabilize banks

Photos:

Photo #	Description
1	inlet A 13661
2	wet basin 13662
3	wet basin 13663
4	dry basin 13664
5	dry & wet basin 13665
6	inlet A 13666
7	sedge grasses on upper bank of basin 13667
8	
9	
10	

looks like what was thought to be done by drawing #3.

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 92

Basin Name (subdivision and/or property owner): Hydrite

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 10-27-07 / 911 Temperature 80 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Oakwood Rd & Commerce Dr.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: industrial Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass ✓ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 1in - 12in : 3in Bank Height 3 - 10ft Buffer Width: none - 8ft.

Number of Inlets: Stormsewer inlet A inlet B 24in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 10in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet A pipe seperated from opening. Inlet B pipe is rusting, major erosion of hillside and dirt where inlet enters basin

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae low

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris____ garbage Excess Sediment Accumulation_____
Excess Woody Vegetation____ willows

Other Observations:
Aquatic Life/ Wildlife (describe): birds, frogs

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

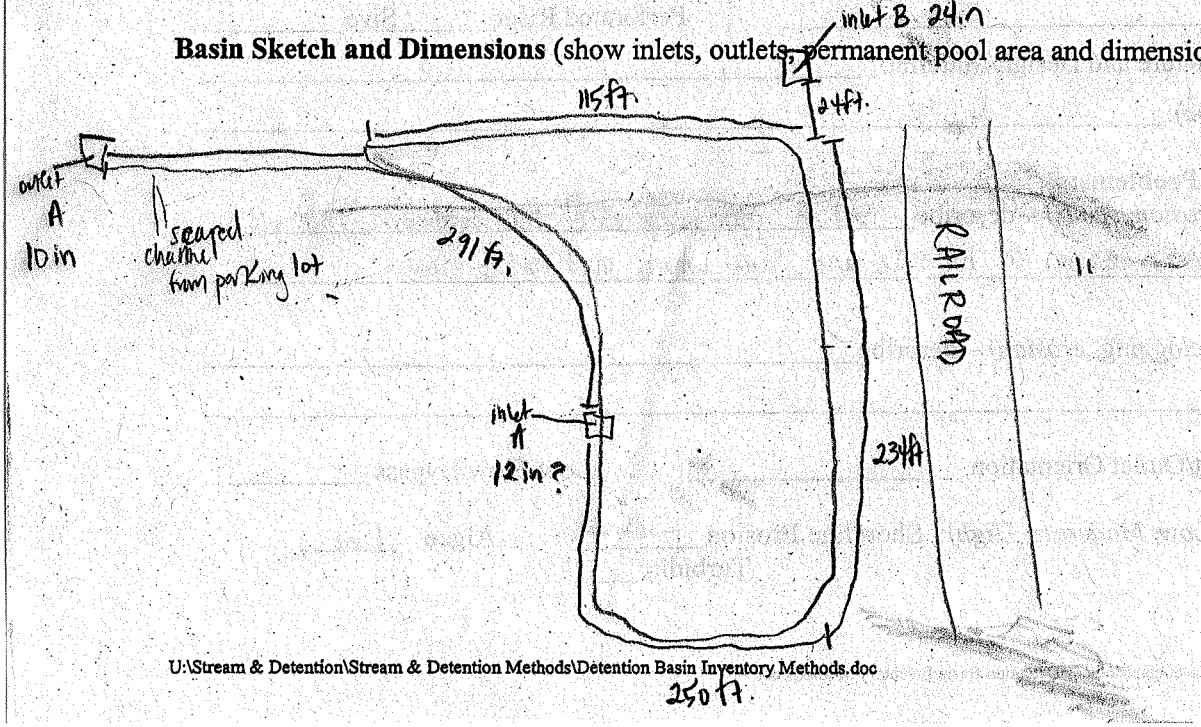
Other:_____

Preliminary Retrofit Opportunities (describe): Replace turf grass w/ native vegetation. Fix inlet A. Stabilize banks.

Photos:

Photo #	Description
1	basin 13675
2	towards outlet A 13676
3	outlet A 13677
4	channel eroded towards basin from parking lot, 13678
5	inlet A 13679
6	" 13680
7	basin 13681
8	" 13682
9	" 13683
10	bank of rail road d inlet pipe 13684
11	inlet B 13685
12	inlet B 13686
13	basin 13687

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 91

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-17-07 / 13:40 Temperature 60 Rainfall (now, (12), 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: oliver way & Commerce Dr.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features: NOT A BASIN ⇒ WETLAND MARSH

Type: Wet _____ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass _____ Rip Rap _____ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) _____ Bank Height _____ Buffer Width: _____

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae high

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): geese, redwinged black birds, plovers, mallards

Potential Safety Problems:_____

Potential Nuisance Problems: lots of algae

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

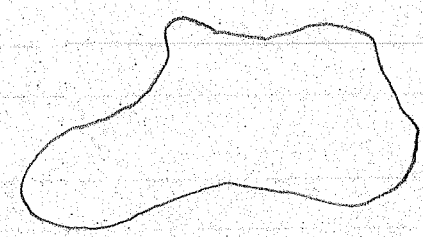
Other:_____

Preliminary Retrofit Opportunities (describe):_____

Photos:

Photo #	Description
1	marsh wetland 11959
2	" 11960
3	" 11961

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 90

Basin Name (subdivision and/or property owner): White Birch Meadows

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-17-06/12:50 Temperature 60 Rainfall (now, (12), 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: E/a Quarter Section: _____

Nearest Cross Streets: Gentry Dr. & Governors Way

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) ~12in : 4-5in. Bank Height 6.5ft. Buffer Width: NONE

Number of Inlets: Stormsewer inlet A 24in cement inlet B Size 12in plastic Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: NONE Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet A has erosion around pipe area,

Outlet Problems (e.g. clogging, erosion) – describe no outlets

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae low

Turbidity low

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

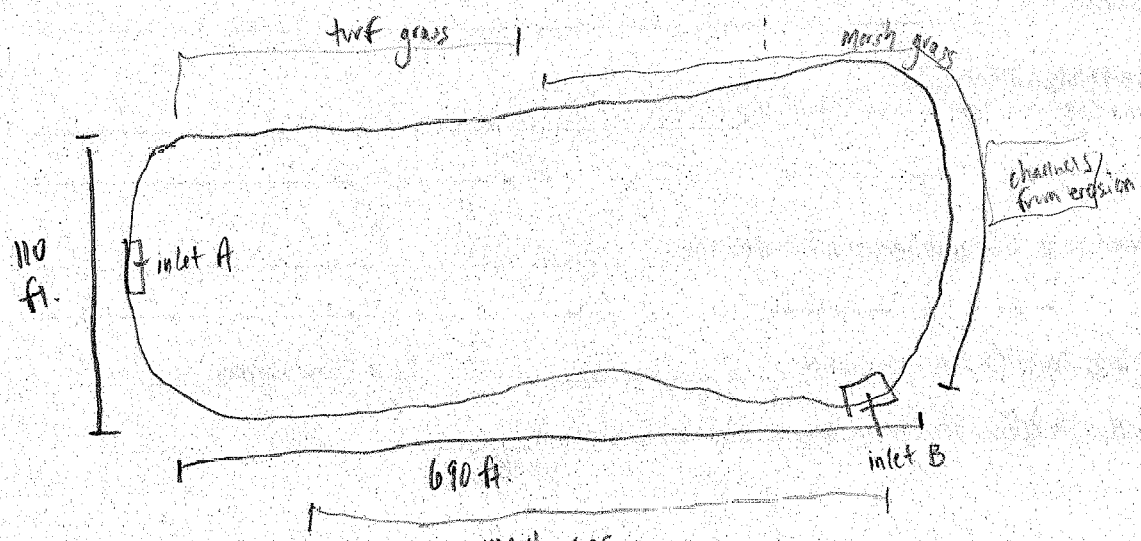
Other Observations:
Aquatic Life/ Wildlife (describe): birds
Potential Safety Problems: inlet A erosion @ pipe joining, bank erosion / channels formed
Potential Nuisance Problems: geese poop
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): remove turf on sides and plant more native veg. in addition to what is already there. Stabilize banks

Photos:

Photo #	Description
1	basin 11950
2	inlet A 11951
3 4	inlet A erosion 11952 / 11953
5 6	shore line / vegetation 11954 / 11955
7	inlet B 11956
8	inlet B 11957
9	channel formed from erosion 11958

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 89

Basin Name (subdivision and/or property owner): Wynstone

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-22-07 / 1110 Temperature 85 Rainfall (now, 12, 24, 48 hours, (week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Rand Rd. & Timber Lake Dr.

Not a detention Basin - Primary Storage tank for waste water

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass _____ Rip Rap _____ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) _____ Bank Height _____ Buffer Width: _____

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae _____

Turbidity _____

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe):_____

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

Other:_____

Preliminary Retrofit Opportunities (describe):_____

_____

_____

Photos:

Photo #	Description

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):

DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 88

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: Wynstone

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-22-07 / 1115 Temperature 85 Rainfall (now, 12, 24, 48 hours, (week)) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Rand Rd & Timber Lake Dr.

NOT A DETENTION BASIN - waste water storage tank

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass _____ Rip Rap _____ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) _____ Bank Height _____ Buffer Width: _____

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae _____

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe):_____

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

Other:_____

Preliminary Retrofit Opportunities (describe):_____

_____

_____

Photos:

Photo #	Description

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):

DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 87

Basin Name (subdivision and/or property owner): near state bank

Maintenance Responsibility:

Contact Name: Phone Number:

General Information:

Date/Time 5-22-07/1040 Temperature 80 Rainfall (now, 12, 24, 48 hours, (week)

Location:

Political Jurisdiction: Township: Ela Quarter Section:

Nearest Cross Streets: Rand Rd at Timberlake Dr.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): Design Storm:

Permanent Pool Volume (acre-feet): Release Rate (cfs/acre)

Estimated Tributary Area (Acres), and upstream area if online:

Land Use Served: commercial Year Constructed:

Basin Design Features:

Type: Wet Dry ✓ Wetland Online

Sediment basin present (Y/N)?

Basin Bottom – Vegetation: Turf Grass ✓ Native Vegetation/Wetland

Concrete Lined Channel Other

Side Slopes: Turf Grass ✓ Rip Rap Native Vegetation Other

Slope (Horizontal:Vertical) 12in : 4in Bank Height 4ft. Buffer Width: NONE

Number of Inlets: Stormsewer inlet A Size 14in concrete Channel/Swale Size

Outlet Type(s) and Dimensions: Culvert: outlet A 14in concrete Restrictor (Y/N) N Size

Surface Weir: Size Perforated Riser Size

Overflow Structure and Design/Material:

Other (describe):

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe grass growing up into culvert

Outlet Problems (e.g. clogging, erosion) – describe algae & grass cluttering opening

Short-Circuiting: Inlet/Outlet Orientation ✓ Low-Flow Bypass

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion Algae

Turbidity

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): frogs

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

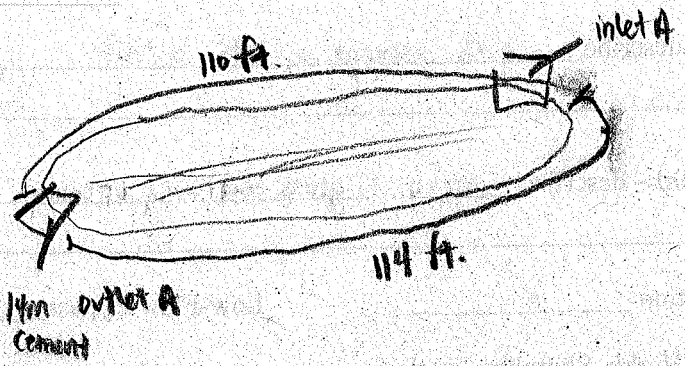
Other:_____

Preliminary Retrofit Opportunities (describe): replace all of turf grass with native vegetation

Photos:

Photo #	Description
1	basin 12133
2	outlet A 12134
3	basin 12135
4	inlet A 12136

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 86

Basin Name (subdivision and/or property owner): near state bank

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-22-07 / 945 Temperature 75 Rainfall (now, 12, 24, 48 hours, (week)) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Rand Rd. & Timberlake Rd.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: commercial office buildings Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry _____ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in:5in Bank Height 20ft. Buffer Width: NONE

Number of Inlets: Stormsewer inlet A 12in (lots of sediment couldn't get an accurate measurement) inlet B Size 12 in. Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 22in (lots of sediment couldn't get an accurate reading) Restrictor (Y/N) N Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

22in Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet A blocked by a lot of grass and some sedimentation

Outlet Problems (e.g. clogging, erosion) – describe outlet A blocked by grasses, a good amount of sedimentation at opening.

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass ?

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae _____

Turbidity Moderate

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris__✓ garbage plant material Excess Sediment Accumulation__✓
Excess Woody Vegetation_____

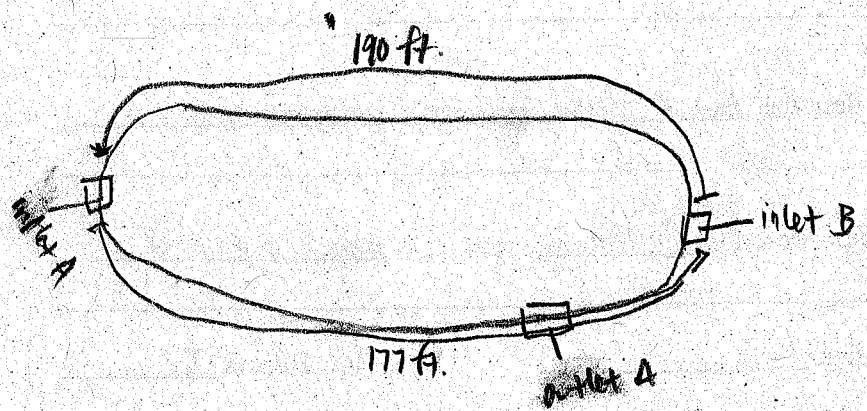
Other Observations:
Aquatic Life/ Wildlife (describe): frogs, birds
Potential Safety Problems: steep basin banks & erosion of turf grass
Potential Nuisance Problems:
Evidence of Upstream Illicit Connections (describe):
Other Basin Uses (rec. field, etc):
Other:

Preliminary Retrofit Opportunities (describe): clear outlet A, put native vegetation on banks to prevent erosion by replacing turf grass

Photos:

Photo #	Description
1	basin 12115
2	erosion on basin bank 12116
3	inlet A 12117
4	inlet A 12118
5	outlet A 12119
6	outlet A 12120
7	inlet B 12121
8	basin 12122

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 85

Basin Name (subdivision and/or property owner): near State bank

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-22-07 / 1022 Temperature 78 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Rand Rd & Timberlake Rd.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: Commercial Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry ✓ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other ✓ rip rap

Side Slopes: Turf Grass _____ Rip Rap _____ Native Vegetation _____ Other ✓ brush

Slope (Horizontal:Vertical) 12in : 3in – before drop off Bank Height 5ft. Buffer Width: NONE

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 18in Restrictor (Y/N) N Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe NONE

Outlet Problems (e.g. clogging, erosion) – describe plants growing into outlet, sedimentation in front of

Short-Circuiting: Inlet/Outlet Orientation ✓ ~ but has wetland plants to slow flow Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae moderate @ pooling areas

Turbidity _____

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ Excess Sediment Accumulation_____
Excess Woody Vegetation ✓ - trees on banks

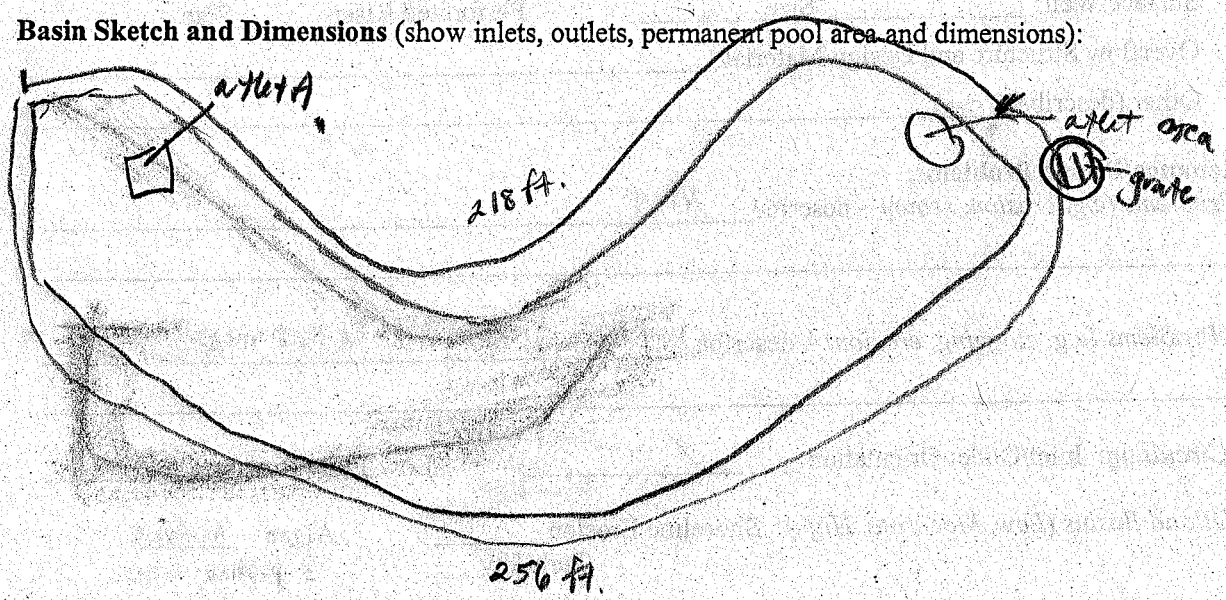
Other Observations:
Aquatic Life/ Wildlife (describe):_____
Potential Safety Problems: dangerous 5ft dropoff into basin
Potential Nuisance Problems:_____
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): remove brick siding and bark mulch, regrade slopes and put in native vegetation

Photos: look @ photos for description has brick steep sides surranded by bark mulch

Photo #	Description
1	basin 12123
2	steep side 12124
3	basin 12125
4	basin 12126
5	stone lining portion of basin 12127
6	grate (outlet C) 12128
7	grate " 12129
8	outlet A 12130
9	outlet A 12131
10	outlet A 12132

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 84

Basin Name (subdivision and/or property owner): Timber Creek

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-22-07/8:45 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Timber Lake Rd. & Stone Marsh Ln.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓ aquatic macrophytes

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 2in : 4in Bank Height 3ft. Buffer Width: NONE - 40ft.

Number of Inlets: Stormsewer inlet A 4in plastic inlet B " Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 8in. cement Restrictor (Y/N) N Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe rocks, grass and sediment in front of outlet A

Short-Circuiting: Inlet/Outlet Orientation ✓ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae low

Turbidity low

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ reed grass, plant litter, garbage Excess Sediment Accumulation_____
Excess Woody Vegetation ✓ a lot of trees & brush

Other Observations:
Aquatic Life/ Wildlife (describe): birds, frogs, fish, turtles

Potential Safety Problems:_____

Potential Nuisance Problems: algae & banks of basin

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

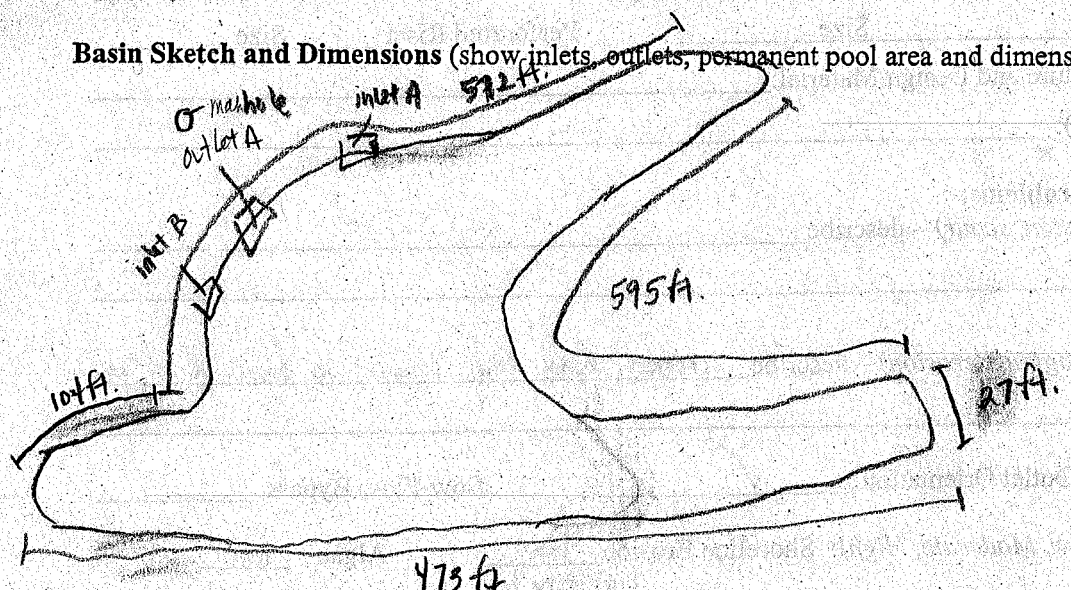
Other:_____

Preliminary Retrofit Opportunities (describe): remove rip rap & turf areas and build up on native vegetation. Cut back some of trees and brush along the banks

Photos: Note: only found 2 inlets, looked carefully but a lot of the banks were covered in dense shrub and tree

Photo #	Description
1	basin 12106
2	basin 12107
3	basin 12108
4	basin end that has a good amt of wood debris 12109
5	inlet A 12110
6	basin 12111
7	outlet A 12112
8	shoreline rocky 12113
9	inlet B 12114

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 83

Basin Name (subdivision and/or property owner): Sonoma

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-31-07 / 1010 Temperature 80 Rainfall (now, 12, 24, 48 hours, (week)) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Main St. / Rt 22 & Garland Dr

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other ✓ Rip rap

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 1in Bank Height 0-5in Buffer Width: none - 15ft

Number of Inlets: Stormsewer inlet A 16in inlet B Size 16in inlet C - unk. inlet D 20in Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 16in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet C is broken apart and under water inlet D has a lot of algae inside & @ opening

Outlet Problems (e.g. clogging, erosion) – describe inlet B has a lot of sediment accumulation @ opening

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae low

Turbidity _____

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ garbage Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): mallards

Potential Safety Problems: erosion and holes at the bank

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe): oil slick in small basin & large basin

Other Basin Uses (rec. field, etc):_____

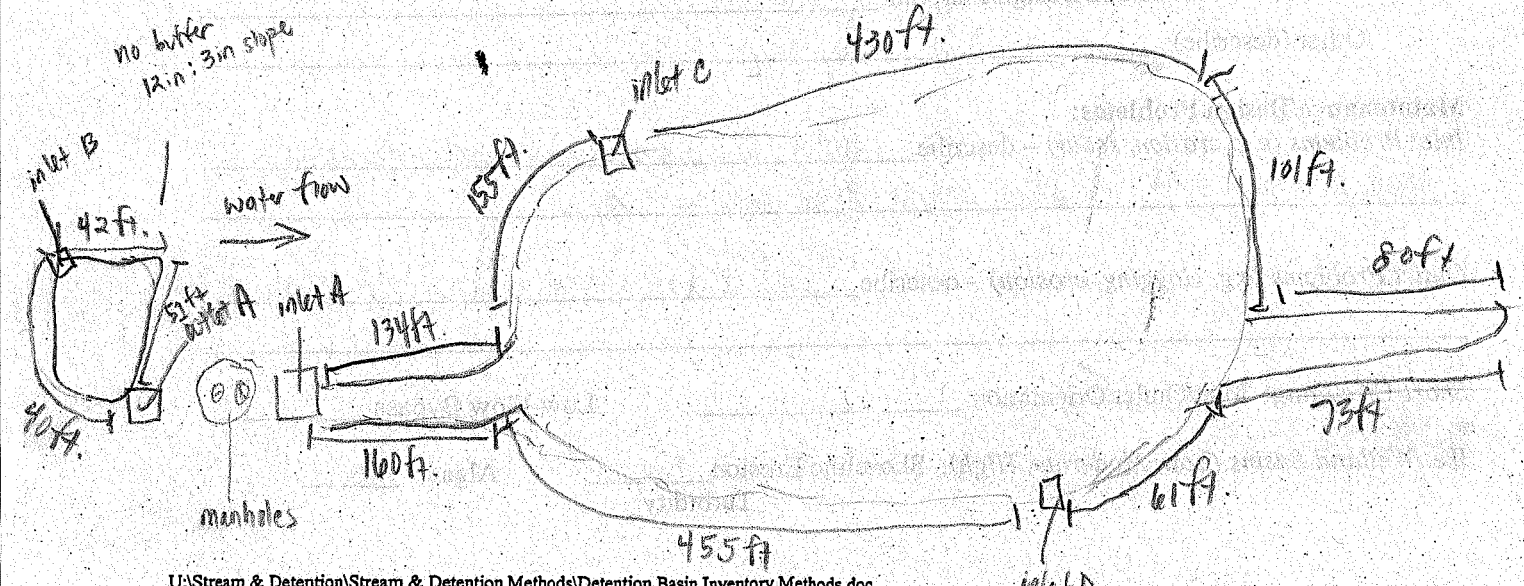
Other:_____

Preliminary Retrofit Opportunities (describe): fix inlet C replace turfgrass with native vegetation and rip rap

Photos:

Photo #	Description
1	inlet A 12439
2	inlet A 12440
3	basin 12441
4	small area by inlet A 12443
5	outlet A 12444
6	inlet B 12445
7	basin 12446
8	basin 12447
9	inlet C 12448
10	inlet D 12449

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 82

Basin Name (subdivision and/or property owner): Sonoma

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-31-07 / 1050 Temperature 80 Rainfall (now, 12, 24, 48 hours, (week) _____

Location:

Political Jurisdiction: _____ Township: Fla Quarter Section: _____

Nearest Cross Streets: Main St. / Rt 22 & Orchard Pond Dr.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓ small amt.

Concrete Lined Channel _____ Other ✓ dia

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 4in Bank Height 10ft Buffer Width: none

Number of Inlets: Stormsewer inlet A - 12in ? - clogged inlet B Size 38in outlet A 12in Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet A clogged w/ algae / grass and sediment could not get accurate measurement. Inlet B has concrete around it breaking apart

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae low

Turbidity moderate

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

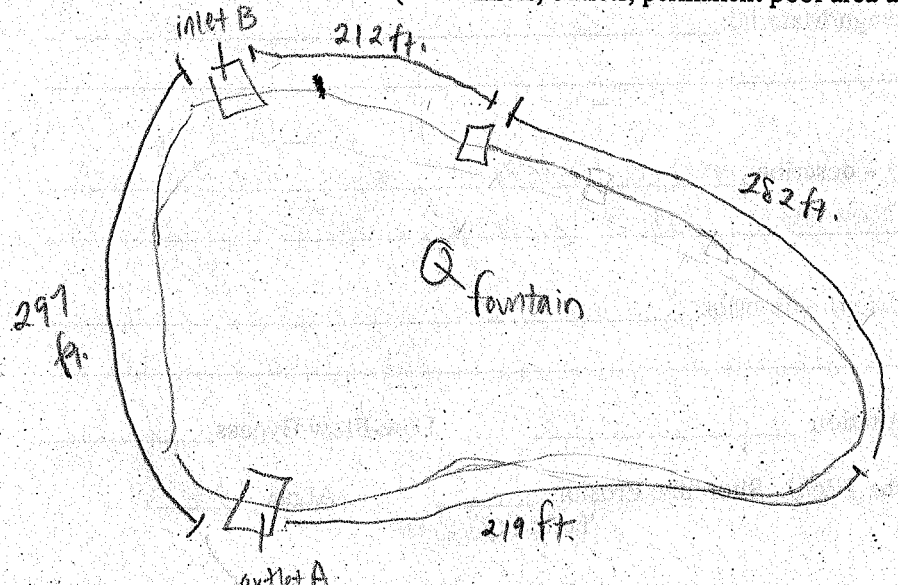
Other Observations:
Aquatic Life/ Wildlife (describe): frogs
Potential Safety Problems: bank erosion
Potential Nuisance Problems:
Evidence of Upstream Illicit Connections (describe):
Other Basin Uses (rec. field, etc):
Other:

Preliminary Retrofit Opportunities (describe): plant native vegetation in place of turf grass
clean out inlet A. fix concrete around inlet B

Photos:

Photo #	Description
1	basin 12450
2	basin 12451
3	outlet A 12452
4	outlet A 12453
5	basin 12454
6	bank erosion 12455
7	inlet A 12456
8	inlet B 12457

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 81b

Basin Name (subdivision and/or property owner): Sonoma

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-31-07 / 1200 Temperature 80 Rainfall (now, 12, 24, 48 hours, (week)) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Memory Ln. cul de sac

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other ✓ dirt

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 0 - 3ft. Buffer Width: none - wooded area

Number of Inlets: Stormsewer inlet A 4in inlet B Size 4in inlet C 4in Inlet D 4in Channel/Swale channel (garden area) storm Size 9ft x 12ft

Outlet Type(s) and Dimensions: Culvert: inlet A 10in Restrictor (Y/N) Size

Surface Weir: Size Perforated Riser Size

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae _____

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ garbage Excess Sediment Accumulation_____
Excess Woody Vegetation ✓ willows

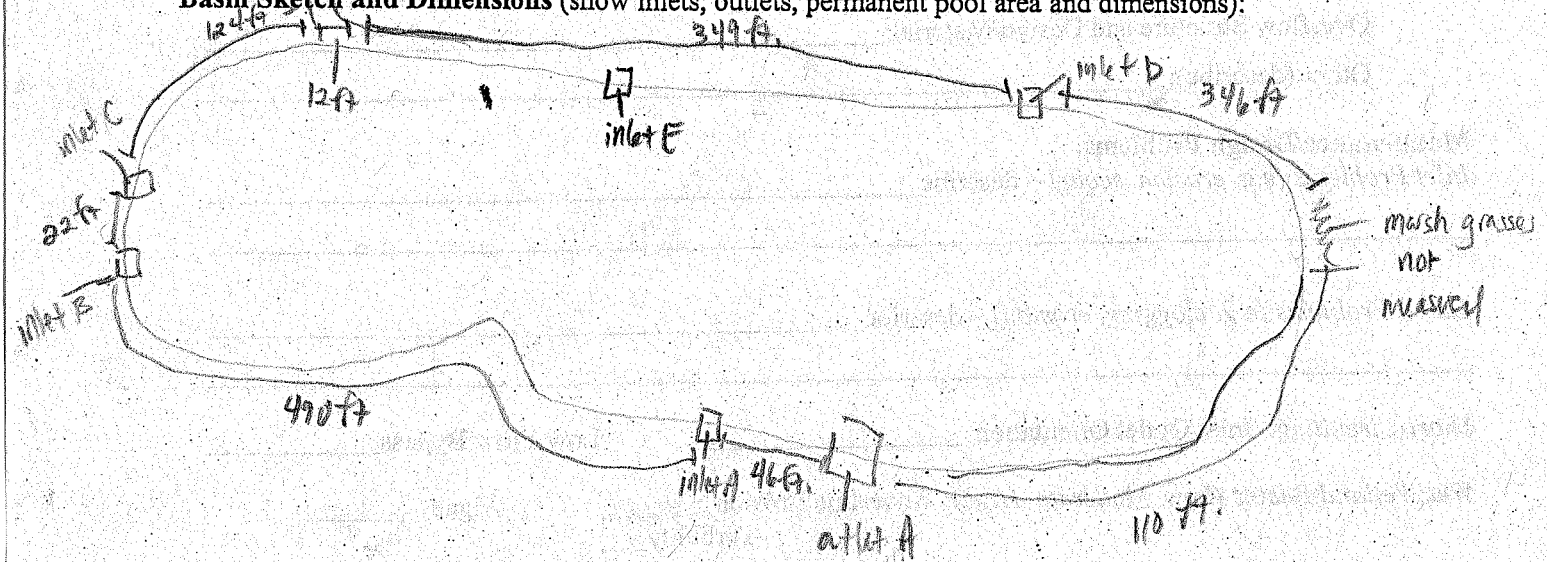
Other Observations:
Aquatic Life/ Wildlife (describe): birds, frogs
Potential Safety Problems:_____
Potential Nuisance Problems: geese poop
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): Replace turf grass with native vegetation
Remove some willows from bank.

Photos:

Photo #	Description
1	outlet A 12462 || inlet E 12472
2	basin 12463
3	basin 12464
4	inlet A 12465
5	inlet B 12466
6	inlet C 12467
7	basin 12468
8	basin 12469
9	stone path 12470
10	inlet D 12471

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 81a

Basin Name (subdivision and/or property owner): Sonoma

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-31-07 / 1140 Temperature 80 Rainfall (now, 12, 24, 48 hours (week)) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Memory Ln cul de sac

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓ aquatic macrophytes

Concrete Lined Channel _____ Other ✓ dirt, riprap

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 5in Bank Height 1ft. Buffer Width: none

Number of Inlets: Stormsewer inlet A 10in inlet B Size 10in Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 10in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet B has dead animal in opening

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation ✓ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae _____

Turbidity moderate

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): mallards, frogs

Potential Safety Problems: erosion holes along bank

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

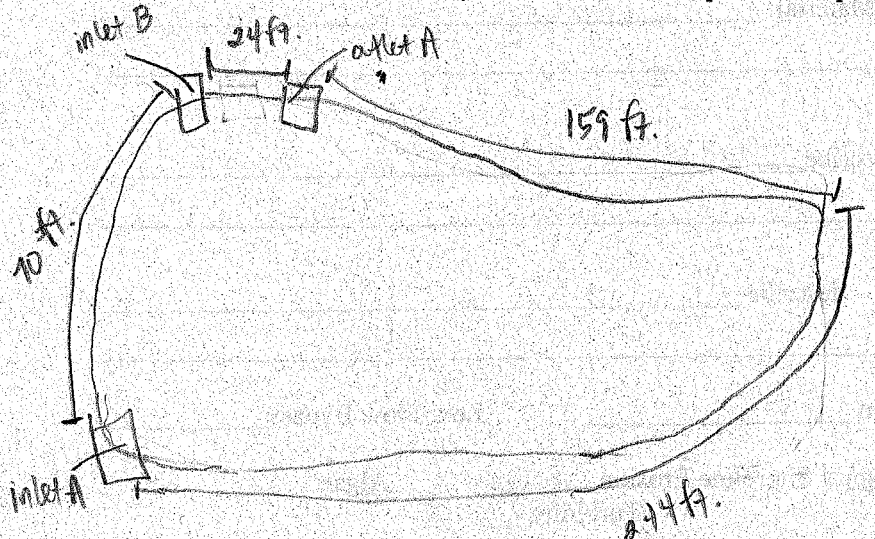
Other:_____

Preliminary Retrofit Opportunities (describe): plant native vegetation in place of turf grass
fix inlet outlet orientation to avoid short circuiting

Photos:

Photo #	Description
1	basin 12458
2	inlet A 12459
3	outlet A 12460
4	inlet B 12461

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 80

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-13-07/ 1036 Temperature 80 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Yorkshire Ln. & Chesterfield Ln.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 2in : 2in Bank Height 2 - 5 ft. Buffer Width: 4 - 15 ft

Number of Inlets: Stormsewer inlet A 4in inlet B 1in Size possible inlet 18in inlet C 18in Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe erosion around possible inlet pipe. Inlet C has separation in pipes

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae low

Turbidity low

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ reed grasses Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): birds

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

Other:_____

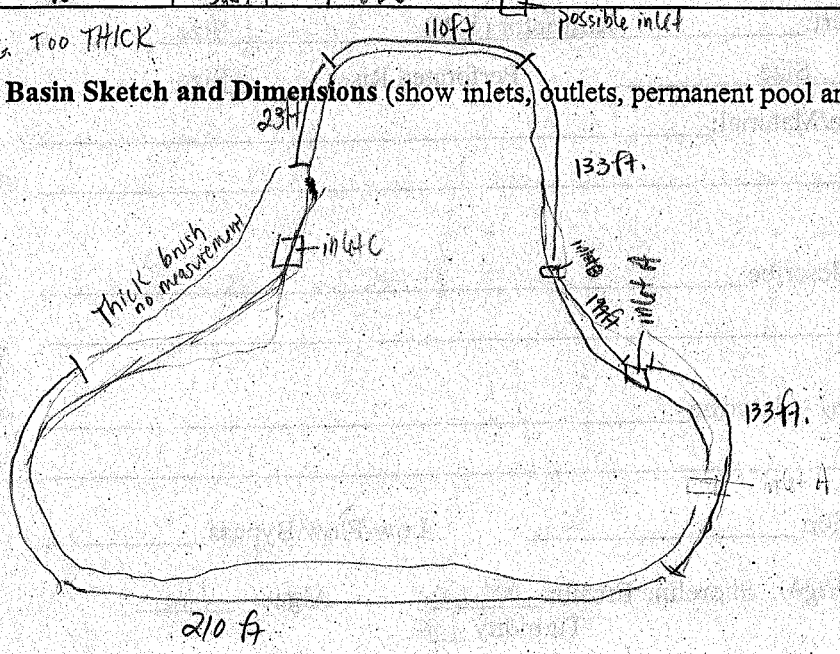
Preliminary Retrofit Opportunities (describe): Remove small portion of bank that is turf grass and replace w/ native vegetation. Fix inlet C and erosion around possible inlet

Photos:

Photo #	Description
1	basin 12877
2	basin 12878
3	basin 12879
4	inlet A 12880
5	inlet B 12881
6	basin 12882
7	inlet C break in pipes 12883
8	" break in pipes 12884
9	" 12885
10	basin 12886
11	possible inlet 12887
12	
13	
14	
15	
16	

BASIN VEG. TOO THICK

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 79

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-13-07 / 1126 Temperature 80 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Berkshire Ln & Donegal Ln.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 0-12in : 3in inlet A 28in Bank Height 0-5ft. Buffer Width: 20 ft.

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae low

Turbidity high

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ trash Excess Sediment Accumulation_____
Excess Woody Vegetation ✓

Other Observations:
Aquatic Life/ Wildlife (describe): blue heron

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

Other:_____

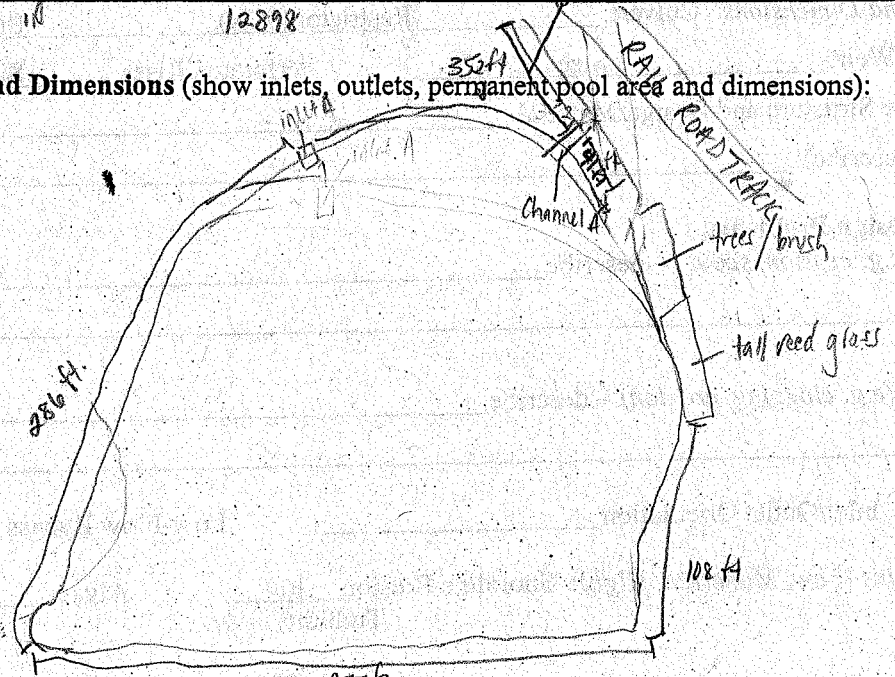
Preliminary Retrofit Opportunities (describe): remove turf grass from bank area and replace w/ native vegetation

Photos: Note: Could not access one side of basin, woody vegetation and backed up to rail road track. Little Channel connects to basin near rail tracks.

Photo #	Description
1	basin 12888
2	basin 12889
3	basin 12890
4	basin 12891
5	basin 12892
6	inlet A 12893
7	inlet A 12894
8	inlet A 12895
9	channel A 12896 (~6.5ft in width)
10	larger channel that channel A connects to 5ft 12897
11.	in 12898

channel A 14-3ft in width

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 78

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-13-07 / 915 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Rand Rd. & Ela Rd.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: commercial Year Constructed: _____

Basin Design Features: NOT SURE THIS IS A BASIN - NO INLETS/OUTLETS

Type: Wet _____ Dry _____ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass _____ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 2in : 2in Bank Height 3ft. Buffer Width: huge

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae high

Turbidity _____

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ reed grass Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): birds

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

Other:_____

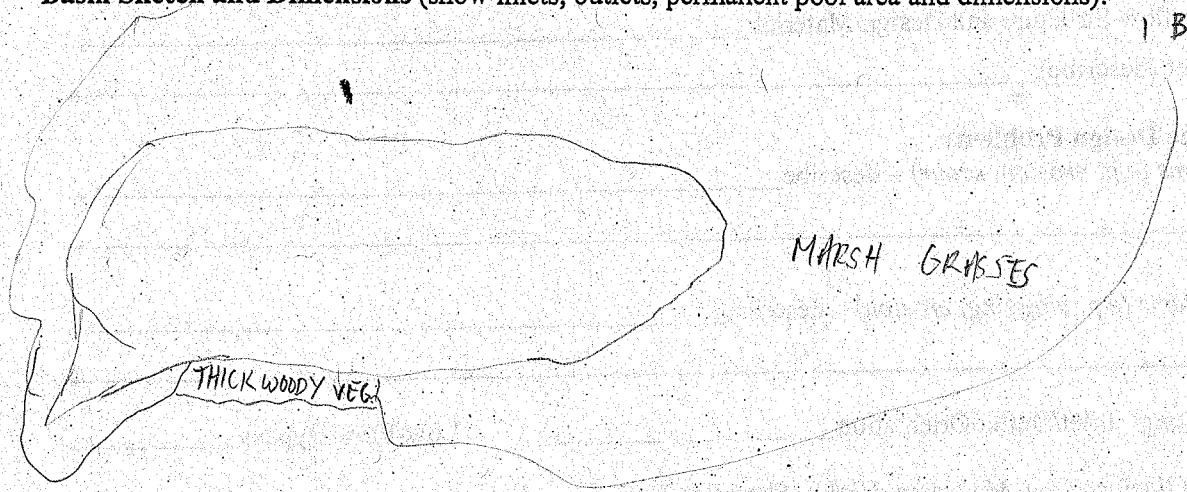
Preliminary Retrofit Opportunities (describe): Remove some of vegetation along banks

Photos:

Photo #	Description
1	basin 12872
2	basin 12873
3	basin 12874
4	basin 12875
5	
6	
7	
8	
9	
10	

COULD NOT GET DIMENSIONAL MEASUREMENTS BASIN (POOLING AREA) DENSELY SURROUNDED BY VEGETATION

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 77

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-13-07 / 852 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Rand Rd & Ela Rd.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: commercial Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass _____ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 4in inlet A 30in Bank Height 6-8ft. Buffer Width: 6-20ft.

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae _____

Turbidity high

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris____✓ from reed grasses Excess Sediment Accumulation_____
Excess Woody Vegetation___✓ from reed grasses

Other Observations:
Aquatic Life/ Wildlife (describe): frogs

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

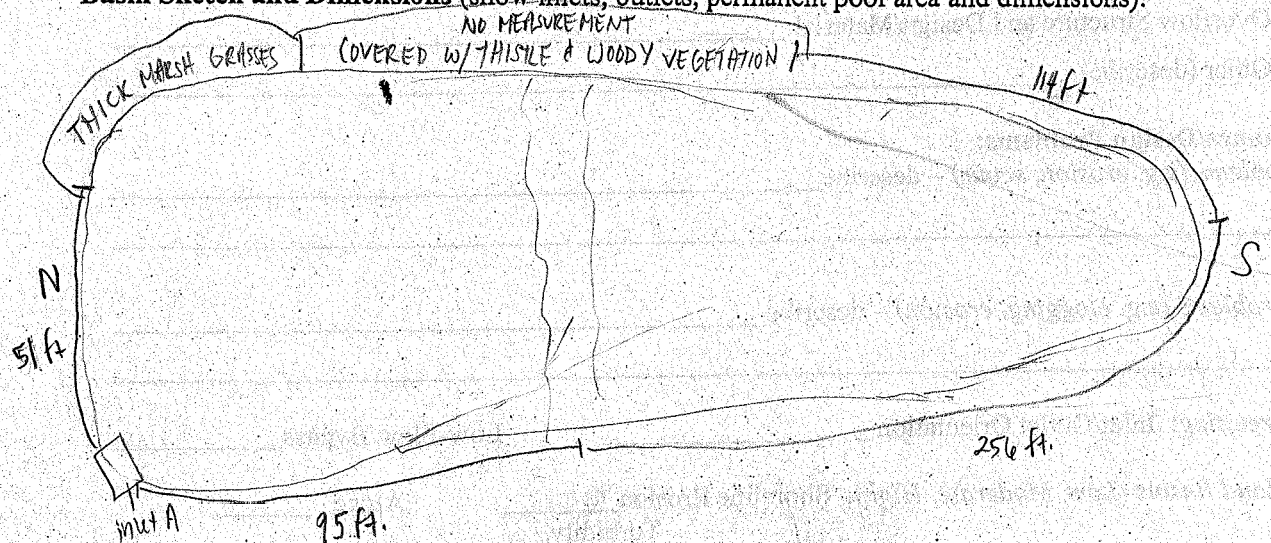
Other:_____

Preliminary Retrofit Opportunities (describe): plant vegetation on portion of banks that are bare dirt

Photos:

Photo #	Description
1	basin 12866
2	basin 12867
3	inlet A 12868
4	erosion on banks 12869
5	rest of basin that is solid wetland grasses 12870
6	basin (southern end) 12871
7	basin (after 4 pics from basin 78) 12876
8	
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 76

Basin Name (subdivision and/or property owner): Hamilton Estates

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-14-07 / 945 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Fla Quarter Section: _____

Nearest Cross Streets: Farthingdale Ct. cul de sac

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12h:3h - 10h:7h Bank Height 3-8ft. Buffer Width: 0 - wetland (huge)

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 24in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae high

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation ✓

Other Observations:
Aquatic Life/ Wildlife (describe): birds, frogs

Potential Safety Problems:

Potential Nuisance Problems:

Evidence of Upstream Illicit Connections (describe):

Other Basin Uses (rec. field, etc):

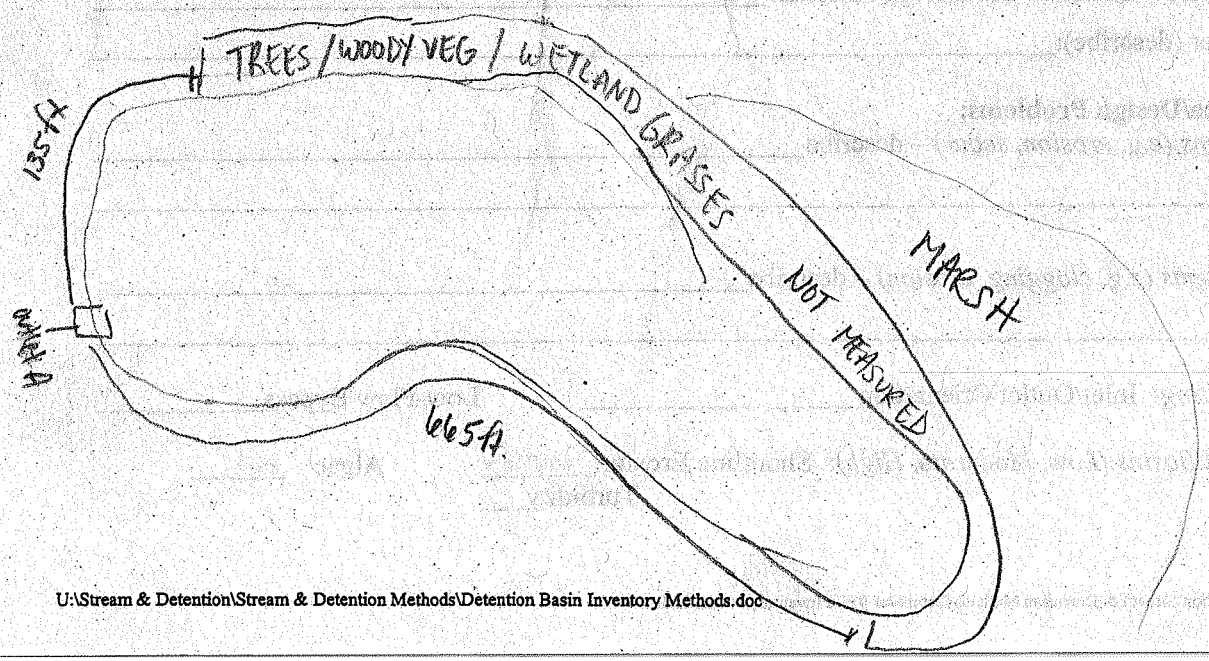
Other:

Preliminary Retrofit Opportunities (describe): Replace turf grass with native vegetation. Stabilize steeper banks w/ erosion by planting native vegetation

Photos:

Photo #	Description
1	outlet A 12970
2	outlet A 12971
3	basin 12972
4	basin 12973
5	basin - bank w/ dense trees & vegetation (not measured) 12974
6	basin from end w/ marsh grasses (opposite end of outlet A) 12975
7	" 12976
8	
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 75

Basin Name (subdivision and/or property owner): Hamilton Estates

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-14-07 / 1015 Temperature 80 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Farthingdale Ct. cul de sac

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 3-7ft Buffer Width: 0-6ft (+ wooded bank)

Number of Inlets: Stormsewer inlet A 20in inlet B 2in Size inlet C 2in Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

outlet A Surface Weir: ✓ see dimensions on back Size 4ft. Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae high

Turbidity moderate

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation ✓ willows

Other Observations:
Aquatic Life/ Wildlife (describe): blue heron

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

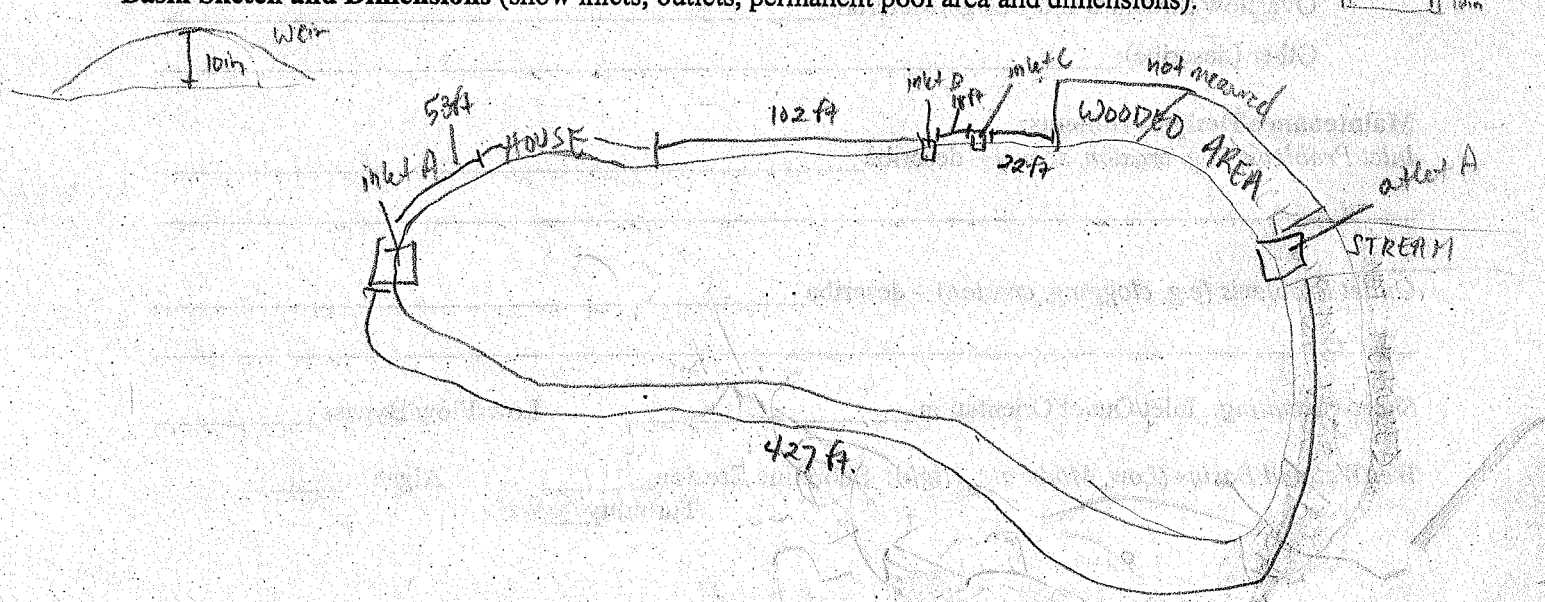
Other:_____

Preliminary Retrofit Opportunities (describe): Replace turf grass with native vegetation. Cut back some of woody vegetation.

Photos:

Photo #	Description
1	basin 12977
2	basin 12978
3	basin 12979
4	outlet A (weir) 12980
5	" 12981
6	" 12982
7	" 12983
8	basin from outlet A 12984
9	inlet A 12985
10	* view of weir from inlet B 12986
11	inlet B 12987
12	inlet C 12988

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 74

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-14-07/755 Temperature 70 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: SE Rand Rd. & Ela Rd.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: Commercial Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other rip rap

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 2in : 4in Bank Height 8 ft. Buffer Width: 8 - 20 ft.

Number of Inlets: Stormsewer inlet A 12in inlet C 24in inlet B 12in Size inlet D 12in Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet B drains across grass to basin, inlet D has erosion around it b/c there is no vegetation

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae moderate

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ garbage Excess Sediment Accumulation_____
Excess Woody Vegetation ✓

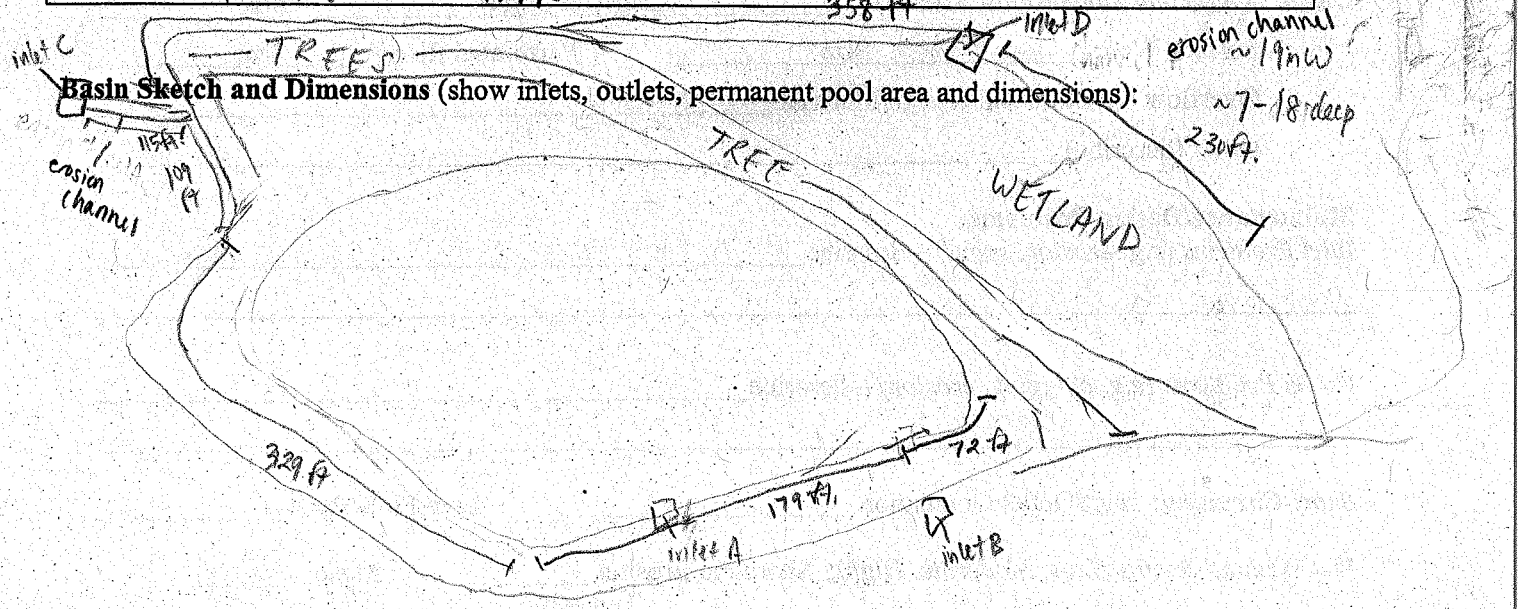
Other Observations:
Aquatic Life/ Wildlife (describe): birds
Potential Safety Problems: ~~beaver~~ holes along some banks
Potential Nuisance Problems: ~~weeds~~
Evidence of Upstream Illicit Connections (describe):
Other Basin Uses (rec. field, etc):
Other:

Preliminary Retrofit Opportunities (describe): Remove woody vegetation from infront of inlet A
Plant more native vegetation along slopes. Remove rip rap from infront of culverts

Photos: Note: inlet C scoured deep channel in turf grass toward basin
brush / reed grass very dense, could only measure along this perimeter

Photo #	Description		
1	basin 12939	11	wetland area on other side of tree line from basin 12949
2	basin 12940	12	" 12950
3	basin 12941	13	" 12951
4	inlet A 12942	14	inlet D 12952
5	inlet B 12943		
6	inlet B 12944		
7	woody veg along bank ~ could not measure this side 12945		
8	erosion channel 12946		
9	inlet C / erosion channel 12947		
10	inlet C 12948		

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 73

Basin Name (subdivision and/or property owner): Hamilton Estates

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-13-07/1330 Temperature 85 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Inglenook ct & Hedgeworth Ln

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other bricks, sand

Slope (Horizontal:Vertical) 12in : 3in Bank Height 6ft. Buffer Width: none

Number of Inlets: Stormsewer inlet A 4in inlet B 16in inlet C 4in inlet D 4in inlet E 4in Size outlet A 16in Channel/Swale stone channel Size 45ft x 3ft

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet E completely enveloped by algae

Outlet Problems (e.g. clogging, erosion) – describe outlet A grate cover is being propped up by a brick of wood

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae _____

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ leafs, branches Excess Sediment Accumulation_____
Excess Woody Vegetation ✓ willow, etc.

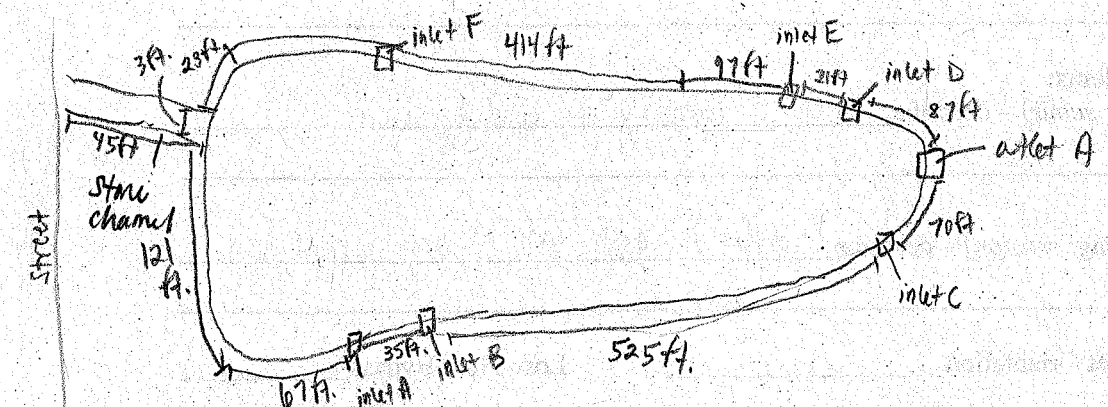
Other Observations:
Aquatic Life/ Wildlife (describe): fish, frogs, mallard
Potential Safety Problems: outlet A's grate.
Potential Nuisance Problems:_____
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): replace turf grass with native vegetation. Remove some of the trees along banks. Remove rock & sand beaches. Fix outlet A.

Photos:

Photo #	Description				
1	basin	12925	11	inlet D	12935
2	basin	12926	12	inlet E	12936
3	inlet A	12927	13	inlet F	12937
4	inlet B	12928	14	stone channel with that leads from road	12938
5	basin	12929			
6	basin	12930			
7	inlet C	12931			
8	outlet A	12932			
9	outlet A	12933			
10	basin	12934			

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 72

Basin Name (subdivision and/or property owner): Chase Wood North

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-14-07/ 842 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Cuba Rd. & Deerpath Rd.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 3-7ft. Buffer Width: 0-5ft.

Number of Inlets: Stormsewer inlet A 20in inlet B 12in inlet C 22in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 11in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet A drains across grass to basin, causing erosion. inlet B has a lot of woody vegetation surrounding it

Outlet Problems (e.g. clogging, erosion) – describe outlet A has a lot of woody veg. surrounding it.

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae _____ Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ garbage Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): birds

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

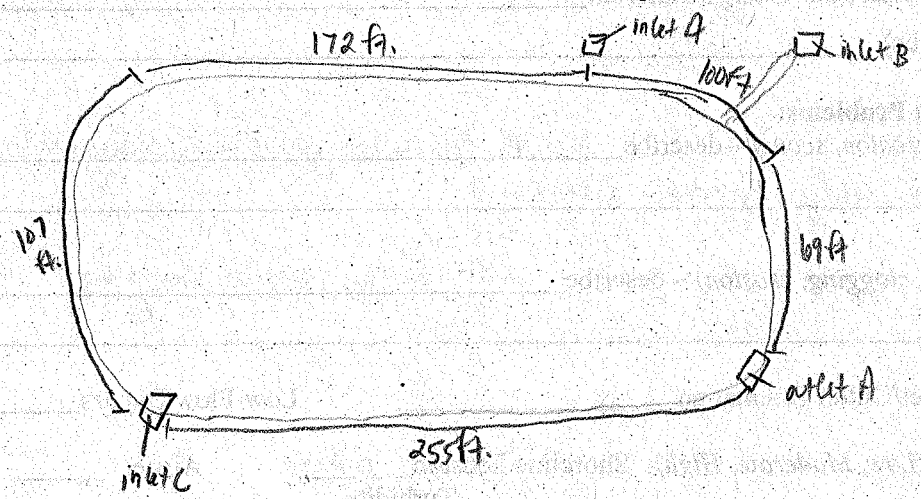
Other:_____

Preliminary Retrofit Opportunities (describe): Remove turf grass and replace w/ native vegetation. Remove woody veg from around inlet C & outlet A.

Photos:

Photo #	Description
1	basin 12953
2	basin 12954
3	basin 12955
4	inlet A 12956
5	inlet B / erosion channel 12957
6	inlet B 12958
7	outlet A 12959
8	inlet C 12960
9	inlet C 12961
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 71

Basin Name (subdivision and/or property owner): Chase wood North

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-14-01/ 914 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Fla Quarter Section: _____

Nearest Cross Streets: Waterford Dr. & Lismore Ct.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry ✓ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass ✓ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other rip rap

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 4in Bank Height 5ft. Buffer Width: none

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 12in outlet B 12in outlet C 12in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe outlet A has plants growing inside also erosion @ pipe connection, outlet B&C have rocks and plants growing @ opening

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae _____

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe):_____

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

Other:_____

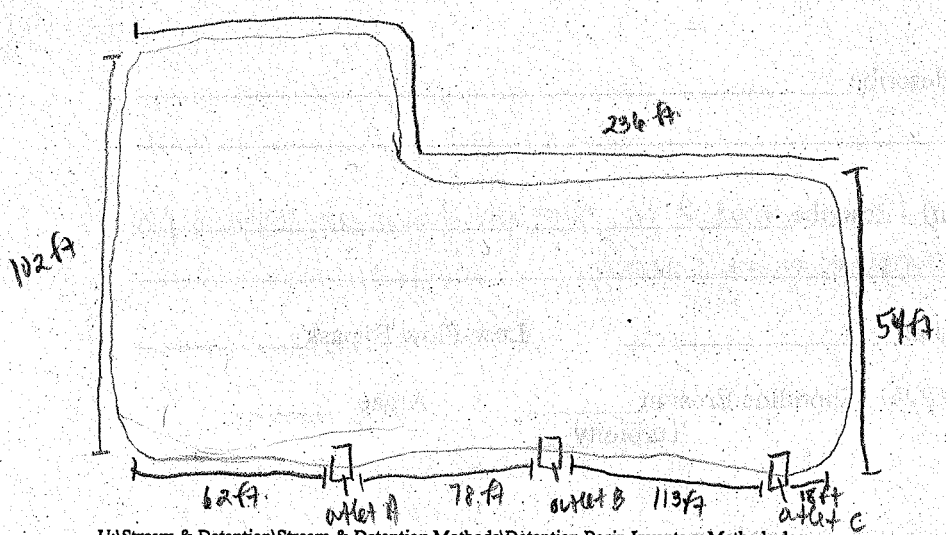
Preliminary Retrofit Opportunities (describe): Replace turf grass and rip rap with native vegetation. Clean outlet

Photos:

Photo #	Description
1	basin 12962
2	basin 12963
3	basin 12964
4	outlet A 12965
5	outlet A erosion @ pipe connection 12966
6	outlet B 12967
7	outlet C 12968
8	outlet C erosion @ pipe connect 12969
9	
10	

measured @ bottom of basin bank

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 70

Basin Name (subdivision and/or property owner): Deerpath Plaza near Oberweis

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-15-07 / 1045 Temperature 85 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: SE Rand Rd & Ela Rd

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: Commercial Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other dirt, rip rap

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other decorative bushes, flowers

Slope (Horizontal:Vertical) 12in : 6in Bank Height 7-8 ft Buffer Width: none

Number of Inlets: Stormsewer inlet A 8in inlet B 8in Size inlet C 4in inlet D 2in Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: circ A 8in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet B has a lot of garbage clogging it's opening.

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae _____

Turbidity _____

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____

Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ garbage Excess Sediment Accumulation_____

Excess Woody Vegetation_____

Other Observations:

Aquatic Life/ Wildlife (describe): Mallard

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

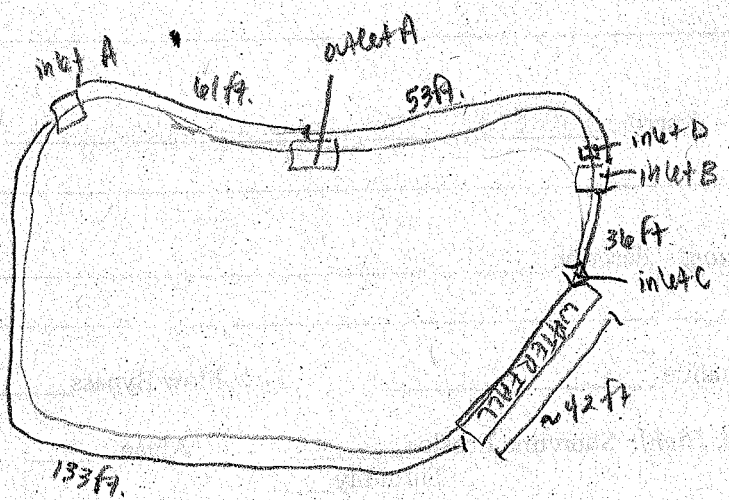
Other:_____

Preliminary Retrofit Opportunities (describe): Replace turf grass on slopes w/ native vegetation. Remove litter from opening of outlet A. Replace rip rap with native vegetation.

Photos: Note: Has brick side walls up bank (~2ft)

Photo #	Description
1	basin 13102
2	inlet A 13103
3	inlet B 13104
4	inlet C 13105
5	inlet D 13106
6	basin 13107
7	outlet A 13108
8	
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 69

Basin Name (subdivision and/or property owner): Deer path Plaza across from Pizza Hut

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-15-07 / 1015 Temperature 85 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: SE Rand Rd & Ela Rd.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: Commercial Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 4in Bank Height 4 - 7 ft. Buffer Width: None - 5 ft.

Number of Inlets: Stormsewer inlet A 10in inlet B 24in Size _____ Channel/Swale storm Channel A 20 ft long Size 3 ft wide

Outlet Type(s) and Dimensions: Culvert: outlet A 10in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe Concrete around inlet A is breaking apart

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation ✓ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae _____

Turbidity high

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ leaf litter / garbage Excess Sediment Accumulation_____
Excess Woody Vegetation ✓

Other Observations:
Aquatic Life/ Wildlife (describe): mallards, red-winged black birds

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

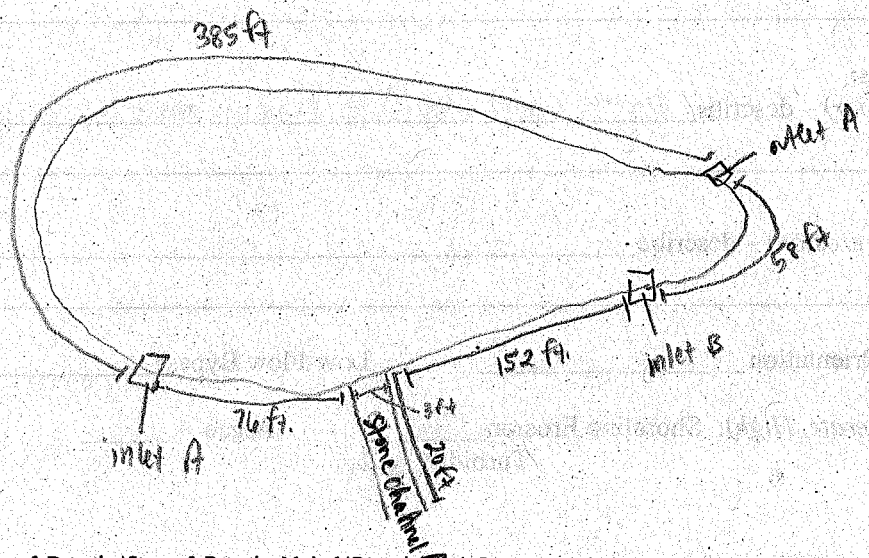
Other:_____

Preliminary Retrofit Opportunities (describe): Plant more native vegetation in place of turf grass. Fix grate on inlet B. Cut back some of woody vegetation

Photos:

Photo #	Description
1	basin 13095
2	inlet A 13096
3	stone channel A 13097
4	inlet B 13098
5	inlet B - grate fallen off 13099
6	outlet A 13100
7	basin 13101
8	
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 68

Basin Name (subdivision and/or property owner): Deerpath Plaza next to Abbey Carpet & Tile

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-15-07 / 940 Temperature 85 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Rand Rd. & Pheasant Ridge Rd.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: Commercial Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other rip rap

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 5in Bank Height 6ft. Buffer Width: none - 2 ft.

Number of Inlets: Stormsewer inlet A 12in inlet B 10in inlet C 10in Size _____ Channel/Swale Stone channel A Size 6 ft long 3 ft wide

Outlet Type(s) and Dimensions: Culvert: outlet A 10in outlet B 10in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe outlet B buried in sediment and plants

Short-Circuiting: Inlet/Outlet Orientation ✓ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae low

Turbidity low

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ √ garbage / plant litter Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): mallards, mouse of some sort

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

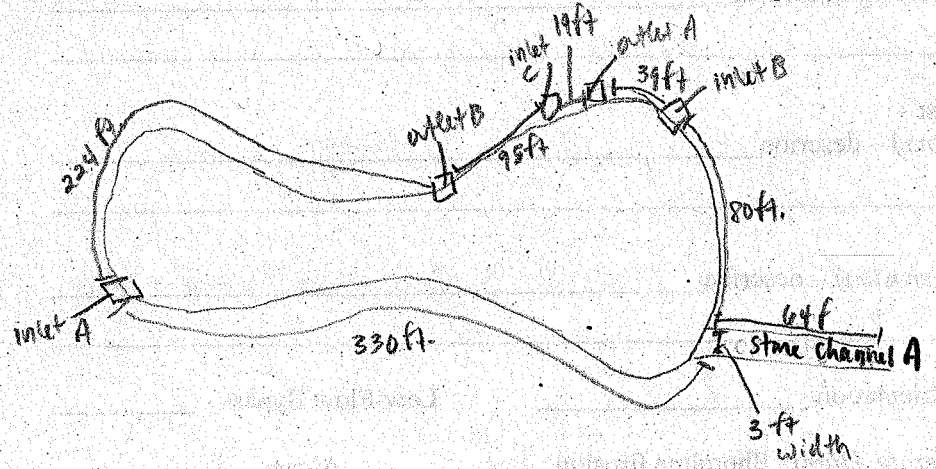
Other:_____

Preliminary Retrofit Opportunities (describe): Remove turf grass and riprap and replace w/native vegetation. Remove concrete & stone around inlet C. Clean at outlet B

Photos:

Photo #	Description
1	basin 13085
2	inlet A 13086
3	stone channel A 13087
4	" 13088
5	basin 13089
6	inlet B 13090
7	outlet A 13091
8	inlet C 13092
9	inlet C + possible sediment basin ? 13093
10	outlet B 13094

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 67

Basin Name (subdivision and/or property owner): Deerpath Plaza next to Alpine Animal Hospital

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-15-07 / 1115 Temperature 90 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Rand Rd. & Pheasant Ridge Rd.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: Commercial Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other dia

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 6-8 ft. Buffer Width: 5ft.

Number of Inlets: Stormsewer inlet A 18 in, inlet B 4in Size inlet C 10in, inlet D 12in Channel/Swale stone channel A 19ft x 2ft, stone channel B Size 19ft x 2ft

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion high Algae _____

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): mallards

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

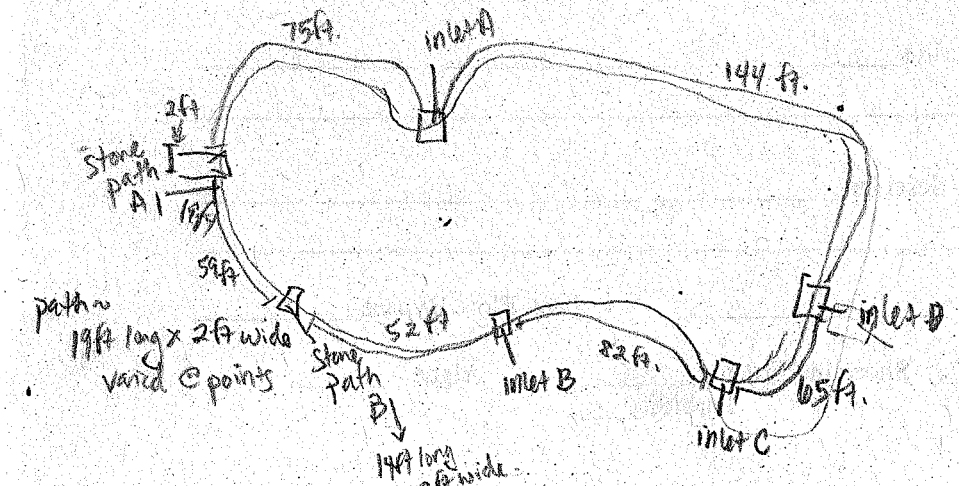
Other:_____

Preliminary Retrofit Opportunities (describe): Replace turf grass with native vegetation.
Remove stones from around inlet D.

Photos: Note: Possible overflow structure @ path B ?

Photo #	Description
1	inlet A 13109 . 11. basin 13119
2	basin 13110
3	stone channel leading to basin (A) 13111
4	plastic 4in pipes running along path – cannot find their inlet/outlet (A) 13112
5	stone channel B 13113
6	overflow structure @ top of stone path B (6 in blocks) ? 13114
7	inlet B 13115
8	inlet C 13116
9	inlet D 13117
10	inlet D & stone bank surrounding it 13118

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 616

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-15-07/1222 Temperature 90 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Handley Ct. cul de sac

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____ ✓ wooded sides

Slope (Horizontal:Vertical) 12in : 3.5in Bank Height 12ft. Buffer Width: 15ft or 20+ ft.

Number of Inlets: Stormsewer Inlet A Size 18in Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 8in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion high Algae high

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): frogs, birds

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

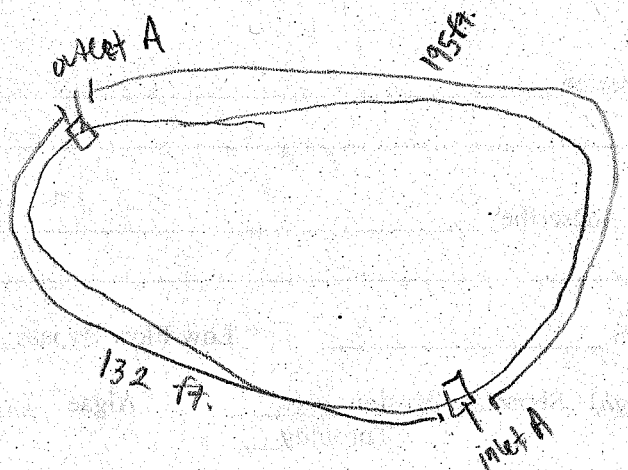
Other:_____

Preliminary Retrofit Opportunities (describe): Remove turf grass on upper portion of bank and replace with native vegetation.

Photos:

Photo #	Description
1	basin 13120
2	basin 13121
3	inlet A 13122
4	outlet A 13123
5	basin 13124
6	
7	
8	
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 65

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-15-07 / 1250 Temperature 90 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Prairie Ln & Dunhill Dr.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 3.5in Bank Height 4-6ft. Buffer Width: 20-80ft (wooded area huge & nearby wetland)

Number of Inlets: Stormsewer inlet A 10in inlet B 20Size inlet C 4in inlet D 14in inlet E 2in inlet F 4in Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 8in outlet B 8in outlet C 8in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet C has slitted cap on end ~ might restrict flows? erosion @ top of outlet A, garbage

Outlet Problems (e.g. clogging, erosion) – describe garbage in outlet C opening

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion high Algae moderate Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____✓_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

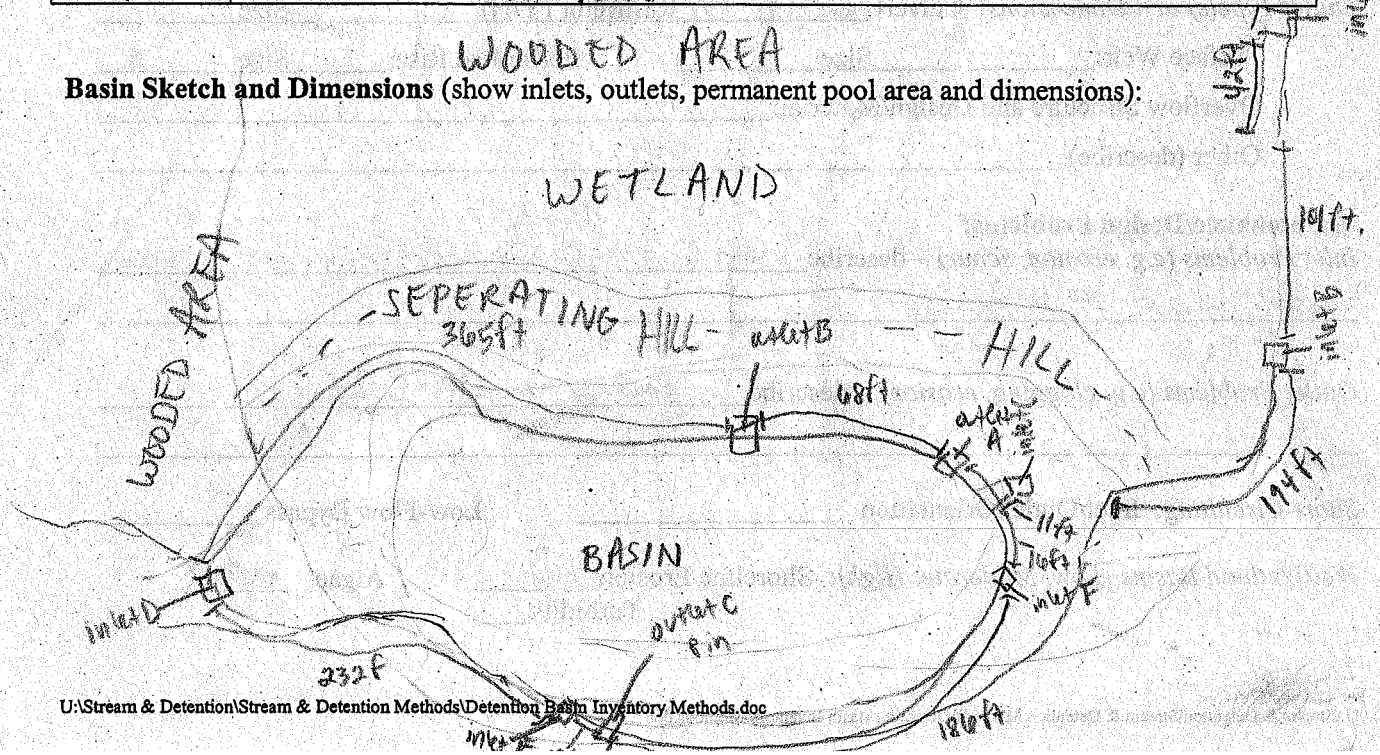
Other Observations:
Aquatic Life/ Wildlife (describe): frogs, birds
Potential Safety Problems: bank erosion
Potential Nuisance Problems:_____
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): Remove turf grass on the side of the bank with the houses. Clean inlets/outlets opening of debris

Photos:

Photo #	Description		
1	wetland next to basin 13125	11	basin 13136
2	inlet A 13126	12	inlet D 13137
3	path to inlet A 13127	13	basin 13138
4	inlet B 13128	14	hill side of basin seperating it from wetland 13139
5	wetland next to basin 13129	15	bank erosion 13140
6	basin 13130	16	inlet E 13141
7	inlet C & another on hill 13131, 13132	17	outlet C 13142
8	outlet A 13133	18	basin from outlet C 13143
9	outlet B 13134	19	inlet F 13144
10	13135		

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 64

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-19-07 / 1020 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Lake St. & Mionske Dr.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation _____ Other stones

Slope (Horizontal:Vertical) 12in : 4in Bank Height 2 ft. Buffer Width: none

Number of Inlets: Stormsewer inlet A 10 inlet C 8in inlet E 8in inlet F 10in inlet B 8in Size inlet D 38in Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A pipe ~22in grate 48 in across Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet A & C clogged w/ garbage, algae. outlet B covered by turf grass and runs across grass to basin. inlets A → C misshapen Inlet F is rusted out @ bottom

Outlet Problems (e.g. clogging, erosion) – describe barrels of hay infront of outlet A

Short-Circuiting: Inlet/Outlet Orientation ✓ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae low Turbidity high

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ garbage Excess Sediment Accumulation_____
Excess Woody Vegetation_____

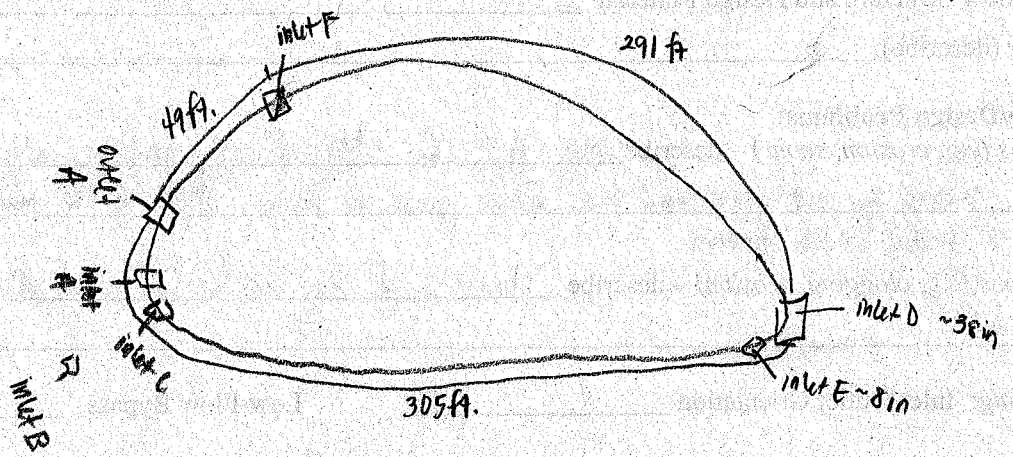
Other Observations:
Aquatic Life/ Wildlife (describe): muskrat ?, frogs, fish
Potential Safety Problems:_____
Potential Nuisance Problems: bird poop
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): Replace turf grass with native vegetation. Remove grass / garbage from infront of inlets A - C. Replace inlet F b/c of rust.

Photos:

Photo #	Description
1	basin 13181 11 inlet F 13191
2	outlet A 13182
3	" 13183
4	inlet A 13184
5	inlet B 13185
6	inlet C 13186
7	basin 13187
8	basin 13188
9	inlet D 13189
10	inlet E 13190

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 63

Basin Name (subdivision and/or property owner): Ela Area Public Library District

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-19-07/745 Temperature 70 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Old Rand Rd & Mohawk Trail

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: institutional Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓ aquatic macrophytes

Concrete Lined Channel _____ Other NA

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 6-9ft. Buffer Width: more

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe below water

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae low

Turbidity moderate

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): tadpoles
Potential Safety Problems:_____
Potential Nuisance Problems:_____
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

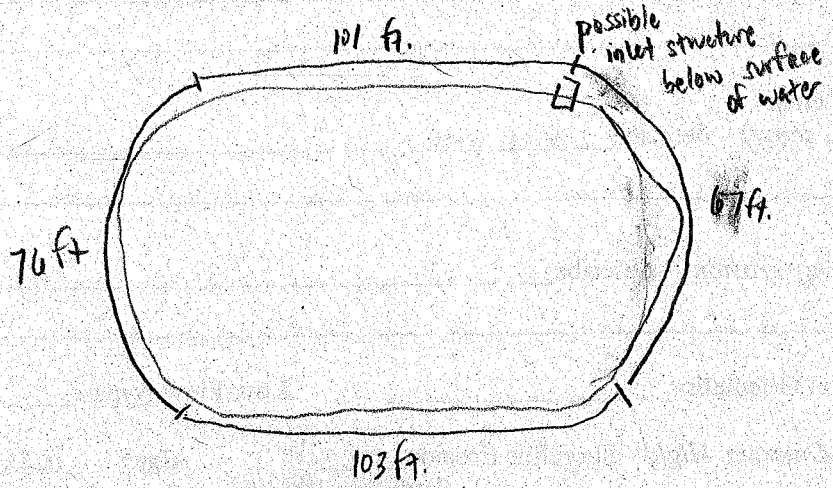
Preliminary Retrofit Opportunities (describe): replace turf with native vegetation

Photos:

Photo #	Description
1	basin 13145
2	basin 13146
3	overflow pipe @ base of tree (4") ~27 in all of basin 13147
4	possible inlet structure below surface of water 13148
5	" 13149
6	
7	
8	
9	
10	

~27 overflow pipes located @ top of bank below trees

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 62

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-25-07 / 1230 Temperature 85 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Main St. / Rt. 22 & Buesching Rd.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: Industrial Year Constructed: _____

Basin surrounded by tall barb-wired fence

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other N/A

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

NOT ABLE TO MEASURE

Slope (Horizontal:Vertical) _____ Bank Height _____ Buffer Width: ~5-30ft

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae low

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe):_____

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

Other:_____

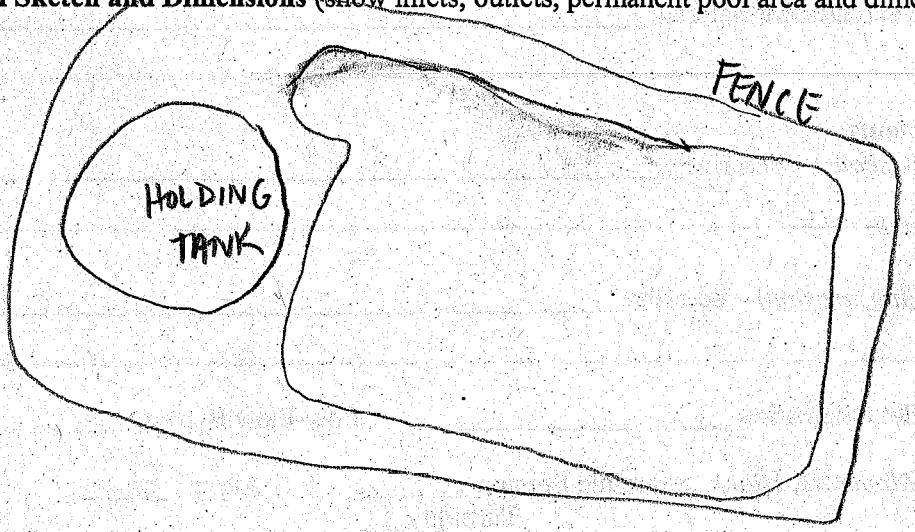
Preliminary Retrofit Opportunities (describe): Remove riprap from banks
Remove some of vegetation hanging over banks

Photos:

Photo #	Description
1	basin 13640
2	" 13641
3	" 13642
4	" 13643
5	holding tank & barb fence surrounding basin 13644
6	
7	
8	
9	
10	

Could not get to basin b/c of tall fence around perimeter. No dimensions measured. Pictures taken thru fencing.

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 61

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-25-07 / 1135 Temperature 85 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Carolyn Ct. cul de sac

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry _____ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 3.5in Bank Height 5-6 ft. Buffer Width: 3ft.

inlet A 10 in

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

outlet A 8in

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet A has plant debris growing in opening.

Outlet Problems (e.g. clogging, erosion) – describe outlet A has plants covering it.

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae low

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____

Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ dead cattails Excess Sediment Accumulation_____

Excess Woody Vegetation ✓

Other Observations:

Aquatic Life/ Wildlife (describe):_____

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

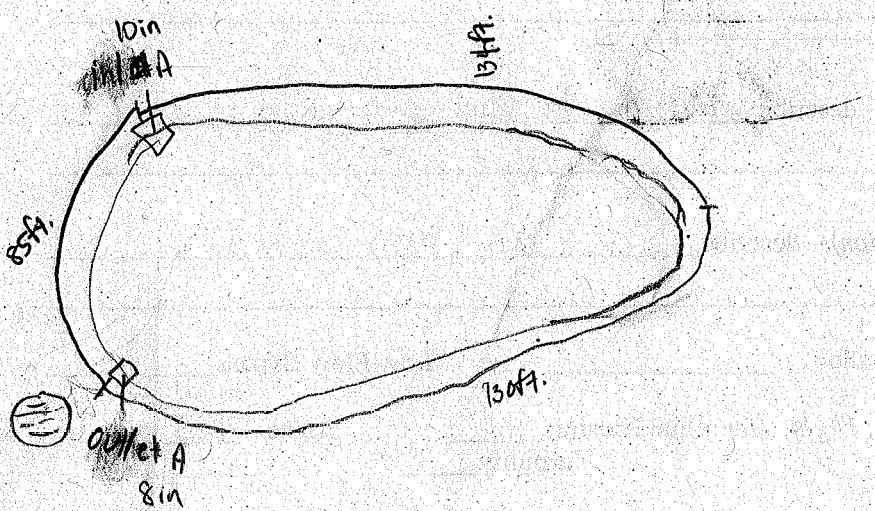
Other:_____

Preliminary Retrofit Opportunities (describe): Replace any surrounding turf grass w/ native vegetation. Clean out vegetation from around inlet & outlet.

Photos:

Photo #	Description
1	basin 13622
2	4 in overflow pipes @ base of tree (7 in total around basin) 13623
3	outlet A 13624
4	" 13625
5	grate @ outlet A 13626
6	" 13627
7	" 13628
8	basin 13629
9	outlet A 13630
10	basin 13631

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 60

Basin Name (subdivision and/or property owner): Fetco

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-25-07/ 1245 Temperature 85 Rainfall (now, 12, 24, (48) hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Rose Rd. & Busching Rd.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: industrial Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 4in Bank Height 4-6ft. Buffer Width: 4-5ft

Number of Inlets: Stormsewer inlet A Size 20in Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 8in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet A covered w/ vegetation.

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae _____

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____

Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____

Excess Woody Vegetation ✓- dead brush along basin banks

Other Observations:

Aquatic Life/ Wildlife (describe): frogs, mallards

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

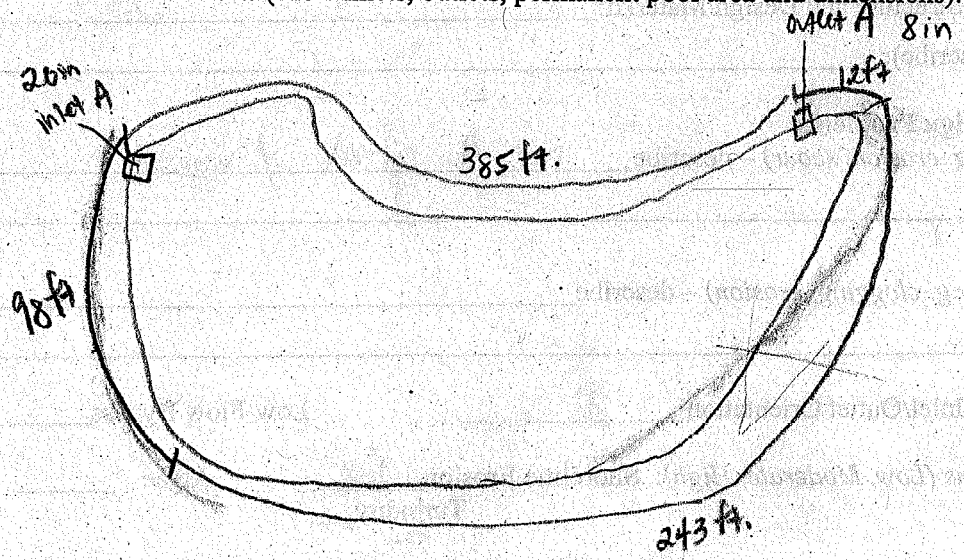
Other:_____

Preliminary Retrofit Opportunities (describe): Replace any surrounding turf grass and rip rap w/ native vegetation.

Photos:

Photo #	Description
1	basin 13645
2	" 13646
3	" 13647
4	outlet A 13648
5	" 13649
6	dead brush along basin banks 13650
7	basin 13651
8	inlet A 13652
9	" 13653
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 59

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-27-07 / 1155 Temperature 85 Rainfall (now, (12), 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Midlothian Rd. north of school

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: institutional Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 2- 7ft Buffer Width: none

Number of Inlets: Stormsewer inlet A 12in inlet B 24in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 8in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae high

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations: red-winged bb
Aquatic Life/ Wildlife (describe): birds, frogs

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

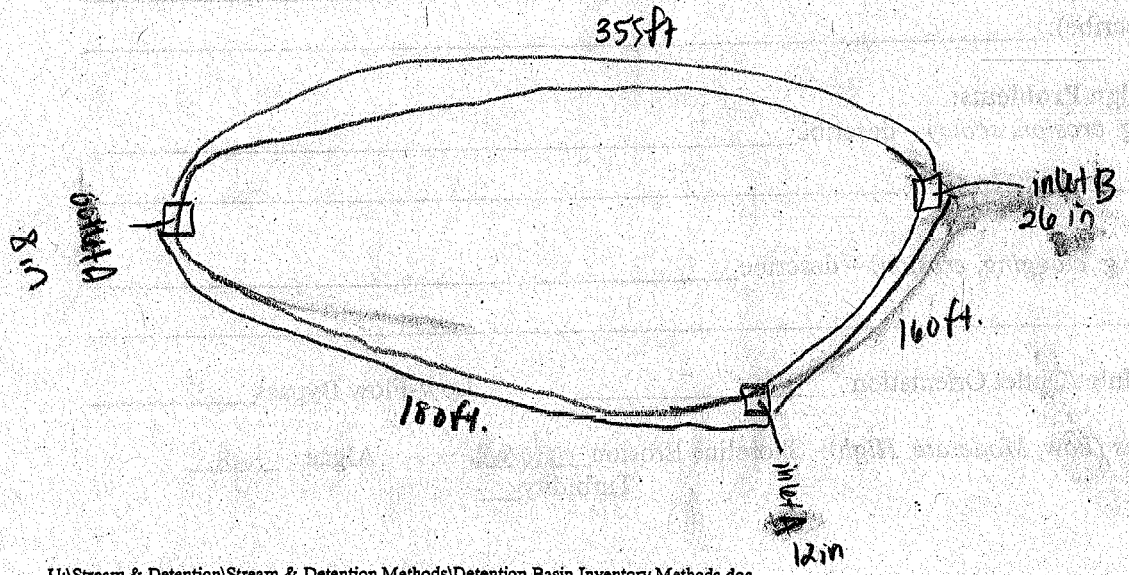
Other:_____

Preliminary Retrofit Opportunities (describe): Replace any turf grass along banks w/ native vegetation. Stabilize banks.

Photos:

Photo #	Description	
1	basin	13732
2	"	13733
3	"	13734
4	"	13735
5	outlet A	13736
6	inlet A	13737
7	"	13738
8	" } pipe broken @ connection	13739
9	inlet B	13740
10	"	13741
11	basin	13742

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 58

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-27-07 / 950 Temperature 80 Rainfall (now, 12, (24), 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Oakwood Rd & March St.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation ✓ Other grass of some sort

Slope (Horizontal:Vertical) 12in : 3in Bank Height 4 - 6ft. Buffer Width: none

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 10in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion high Algae low

Turbidity low

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): fish, birds

Potential Safety Problems: erosion of banks

Potential Nuisance Problems: bird poop

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

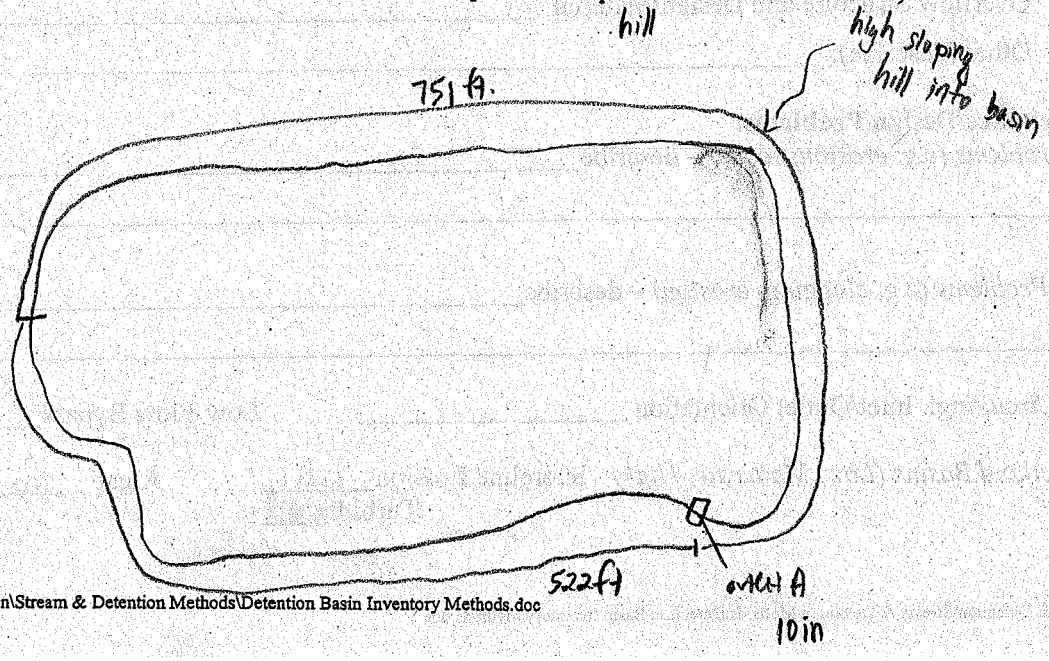
Other:_____

Preliminary Retrofit Opportunities (describe): Replace turf grass with native vegetation. Stabilize banks.

Photos:

Photo #	Description
1	basin 13688
2	basin 13689
3	shoreline erosion 13690
4	outfall 13691
5	basin 13692
6	
7	
8	
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 57

Basin Name (subdivision and/or property owner): HLP Stamping, Inc.

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-27-07 / 1036 Temperature 85 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Enterprise Pkwy

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: Industrial Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓ aquatic macrophytes

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in · 6in – 12in · 9in Bank Height 5-6 ft. Buffer Width: none

Number of Inlets: Stormsewer inlet A 14in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 24in outlet B 48in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion high Algae _____

Turbidity moderate

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

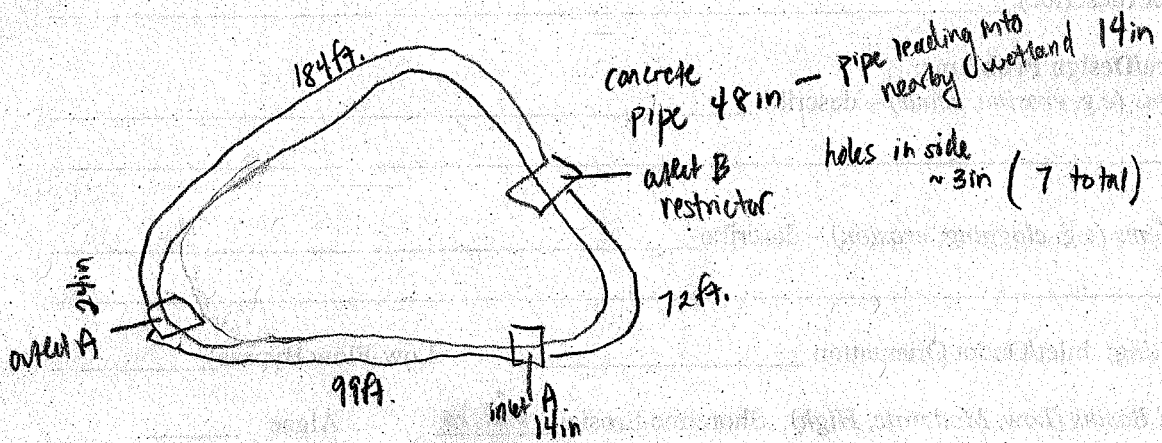
Other Observations:
Aquatic Life/ Wildlife (describe): fish, canada geese
Potential Safety Problems: bank erosion, steepness of banks
Potential Nuisance Problems: bird poop
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): Replace turf grass w/ native vegetation. Stabilize banks.

Photos:

Photo #	Description
1	basin 13702
2	outlet A 13703
3	bank erosion 13704
4	inlet A 13705
5	basin 13706
6	outlet B restrictor 13707
7	" holes along side, spills into nearby wetland 13708
8	outlet B 13709
9	outlet B 13710
10	" 13711

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 56

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-27-07 / 1101 Temperature 85 Rainfall (now, (12), 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Midlothian Rd & Enterprise Pkwy

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: industrial Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other dirt, riprap

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 5 - 15ft Buffer Width: none

Number of Inlets: Stormsewer inlet A Size 8in Channel/Swale stone channel A Size 34ft x 9ft stone channel B 20ft - 5-12ft

Outlet Type(s) and Dimensions: Culvert: outlet A 8in Restrictor (Y/N) Y Size 8in ?

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe outlet A clogged w/ debris

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae low

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): fish

Potential Safety Problems:_____

Potential Nuisance Problems: bird poop

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

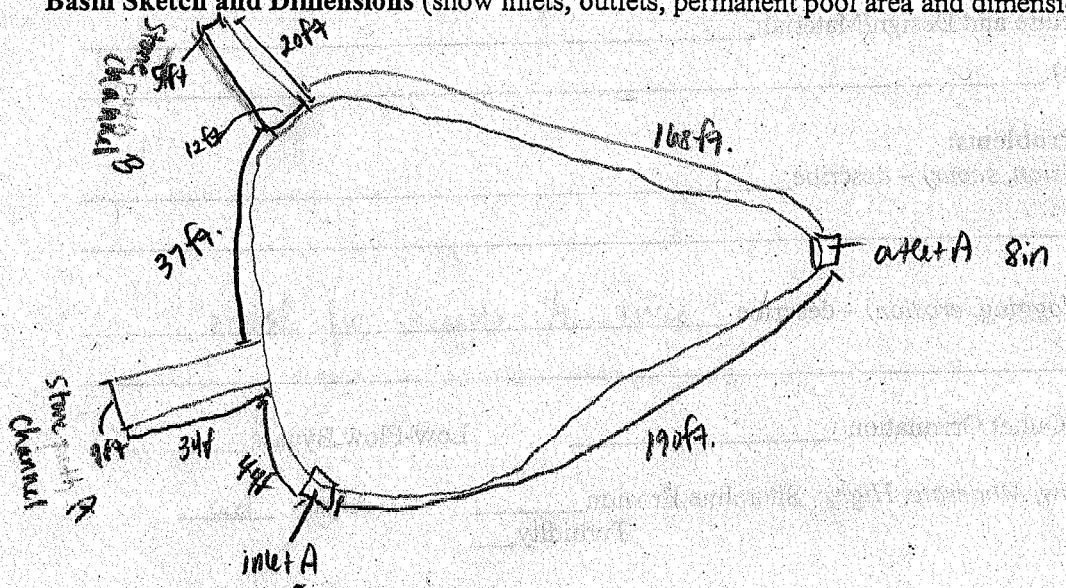
Other:_____

Preliminary Retrofit Opportunities (describe): Replace turf grass and stones with native vegetation. Clean off outlet A.

Photos:

Photo #	Description	
1	basin	13712
2	stone channel A	13713
3	"	up from basin 13714
4	inlet A	13715
5	outlet A (some water coming out of it)	13716
6	restrictor	13717
7	"	13718
8	"	13719
9	basin	13720
10	Stone channel B	13721
11	"	13722

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 55

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-27-07/ 1125 Temperature 85 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Midlothian Rd & Enterprise PKwy

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: industrial Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other rip rap

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 5-6ft. Buffer Width: none

Number of Inlets: Stormsewer inlet A 14in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 14in outlet C 8in outlet B 6in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe slight erosion @ pipe connection of outlet A outlet B & C clogged w/ sediment.

Short-Circuiting: Inlet/Outlet Orientation ✓ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae low

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): blue heron, fish

Potential Safety Problems:_____

Potential Nuisance Problems: bird poop.

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

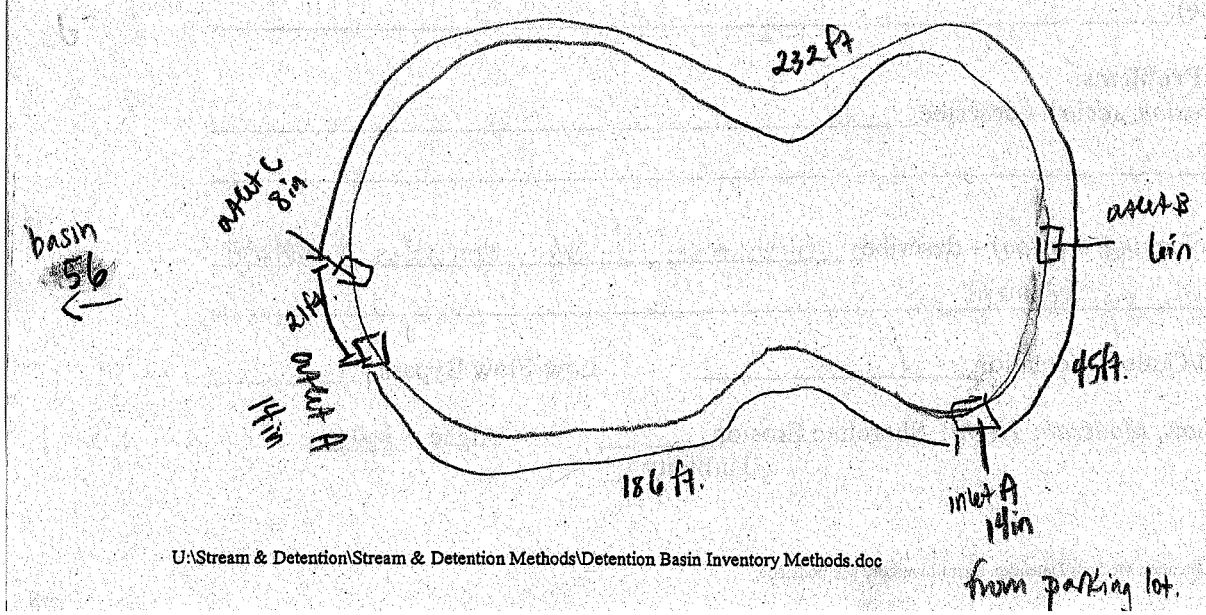
Other:_____

Preliminary Retrofit Opportunities (describe): Replace turf grass and riprap with native vegetation. Clean debris from grates of all outlets.

Photos:

Photo #	Description
1	basin 13723
2	" 13724
3	outlet A 13725
4	inlet A 13726
5	outlet B 13727
6	restrictor @ outlet B 13728
7	" 13729
8	basin 13730
9	outlet C 13731
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 54

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-27-07 / 1009 Temperature 80 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Midlothian Rd & Oakwood Rd.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: Industrial Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other rip rap

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other shrubs

Slope (Horizontal:Vertical) 12in : 3in Bank Height 5 - 15ft. Buffer Width: none

Number of Inlets: Stormsewer inlet A 8in inlet B 4in Size _____ Channel/Swale stone channel Size 10ft x 6ft

Outlet Type(s) and Dimensions: Culvert: outlet A 20in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe a lot of erosion around inlet B

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae _____

Turbidity _____

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____ ✓ willows

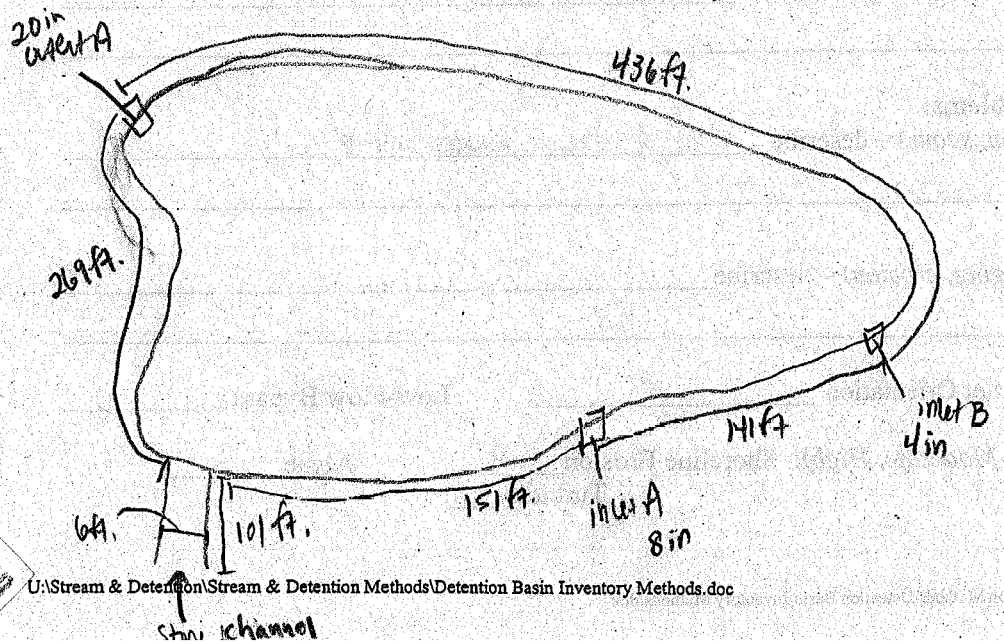
Other Observations:
Aquatic Life/ Wildlife (describe): frogs, canada geese
Potential Safety Problems:_____
Potential Nuisance Problems: bird poop.
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): Replace riprap and turf grass with native vegetation. Stabilize erosion @ inlet B

Photos:

Photo #	Description	
1	stone channel from parking lot to basin	13693
2	basin	13694
3	basin	13695
4	inlet A	13696
5	inlet B & erosion.	13697
6	"	13698
7	basin	13699
8	"	13700
9	outlet A	13701
10		

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 53

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-28-07 / 900 Temperature 70 Rainfall (now, 12, (24), 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Gabriel Dr. & Sacomano Ln.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass ✓ Rip Rap / Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 1in Bank Height 3ft. Buffer Width: none

Number of Inlets: Stormsewer inlet A 4in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 8in outlet B 8in Restrictor (Y/N) _____ Size _____

wooden weir infront of outlet B

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe outlet B clogged w/ sediment & plants.

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae moderate

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): frogs, birds, mallard

Potential Safety Problems:_____

Potential Nuisance Problems: bird poop

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

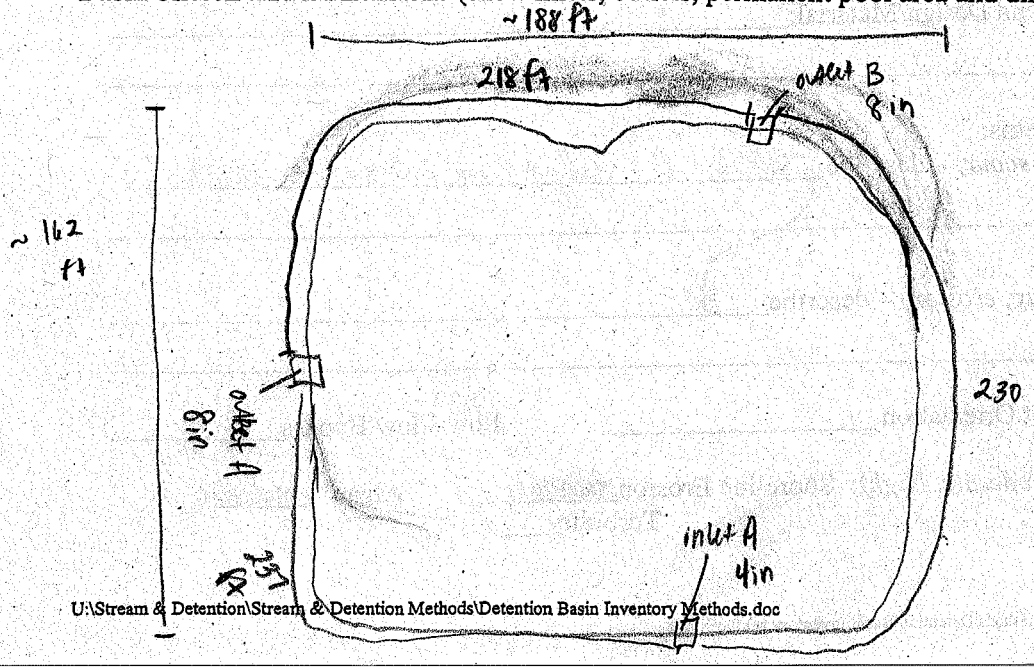
Other:_____

Preliminary Retrofit Opportunities (describe): Replace turf grass with native vegetation. Stabilize banks. Clean at outlet B.

Photos:

Photo #	Description
1	basin 13762
2	basin 13763
3	outlet A 13764
4	Bank stabilized by wood, stones & bricks 13765
5	inlet A 13766
6	basin 13767
7	outlet B 13768
8	outlet B wood weir infront of opening (~8 in height, 3ft in width) 13769
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 52

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-28-07/ 940 Temperature 70 Rainfall (now, 12, (24) 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: O'Malley Dr. & Rodgers Ln

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass _____ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 7-8ft Buffer Width: 30-50ft

Number of Inlets: Stormsewer inlet A 10in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A Restrictor (Y/N) _____ Size _____

Surface Weir: Yes Size 26 in tall opening very thin Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae low

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ garbage Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): blue heron, red-winged black-bird., fish

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

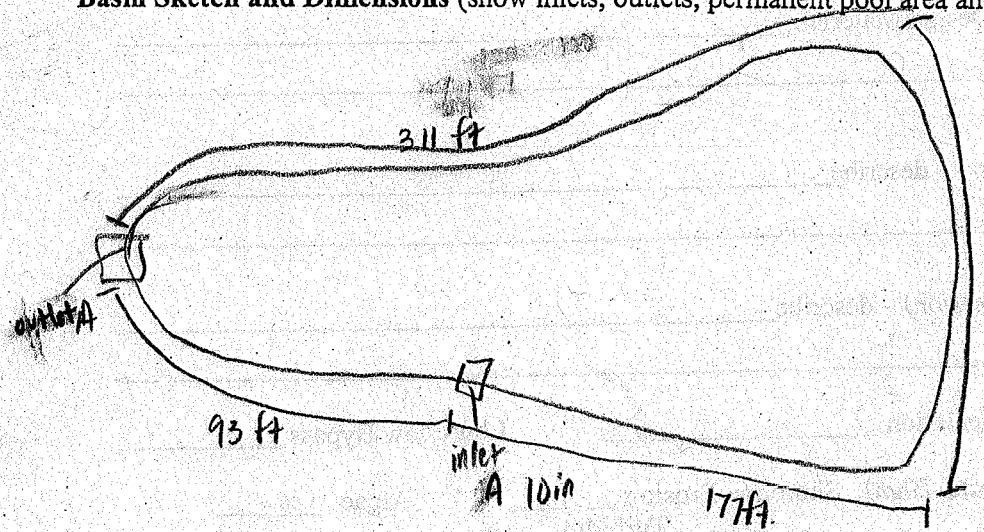
Other:_____

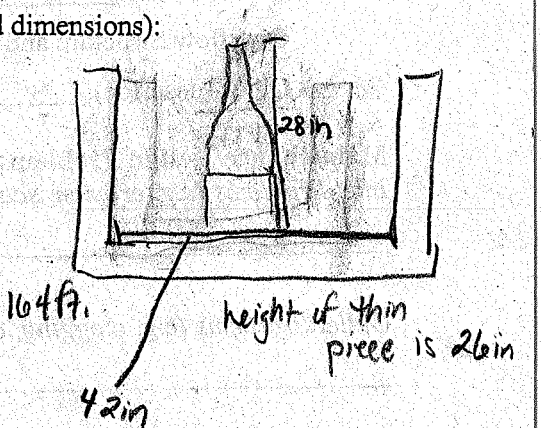
Preliminary Retrofit Opportunities (describe): Remove plant growth from infront of inlet & outlet.

Photos:

Photo #	Description
1	basin 13770
2	outlet A 13771
3	" 13772
4	" 13773
5	" 13774
6	" 13775
7	inlet A 13776
8	basin 13777
9	" 13778
10	thin opening of outlet A 13779

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):





DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 51

Basin Name (subdivision and/or property owner): Lake Zurich Fire Department

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-28-07/1053 Temperature 70 Rainfall (now, 12, (24) 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: South of Old Mchenry Rd.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: institutional Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other dirt algae

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 1in - 12in : 3in Bank Height 2-6 ft. Buffer Width: 0-2 ft.

Number of Inlets: Stormsewer inlet A 30in inlet B Size 10in Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 14in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe outlet A almost completely submerged by water. - was difficult to find

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion high Algae moderate

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): frogs, fish

Potential Safety Problems: bank erosion

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

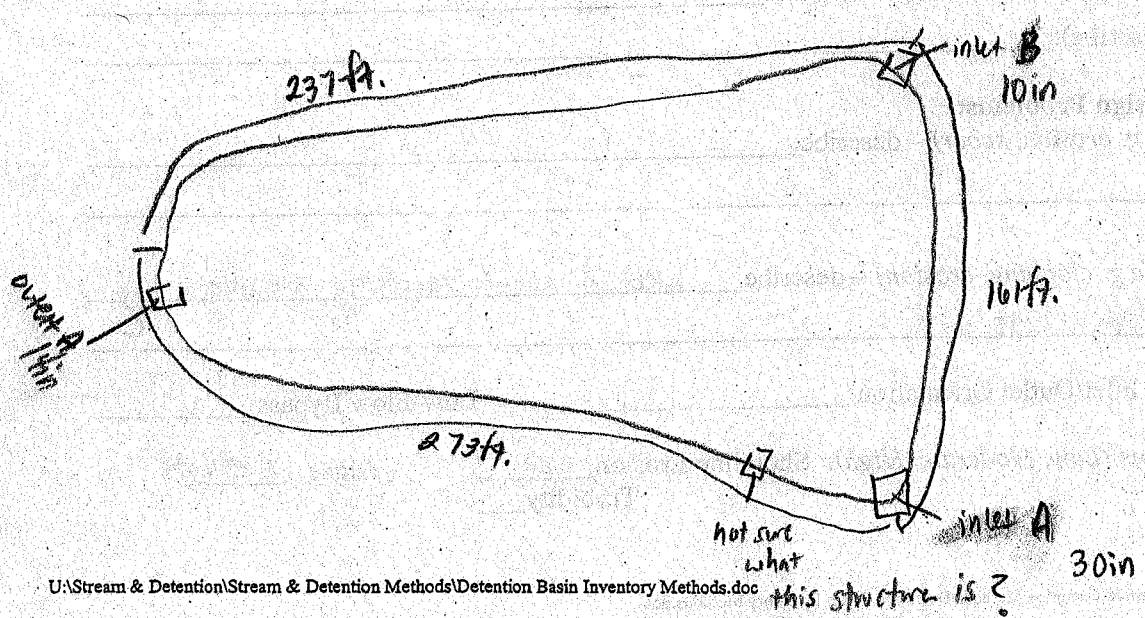
Other:_____

Preliminary Retrofit Opportunities (describe): Replace turf grass with native vegetation. Stabilize banks.

Photos:

Photo #	Description	
1	basin	13784
2	unsure what structure is - no outlet opening ~ only solid concrete	13785
3	"	13786
4	outlet A	13787
5	basin	13788
6	basin	13789
7	bank erosion	13790
8	inlet B	13791
9	"	13792
10	basin	13793
11	"	13794
12	outlet A	13795

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 50

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-28-07/1030 Temperature 70 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Franson Ct. cul de sac

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 6-7ft Buffer Width: none

Number of Inlets: Stormsewer inlet A 4in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet B 10in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe Inlet A run across grass to basin

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae moderate

Turbidity low

few spots where channels have formed.

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): fish, frogs

Potential Safety Problems: erosion hidden by overgrown grass

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

Other:_____

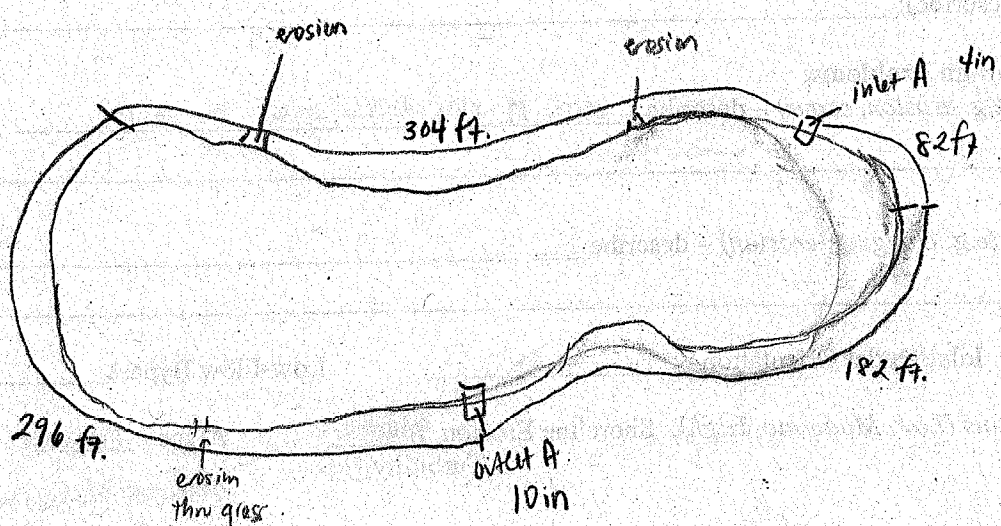
Preliminary Retrofit Opportunities (describe): Replace turf grass with native vegetation. Clean grass clippings and bank stabilizing mesh at edge of water.

Photos:

Photo #	Description
1	basin 13780
2	outlet A 13781
3	basin 13782
4	inlet A 13783
5	
6	
7	
8	
9	
10	

Inlet A runs across grass to basin

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 49

Basin Name (subdivision and/or property owner): Foglia YMCA

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-28-07 / 1130 Temperature 70 Rainfall (now, 12, (24), 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: South of Old McHenry Rd.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: commercial Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 4 - 6 ft. Buffer Width: 0 - 5 ft.

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet B Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: → manhole in basin (see pics)

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion high Algae moderate

Turbidity low

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

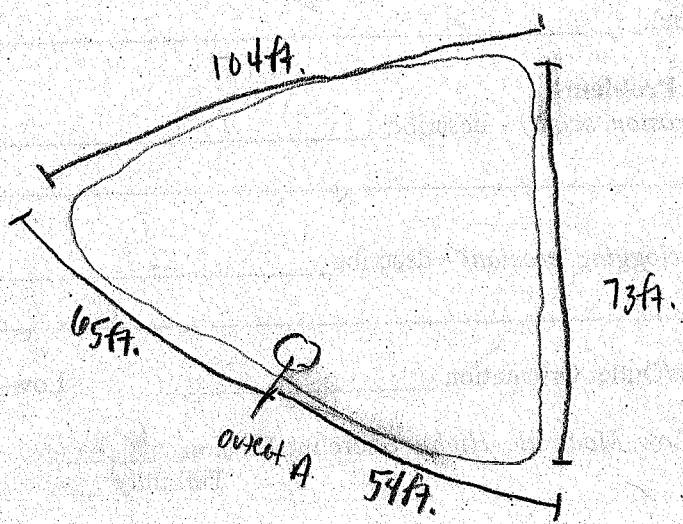
Other Observations:
Aquatic Life/ Wildlife (describe): Frogs
Potential Safety Problems: unstable banks
Potential Nuisance Problems:_____
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): Replace surrounding turf grass with native vegetation. Stabilize banks.

Photos:

Photo #	Description
1	basin 13796
2	outlet A 13797
3	" 13798
4	dried-out grass on shoreline 13799
5	basin 13800
6	
7	
8	
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 48

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-28-07/830 Temperature 70 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Echo Lake Rd. south of Miller Rd.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other rock

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 2in Bank Height 2-4ft. Buffer Width: none

Number of Inlets: Stormsewer inlet A 4in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 14in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae low

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): frogs

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

Other:_____

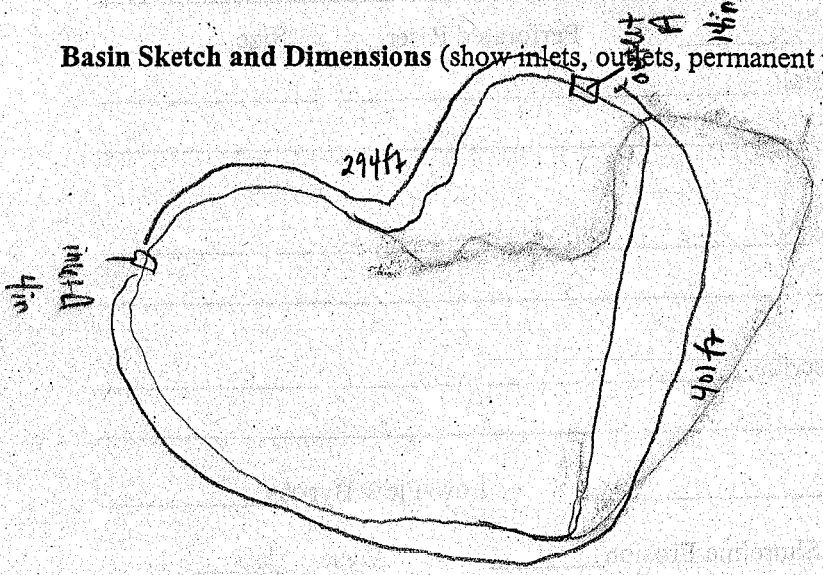
Preliminary Retrofit Opportunities (describe): Replace turf grass and rip rap along shore line with native vegetation.

Next to small Horse Farm

Photos:

Photo #	Description
1	basin 13757
2	inlet A 13758
3	basin 13759
4	inlet A 13760
5	basin 13761
6	
7	
8	
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 47

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-24-07 / 1350 Temperature 90 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Lims Dr. & Lims Ct.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry ✓ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass ✓ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 25 ft Buffer Width: NONE

Number of Inlets: Stormsewer inlet A 4in cement inlet B 4in plastic Size inlet C&D 4in Plastic Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet A is covered w/ grass clippings

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae _____ Turbidity _____

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe):_____

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

Other:_____

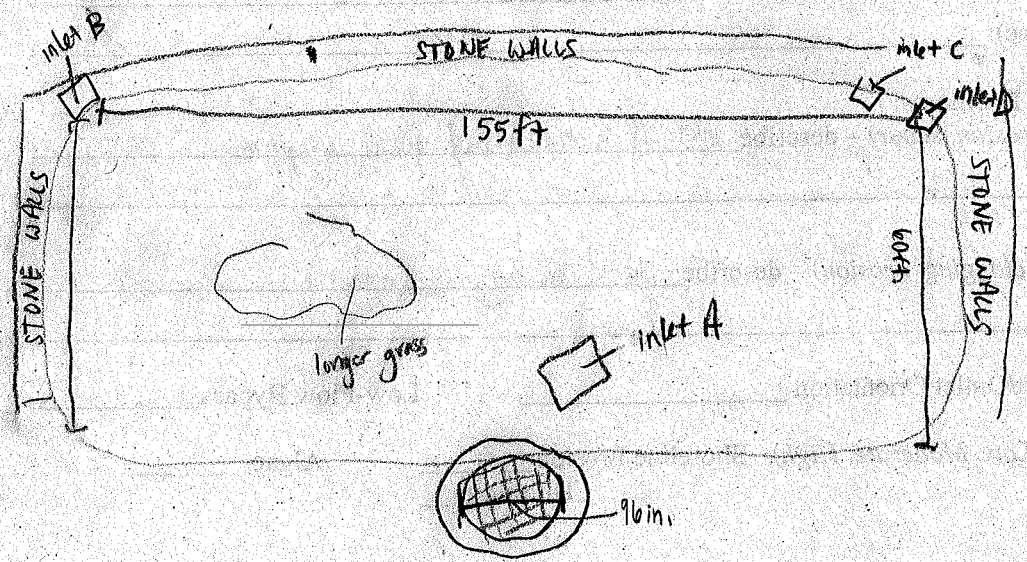
Preliminary Retrofit Opportunities (describe): remove turf grass in entire basin and replace with native vegetation.

NOTE = dried at except for center portion of tall grasses

Photos:

Photo #	Description
1	basin 12287 12 longer grass in small portion of basin 12299
2	basin 12288
3	basin 12289
4	manhole 12290
5	inside manhole ~ inlet pipe 12291
6	inlet A 12292
7	inlet A 12293
8	inlet B 12294
9	inlet B 12295
10	inlet C 12297
11	inlet D 12298

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 46

Basin Name (subdivision and/or property owner): Alpine Chapel

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-27-07 / 1300 Temperature 85 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Echo Lake Rd. & Miller Rd.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: institutional Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other dirt, rip rap

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 2in Bank Height 2 ft. Buffer Width: none

Number of Inlets: Stormsewer inlet A 4in inlet B 4in inlet C 4in inlet D 4in inlet E 6in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 22in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe part of inlet D' plastic piping broken.

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae low

Turbidity low

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): frogs

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

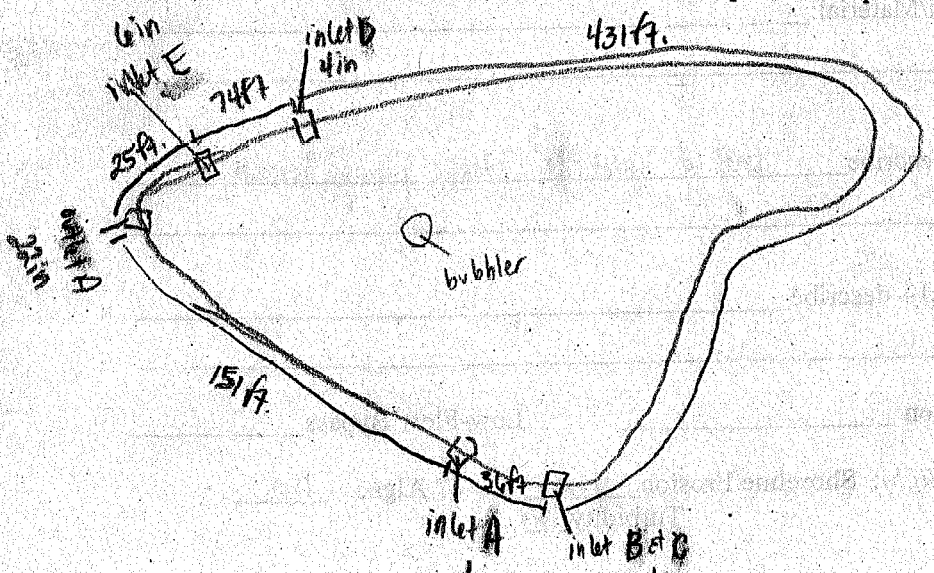
Other:_____

Preliminary Retrofit Opportunities (describe): Replace surrounding turf grass and rip rap with native vegetation. Fix inlet D pipe.

Photos:

Photo #	Description	
1	basin	13749
2	outlet A	13750
3	basin	13751
4	inlet A	13752
5	inlet B & C	13753
6	basin	13754
7	inlet D	13755
8	inlet E	13756
9		
10		

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 45

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-24-07 / 1115 Temperature 85 Rainfall (now, 12, 24, 48 hours, (week)) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Lone Ln. east side

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry _____ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass / Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap / Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 5in. Bank Height 15ft. Buffer Width: NONE

Number of Inlets: Stormsewer inlet A 8in plastic inlet B 4in plastic inlet C 4in plastic inlet D 4in plastic Size Channel/Swale channel A 21in x 24in Size

Outlet Type(s) and Dimensions: Culvert: outlet A 36in Restrictor (Y/N) Size

Surface Weir: Size Perforated Riser Size

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlets B & C has high erosion around pipes

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae _____

Turbidity _____

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe):_____

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

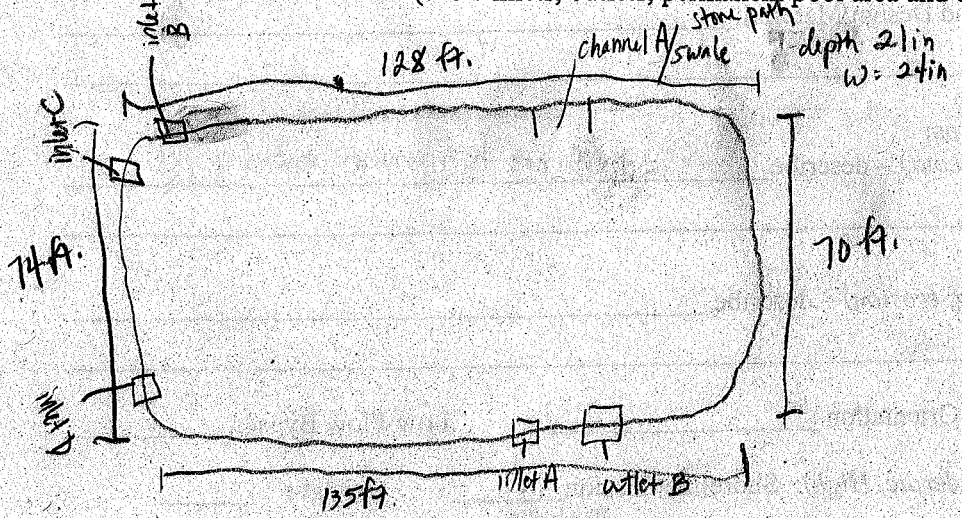
Other:_____

Preliminary Retrofit Opportunities (describe): remove turf grass & riprap, sand and replace with native vegetation.

Photos:

Photo #	Description
1	inlet A 12239
2	outlet B 12240
3	outlet B 12241
4	basin 12242
5	channel 12243
6	channel 12244
7	inlet A 12245
8	inlet B 12246
9	inlet D 12247
10	basin 12248

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



✓ Start

DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 44

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-24-07 / 1140 Temperature 90 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Lovie Ln & Lucy Ct.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 5in Bank Height 5ft. Buffer Width: NONE

Number of Inlets: Stormsewer Inlet A & B 4in plastic Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 32in concrete Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe outlet A has plants built up infront and inside of opening

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae moderate Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_✓ garbage_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe):_birds_____

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

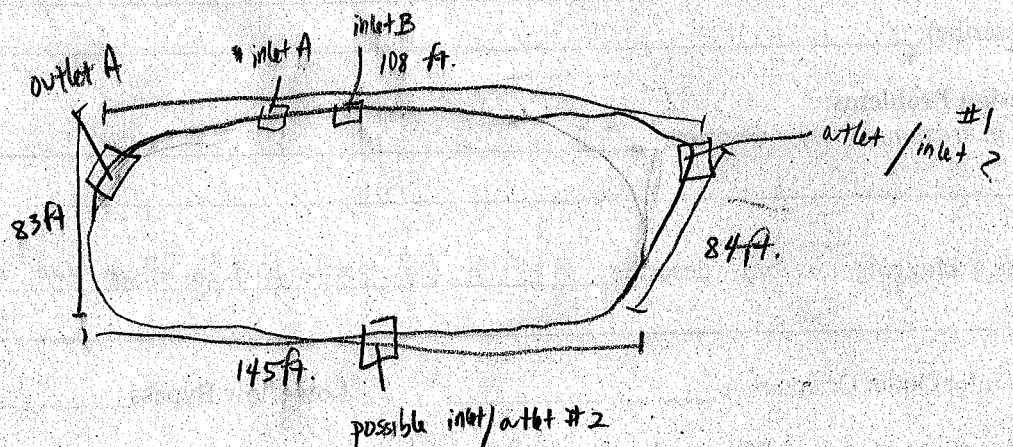
Other:_____

Preliminary Retrofit Opportunities (describe):_replace surrounding turf grass with native vegetation
remove reed grass / sediment from outlet / inlet #1 & #2 (completely jammed opening)

Photos:

Photo #	Description	
1	basin	12249
2	inlet / outlet ? #1 - too much sediment / plant growth @ opening	12250
3	"	12251 C
4	inlet A on hill side drains thru grass	12252
5	inlet B on hill side drains thru grass	12253
6	outlet A -	12254
7	outlet A - algae & muck	12255
8	basin	12256
9	possible inlet / outlet # 2	12257
10		

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 43

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-24-07 / 12:10 Temperature 90 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Lone Ln. west of cul de Sac

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in: 4in Bank Height 6ft. Buffer Width: NONE

Number of Inlets: Stormsewer ?Inlet A 18in Inlet B 4in Inlet C 10in Size plastic Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: outlet A 10in Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae moderate

Turbidity moderate

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): frogs, birds

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

Other:_____

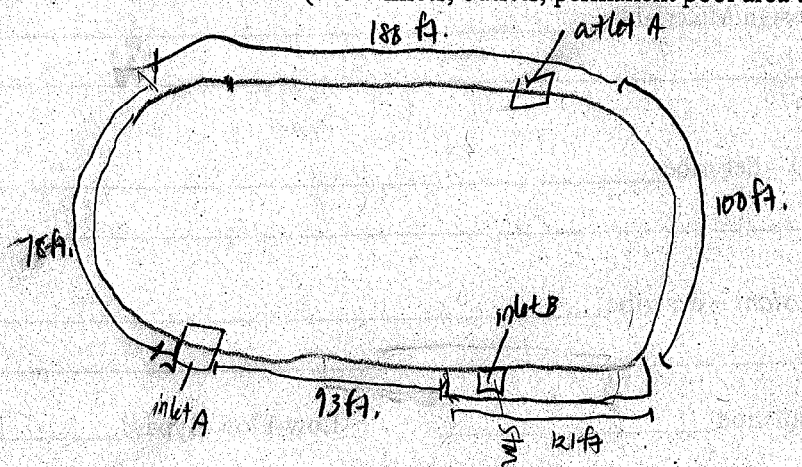
Preliminary Retrofit Opportunities (describe): Replace surrounding turf grass with native vegetation. Clean out inlets of sediment & plants.

NOTE: inlet A could possibly be an outlet ~ can't tell w/ water level

Photos:

Photo #	Description	
1	basin	12258
2	inlet A	12259
3	inlet B	12260
4	inlet C	12261
5	basin	12262
6	outlet A	12263

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 42

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-24-07 / 1020 Temperature 85 Rainfall (now, 12, 24, 48 hours, (week)) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Miller Rd & Briarwoods Ln.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: Institutional (grade school) Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry _____ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass _____ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 5in Bank Height 15ft Buffer Width: 30 - 70 ft.

inlet A ~12in couldn't reach inside

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

outlet A → could not see well

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae moderate

Turbidity high

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): birds & frogs

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

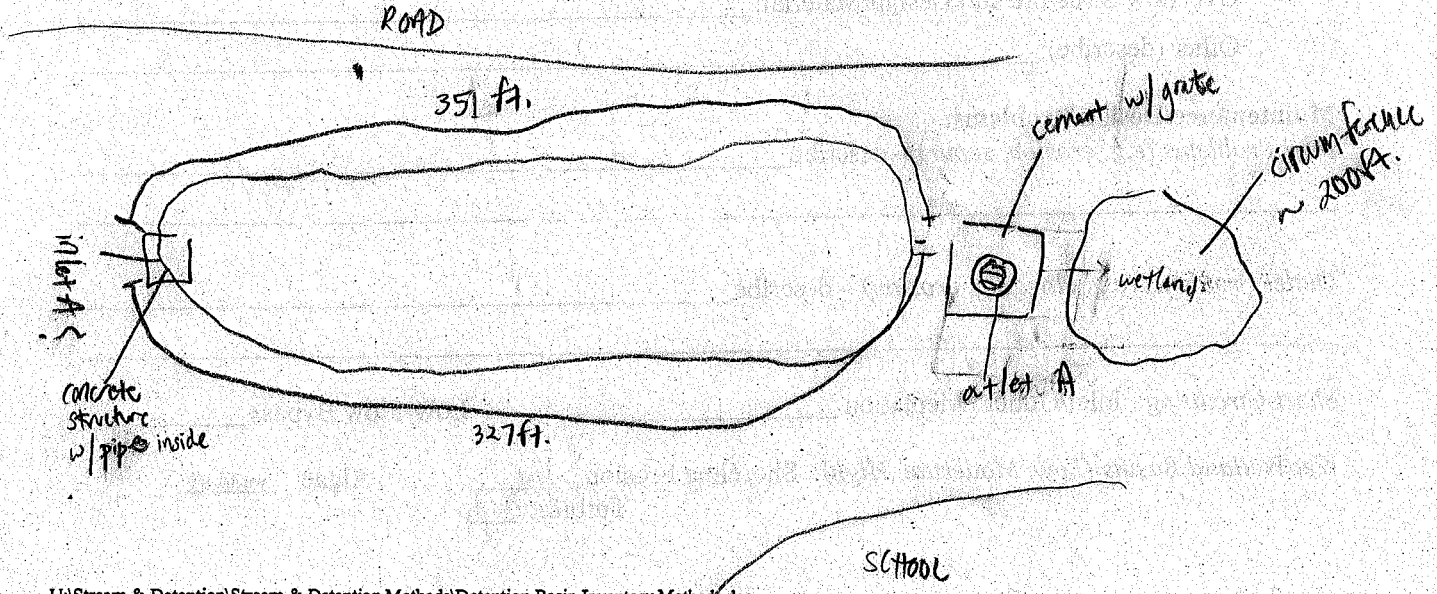
Other:_____

Preliminary Retrofit Opportunities (describe): NONE

Photos:

Photo #	Description
1	basin 12232, 12233
2	inlet A?, 12234
3	inlet box 12235
4	" 12236
5	grate / outlet A 12237
6	grate / outlet A 12238
7	wetland 12239
8	
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 41

Basin Name (subdivision and/or property owner): Walgreens

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-24-07 / 850 Temperature 80 Rainfall (now, 12, 24, 48 hours, (week) _____

Location:

Political Jurisdiction: _____ Township: Fla Quarter Section: _____

Nearest Cross Streets: Rand Rd. & Miller Rd NE corner

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: Commercial Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry _____ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 4in Bank Height 3ft Buffer Width: NONE - 50ft

Number of Inlets: Stormsewer inlet A 12in. inlet B 12in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: inlet A 22in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe a lot of sediment in outlet A

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae high

Turbidity high

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ Excess Sediment Accumulation ✓
Excess Woody Vegetation ✓

Other Observations:
Aquatic Life/ Wildlife (describe): woodchuck / beaver

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

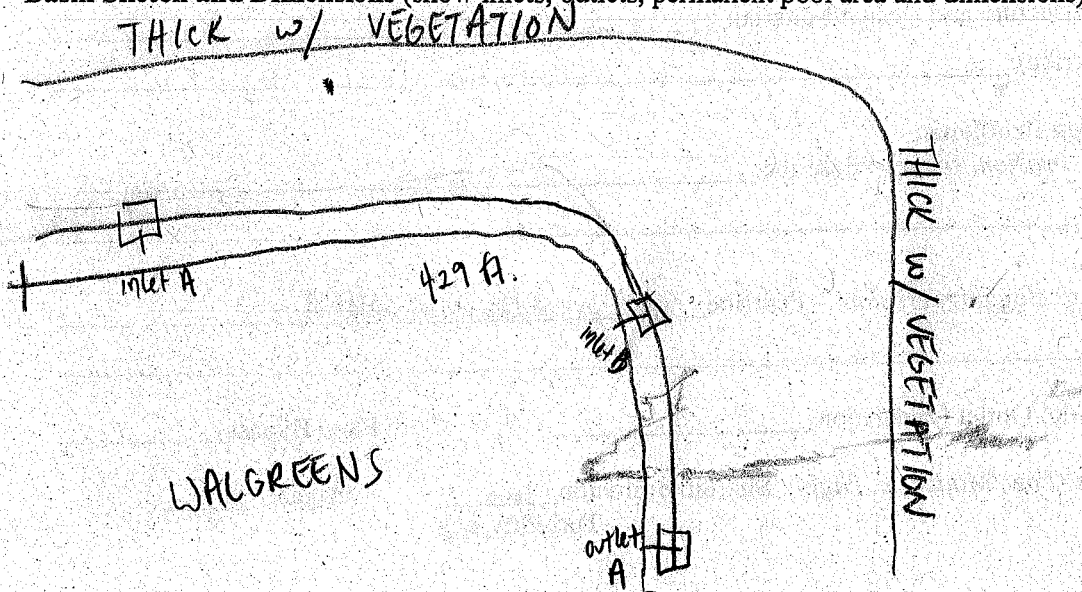
Other: a lot of garbage in basin. (ie. a shopping cart)

Preliminary Retrofit Opportunities (describe): plant native vegetation in place of turf grass next to parking lot area. Remove some of the overhanging bush and trees

Photos: Note: only did dimension on side of parking lot all other sides were to densly covered by trees / vegetation

Photo #	Description
1	wetland / basin area 12212
2	" 12213
3	wood chuck 12214
4	inlet A 12215
5	inlet B 12216
6	outlet A 12217
7	basin along side of walgreen 12218
8	basin (w/ shopping cart) 12219
9	basin 12220

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 40

Basin Name (subdivision and/or property owner): Miller Grove

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-24-07 / 145 Temperature 85 Rainfall (now, 12, 24, 48 hours, (week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Miller Road & Holly Circle

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other riprap ✓

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other ✓ iris

Slope (Horizontal:Vertical) 12in : 2in Bank Height 4ft. Buffer Width: NONE

Number of Inlets: Stormsewer inlet A 12in. inlet B 4in plastic inlet C 4in Plastic inlet D 2in PVC Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 18in outlet B 18in outlet C 18in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe outlet C has sedimentation / plant matter at opening

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae low

Turbidity moderate

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

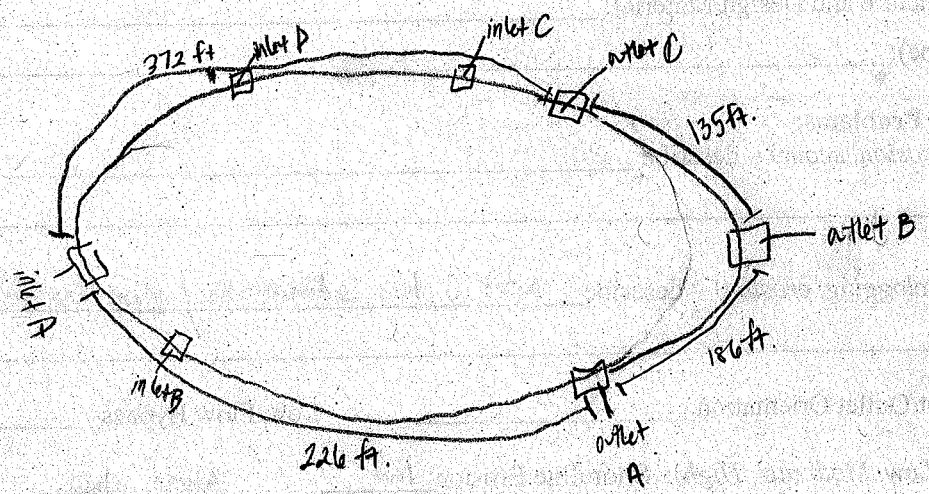
Other Observations:
Aquatic Life/ Wildlife (describe): canada geese / mallards
Potential Safety Problems: larger outlet/inlet pipes have grates
Potential Nuisance Problems:_____
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): put a grate infront of inlet A & outlet A/B
replace turf grass with natural wetland species

Photos:

Photo #	Description
1	basin 12221
2	basin 12222
3	inlet A 12223
4	inlet B - crumpled 12224
5	outlet A 12225
6	outlet B 12226
7	outlet B 12227
8	outlet C 12228
9	outlet C 12229
10	inlet C 12230
11	inlet D 12231

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 39

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-24-07 / 14:30 Temperature 90 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Vista Rd. & Butterfield Rd.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? Y @ inlet A

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other rip rap

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 2in : 2in Bank Height 20ft. Buffer Width: NONE - 25ft.

Number of Inlets: Stormsewer inlet A 14in inlet B 4in Size plastic Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 16in outlet B 10in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet A has erosion around pipe

Outlet Problems (e.g. clogging, erosion) – describe outlet A planted sediment clogging opening outlet B has oily slick @ opening

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae _____ Turbidity _____

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): birds

Potential Safety Problems: inlet A is falling apart, has metal reinforcements sticking out., broken pipe

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe): oil slick @ opening of outlet B

Other Basin Uses (rec. field, etc):_____

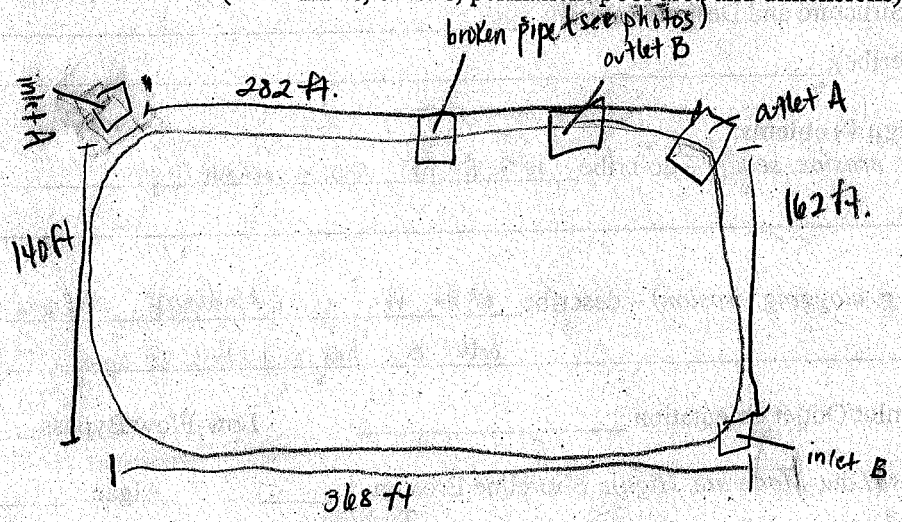
Other:_____

Preliminary Retrofit Opportunities (describe): remove turf grass around basin edges replace w/native vegetation replace inlet A and fix erosion around it. Fix the broken pipe lying exposed

Photos: Note: not sure of purpose of broken pipe

Photo #	Description				
1	basin	12300	12	broken pipe	12311
2	inlet A	12301	13	broken pipe - 12 in.	12312
3	inlet A sedimentation basin	12302	14	broken pipe	12313
4	erosion @ inlet A pipe	12303			
5	path of inlet A to basin	12304			
6	basin	12305			
7	inlet A needs to be replace	12306			
8	inlet B	12307			
9	outlet A	12308			
10	outlet A	12309			
11	outlet B	12310			

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 38

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-30-07 / 1216 Temperature 90 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Lake Breeze Ct.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other ✓ dirt, rip rap

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 6ft. Buffer Width: 15ft.

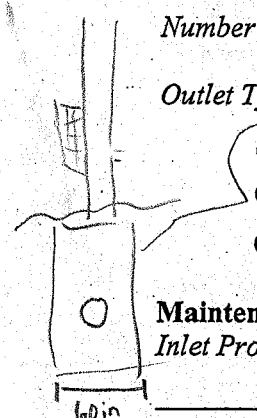
Number of Inlets: Stormsewer inlet A 12 in, inlet B 18 in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 12 in Restrictor (Y/N) Y Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: overflow pipes on banks all 4" black (29 total)

Other (describe): → mostly @ the base of the trees around the basin



Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

6 in thickness ~10ft tall

Outlet Problems (e.g. clogging, erosion) – describe _____

- can't see very well

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae _____

Turbidity moderate

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

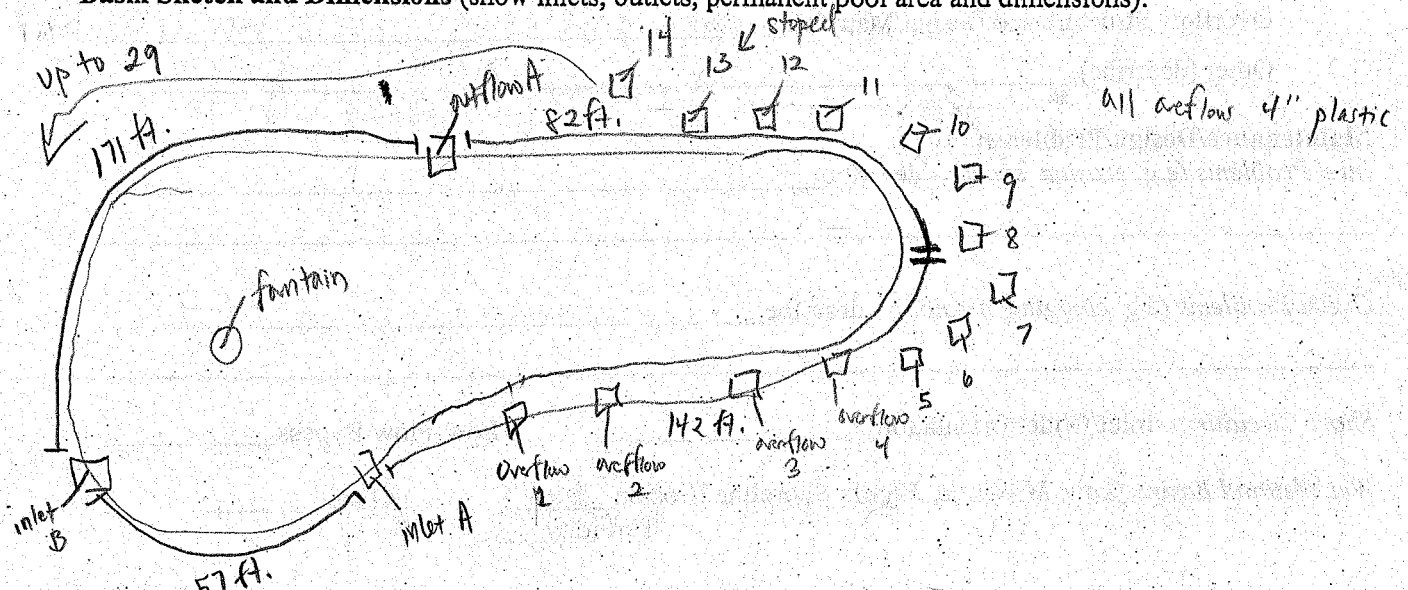
Other Observations:
Aquatic Life/ Wildlife (describe): fish, frogs
Potential Safety Problems:_____
Potential Nuisance Problems:_____
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): plant native vegetation along banks

Photos:

Photo #	Description				
1	inlet A	12369	14	overflow 12	
2	overflow 1 – above basin on bank		15	outlet A	12383
3	overflow 2		16		12384
4	overflow 3		17	outlet grate	12385
5	overflow 4		18	restriction	12386
6	" 5		19	inlet B	12387
7	" 6		20	basin	12388
8	" 7		21	basin shoreline / erosion, ~ reseeding banks	12389
9	" 8				
10	" 9				
11	" 10				
12	" 11				
13 basin		12381			

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



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DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 37

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-30-07 / 1030 Temperature 85 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Rand Rd. & Clove Hill Ln.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: _____ Year Constructed: _____

Basin Design Features: NOT A BASIN — WETLAND MARSH AREA

Type: Wet _____ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass _____ Rip Rap _____ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) _____ Bank Height _____ Buffer Width: _____

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae _____

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe):_____

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

Other:_____

Preliminary Retrofit Opportunities (describe):_____

_____

_____

Photos:

Photo #	Description
1	wetland 12356
2	wetland 12357

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):

DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 36

Basin Name (subdivision and/or property owner): KOHL'S / CULVERS PLAZA

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-24-07 / 15:30 Temperature 90 Rainfall (now, 12, 24, 48 hours, (week)) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Rand Rd. & Clover Hill Ln.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: Commercial Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other ✓ dirt

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 6 ft. Buffer Width: NONE

Number of Inlets: Stormsewer inletA 22 in concrete Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 10 in conc. Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe eroding around pipe

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion high Algae _____

Turbidity moderate

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

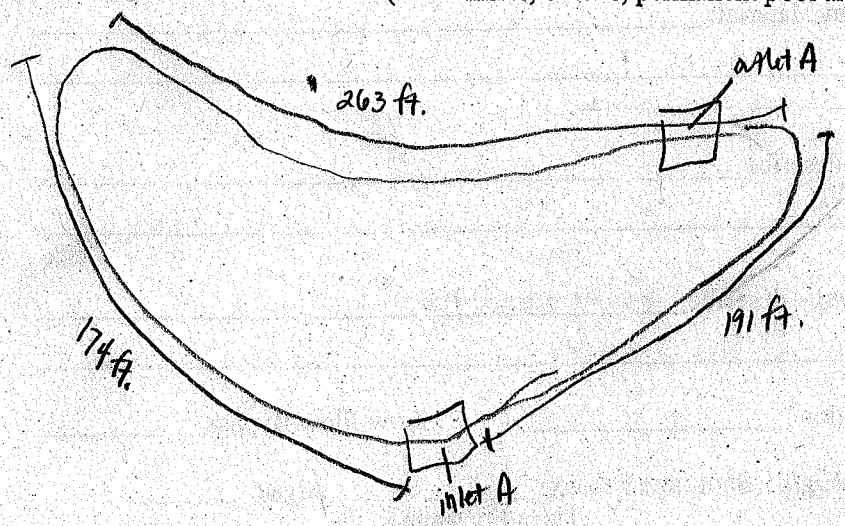
Other Observations:
Aquatic Life/ Wildlife (describe): frogs
Potential Safety Problems: outlet A has erosion around it
Potential Nuisance Problems:
Evidence of Upstream Illicit Connections (describe):
Other Basin Uses (rec. field, etc):
Other:

Preliminary Retrofit Opportunities (describe): remove turf grass on banks and replace with native vegetation and design good buffer between basin and parking lot. Stabilize banks.

Photos:

Photo #	Description
1	basin 12314
2	basin 12315
3	erosion 12316
4	inlet A 12317
5	basin 12318
6	outlet A ending round pipe 12319
7	outlet A 12320

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 35

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-24-07 / 830 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Ravel Rd. & Miller Rd. SE corner

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential / park area Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓ lily pads & other aquatic macro invert

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 2 ft. Buffer Width: NONE - 15ft

Number of Inlets: Stormsewer NONE Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A - 18in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe vegetation directly in front of outlet A

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae _____

Turbidity _____

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris √ garbage Excess Sediment Accumulation_____
Excess Woody Vegetation_____

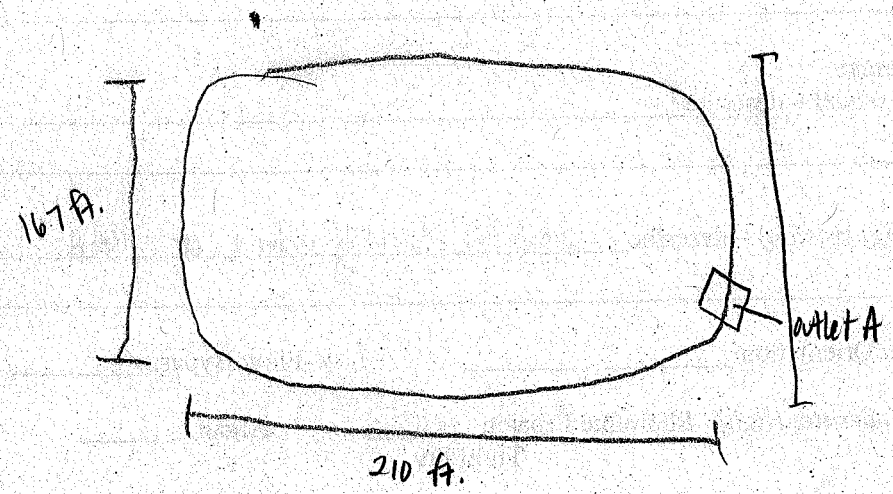
Other Observations:
Aquatic Life/ Wildlife (describe): mallards, frogs, other birds
Potential Safety Problems: no grate infront of outlet A ~ safety
Potential Nuisance Problems: geese poop
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): replace turf grass sides w/ native vegetation to allow for better buffer. Put grate to cover outlet A

Photos:

Photo #	Description
1	basin 12208
2	basin 12209
3	~~frog~~
4	outlet A 12210
5	outlet A 12211
6	
7	
8	
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



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DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 34

Basin Name (subdivision and/or property owner): Flint Creek

Maintenance Responsibility: I

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-30-07 / 915 Temperature 85 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Samantha Ln & Rand Rd

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry _____ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 5in. Bank Height 6.5ft. Buffer Width: 20 ft.

Number of Inlets: Stormsewer Inlet A Size 12" Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: ✓ PVC 12"

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe covered in black cloth

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae _____

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ from cattails Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): birds

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

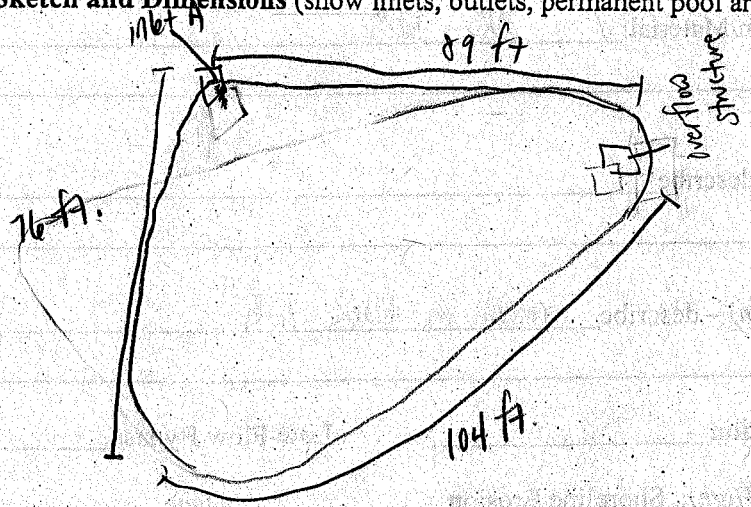
Other:_____

Preliminary Retrofit Opportunities (describe): plant native vegetation on banks in place of turf grass. Remove black cloth from overflow

Photos:

Photo #	Description
1	basin 12346
2	basin 12347
3	overflow 12348
4	overflow - wrapped in black cloth? 12349
5	inlet A 12350

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



1 2

DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 33

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-30-07 / 1305 Temperature 90 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Honey Lake Rd & Beech Dr.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

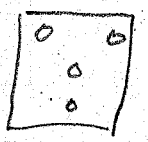
Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in 5in Bank Height 6ft Buffer Width: none

Number of Inlets: Stormsewer inlet A 18in inlet B 12in Size _____ Channel/Swale _____ Size _____



Outlet Type(s) and Dimensions: Culvert: outlet A 12in outlet B 12in Restrictor (Y/N) Y Size 4 4in PVC

Surface Weir: _____ Size _____ Perforated Riser _____ Size see picture

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae _____

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): frogs

Potential Safety Problems: a couple of holes along banks, restrictor needs cover w/ smaller slots

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

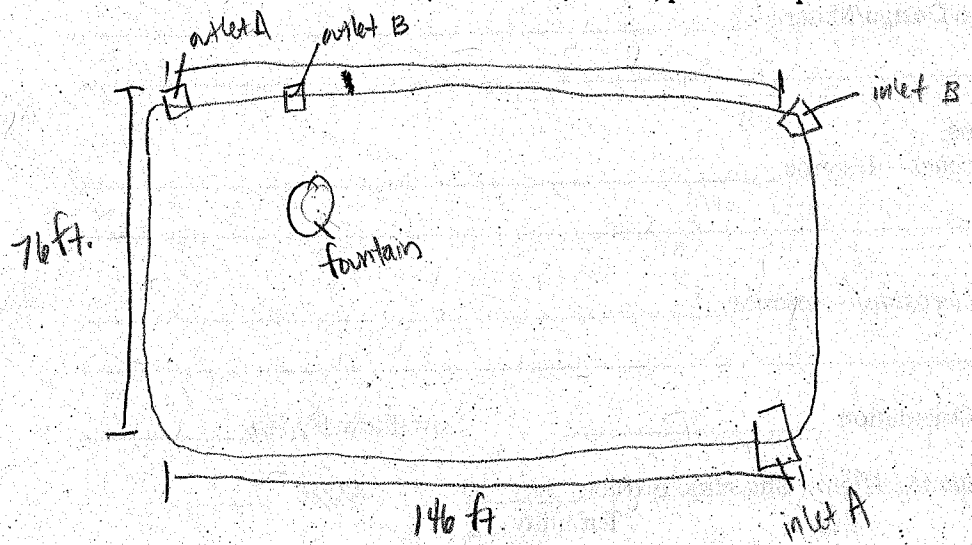
Other:_____

Preliminary Retrofit Opportunities (describe): replacerestrictor grate with one that has smaller bars, replace turf grass with native vegetation.

Photos:

Photo #	Description	
1	basin	12390
2	inlet A	12391
3	erosion along bank ~ sink holes	12392
4	outlet A	12393
5	outlet B	12394
6	restrictor	12395
7	restrictor	12396
8	inlet B	12397
9	basin	12398

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



13

DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 32

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-30-07 / 1340 Temperature 90 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Pleasant Rd & Shore View Ln

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other ✓ dirt, rip rap

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 2in Bank Height 2in - 6in Buffer Width: none

* look @ pics for inlet B

Number of Inlets: Stormsewer 7 inlet A ~28in Size inlet B 12in inlet C 4" inlet D 4in Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 32in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet A has rock & fragments at it

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae low

Turbidity moderate

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation ✓ willows

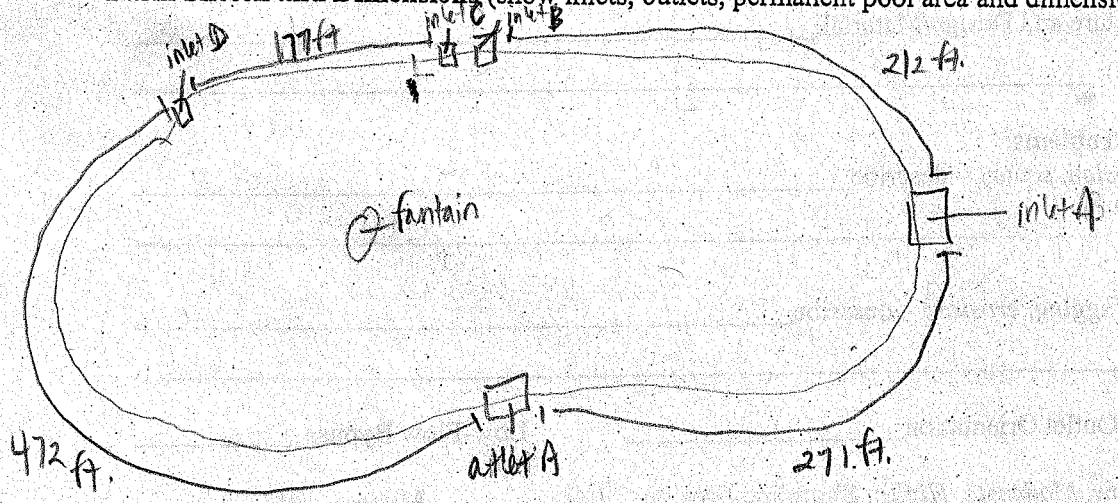
Other Observations:
Aquatic Life/ Wildlife (describe): frogs, fish, mallards, geese
Potential Safety Problems:_____
Potential Nuisance Problems: duck & geese poop
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): replace turf grass with native vegetation and rip rap

Photos:

Photo #	Description
1	outlet A 12399
2	inlet A / grate thing 12400
3	" " 12401
4	inlet A 12402
5	inlet A grate thing 12403
6	inlet B 12404
7	inlet C 12405
8	inlet D 12406
9	basin 12407
10	basin 12408

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



12

DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 31

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-30-07 / 1415 Temperature 90 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Clubhouse Ln & Tyler Ct.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 3.5in Bank Height 5.5 ft. Buffer Width none - 10 ft.

Number of Inlets: Stormsewer inlet A Size 12 in Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 10 in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe outlet A has significant sedimentation @ opening

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae low

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe):_____

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe): small oil slick in outlet A

Other Basin Uses (rec. field, etc):_____

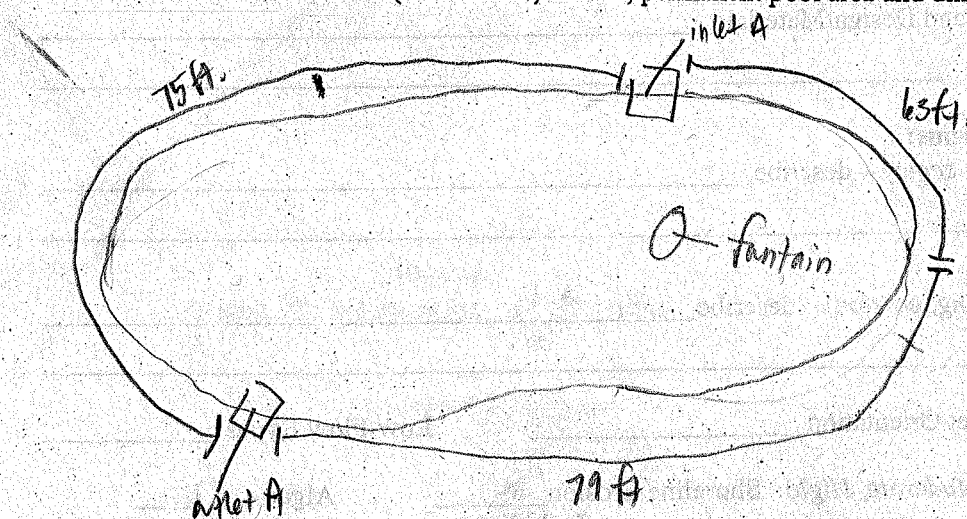
Other:_____

Preliminary Retrofit Opportunities (describe): plant more native vegetation on banks. get rid of blue (treatment to ↓ algae) water.

Photos:

Photo #	Description
1	outlet A 12409
2	basin 12410
3	unnatural blue water 12411
4	inlet A 12412

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ a ton of garbage Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): mallards

Potential Safety Problems: inlet C has two pipes that are disconnected

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe): oil slick @ opening of outlet A & inlet C

Other Basin Uses (rec. field, etc):_____

Other:_____

Preliminary Retrofit Opportunities (describe): plant native vegetation on banks. If public meant to be kept out of basin fix fencing.

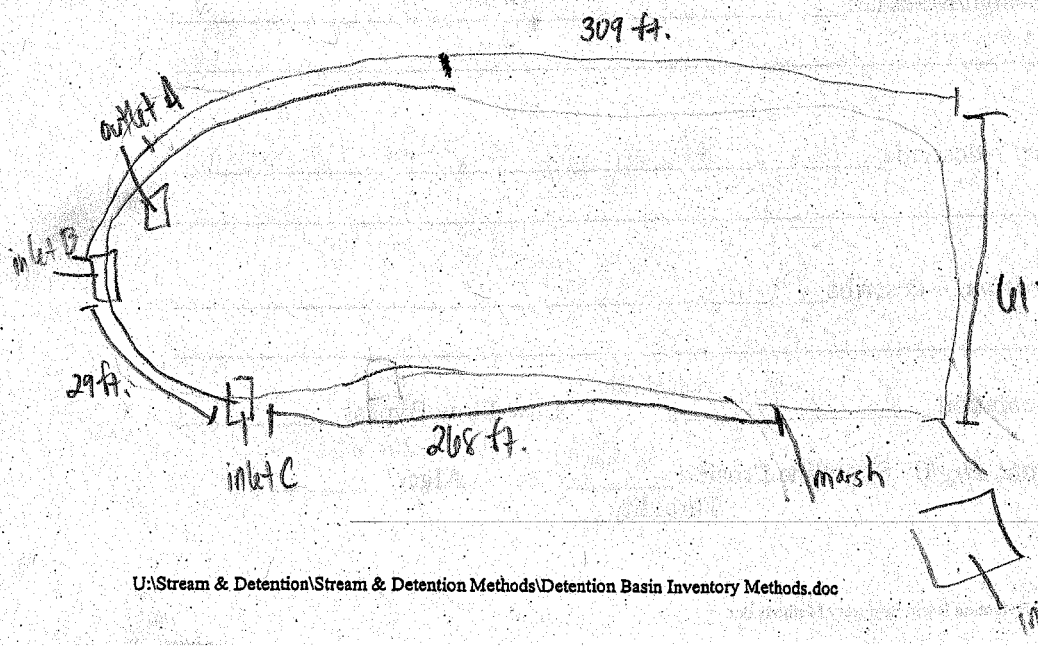
Photos: NOTE: Basin mostly dry. Basin enclosed on all sides by 6ft. fencing

Photo #	Description
1	basin dried 12417 13 inlet A 12429
2	basin ↓ 12418 14 inlet A 12430
3	basin ↓ 12419
4	path to inlet A 12420
5	basin 12421
6	shopping carts / trash 12422
7	outlet A 12423
8	inlet B 12424 9 inlet B / outlet A 12425
10	inlet C 12426
11	inlet C - 2 disconnected pipes 12429
12	" 12428

crawled through bushes to get pics of inlet A

Note: could not measure up to inlet A surrounded by high marsh grass, bushes and fencing.

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



1

DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 30

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-31-07 / 840 Temperature 78 Rainfall (now, 12, 24, 48 hours, (week)) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: West of Rand Rd @ Whitney Rd.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other ✓ dirt

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ by inlet A Other _____

Slope (Horizontal:Vertical) 12in:6in Bank Height 15ft. Buffer Width: 15 ft

Number of Inlets: Stormsewer inlet A 22in Size inlet B 14in inlet C 16in Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 12in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet C has 2 pipes that are disconnected

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation ✓ inlet B & outlet A Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate – but basin mostly dry Algae _____

Turbidity ___

b 2

DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 29

Basin Name (subdivision and/or property owner): Willow Ponds professional center

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-31-07 / 940 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Elg Quarter Section: _____

Nearest Cross Streets: North of Main St. / Rt 22 & Orchard Pond Rd

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: commercial Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry _____ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other / rip rap

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 4in Bank Height 5ft. Buffer Width: 3ft inside next to building ~10ft on other side

Number of Inlets: Stormsewer inlet A 16in inlet B 16in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 12in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet A has sediment accumulation and wetland grasses @ opening

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation ✓ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae low

Turbidity high

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ from wetland grasses / garbage Excess Sediment Accumulation_____
Excess Woody Vegetation_____

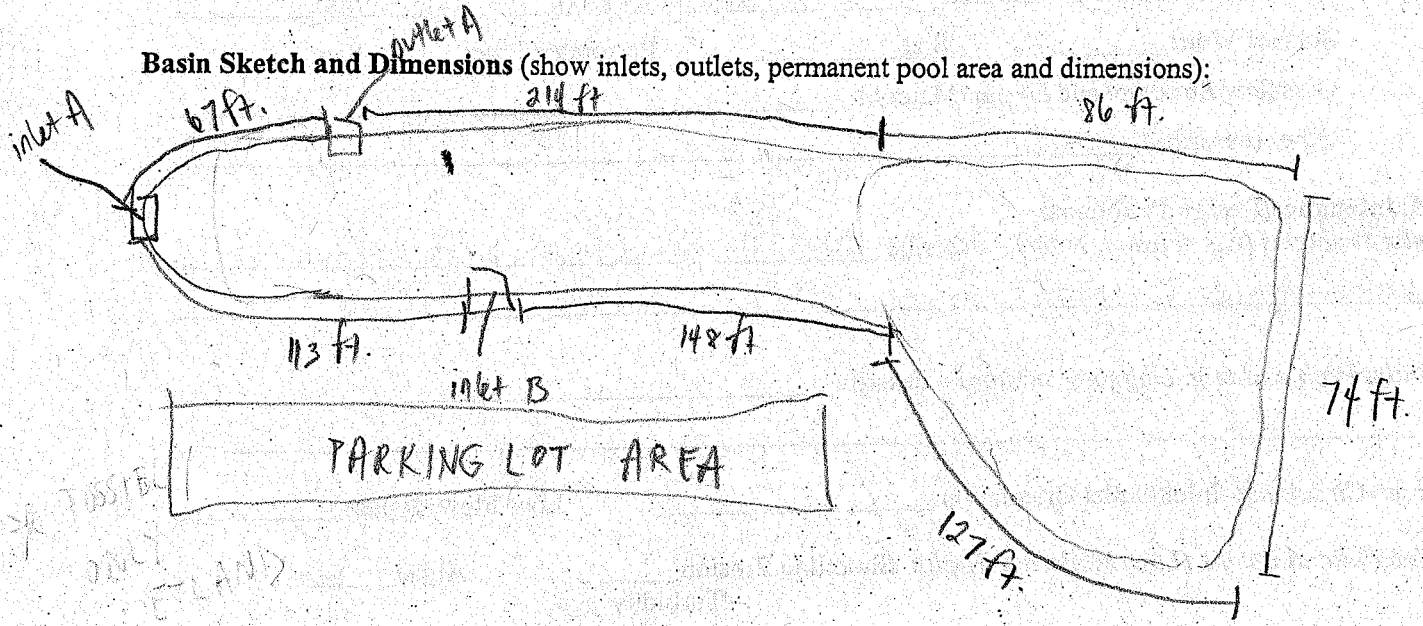
Other Observations:
Aquatic Life/ Wildlife (describe): birds, frogs
Potential Safety Problems:_____
Potential Nuisance Problems:_____
Evidence of Upstream Illicit Connections (describe): oil slick on basin area next to parking lots (inlet B)
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): plant more native vegetation along slopes. look into oil contamination near parking lot area.

Photos: Note: adjacent to another wetland

Photo #	Description
1	basin 12431
2	basin 12432
3	basin - looking @ channel area 12433
4	basin 12434
5	outlet A 12435
6	channel basin area 12436
7	inlet A 12437
8	inlet B 12438

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 28

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-31-07 / 730 Temperature 75 Rainfall (now, 12, 24, 48 hours, (week)) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Pleasant Rd & Poplar Ct.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other rip rap

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 3ft. Buffer Width: 7ft.

inlet A 32in

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 10in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae _____

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): blue heron, frogs
Potential Safety Problems:_____
Potential Nuisance Problems:_____
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

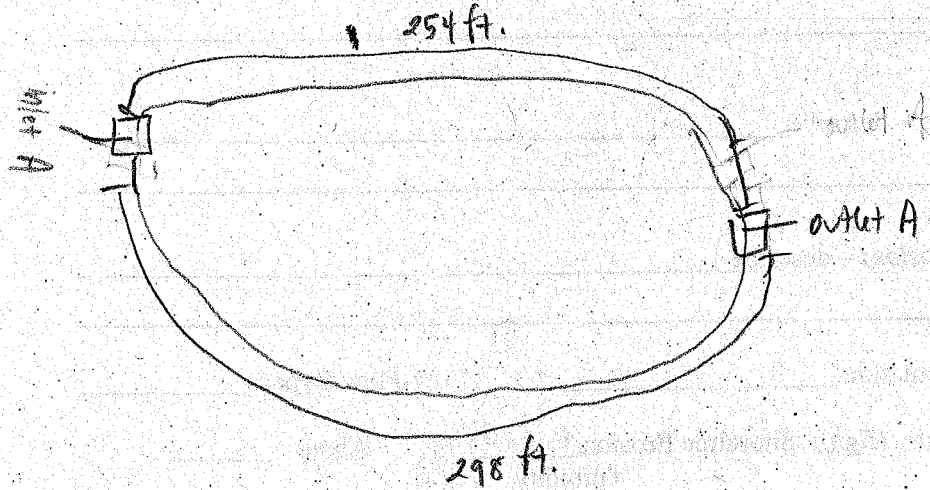
Preliminary Retrofit Opportunities (describe): Stabilize banks by planting more native vegetation. Remove rip rap

Photos:

Photo #	Description
1	basin 12413
2	inlet A 12414
3	basin 12415
4	outlet A 12416

not shaft circulating - enough distance between 2 and aquatic macrophytes in 95% of basin

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 27

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-6-07 / 1500 Temperature 70 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: Rt 22 & Havana Way

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other rip rap

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 5-20ft. Buffer Width: none-50 ft

Number of Inlets: Stormsewer _____ Size inlet A 10in Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A ~ 40in width outlet B ~12in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe a lot of plant material directly infront of opening

Outlet Problems (e.g. clogging, erosion) – describe outlet B is crumpled outlet A is poor design w/rocks

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion high Algae _____ Turbidity _____

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ along banks grasses Excess Sediment Accumulation_____
Excess Woody Vegetation ✓ trees

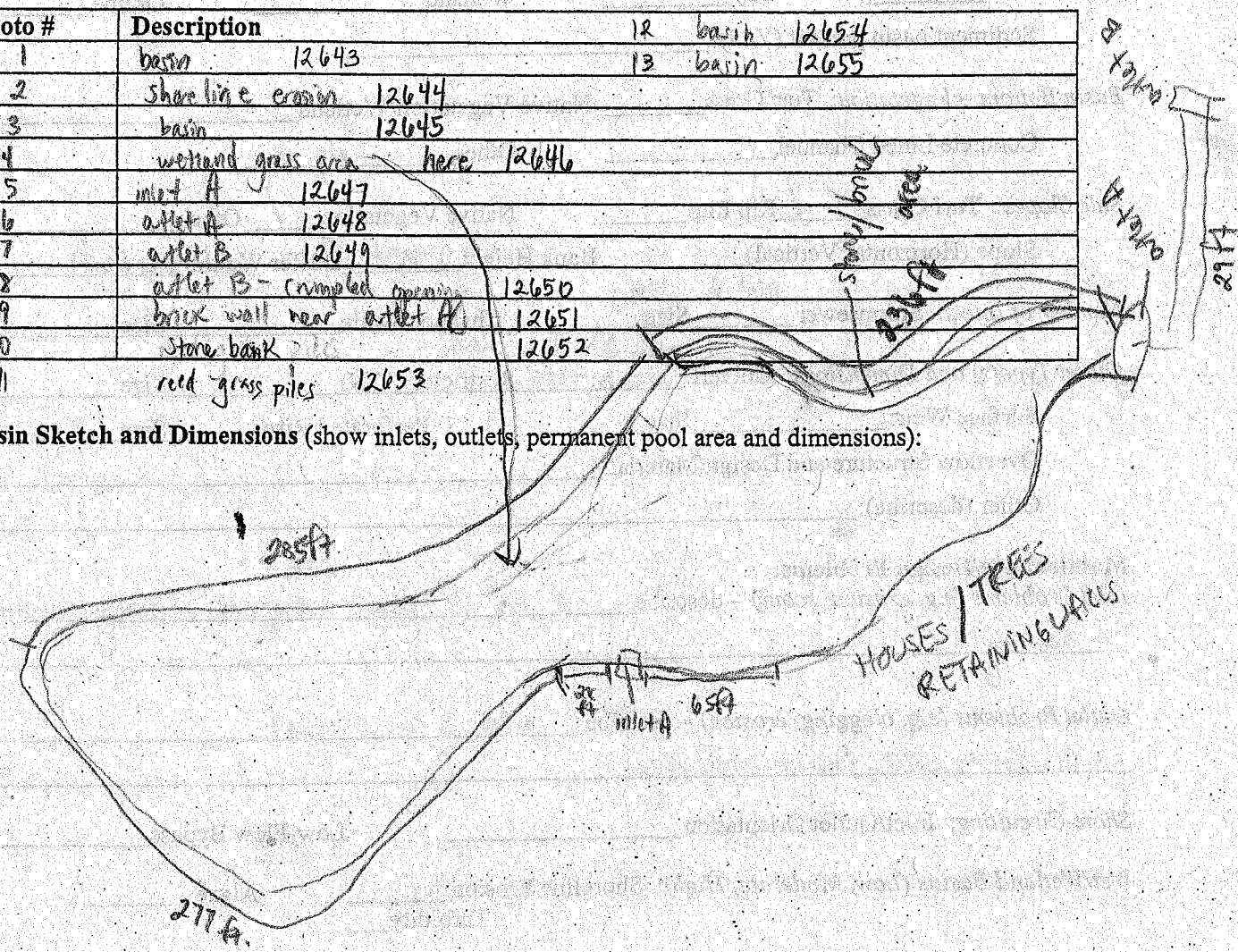
Other Observations:
Aquatic Life/ Wildlife (describe): deer, frogs, birds
Potential Safety Problems:_____
Potential Nuisance Problems: duck poop
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): Plant native vegetation around basin to provide buffer and stabilize slopes. Remove decorative retention walls and in place put native vegetation. Redo outlet area

Photos:

Photo #	Description
1	basin 12643
2	shoreline erosion 12644
3	basin 12645
4	wetland grass area here 12646
5	inlet A 12647
6	outlet A 12648
7	outlet B 12649
8	outlet B - crimpled opening 12650
9	brick wall near outlet A 12651
10	stone bank 12652
11	reed grass piles 12653
12	basin 12654
13	basin 12655

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 26

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-8-07 / 1345 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: Buckley Rd. & Porter School Rd.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry ✓ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass ✓ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 6-10 ft Buffer Width: none

Number of Inlets: Stormsewer Inlet A 10 in Inlet B 10 in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet A & B have mesh covers over openings, grass and leaf litter are stuck to this mesh

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae _____

Turbidity _____

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe):_____

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

Other:_____

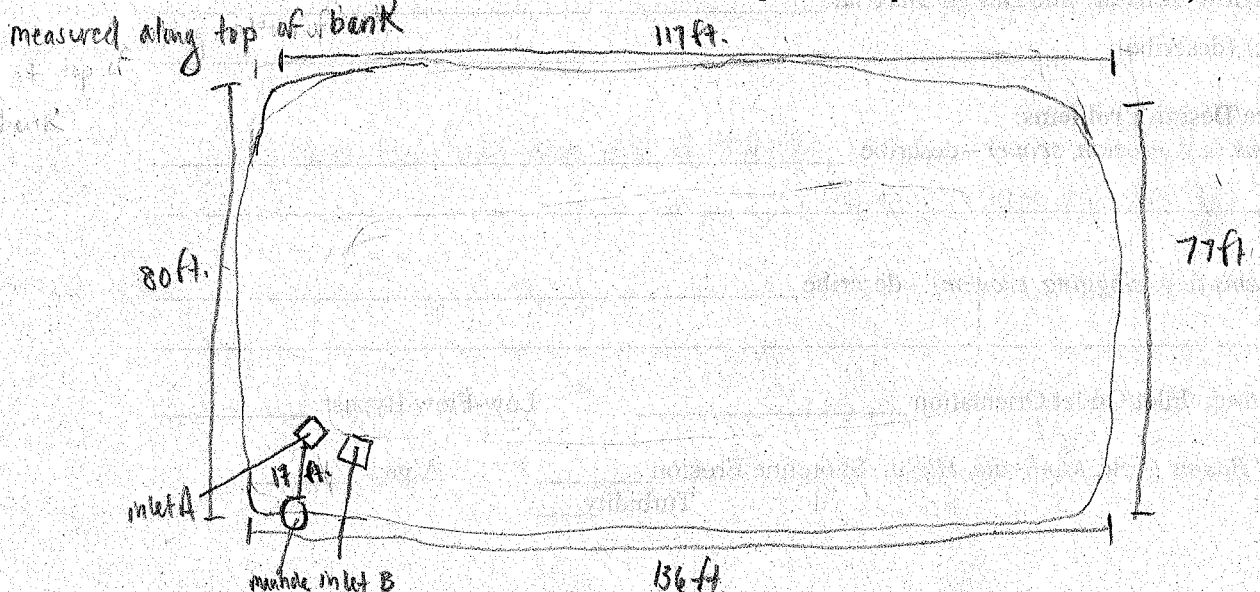
Preliminary Retrofit Opportunities (describe): replace turf grass with native vegetation put another type of cover over inlets so that grass cuttings don't clog it if it were to rain. (not such small mesh)

Photos:

Photo #	Description
1	basin 12750
2	basin 12751
3	inlet A 12752
4	inlet B 12753
5	inlet A/B 12754
6	height of bank ~ while standing in basin 12755
7	basin 12756
8	
9	
10	

1, deep basin

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 25

Basin Name (subdivision and/or property owner): Swiss Automation

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-8-07 / 1230 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: Northwest Hwy & Pepper Rd.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: industrial Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 6 ft. Buffer Width: none

Number of Inlets: Stormsewer inlet A 10in inlet B 10in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 10in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe Somethings wrong inlet B ?

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation ✓ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae _____

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

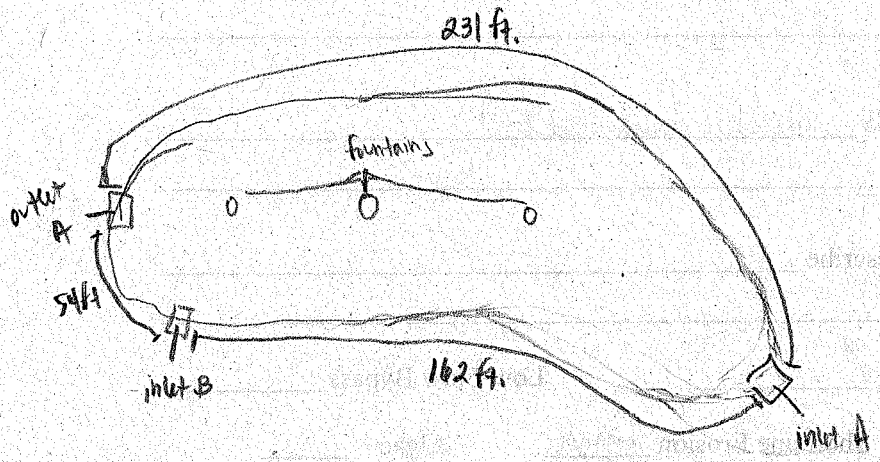
Other Observations:
Aquatic Life/ Wildlife (describe): frogs
Potential Safety Problems: unstable rock around outlet A, holes along banks
Potential Nuisance Problems:
Evidence of Upstream Illicit Connections (describe):
Other Basin Uses (rec. field, etc):
Other:

Preliminary Retrofit Opportunities (describe): Replace turf grass on banks w/ native vegetation and rip rap

Photos:

Photo #	Description
1	basin 12735
2	inlet A 12736
3	some foam ropes ~ inlet A & it ropes 12737
4	outlet A + foam ropes 12738
5	outlet A 12739
6	outlet A & unstable rock around it. 12740
7	basin 12741
8	inlet B + foam around it ~ to collect pollution entering 12742
9	inlet B 12743
10	floating absorption pads 12744

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 24

Basin Name (subdivision and/or property owner): Tuttle - Arlington Fastners Company

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-8-07 / 1255 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: Northwest Hwy. & Kelsey Rd.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: Industrial Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 6ft. Buffer Width: none

Number of Inlets: Stormsewer inlet A 10in inlet B 28in inlet C 10in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe all inlets have thick algae growing at the openings

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae low

Turbidity high

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ garbage Excess Sediment Accumulation_____
Excess Woody Vegetation_____

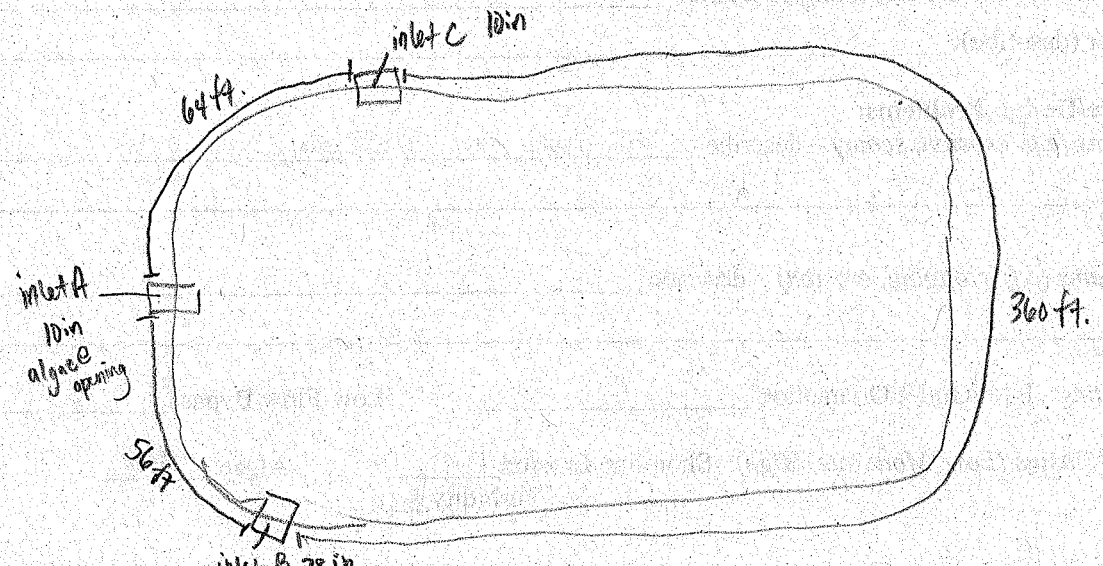
Other Observations:
Aquatic Life/ Wildlife (describe):_____
Potential Safety Problems: erosion on banks hidden by over-grown turf grass
Potential Nuisance Problems:_____
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): Replace all turf grass with native vegetation
fix break in pipe connection @ inlet C.

Photos:

Photo #	Description
1	basin 12745
2	inlet A 12746
3	inlet B 12747
4	inlet C 12748
5	erosion at inlet C pipe connection 12749
6	
7	
8	
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 23

Basin Name (subdivision and/or property owner): Savannah

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-6-07 / 1115 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: W. Savannah Trail & Savannah

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 6ft. Buffer Width: 3ft. & 10ft other bank

Number of Inlets: Stormsewer inlet A 4in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 12in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet A drains over rocks

Outlet Problems (e.g. clogging, erosion) – describe a lot of sediment & plant growth at opening

Short-Circuiting: Inlet/Outlet Orientation ✓ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae moderate

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): frogs, birds

Potential Safety Problems:

Potential Nuisance Problems:

Evidence of Upstream Illicit Connections (describe):

Other Basin Uses (rec. field, etc):

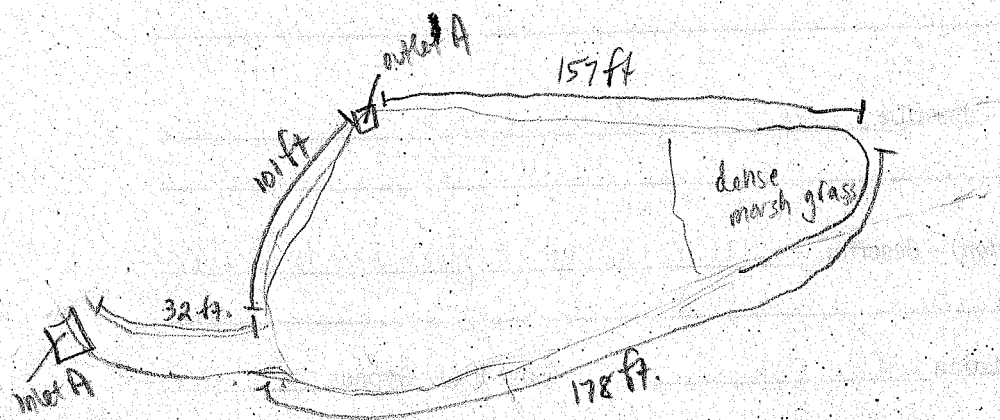
Other:

Preliminary Retrofit Opportunities (describe): remove rip rap and turf grass from banks and replace w/ native vegetation. Remove riprap from inlet A & replace with more native vegetation

Photos:

Photo #	Description	
1	inlet A	12601
2	steep path from inlet A to basin	12602
3	basin	12603
4	basin	12604
5	basin	12605
6	outlet A	12606
7	basin area w/ dense marsh grasses	12607

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 22

Basin Name (subdivision and/or property owner): Savannah

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-6-07/ 1030 Temperature 70 Rainfall (now, 12, (24), 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: W. Savannah Trail cul de sac

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry _____ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 2ft. Buffer Width: 10 - 35 ft

Number of Inlets: Stormsewer inlet A 18in inlet B 18 Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae high

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ Excess Sediment Accumulation_____
Excess Woody Vegetation ✓

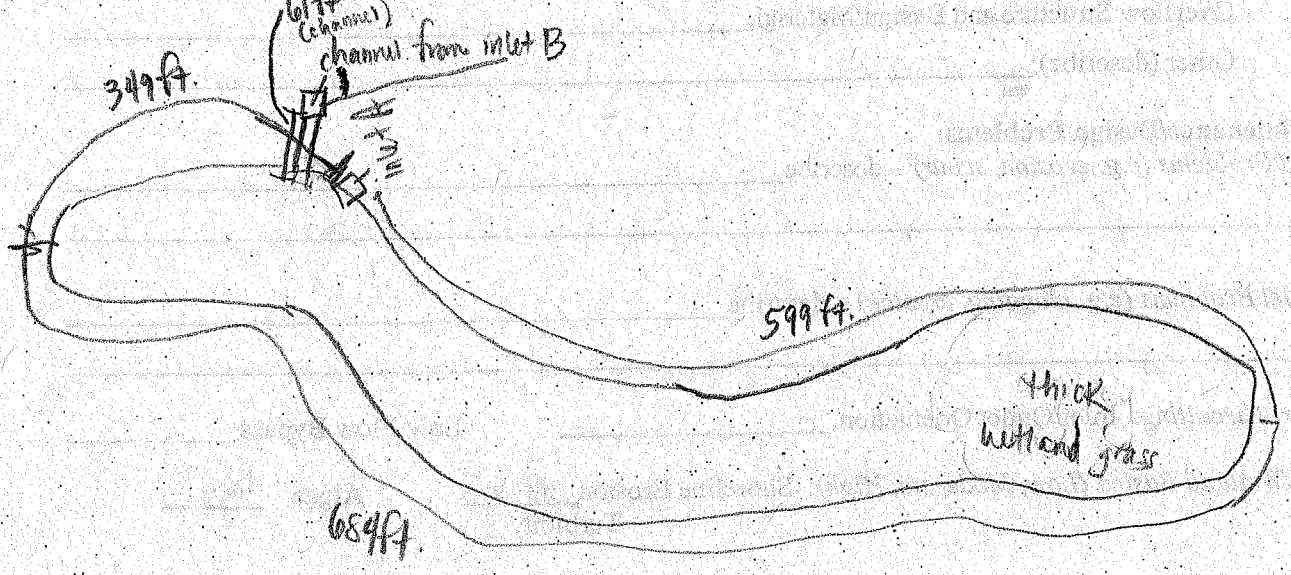
Other Observations:
Aquatic Life/ Wildlife (describe): birds
Potential Safety Problems:_____
Potential Nuisance Problems:_____
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): remove woody vegetation and bushes along bank and replace w/ native vegetation. Re Design inlet B channel to get rid of plastic lining & rip rap - Replace any turf grass and rip rap with native vegetation.

Photos: Note

Photo #	Description
1	basin 12592
2	basin - woody banks 12593
3	inlet A 12594
4	basin 12595
5	basin C and labeled thick wetland grass 12596
6	basin 12597
7	inlet B 12598
8	inlet B path to basin 12599
9	point where inlet B enters basin (black plastic lining) 12600

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 21

Basin Name (subdivision and/or property owner): Savannah

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-6-07 / 1145 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: E. Savannah Trail cul de sac

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 5ft. Buffer Width: none - 30ft. = 7 varies by which side of basin

inlet A 4" - w/ cover of soil

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

outlet B 12in

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe outlet A has a lot of rip rap @ opening

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion high Algae moderate

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ trash / dead marsh grass Excess Sediment Accumulation_____
Excess Woody Vegetation_____

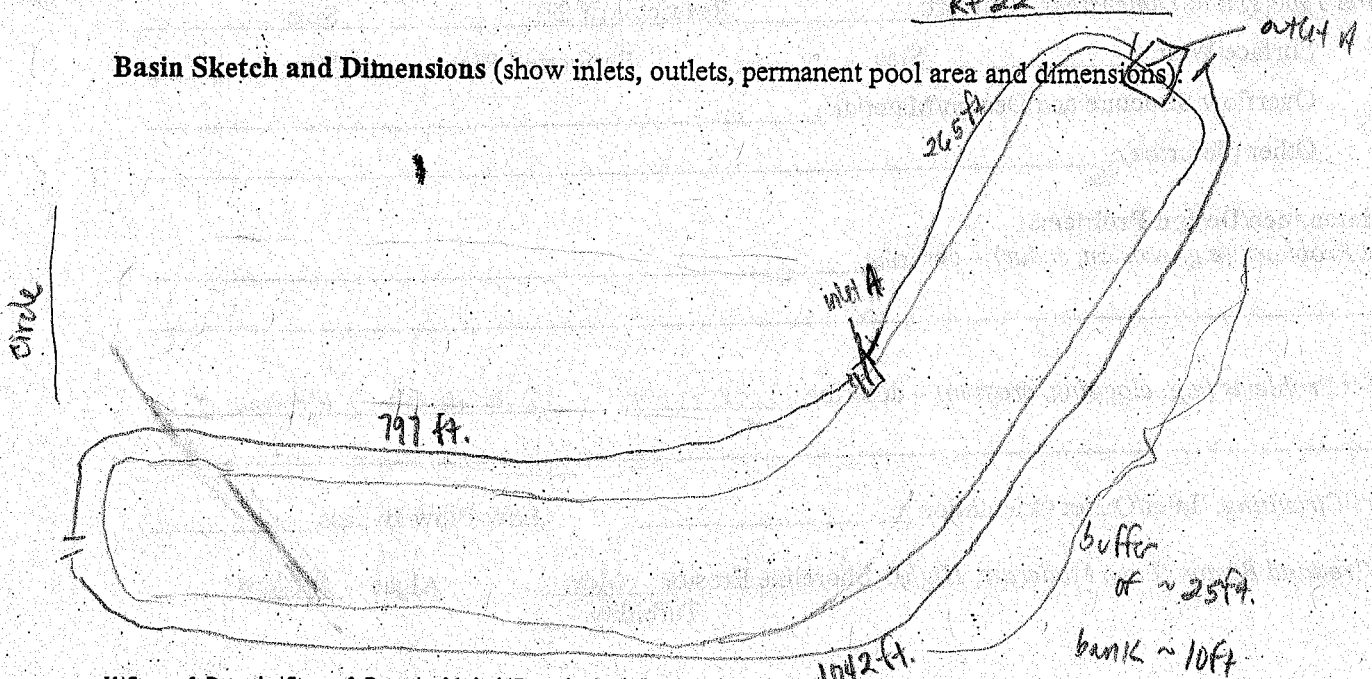
Other Observations:
Aquatic Life/ Wildlife (describe): frogs, birds
Potential Safety Problems: erosion along banks
Potential Nuisance Problems:
Evidence of Upstream Illicit Connections (describe):
Other Basin Uses (rec. field, etc):
Other:

Preliminary Retrofit Opportunities (describe): replace turf grass with wetland vegetation. Stabilize portion of bank w/out vegetation, plant native veg. Do something about erosion channels along banks, redesign? Remove rocks from area A

Photos: Note: erosion channels along bank, hidden under dense grasses.

Photo #	Description	
1	basin	12608
2	bank of basin w/out stabilizing vegetation	12609
3	erosion channels along bank	12610
4	"	12611
5	basin	12612
6	outlet B	12613
7	inlet A	12614
8	picture taken @ bend towards Rt. 22	12615
9	" towards circle	12616

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 20

Basin Name (subdivision and/or property owner): Good Shepherd Hospital

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-6-07 / 830 Temperature 60 Rainfall (now, 12, (24), 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ooba Quarter Section: _____

Nearest Cross Streets: Good Shepherd Hosp. & Rt 22

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: Institutional Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? ~ dip in Storm @ end of channel A & channel D

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other dirt / rip rap

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 5in Bank Height 2 - 6 ft Buffer Width: none

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale Channel A 60in width Channel B 60in Size Channel C " Channel D "

Outlet Type(s) and Dimensions: Culvert: outlet A 24in outlet B 24in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae low

Turbidity moderate

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): Cormorant, mallards, frogs

Potential Safety Problems: rocks around banks are unstable

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

Other:_____

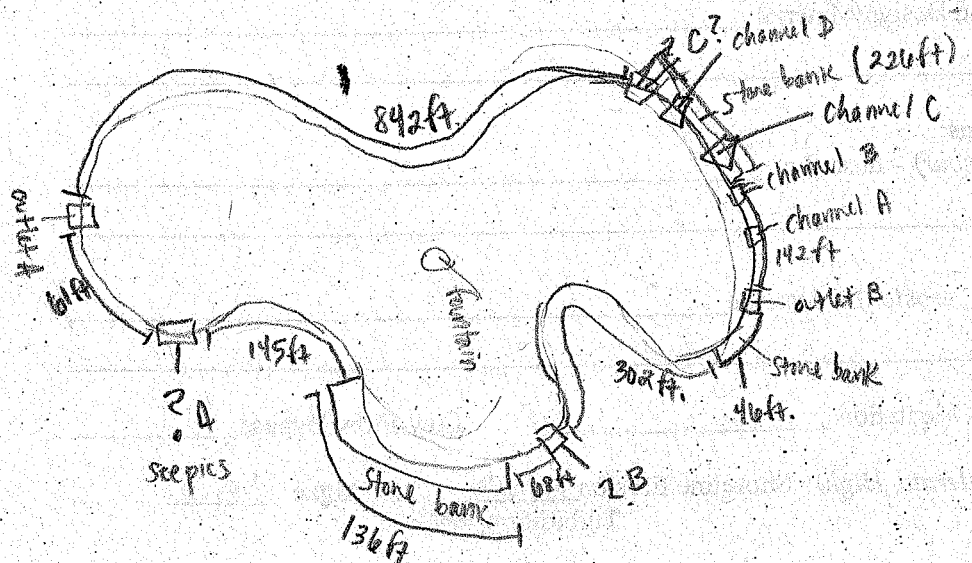
Preliminary Retrofit Opportunities (describe): remove rip rap and turf grass from banks and replace w/ native vegetation. Replace concrete channel inlets with native vegetation or something more natural

Photos: NOTE: looks that most of runoff moves over turf grass banks before entering basin.

3% 36 x 4 = 144in

Photo #	Description
1	basin 12570
2	outlet A 12571
3	not sure what this is ~144in length (A) 12572
4	" 12573
5	" 12574
6	Stone bank 12575
7	not sure (B) same dimensions as ?(A) 12576
8	stone bank / outlet B 12577
9	outlet B 12578
10	channel A 12579
11	possible sediment basin @ channel A 12580
12	channel B 12581
13	channel C 12582
14	channel D / ?C 12583
15	channel D 12584
16	possible sediment basin @ channel D 12585
17	basin 12586

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 19

Basin Name (subdivision and/or property owner): Flint Lake Estates

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-5-07 / 1415 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: Flint Dr. & Vista Ln

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental / institutional Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other stone

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in:4in Bank Height 6 - 15ft Buffer Width: 30 - 60 ft

Number of Inlets: Stormsewer inlet A 32in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 18in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae _____

Turbidity _____

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation ✓

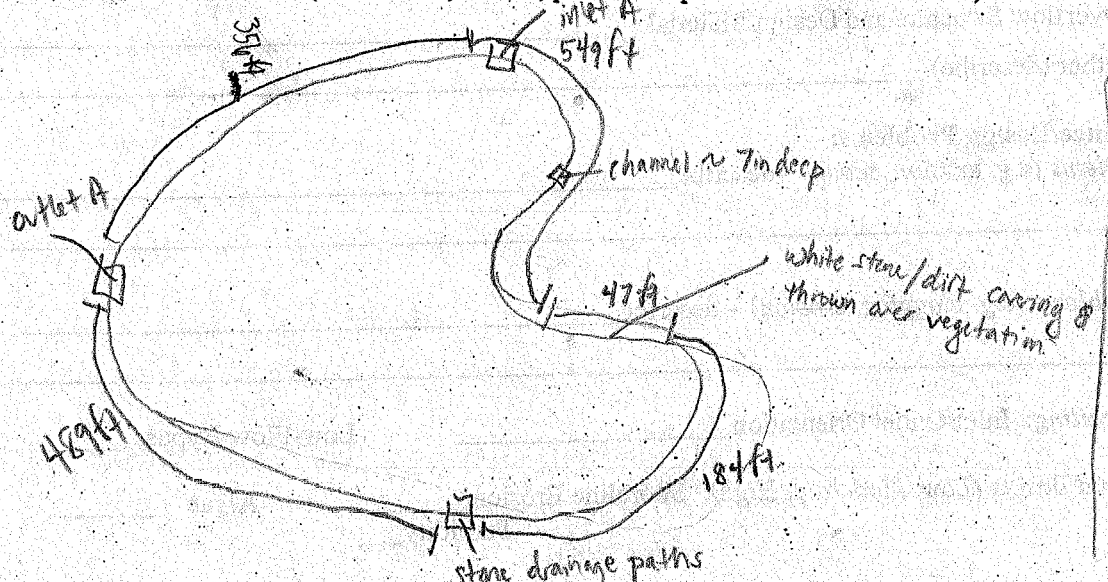
Other Observations:
Aquatic Life/ Wildlife (describe): birds, frogs
Potential Safety Problems:
Potential Nuisance Problems:
Evidence of Upstream Illicit Connections (describe):
Other Basin Uses (rec. field, etc):
Other:

Preliminary Retrofit Opportunities (describe): cut back some of woody vegetation along banks. Replace any turf grass w/ native vegetation. Remove white stones along portion of bank labeled in sketch

Photos: Note: majority of basin banks are covered w/ thick veg & brush making finding inlets/outlets difficult.

Photo #	Description
1	basin 12560
2	basin 12561
3	stone drainage path; ~ no culvert present 12562
4	" 12563
5	stoned over area of bank. 12564
6	7in deep channel 12565
7	inlet A' 12566
8	" 12567
9	basin 12568
10	outlet A 12569

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 18

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-5-07 / 1145 Temperature 70 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ciba Quarter Section: _____

Nearest Cross Streets: Hillfarm Rd & Hillfarm Ct.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry _____ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 4in Bank Height _____ Buffer Width: none

Number of Inlets: Stormsewer inlet A 10in inlet B 12in inlet C 14in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 12in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe algae clogging inlet A & B

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae moderate

Turbidity _____

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): frogs, birds

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

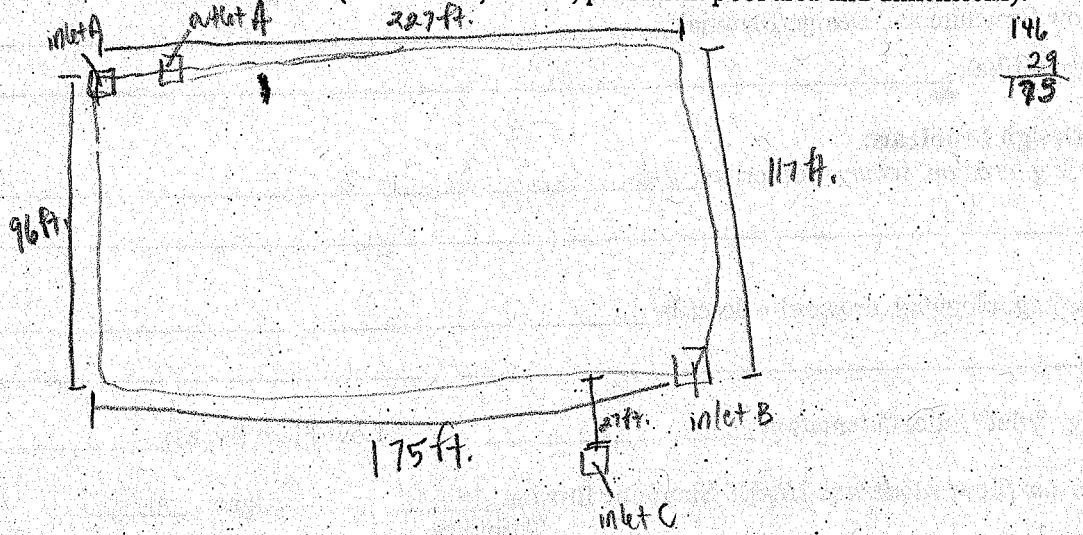
Other:_____

Preliminary Retrofit Opportunities (describe): replace turf grass and riprap on banks with vegetation

Photos:

Photo #	Description
1	basin 12521
2	basin 12522
3	basin 12523
4	inlet A 12524
5	inlet A 12525
6	inlet A 12526
7	inlet B 12527
8	inlet C 12528
9	inlet C 12529

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 17

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-5-07 / 1100 Temperature 70 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: Hillfarm Rd. & Megraw Ct.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in:5in Bank Height 6ft. Buffer Width: 4ft.

Number of Inlets: Stormsewer inlet A 20in, inlet B 14in, inlet C 4in, inlet D 8in, inlet E 14in, inlet F 14in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 12in, outlet B 12in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe wetland grass @ opening of outlet A effecting flow out of basin

Short-Circuiting: Inlet/Outlet Orientation ? outlet B, inlet F ? Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae _____

Turbidity _____

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): birds, frogs

Potential Safety Problems:

Potential Nuisance Problems:

Evidence of Upstream Illicit Connections (describe):

Other Basin Uses (rec. field, etc):

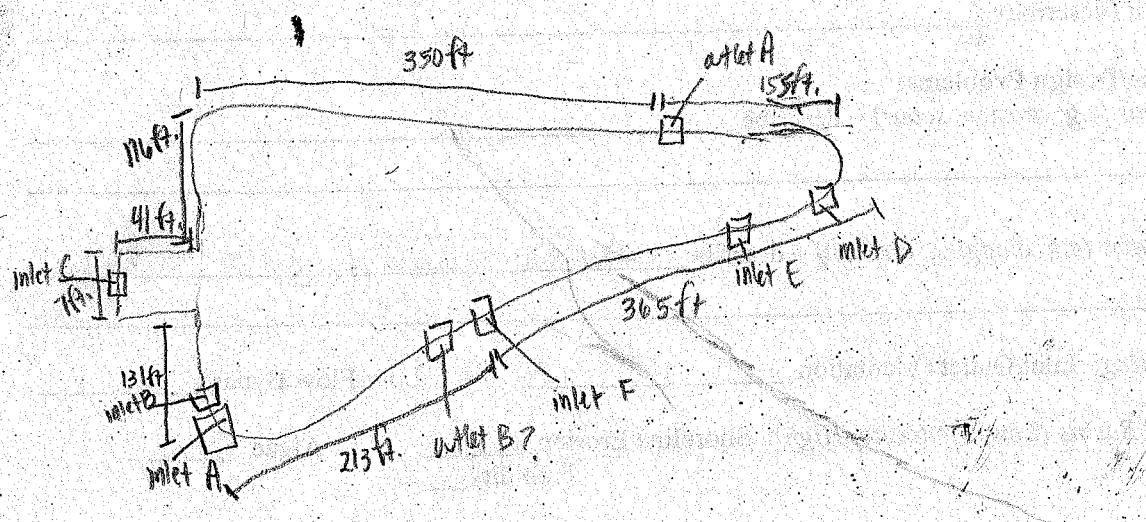
Other:

Preliminary Retrofit Opportunities (describe): replace turf grass on banks with native vegetation. Remove rocks & sediment from opening of outlet B

Photos:

Photo #	Description
1	basin 12509
2	inlet A 12510
3	inlet D 12511
4	inlet C 12512
5	basin 12513
6	basin 12514
7	outlet A 12515
8	inlet D 12516
9	inlet D - pipe inside, black plastic & grate 12517
10	inlet F 12518
11	inlet D 12519
12	outlet B 12520

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 16

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-5-07 / 1300 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: LookOut Pointe Rd & Pointe Ct.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry ✓ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass ✓ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 6.5ft Buffer Width: none

Number of Inlets: Stormsewer inlet A 14in inlet B 12in Size inlet C 4in inlet D 4in Channel/Swale ⇒channel ~ 7" deep 6" wide Size

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe erosion around pipe

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae low Turbidity _____

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): frogs, birds

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

Other:_____

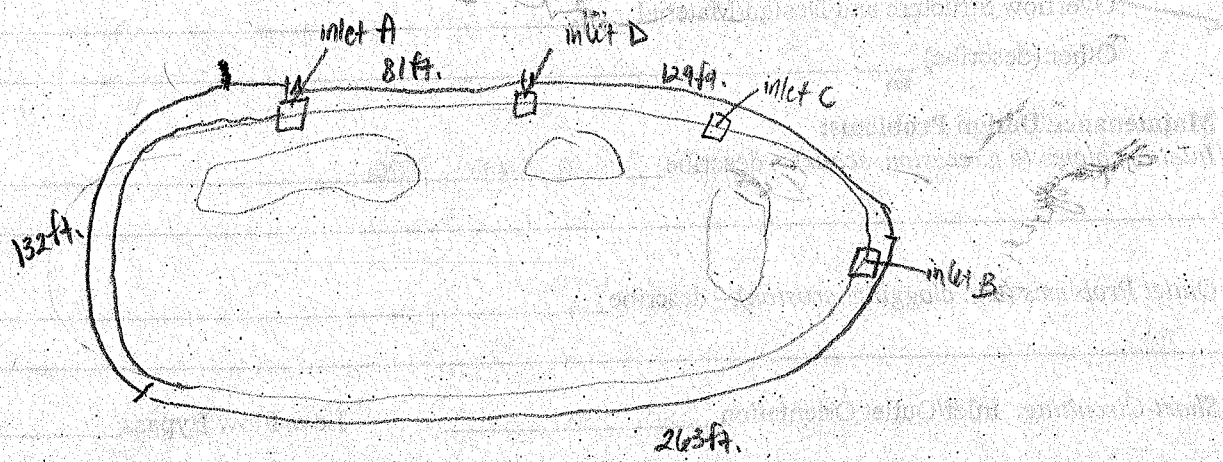
Preliminary Retrofit Opportunities (describe): replace surrounding turf grass w/ native vegetation. fix erosion around inlet A

Photos: Note: hard to get accurate measurement of inlet B surrounded by thorney rose bush. wetland plants but majority of basin is dry

Photo #	Description
1	inlet A 12542
2	erosion around inlet A 12543
3	erosion along bank 12544
4	basin 12545
5	basin 12546
6	inlet B 12547
7	wetland pool at end of basin by inlet B 12548
8	inlet C 12549
9	inlet C channel eroded away to basin 12550
10	inlet D - stone path leading to basin 12551

Channel has eroded as result of inlet C

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 15

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-5-07 / 1340 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: Old Barrington Rd & Hillfarm Rd.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland ✓ ? Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 4in Bank Height 7-10ft. Buffer Width: 25ft.

Number of Inlets: Stormsewer inlet A 4in inlet B 20in Size _____ Channel/Swale (channel) 4-18in Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 12in Restrictor (Y/N) Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae high

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ reed grass Excess Sediment Accumulation_____
Excess Woody Vegetation_____

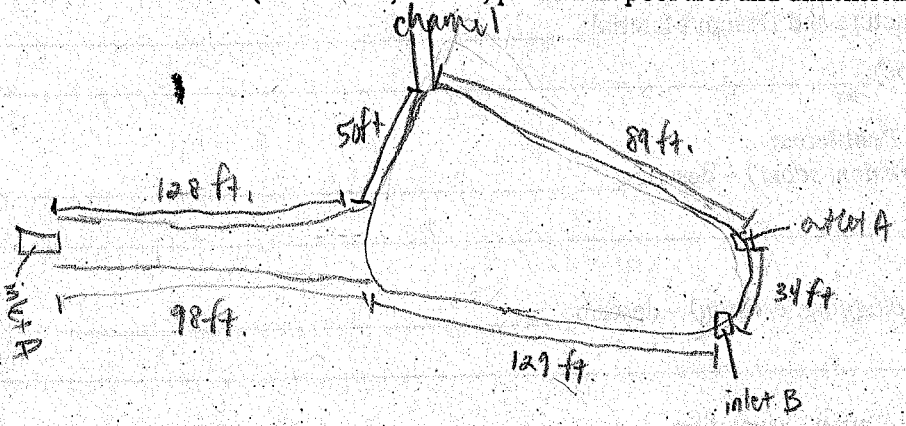
Other Observations:
Aquatic Life/ Wildlife (describe): frogs
Potential Safety Problems:_____
Potential Nuisance Problems:_____
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): plant more native vegetation on banks in place of any turf grass.

Photos:

Photo #	Description
1	basin 12552
2	basin 12553
3	inlet A 12554
4	inlet B 12555
5	basin 12556
6	outlet A 12557
7	channel hidden by grasses 12558
8	pic looking from basin up to inlet A 12559

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 14

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-5-07 / 1215 Temperature 70 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: Hillfarm Rd. & LookOut Pointe Rd.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry _____ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 4in Bank Height 3-10ft Buffer Width: 6ft.

Number of Inlets: Stormsewer inlet A 18in inlet B 10in inlet C 12in inlet D 12in inlet E 18in Size outlet A 12in Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlets A & E flow over good amt of rocks to get to basin

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion high (very) Algae moderate

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____

Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ garbage Excess Sediment Accumulation_____

Excess Woody Vegetation ✓ grasses

Other Observations:

Aquatic Life/ Wildlife (describe):_____

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

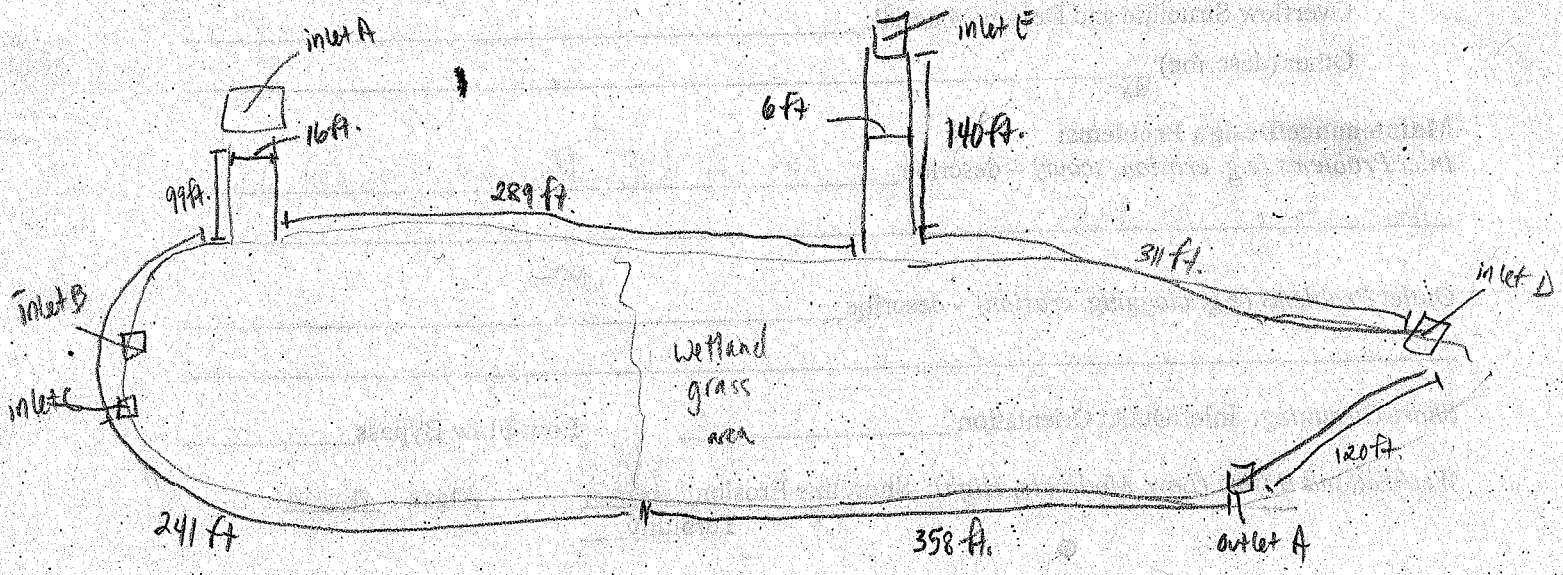
Other:_____

Preliminary Retrofit Opportunities (describe): stabilize bank on the street side of basin by planting native vegetation. Replace all surrounding turf grass with native vegetation. Replace rip rap in front of inlet A. with wetland grasses

Photos:

Photo #	Description
1	Slope near road that is mostly dirt ~needs to be stabilized 12530
2	inlet A 12531
3	inlet A 12532
4	inlet B 12533
5	inlet C 12534
6	wetland side of basin 12535
7	wet/wetland side of basin 12536
8	outlet A 12537
9	inlet D 12538
10	basin 12539
11	Inlet E 12540
12	inlet E towards basin 12541

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 13

Basin Name (subdivision and/or property owner): Wedgewood Trails

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-5-07 / 1015 Temperature 70 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: Coventry Ln & Wedgewood Ln.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 2in Bank Height 4ft. Buffer Width: none - 30ft.

Number of Inlets: Stormsewer inlet A 22in inlet B 6in Size inlet C 4" inlet D 4" Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 12in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe erosion around pipe of inlet A

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae moderate ↑ high around inlet A

Turbidity _____

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ Excess Sediment Accumulation_____
Excess Woody Vegetation ✓

Other Observations:
Aquatic Life/ Wildlife (describe): birds, blue heron

Potential Safety Problems: erosion around inlet A

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

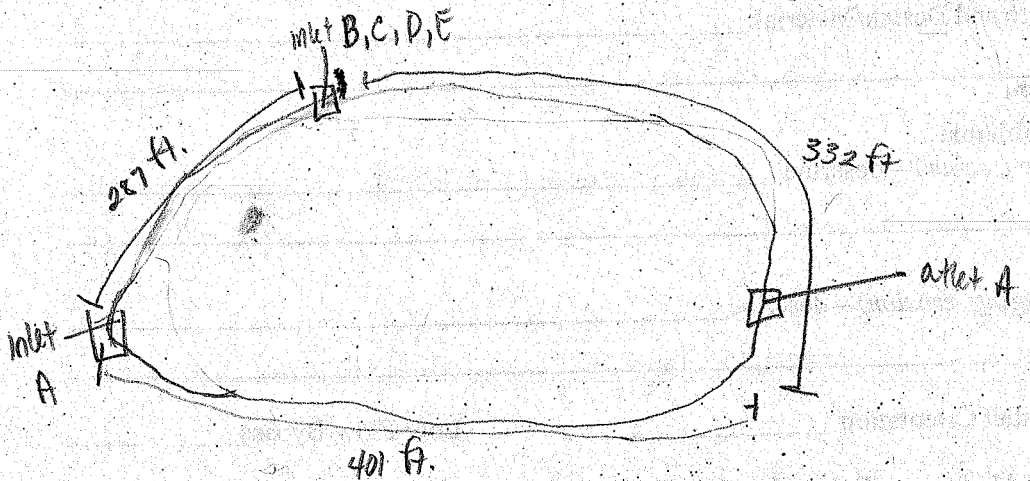
Other:_____

Preliminary Retrofit Opportunities (describe): replace turf grass on bank/slopes with native vegetation. Remove junk from infront of inlet A. Fix erosion @ top of inlet A

Photos:

Photo #	Description
1	basin 12499
2	basin 12500
3	inlet A 12501
4	erosion at inlet A pipe 12502
5	junk infront of inlet A 12503
6	algae near inlet A 12504
7	inlet B, C, D, E 12505
8	" 12506
9	basin 12507
10	outlet A 12508

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 12

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-5-07 / ~1045 Temperature _____ Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ciba Quarter Section: _____

Nearest Cross Streets: Miller Rd & Oak Hill Rd.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

NOTE COULD NOT ENTER - gated & heavily fenced

Basin Design Features:

Type: Wet_____ Dry_____ Wetland_____ Online_____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass_____ Native Vegetation/Wetland_____

Concrete Lined Channel_____ Other_____

Side Slopes: Turf Grass_____ Rip Rap_____ Native Vegetation_____ Other_____

Slope (Horizontal:Vertical)_____ Bank Height_____ Buffer Width:_____

Number of Inlets: Stormsewer_____ Size_____ Channel/Swale_____ Size_____

Outlet Type(s) and Dimensions: Culvert:_____ Restrictor (Y/N) _____ Size_____

Surface Weir:_____ Size_____ Perforated Riser_____ Size_____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass_____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion_____ Algae _____

Turbidity___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe):_____

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

Other:_____

Preliminary Retrofit Opportunities (describe):_____

_____

_____

Photos:

Photo #	Description

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):

DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: IIB East basin

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-30-07 / 805 Temperature 85 Rainfall (now, 12, 24, (48) hours, week) _____

Location:

Political Jurisdiction: _____ Township: _____ Quarter Section: _____

Nearest Cross Streets: Rt 59 & Grandview Dr

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in:1in Bank Height 1.5ft Buffer Width: none - wooded area

Number of Inlets: Stormsewer inlet A 4in inlet B 4in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion high Algae moderate

Turbidity moderate

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ Excess Sediment Accumulation_____
Excess Woody Vegetation ✓ sides densely covered by trees

Other Observations:
Aquatic Life/ Wildlife (describe): birds
Potential Safety Problems: erosion of banks
Potential Nuisance Problems:_____
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

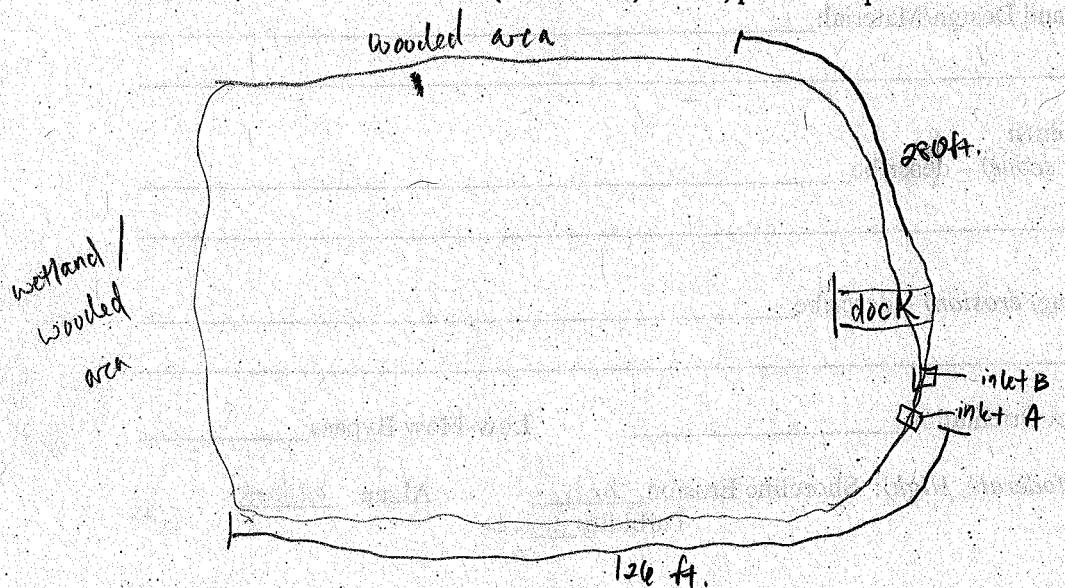
Preliminary Retrofit Opportunities (describe): replace turf grass with native vegetation. Remove some of trees on bank. Stabilize banks

Photos:

Photo #	Description
1	basin 12330
2	basin 12331
3	bank erosion / inlet A 12332
4	inlet A 12333
5	inlet B 12334
6	circular concrete basin - standing water / pipe on side 12335
7	pipe in circular concrete basin 12336
8	wooded / wetland side of basin 12337
9	" 12338
10	

Note: could not access wooded sides of basin, thick veg. & wetlands

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



check original GPS data

DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 11 A further west

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-30-07 / 720 Temperature 80 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Cuba Quarter Section: _____

Nearest Cross Streets: Rt. 59 & Grandview Dr.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other ✓ dirt

Side Slopes: Turf Grass ✓ Rip Rap J Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 2in Bank Height 2ft. Buffer Width: none

Number of Inlets: Stormsewer inlet A Size - 1in. Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet A is very small pipe

Outlet Problems (e.g. clogging, erosion) – describe send bag & make-shift pipe

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion high Algae low

Turbidity high

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): blue heron, fish

Potential Safety Problems: bankerosion

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

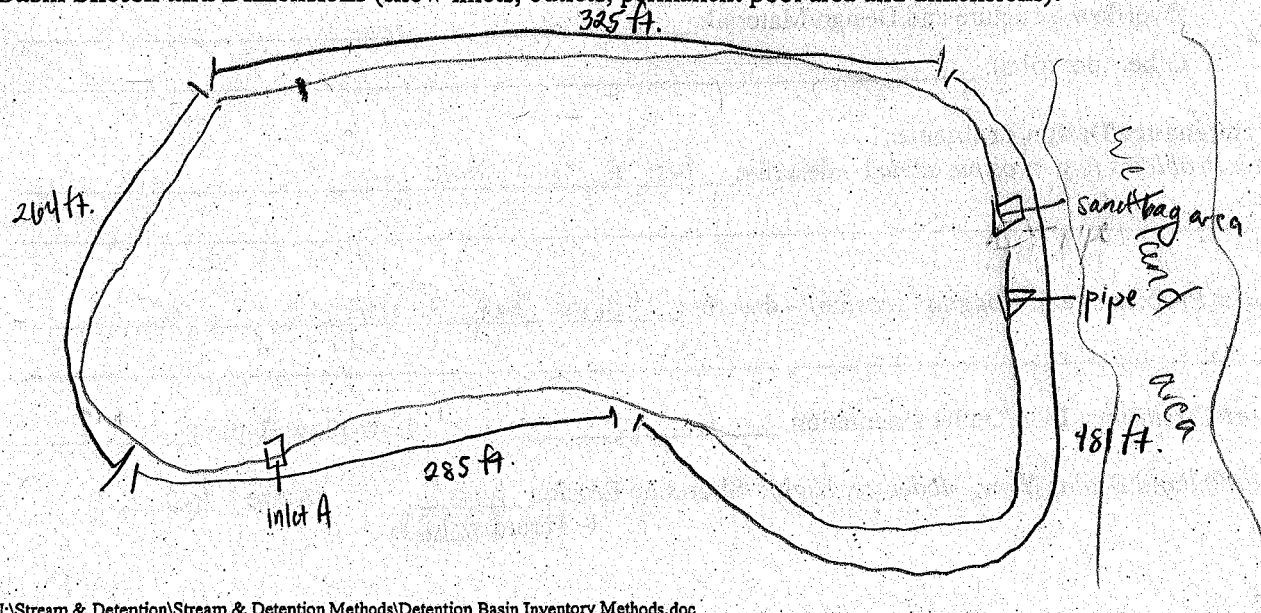
Other:_____

Preliminary Retrofit Opportunities (describe): plant native vegetation in place of turf grass. Fix inlets, construct outlets to replace sand bag and other pipe next to wetland area. Stabilize banks

Photos:

Photo #	Description	
1	basin	12321
2	basin	12322
3	make-shift pipe draining into nearby wetland (4")	12323
4	sand bag levee @ wetland / basin intersection	12324
5	"	12325
6	bank erosion	12326
7	basin	12327
8	concrete blocks lining bank	12328
9	inlet A - tiny pipe	12329

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 10

Basin Name (subdivision and/or property owner): Copperfield

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-17-07/10:54 Temperature 60 Rainfall (now, (12) 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Chancellor Ct. cul de sac

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? N

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other rip rap

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in/4in Bank Height 1-2ft Buffer Width: NONE

Number of Inlets: Stormsewer inlet A 12in, inlet B Size 4in, inlet C, inlet D 4in Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: ✓4in 45° Restrictor (Y/N) N Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: inlets concrete

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae low

Turbidity high

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation ✓ willows lining one side of basin

Other Observations:
Aquatic Life/ Wildlife (describe): fish & ducks

Potential Safety Problems:_____

Potential Nuisance Problems: algae build up @ edges of basin & heavy around inlet pipes

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

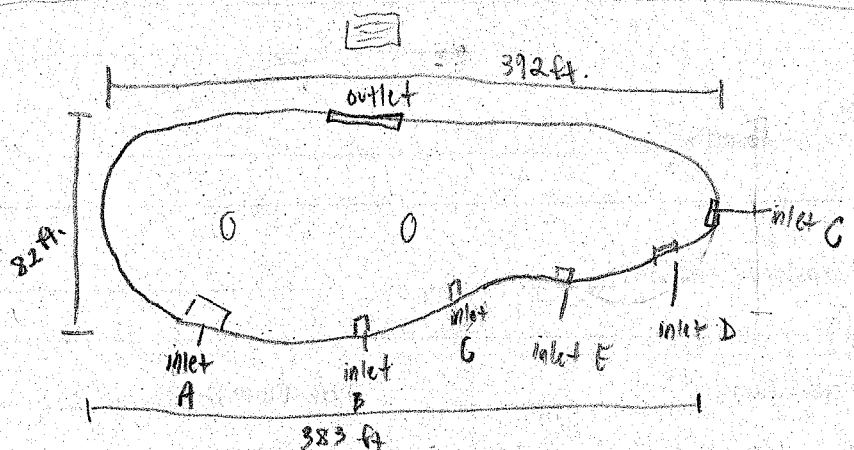
Other: fountains

Preliminary Retrofit Opportunities (describe): remove gravel surrounding basin & turf grass instead plant native vegetation

Photos:

Photo #	Description
~~1~~	~~inlet B~~
2	inlet B R0011924
3	inlet A - algae built up @ opening 0011925
4	inlet C - algae built up @ opening 0011926
5	inlet D 0011927
6	algae 0011928
7	basin 1/2 0011929
8	basin 2/2 0011930
9	outlet 0011931
10	outlet 0011932
11	gravel & edge of basin 0011933
12	inlet E 0011934
13	inlet D 0011935

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 9

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-17-07/12:00 Temperature 65 Rainfall (now, (12) 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Copperfield Dr. & Wedgewood Dr.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: _____ Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓ & algae on submerged macrophytes

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation ✓ nearby wetland @ portion of basin Other _____

Slope (Horizontal:Vertical) 12in : 45in Bank Height 1ft. Buffer Width: NONE

Number of Inlets: Stormsewer inlet A 34in. inlet B 12in. inlet C 10in. Size 10in. Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: ? 18in. tubing Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

outlet ? ? maybe into wetland

no storm sewer or manhole present

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe trash, algal mess

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae low

Turbidity High

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ Excess Sediment Accumulation_____
Excess Woody Vegetation ✓

Other Observations:

Aquatic Life/ Wildlife (describe): fish, birds

Potential Safety Problems: erosion of bank entire perimeter of basin

Potential Nuisance Problems: lots of algae @ basin edges over taking most macrophytes, alot of geese poop

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

Other:_____

Preliminary Retrofit Opportunities (describe): remove turf grass replace with native veg. as buffer to street allow for bank transition (gradual slope) to prevent erosion; remove trash

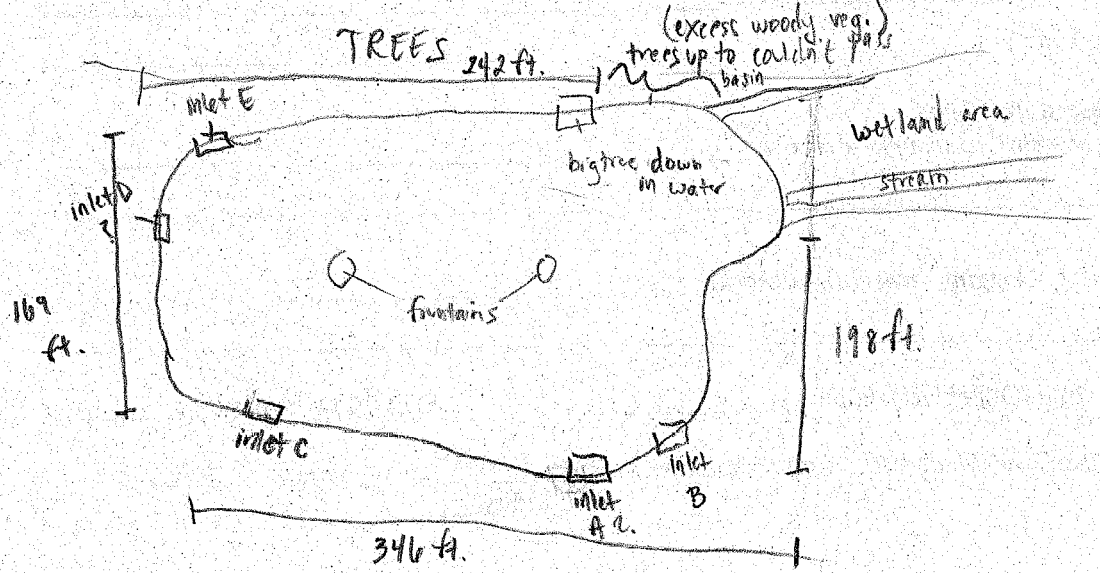
Photos:

Photo #	Description
1	wetland 11938
2	wetland 11939
3	basin 11940
4	basin 11941
5	bank erosion 11942
6	inlet A 11943
7	inlet B 11944
8	some thing (fire hydrant) slow drain into basin 11945
9	inlet C 11946
10	inlet D 11948
12	inlet E - completely clogged by debris & trash 11947

107

dangerous erosion 11947

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 8

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-18-07 / 9:50 Temperature 65 Rainfall (now, 12, 24, (48) hours, week) _____

Location:

Political Jurisdiction: _____ Township: _____ Quarter Section: _____

Nearest Cross Streets: Old Mc Henry Rd. & Abbey Glenn Rd

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: institutional – elementary school Year Constructed: _____

looks like a wetland

Basin Design Features:

Type: Wet _____ Dry _____ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in:5in Bank Height 30 ft. Buffer Width: _____

Number of Inlets: Stormsewer inlet A, inlet B, inlet C Size 28 in, 22 in, 10 in Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe Inlet A has reed grass growing in it.

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae _____

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): birds

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

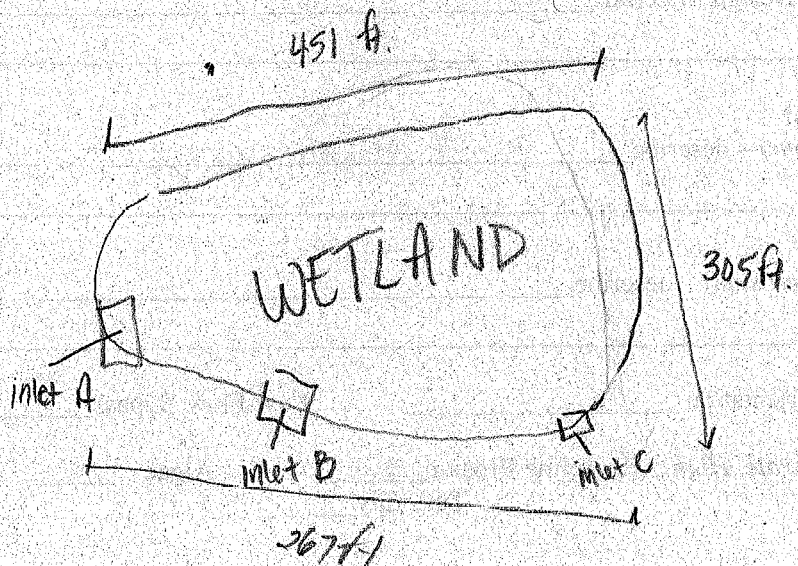
Other:_____

Preliminary Retrofit Opportunities (describe): establish more native grasses on banks to act as better buffer than turf grass. also to prevent any erosion.

Photos:

Photo #	Description	
1	inlet A	11997
2	inlet B	11998
3	inlet C	11999
4	wetland	12000
5	wetland	12001

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 7

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-18-07 / 1005 Temperature 65 Rainfall (now, 12, 24, (48) hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: old McHenry Rd & Abbey Glenn Rd

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: institutional - school Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry _____ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in: 5in Bank Height 25ft Buffer Width: NONE

Number of Inlets: Stormsewer inlet 4 Size 8in / inlet 3 8in Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe reed grass grown infront of it

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae med

Turbidity high

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____✓_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

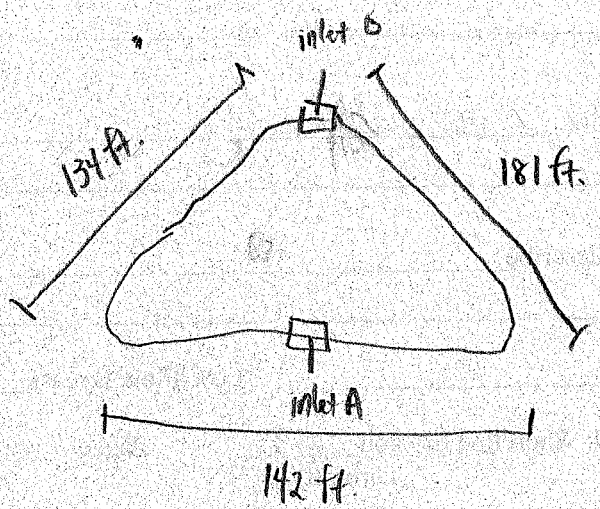
Other Observations:
Aquatic Life/ Wildlife (describe): frogs
Potential Safety Problems:_____
Potential Nuisance Problems: algae
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): establish more native vegetation up banks to replace turf grass and other weeds.

Photos:

Photo #	Description
1	basin1 12002
2	inlet A 12003
3	inlet B 12004
4	basin 12005
5	not sure what these are ~ something to do w/ sewage 12006
6	" 12007

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 6

Basin Name (subdivision and/or property owner): Abbey Glenn Estates

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 5-18-07 / 930 Temperature 65 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: Abbey Glenn Dr. & Northbridge Ct

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

Basin Design Features: NOT A BASIN - WETLAND w/1 inlet

Type: Wet _____ Dry _____ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass _____ Rip Rap _____ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) _____ Bank Height _____ Buffer Width: _____

Number of Inlets: Stormsewer inlet A Size 16in Channel/Swale channel A Size 7 x 3 ft.

inlet A flows into wetland thru channel - no picture taken all reed grass

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae _____

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): birds, fish, amphibians

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

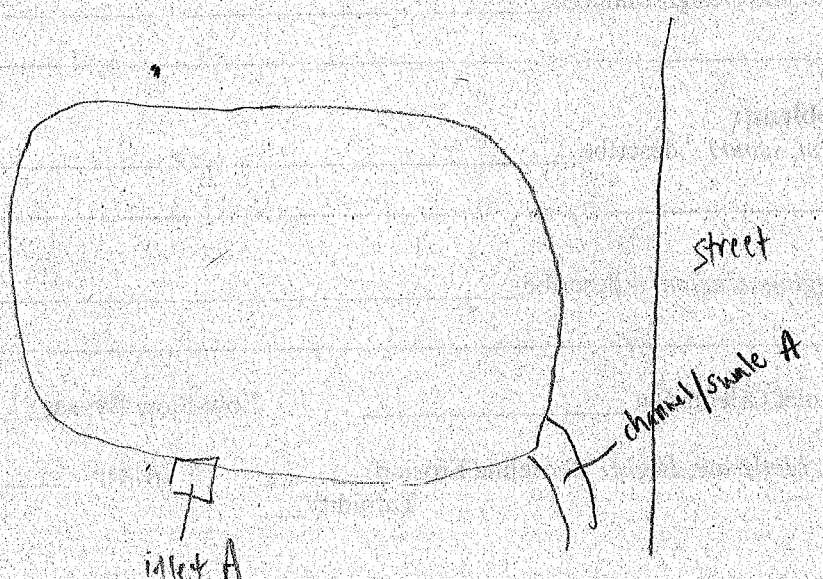
Other:_____

Preliminary Retrofit Opportunities (describe):_____

Photos:

Photo #	Description
1	inlet A 11992
2	inlet A 11993
3	Channel/swale 11994
4	wetland 11995
5	wetland 11996

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 193

Basin Name (subdivision and/or property owner): Park Barrington

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-22-07 / 1348 Temperature 75 Rainfall (now, (12), 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Barrington Quarter Section: _____

Nearest Cross Streets: Park Barrington Dr. & Grove St.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other rip rap, dirt

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in:1in - 12in:3in Bank Height 5-6 ft. Buffer Width: none

Number of Inlets: Stormsewer inlet A 8in inlet B 14in inlet C 14in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 8in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet B has erosion around pipe & pipe also seperated.

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation ✓ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae low

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

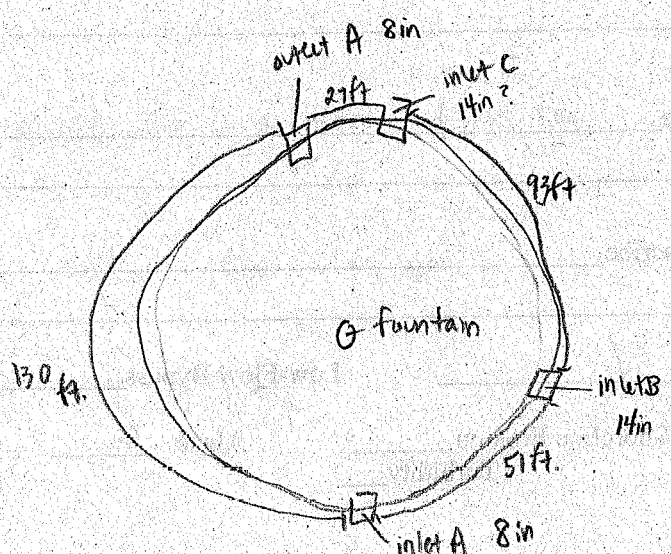
Other Observations:
Aquatic Life/ Wildlife (describe): frogs
Potential Safety Problems:_____
Potential Nuisance Problems:_____
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): Replace turf grass and rip rap along basin with native vegetation. Fix seperation and erosion of inlet B. Clean off outlet A trash rack

Photos:

Photo #	Description
1	basin 13581
2	basin 13582
3	basin 13583
4	inlet A 13584
5	inlet B 13585
6	erosion @ pipe connect separation of inlet B 13586
7	" 13587
8	inlet C - rocks cluttered @ opening could not get accurate measurement. 13588
9	basin 13589
10	outlet A 13590.

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 192

Basin Name (subdivision and/or property owner): Park Barrington

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-25-07 / 946 Temperature 80 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Barrington Quarter Section: _____

Nearest Cross Streets: Park Barrington Dr. & Cornell St.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other rip rap

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 2in Bank Height 6ft. Buffer Width: none

Number of Inlets: Stormsewer inlet/outlet A 18in Size inlet B 22in Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 6in outlet B 6in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation ✓ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae low

Turbidity _____

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation ✓ willows

Other Observations:
Aquatic Life/ Wildlife (describe): frogs

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

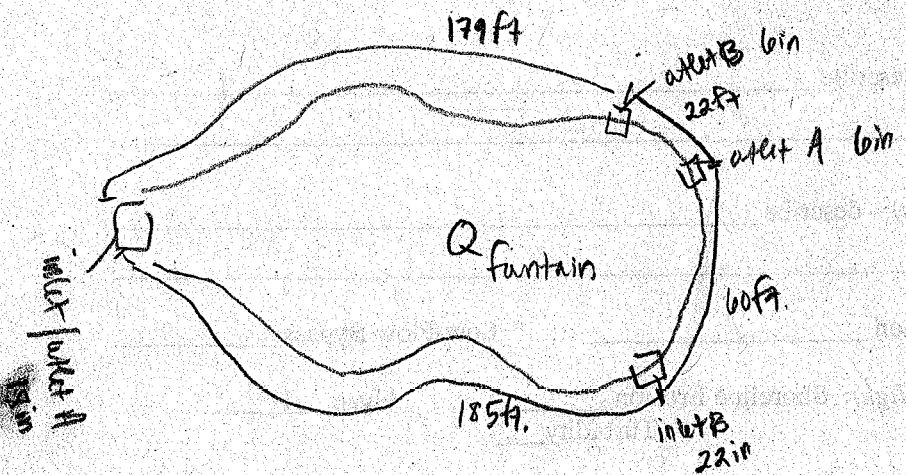
Other:_____

Preliminary Retrofit Opportunities (describe): Remove riprap from around inlets & outlets. Replace turf grass and riprap with native vegetation.

Photos:

Photo #	Description
1	basin 13606
2	inlet / outlet A Connects to basin 191 13607
3	" 13608
4	inlet B 13609
5	basin 13610
6	outlet A - clogged w/ algae & plant debris 13611
7	outlet B - rocks inside opening, Plant litter clogging litter rack 13612
8	" bin surrounding opening as outlet. 13613
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 191

Basin Name (subdivision and/or property owner): Park Barrington

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-25-07/ 1015 Temperature 80 Rainfall (now, 12, 24, (48) hours, week) _____

Location:

Political Jurisdiction: _____ Township: Barrington Quarter Section: _____

Nearest Cross Streets: Park Barrington Dr. & Cornell St.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other rip rap

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 4in (inlet/outlet A 11ein) Bank Height 5-6ft. (inlet C 8in) Buffer Width: none

Number of Inlets: Stormsewer inlet B 8in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 8in outlet B 8in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae _____

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): frogs

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

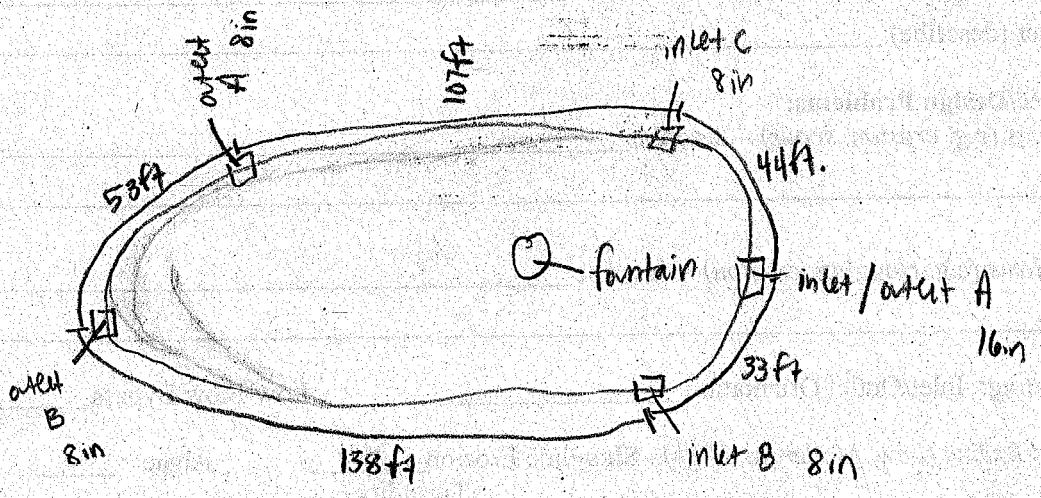
Other:_____

Preliminary Retrofit Opportunities (describe): Remove turf grass and rip rap from banks and replace with native vegetation. Remove any rip rap clogging inlets or outlets.

Photos:

Photo #	Description
1	basin 13614
2	inlet B 13615
3	inlet/outlet A - connects to basin 192 13616
4	inlet C 13617
5	outlet A 13618
6	basin 13619
7	" 13620
8	outlet B 13621
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 190

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-22-07/ 1319 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Barrington Quarter Section: _____

Nearest Cross Streets: South of Cornell Ave & Grove Ave.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: Commercial Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry _____ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass ✓ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass _____ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) _____ Bank Height _____ Buffer Width: _____

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae _____

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe):_____

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

Other:_____

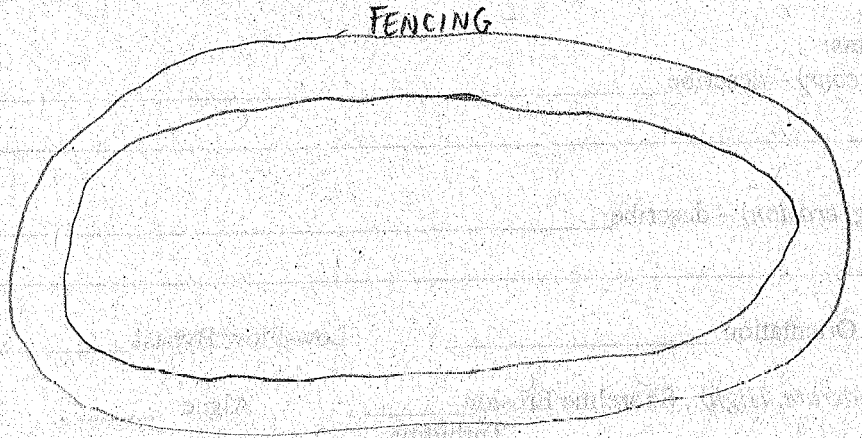
Preliminary Retrofit Opportunities (describe): None. Could not see basin

Photos: BASIN SURROUNDED BY ROD-IRON FENCING - COULD NOT ENTER TO GET MEASUREMENTS or PICTURES

Photo #	Description
1	basin 13567
2	" 13568
3	" 13569
4	basin w/ fencing view from road 13570
5	basin 13571
6	basin 13572
7	basin 13573
8	
9	
10	

couldn't find inlet/outlets from looking from fencing

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 189

Basin Name (subdivision and/or property owner): Barrington Middle School Prairie Campus

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-21-07 / 1241 Temperature 80 Rainfall (now, 12, 24, 48 hours, (week)) _____

Location:

Political Jurisdiction: _____ Township: Barrington Quarter Section: _____

Nearest Cross Streets: Dundee Rd. & Lions Dr. / Glencrest

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: institutional Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry _____ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 3ft. Buffer Width: none - 4ft.

Number of Inlets: Stormsewer inlet A 8in Size _____ Channel/Swale storm channel 18ft x 6ft Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 10in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae _____

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ garbage Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): birds

Potential Safety Problems:

Potential Nuisance Problems:

Evidence of Upstream Illicit Connections (describe):

Other Basin Uses (rec. field, etc):

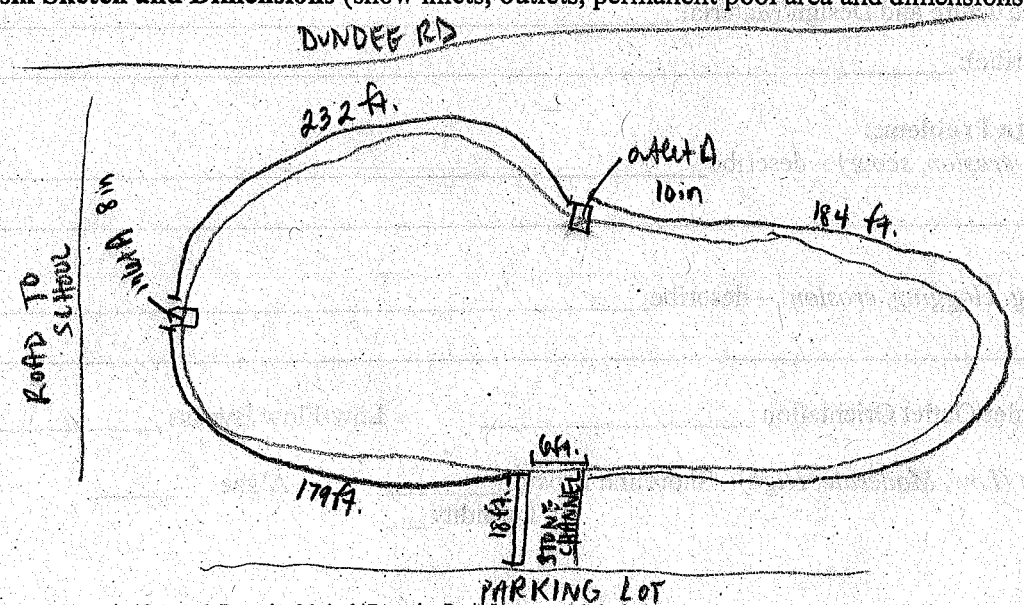
Other:

Preliminary Retrofit Opportunities (describe): Replace surranding turf grass with native vegetation.

Photos:

Photo #	Description
1	basin 13415
2	basin 13416
3	storm runoff pathway from parking lot into basin 13417
4	outlet A 13418
5	" 13419
6	inlet A 13420
7	basin 13421
8	
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 188

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-25-07 / 905 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Barrington Quarter Section: _____

Nearest Cross Streets: Dundee Rd & Grove Ave

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: institutional / residential Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry ✓ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other rip rap

Side Slopes: Turf Grass _____ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 4-6ft. Buffer Width: 30 - +200ft

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 8in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae _____

Turbidity _____

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): birds

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

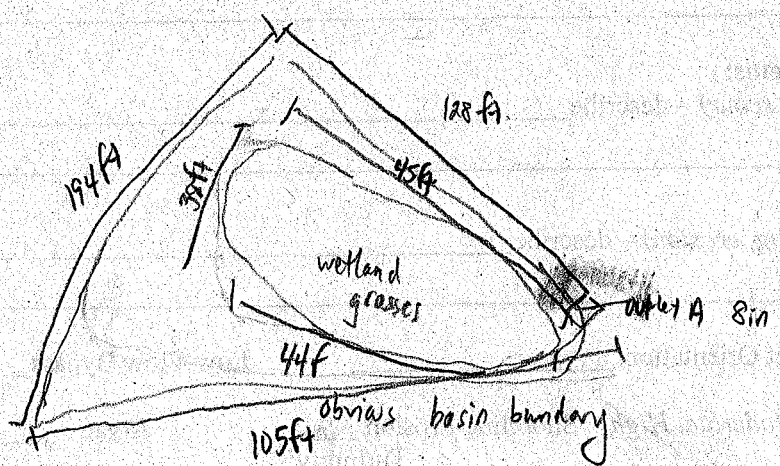
Other:_____

Preliminary Retrofit Opportunities (describe): Remove rip rap from top of area A. Stabilize banks to prevent erosion channels

Photos:

Photo #	Description	
1	basin	13599
2	outlet A	13600
3	"	13601
4	dry portion of basin w/ wetland grasses	13602
5	basin	13603
6	erosion channels	13604
7	basin	13605
8		
9		
10		

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 187

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-25-07 / 821 Temperature 75 Rainfall (now, 12, 24, (48) hours, week) _____

Location:

Political Jurisdiction: _____ Township: Barrington Quarter Section: _____

Nearest Cross Streets: Dundee Rd. & Grove Ave

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: institutional / residential Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry _____ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass _____ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 25ft. Buffer Width: 30 - 100 ft.

inlet A 32in

Number of Inlets: Stormsewer inlet B 8in Size _____ Channel/Swale _____ Size _____

outlet A 8in

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet A has a lot of excess sediment & opening

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae _____

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): frogs, birds

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

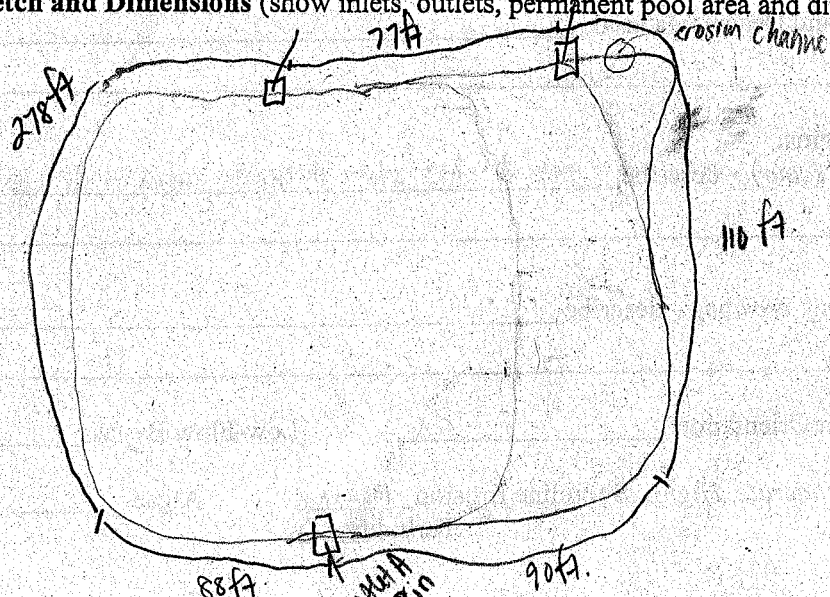
Other:_____

Preliminary Retrofit Opportunities (describe): Remove riprap from around outlet A & inlet A
Stabilize banks & Fix erosion channels.

Photos:

Photo #	Description
1	basin 13591
2	" 13592
3	outlet A 13593
4	basin 13594
5	erosion channel along bank 13595
6	inlet A 13596
7	" 13597
8	inlet B 13598
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 186

Basin Name (subdivision and/or property owner): The Oaks of Barrington

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-21-07 / 952 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Barrington Quarter Section: _____

Nearest Cross Streets: Dundee Rd & Columbia Ln.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other rip rap

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 4-5ft. Buffer Width: 0-20ft.

Number of Inlets: Stormsewer inlet A 10in inlet B 10in inlet C 10in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 12in outlet B 14in Restrictor (Y/N) _____ Size _____

Surface Weir: ✓ Size 3in Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlet B clogged w/ sediment & vegetation

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae low

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe):_____

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

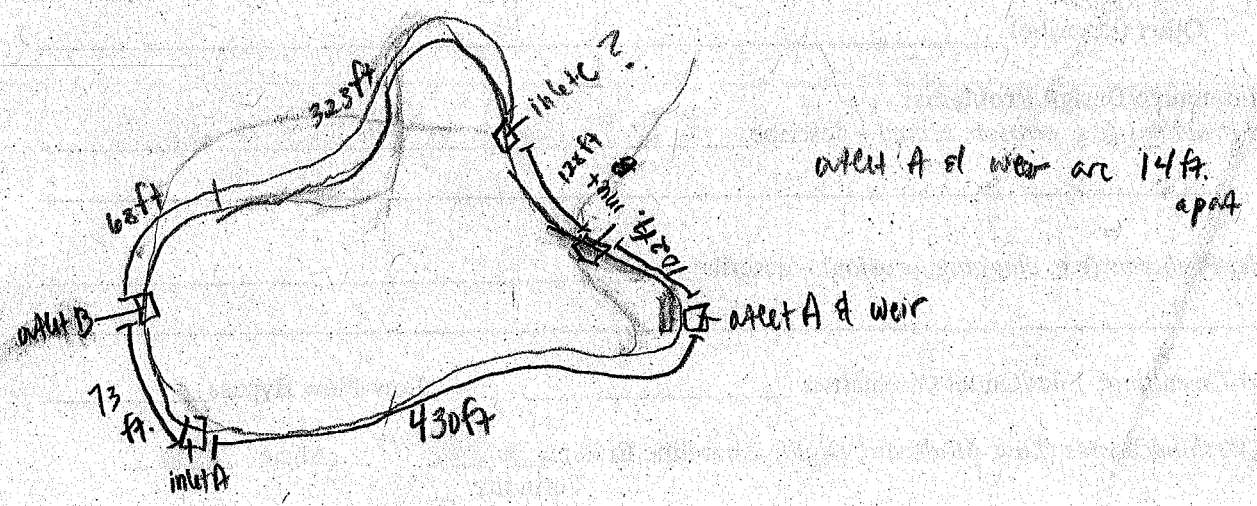
Other:_____

Preliminary Retrofit Opportunities (describe): Remove rocks @ outlet A & weir portion of basin. Remove cattails. Replace surrounding turf grass w/ native vegetation.

Photos:

Photo #	Description
1	basin 13373 11. outlet B 13385
2	inlet A 13374
3	shoreline erosion & algae 13375
4	outlet A & weir 13376
5	outlet A & weir 13377
6	weir 13378 outlet A 13379
7	inlet B 13381 weir 13380
8	inlet C 13382
9	basin 13383
10	" 13384

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 185

Basin Name (subdivision and/or property owner): The Oaks of Barrington

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-21-07 / 1031 Temperature 80 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Barrington Quarter Section: _____

Nearest Cross Streets: Dundee Rd. & Columbia Ln

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other NA

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 4-7ft. Buffer Width: 0 ~ 4ft.

Number of Inlets: Stormsewer inlet A 12in, inlet B 6in Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 12in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation ✓ outlet A & inlet B Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae _____

Turbidity _____

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe):_____

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

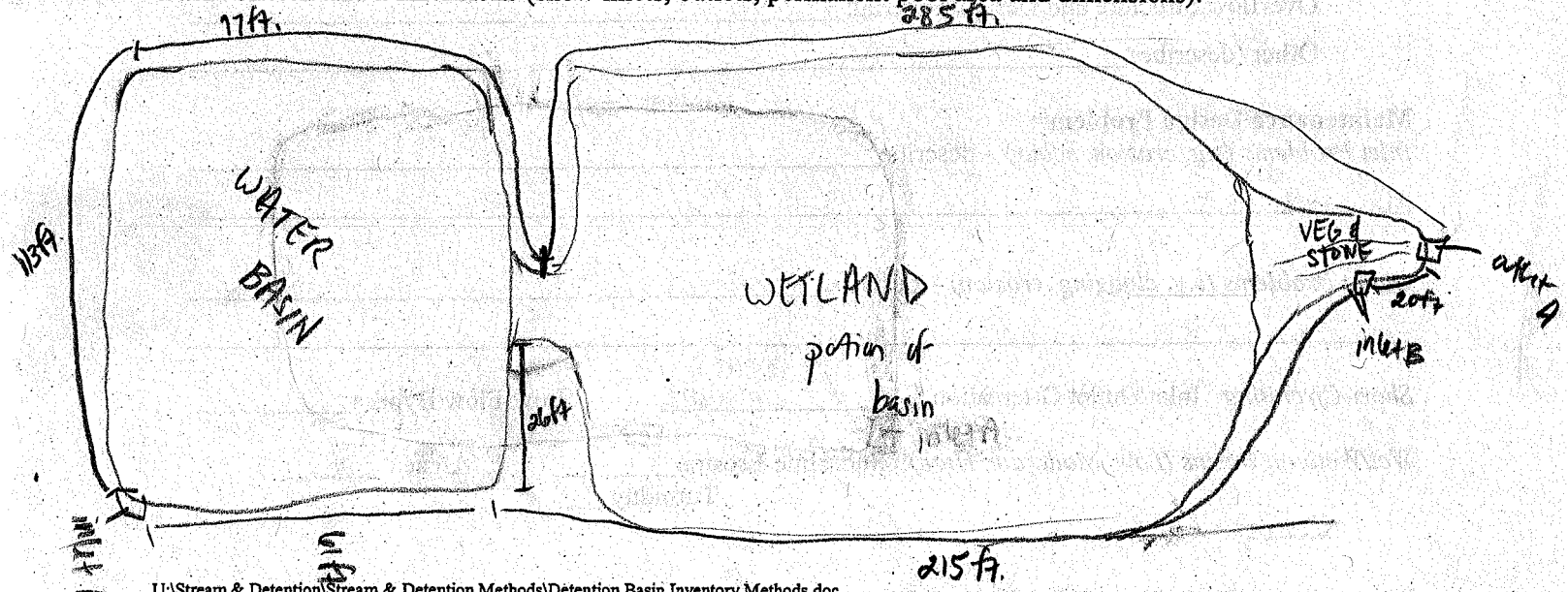
Other:_____

Preliminary Retrofit Opportunities (describe): Replace any surrounding turf grass with native vegetation.

Photos:

Photo #	Description
1	basin 13386
2	inlet A 13387
3	where basin connects to wetland 13388
4	wetland 13389, 13390
5	inlet B 13390
6	outlet A 13392
7	basin 13393
8	basin 13394
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 197

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-11-07 / 732 Temperature 75 Rainfall (now, 12, 24, 48 hours, (week)) _____

Location:

Political Jurisdiction: _____ Township: Barrington Quarter Section: _____

Nearest Cross Streets: Swth of Lake Cook @ Pepsi / Cat

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: Industrial Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry ✓ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass ✓ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 4in : 3in Bank Height 0 - 4ft. Buffer Width: none

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet 4 4in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe outlet A was caved w/ some piece of plastic & clogged w/ grass clippings

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae _____

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe):_____

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

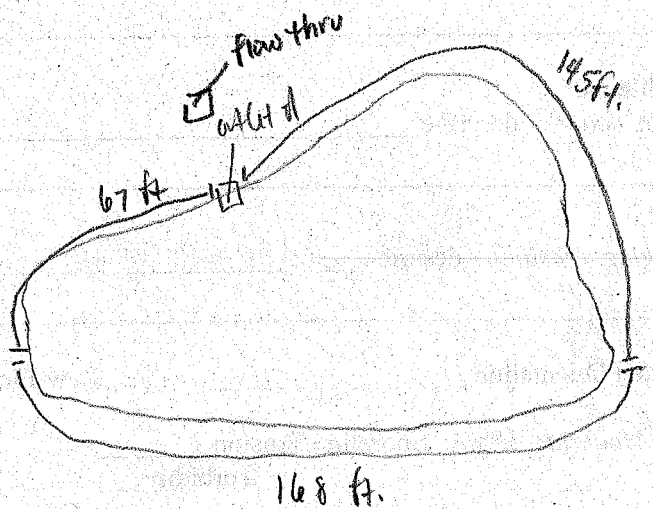
Other:_____

Preliminary Retrofit Opportunities (describe): replace turf grass with native vegetation.

Photos: Note: Basin serves as runoff from parking lot of company no other inlets.

Photo #	Description
1	basin 12759
2	basin 12760
3	outlet A 12761
4	flow thru on other side of mound - outlet A path 12762
5	basin 12763
6	
7	
8	
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 196

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-21-07 / 1110 Temperature 80 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Barrington Quarter Section: _____

Nearest Cross Streets: Dundee Ln & Marbury Ln.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other dirt

Side Slopes: Turf Grass ✓ Rip Rap _____ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in:5in Bank Height 4ft. Buffer Width: 6-4ft.

Number of Inlets: Stormsewer Inlet A Size 14in Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 16in outlet B 12in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe Outlet B trash rack covered w/ cattail debris

Short-Circuiting: Inlet/Outlet Orientation ✓ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae low

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris____✓ garbage / cattail debris____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

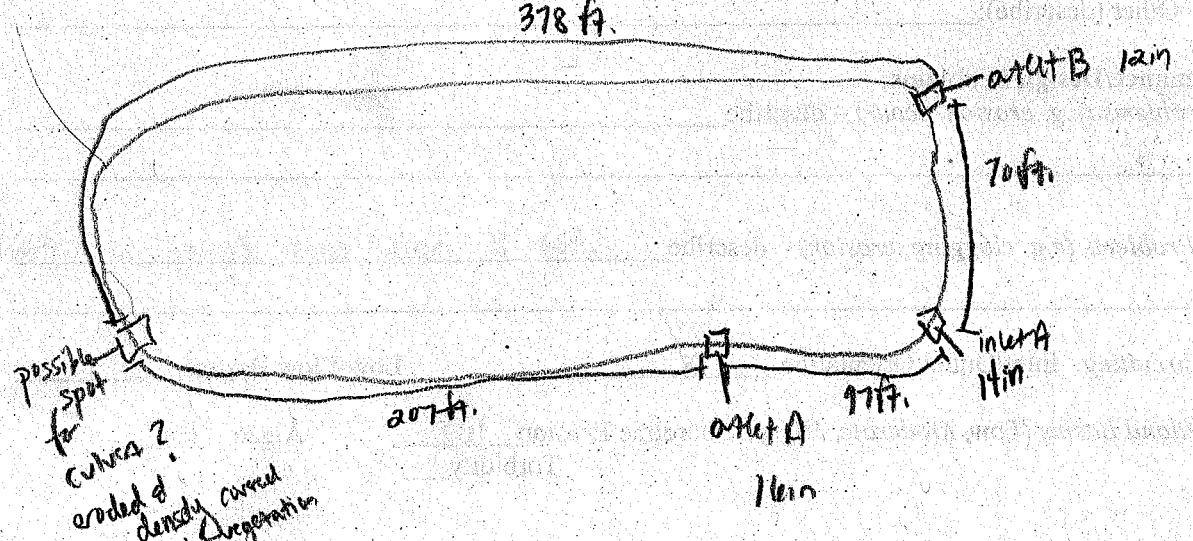
Other Observations:
Aquatic Life/ Wildlife (describe): frogs, birds
Potential Safety Problems: erosion along banks covered by over-grown vegetation
Potential Nuisance Problems:_____
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

Preliminary Retrofit Opportunities (describe): Remove cattails, replace surrounding turf grass on banks w/ appropriate native vegetation. Clean off debris from culvert trash racks

Photos:

Photo #	Description
1	basin 13395
2	basin 13396
3	possible place for culvert - vegetation to thick to find 13397
4	outlet A 13398
5	inlet A 13399
6	outlet B 13400
7	basin 13401
8	
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 195

Basin Name (subdivision and/or property owner): Alden Estates of Barrington

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-21-07 / 857 Temperature 75 Rainfall (now, 12, 24, 48 hours, (week)) _____

Location:

Political Jurisdiction: _____ Township: Barrington Quarter Section: _____

Nearest Cross Streets: Barrington Rd. & Manchester Dr.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential / commercial Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry _____ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other rip rap

Side Slopes: Turf Grass _____ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 3in Bank Height 15ft Buffer Width: 30ft.

inlet A 14in

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: outlet A 8in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe water flowing out from below inlet A & not opening; perhaps pipe is broken.

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion moderate Algae high

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): frogs

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

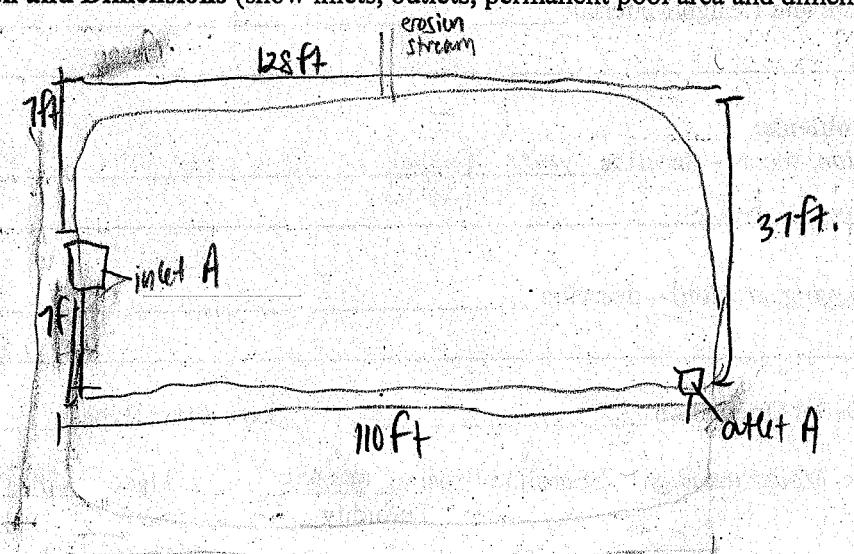
Other:_____

Preliminary Retrofit Opportunities (describe): Stabilize banks to prevent further erosion. Fix inlet A. Replace vegetation and rip rap w/ native vegetation.

Photos:

Photo #	Description
1	basin 13362
2	inlet A 13363
3	" 13364
4	basin 13365
5	outlet A 13366
6	basin 13367
7	
8	
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 194

Basin Name (subdivision and/or property owner): Park Barrington

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-22-07/ 1332 Temperature 75 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Barrington Quarter Section: _____

Nearest Cross Streets: Park Barrington Dr. & Grove St.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other dirt & rip rap

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in:1in - 12in:3in Bank Height 4-10ft. Buffer Width: none

Number of Inlets: Stormsewer inlet A 8in inlet B 8in Size _____ Channel/Swale outlet A 10in Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae low

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): frogs
Potential Safety Problems:_____
Potential Nuisance Problems:_____
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

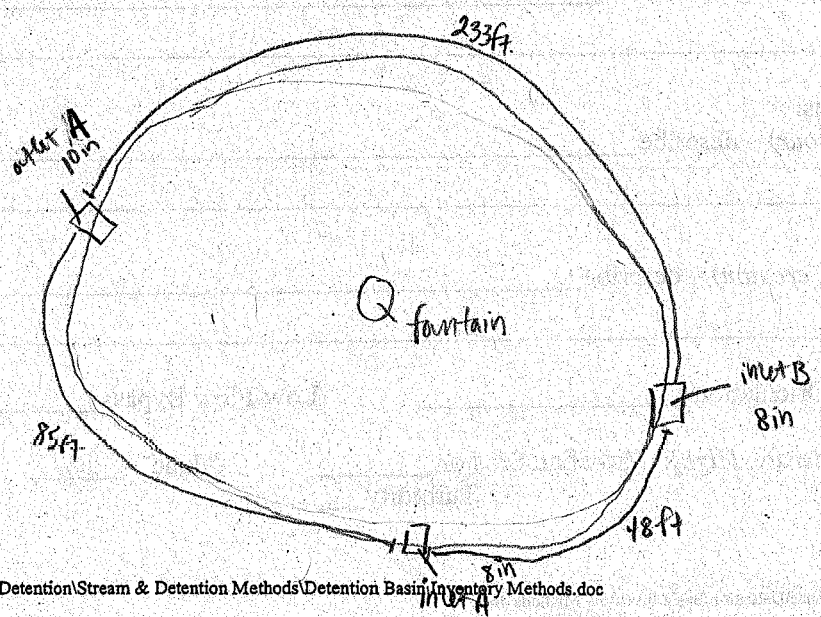
Preliminary Retrofit Opportunities (describe): Replace turf grass and stones with native vegetation.

Photos:

Photo #	Description
1	basin 13574
2	basin 13575
3	basin 13576
4	inlet A 13577
5	inlet B 13578
6	basin 13579
7	outlet A 13580
8	
9	
10	

- water has blu-green hue

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: between 97 & 102

Basin Name (subdivision and/or property owner): next to 5/3 bank

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-15-07 / 832 Temperature 80 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Ela Quarter Section: _____

Nearest Cross Streets: SE Rand Rd & Ela Rd.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: Commercial Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry _____ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other rip rap

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 2in Bank Height 2 ft. Buffer Width: none

Number of Inlets: Stormsewer _____ Size inlet A 10in Channel/Swale _____ Size

Outlet Type(s) and Dimensions: Culvert: outlet A 8in Restrictor (Y/N) _____ Size

Surface Weir: _____ Size _____ Perforated Riser _____ Size

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe & plastic fence infront of outlet A & other debris

Short-Circuiting: Inlet/Outlet Orientation ✓ 2 Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae _____

Turbidity _____

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris ✓ garbage Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): birds

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

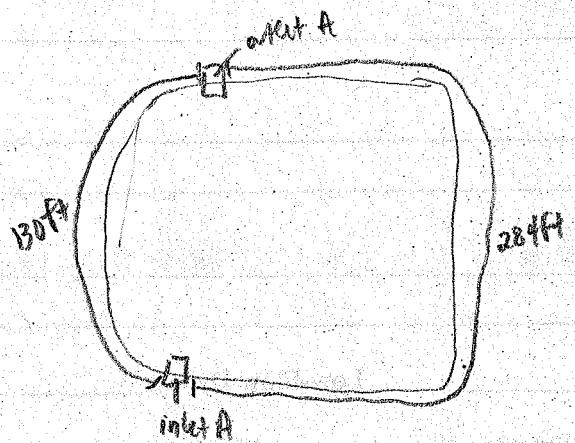
Other:_____

Preliminary Retrofit Opportunities (describe): Replace turf grass with native vegetation
Remove fence from infront of inlet A.

Photos:

Photo #	Description
1	basin 13074
2	basin 13075
3	inlet A 13076
4	outlet A 13077
5	" & silt fence, garbage, debris infront 13078
6	basin 13079
7	
8	
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin #: 201

Basin Name (subdivision and/or property owner): Chatyn Downs

Maintenance Responsibility: Lake View of Barrington

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-20-07/1430 Temperature 85 Rainfall (now, 12, 24, (48) hours, week) _____

Location:

Political Jurisdiction: _____ Township: Palantine Quarter Section: _____

Nearest Cross Streets: Hillside Rd & Lakewoods Dr.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other dirt, rip rap

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation _____ Other _____

Slope (Horizontal:Vertical) 12in : 3.5in (12in-5in) Bank Height 3-4ft Buffer Width: none

Number of Inlets: Stormsewer inlet A 28in inlet B 14in Size outlet A 14in Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae low

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation ✓ willows

Other Observations:
Aquatic Life/ Wildlife (describe): fish, frogs

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

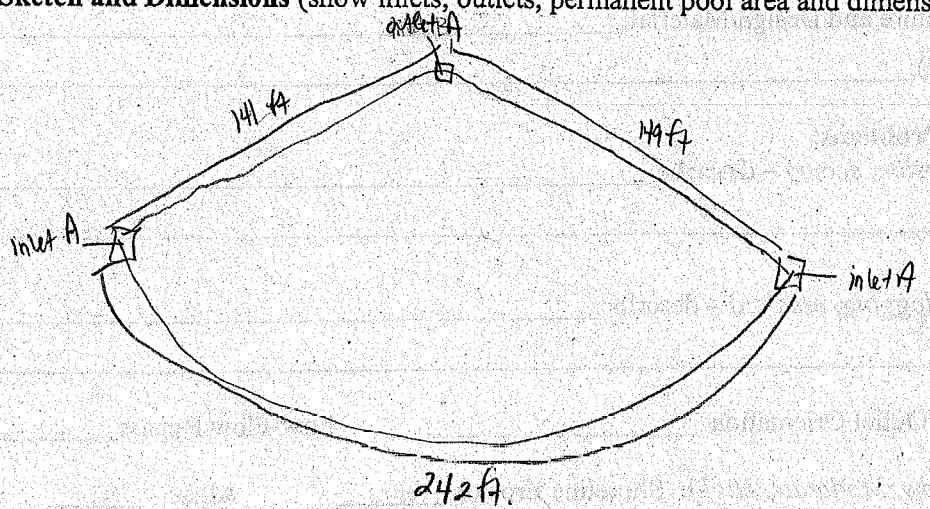
Other:_____

Preliminary Retrofit Opportunities (describe): Replace turf grass with native vegetation. Remove rocks along shoreline

Photos:

Photo #	Description
1	basin 13347
2	basin 13348
3	inlet A 13349
4	outlet A 13350
5	basin B 13351
6	basin 13352
7	inlet B 13353
8	
9	
10	

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 200

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-20-07 / 1354 Temperature 85 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Palantine Quarter Section: _____

Nearest Cross Streets: End of Old Mill Rd.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residental Year Constructed: _____

Basin Design Features:

Type: Wet _____ Dry _____ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other invasive

Side Slopes: Turf Grass _____ Rip Rap _____ Native Vegetation ✓ Other invasive

Slope (Horizontal:Vertical) 12in : 5in Bank Height 6-8ft Buffer Width: 10ft.

Number of Inlets: Stormsewer _____ Size _____ Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: Mat A 8in Mat B 20in Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

Outlet Problems (e.g. clogging, erosion) – describe Mat A clogged w/ debris & grass clippings

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae _____

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): birds

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

Other:_____

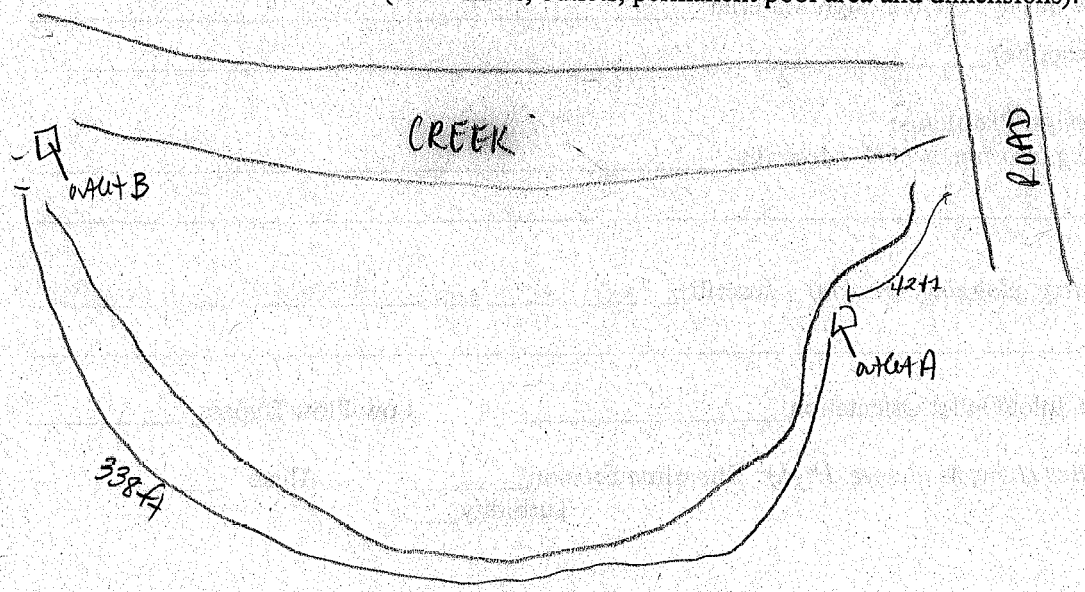
Preliminary Retrofit Opportunities (describe): Replace nonnative plants w/ native clean at vegetation infront of atlet B

Photos:

Photo #	Description	
1	basin	13340
2	basin	13341
3	oAlet A	13342
4	basin	13343
5	oAlet B	13344
6	"	13345
7	basin	13346
8		
9		
10		

BASIN THAT IS PARALLEL TO CREEK

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 199

Basin Name (subdivision and/or property owner): Chateau Bourne

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-20-07 / 1320 Temperature 80 Rainfall (now, 12, 24, (48) hours, week) _____

Location:

Political Jurisdiction: _____ Township: Palantine Quarter Section: _____

Nearest Cross Streets: Hillside Rd. & Fairfield Dr.

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features: Creek runs thru this basin

Type: Wet _____ Dry _____ Wetland ✓ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland _____

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass ✓ Rip Rap ✓ Native Vegetation very few ✓ Other ✓ invasives / weeds

Slope (Horizontal:Vertical) 12in : 2in Bank Height 4ft. Buffer Width: 6 - 10ft.

Number of Inlets: Stormsewer inlet A 30in x 40in inlet B 14in Size _____ Channel/Swale inlet C 16in Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: _____ Size _____ Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe inlets noted & photographed lead into creek then creek goes through basin.

Outlet Problems (e.g. clogging, erosion) – describe _____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion _____ Algae _____

Turbidity ___

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): frogs, birds, chipmunks

Potential Safety Problems:_____

Potential Nuisance Problems:_____

Evidence of Upstream Illicit Connections (describe):_____

Other Basin Uses (rec. field, etc):_____

Other:_____

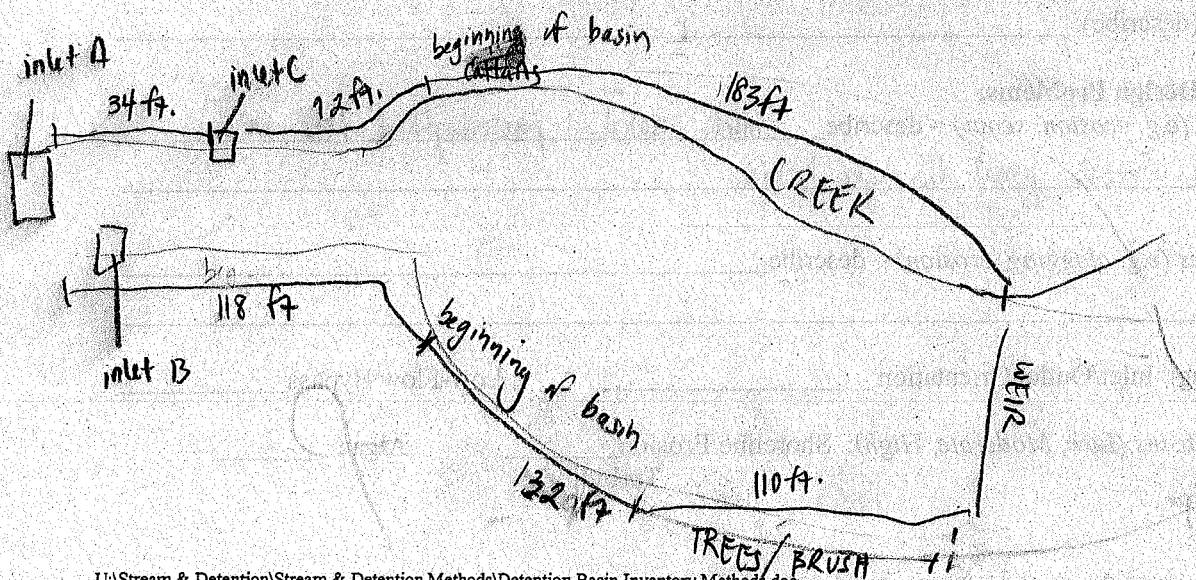
Preliminary Retrofit Opportunities (describe): Remove nonnative and replace w/ native vegetation.

Photos:

Photo #	Description
1	basin / creek 13327 WETLAND 13337
2	basin / creek 13328 ~~WEIR~~
3	inlet A 13329 CREEK after weir 13338
4	inlet B 13330 weir 13339
5	creek leading into basin 13331
6	inlet C 13332
7	basin / cattails 13333
8	WEIR 13334
9	WEIR 13335
10	WEIR 13336

Creek runs through basin, inlets are coming into creek then basin

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



DETENTION BASIN INVENTORY FORM

Basin Information: Basin # : 198

Basin Name (subdivision and/or property owner): _____

Maintenance Responsibility: _____

Contact Name: _____ Phone Number: _____

General Information:

Date/Time 6-20-07 / 1222 Temperature 80 Rainfall (now, 12, 24, 48 hours, week) _____

Location:

Political Jurisdiction: _____ Township: Palatine Quarter Section: _____

Nearest Cross Streets: Haven Dr. cul de sac, nr. Roth d

Basin Size and Drainage Area Characteristics (based on permit records, if available):

Active Storage Volume (acre-feet): _____ Design Storm: _____

Permanent Pool Volume (acre-feet): _____ Release Rate (cfs/acre) _____

Estimated Tributary Area (Acres), and upstream area if online: _____

Land Use Served: residential Year Constructed: _____

Basin Design Features:

Type: Wet ✓ Dry _____ Wetland _____ Online _____

Sediment basin present (Y/N)? _____

Basin Bottom – Vegetation: Turf Grass _____ Native Vegetation/Wetland ✓

Concrete Lined Channel _____ Other _____

Side Slopes: Turf Grass _____ Rip Rap _____ Native Vegetation ✓ Other _____

Slope (Horizontal:Vertical) 12in : 2in Bank Height 6-8 ft. Buffer Width: 22 - 48 ft

Number of Inlets: Stormsewer inlet A Size 12in Channel/Swale _____ Size _____

Outlet Type(s) and Dimensions: Culvert: _____ Restrictor (Y/N) _____ Size _____

Surface Weir: 4in pipe Size 2 x 7in woolen = 14in Perforated Riser _____ Size _____

Overflow Structure and Design/Material: _____

Other (describe): _____

Maintenance/Design Problems:

Inlet Problems (e.g. erosion, scour) – describe _____

_____

Outlet Problems (e.g. clogging, erosion) – describe _____

_____

Short-Circuiting: Inlet/Outlet Orientation _____ Low-Flow Bypass _____

Wet/Wetland Basins (Low, Moderate, High): Shoreline Erosion low Algae _____

Turbidity high

Dry Basins: Poor Drainage in Areas Intended to Be Dry_____
Concrete Channels_____ Stilling Basin(s) Present_____

Other: Excess Litter/Debris_____ Excess Sediment Accumulation_____
Excess Woody Vegetation_____

Other Observations:
Aquatic Life/ Wildlife (describe): frogs
Potential Safety Problems:_____
Potential Nuisance Problems:_____
Evidence of Upstream Illicit Connections (describe):_____
Other Basin Uses (rec. field, etc):_____
Other:_____

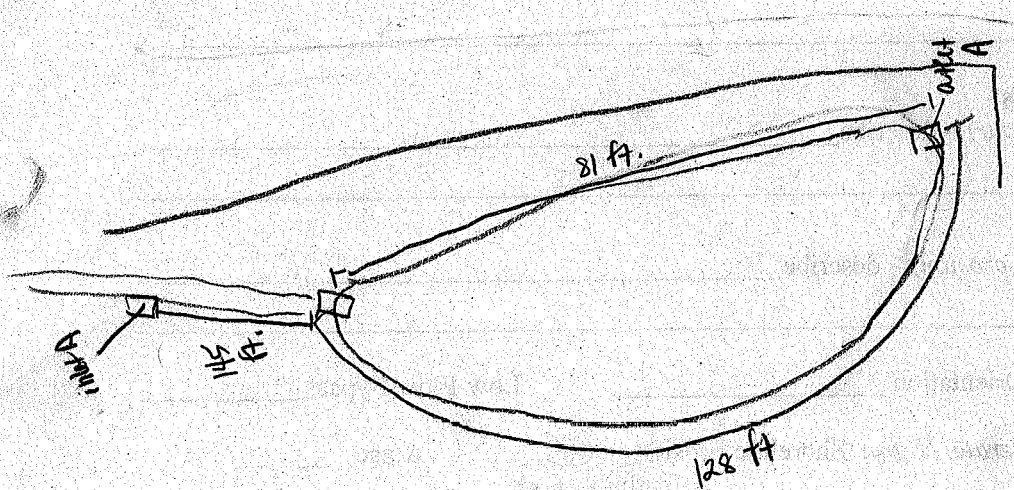
Preliminary Retrofit Opportunities (describe): Repair sides of shoreline to prevent erosion. Remove wooden wall from upper bank.

Photos:

Photo #	Description
1	basin 13314
2	basin 13315
3	shoreline erosion 13316
4	stream inlet 13317
5	stream inlet portion of basin 13318
6	metal meshing along bank. 13319
7	outlet A 13320
8	outlet A 13321
9	outlet A - stone path that leads to basin 13322
10	inlet A 13323
11	inlet A 13324
12	inlet A to basin 13325
13	wooden wall along upper bank 13326

has metal mesh along banks & sides @ water edge

Basin Sketch and Dimensions (show inlets, outlets, permanent pool area and dimensions):



Appendix G: Cost Savings in Ecologically Designed Conservation Developments

Cost Savings in Ecologically Designed Conservation Developments

By

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Abstract

There is an interest in the real-estate development world to quantify costs of different development techniques. This paper presents a standardized method to compare residential development designs using conservation and conventional design approaches. Residential development projects are designed using two different design methodologies on the same parcels, using unit costs provided by the developers and Applied Ecological Services (AES) for land restoration and management, then the results are compared side by side. Ten representative projects from the Midwestern USA are used to evaluate and demonstrate the value of conservation design in a standard comparison methodology and format. These comparisons document a total development and average per-lot savings of 10% and 25%, respectively, using the ten representative projects. Individual project comparisons ranged from 13% more spent with conservation development, to 34% saved. The minimum average per-lot savings ranged from a low of 5% to a high of 39%.

Savings were found in reduced infrastructure (e.g. roads lengths, widths and nested utilities – sanitary and water), reduced or eliminated site changes (e.g. earthmoving) and infrastructure (e.g. stormwater sewers, detention ponds, etc), and creation of land-use features that are less expensive to create and maintain (e.g. native landscaping instead of formal landscapes). This standardized cost-comparison approach can be used by other developers, designers, and citizens to evaluate community choices in future development proposals.

Introduction

Clarifying the "bottom line" associated with alternative approaches to land developed has been difficult because of the proprietary nature of project economics. Yet at the same time, market transformation can occur best and most expeditiously if investors clearly understand the benefits of their investments. The market doesn't change unless investors openly see increased value, reduced time to obtain returns, or other benefits including non-monetary values (e.g. ecological, social, cultural, political, etc) to which they can contribute. The lag time between investor behavioral changes and market demands can be protracted because investors think demand may be short lived, or they are unwilling to change a tried-and-true business model and "formal" method for approaching an investment type, and because a moving market isn't necessarily easily followed, or lead. This explains why the market can be slow to accommodate the desired changes even when consumers clearly demand something other than what is offered in the marketplace.

Such is the case with land development. Millions of homes are constructed annually in conventionally designed communities that do not appear to be as desirable to a growing, increasingly sophisticated and demanding consumer pool. When the market does finally respond, it appears to be focused on cosmetic, or small, incremental changes. As such, most residential land development continues to contribute to a legacy of: a) high land consumption; b) downstream deleterious effects on water quality, flooding, deteriorating streams, wetland and other water bodies; c) creating petroleum- fuel- consumptive and automobile-dependant designs that contribute to deteriorating air and water quality, human quality of life; d) burdensome development maintenance costs that appear to exceed tax revenues now and in the future; and e) lax or declining quality and quantity of open space for the quiet enjoyment of life.

Once the market demands something different, the two biggest impediments to market transformation are regulation and investor behavior, and both have been slow to change. Regulation is often the most difficult to adapt to changes, and both can lag market demand for years, even when everyone knows they are operating with antiquated, under-performing regulations, and in the face of measurable and failed policies on the ground. Such failures include

increasingly problematic flooding and poor water quality, and costly public financial burdens for maintaining infrastructure and questionable adequacy of long term funding for their upkeep (e.g. roads, sewers, emergency services, etc) and often near-term and definitely long-term under funding of their repair, upkeep, or replacement).

Ecologically designed conservation developments (Arendt, 1996; Apfelbaum et al, 1995; Apfelbaum et al, 1997) start with a different premise, by identifying the land to avoid and protect, and some designers (Apfelbaum et al, 1995) also integrate restoration of degraded lands early, and may also integrate alternative stormwater management (AES, 1993) and trails and other important features as major organizing elements in the design. While the conventional development design process may integrate some of these features where they provide a tangible benefit (or if the developer is requested to do so), even stormwater is integrated often very late in the conventional design process. Trail links are more commonly integrated than just a few years ago in conventional developments.

Many communities are moving their policies toward allowing more development design flexibility and adopting ordinances to encourage a greater level of conservation. These include a requirement for more open space, linking communities with trails and greenways, and also trying to solve pending and future predicted problems with flooding, declining ground water and potable water supplies, and looming water quality issues. National, State and County policies also appear to be changing and becoming more focused in encouraging and requiring that conservation design principles be more pivotal in the design of developments. Such changes include the tightening Federal Clean Water Act restrictions on wetland impacts; increasingly stringent stormwater management requirements focused on water quantity management; and integrating a requirement for water quality (see USEPA Best Management practices manuals, etc).

This paper is focused on summarizing some case studies AES has documented through our 30+ years in the design of conventional and conservation communities. The basic principles of conservation development and ecological design used by AES, Inc. include the following:

- Clustered housing
- Smaller lots
- Distinct neighborhoods that are linked through green- and open-space systems.
- Use of less natural resources because of the consolidation of build-out
- Mixed use to reduce requirements for automobile travel for basic needs, etc.
- Restoration of open space, not just allowing the land to lay fallow
- Extensive trail networks and all homes having visual and/or pedestrian access to open-space systems
- Communities engaged in land management through traditions (e.g. midwestern prairie prescribed burning) and education
- Beneficial use of open space for functional needs – stormwater management, ground-water recharge to serve potable water supply replenishment needs, flood-damage reduction and mitigation of down-stream problems, elimination of stormwater sewers and piped systems, greenways, passive and active parks, etc.

Deployment of these principles involves the integration of built and open-space areas by placing homes adjacent to the open space. Alternative stormwater management, recreation, wildlife and aesthetic enjoyment all occur in this open-space system. With this approach, ecologically-designed conservation developments are sometimes assumed to be more expensive because land is being set aside or "given away" to open space (and thus not divided into lots) with the additional burden of restoring that open space. This perception has been part of the reason this study was conducted. This paper summarizes results from the comparison of conceptual design plans (not built projects) of conventional vs. ecologically designed conservation developments (i.e. paired conventional and conservation plans) for 10 sites. The economic data used here was jointly prepared with our clients and once constructed, as a follow-up

assessment, we will be able to provide actual construction costs rather than the projections provided here. We also intend to provide the top-side economics – that is, lot and home sales velocity, price-point and premiums (or losses) over competitive market-area projects.

The only comparison of built projects that works is a scenario where there is a built ecologically designed conservation development "just down the road" from a built conventional development. But it is still very difficult to compare the cost savings inherent to one design approach over another, because they remain two separate sites – each with its own idiosyncrasies affecting construction costs and planning differences. And so this brings us back to the efficacy of comparing costs between two conceptual "paper" alternatives on the same site.

Prior Analyses

Previous cost-comparison research has varied greatly; from studying real-estate appreciation with homes next to open space to reducing flooding risk by using conservation-development practices. Northern Illinois Planning Commission (NIPC, 2005) compared the economic costs of designing and building conservation versus conventional developments, primarily as it relates to stormwater management practices. Comparing the assessed costs – site preparation (clearing and grading); lot clustering; stormwater, sewer, and water supply infrastructure installation and maintenance; landscaping installation and maintenance; and paving – the study showed cost savings ranging from $2500 to $3700 per lot.

Reacting to concern over the marketability and price of smaller lots in conservation developments, a tudy by Lacy (1995) compared appreciation rates in clustered housing developments with permanently preserved open space and conventional developments. Appreciation rates for the cluster/open space development averaged 167.9% over eight years, while the rate for conventional developments was 146.8%. Lacy concluded that the spending behavior of buyers suggests an increasing desire for homes with proximity to permanently-protected lands, over demand for homes located on bigger lots without the open-space amenity.

Community infrastructure maintenance costs were investigated by Stephenson et al (2001) who found, "cluster development would have a negligible to positive consequence on local government costs." The study determined that cluster developments would have some advantages, including the reduction of infrastructure maintenance due to reduced infrastructure, and other studies have found a correlated cost savings from reduced downstream flooding risk, a cost not always reviewed or calculated by municipalities (NIU, 2004 and IDNR and CDF, 2004).

NOAA (2005-2006) quantified the cost savings and environmental and social impacts of different development types. By comparing conventional, conservation and new-urbanist project design construction costs, potential new revenue and conceptual estimates for return on development investment, remediation costs for water quality and cost of government services. Conservation development had the lowest cost to develop, while new-urbanism had the highest potential net revenue and both had the same positive attributes for a rapid return on developer investment, as well as reduced cost of local governmental services.

The Western Reserve Conservation & Development Council, (1998) identified increased lot premiums and faster lot sales (absorption) with a conservation-development design approach. At Laurel Springs (Bainbridge, Ohio), lots abutting open space sold for a 10% premium over conventional lots, and lot absorption increased by a minimum of .5 units per month. The residual profit to the developer was 55% with conservation development versus 27% with conventional. At Thornbury (Solon, Ohio), conservation lot premiums were 10% over conventional lots. A cost savings per lot of $10,000, or 17.5% was found in comparison with conventional lots. Conservation-development lot absorption rates were more than twice conventional lots (eight years to sell out versus 17 years).

Currently, apart from the aforementioned studies, there are few economic comparisons of conservation vs. conventional development. At the same time there is increased interest for these data and understandings. From our review, we learned that most comparisons used different parameters, measures and definitions and while useful, this lack of standardization has made it difficult to extract unifying and predictable principles. The following standardized method provides the metrics for making, evaluating and reporting infrastructure cost comparisons that could be used by investors and others in the marketplace.

comparison by the marketplace and investors, as the review highlighted a need for a standardized method and metrics for making, evaluating and reporting such comparisons.

Methods

This paper is focused on presenting a standardized method for comparing conservation and conventional residential developments and providing the summary of this comparison. As a result of the focus on this method, only ten example projects are provided here. The following criteria were used for selecting the sample projects included in this paper:

1. Personal experience and involvement by the authors on each project
2. The project is a residential subdivision of the Upper Midwest
3. The project had a both a baseline "conventional" and an ecologically-designed "conservation" concept plan.
4. Sewer service and water supply requirements are the same for both "conventional" and "conservation" concept plans.
5. Both project designs meet local ordinances (i.e., approvable under standard subdivision, P.U.D., or conservation ordinances).
6. All projects are Greenfield developments (i.e. project sites had not been previously developed).

In addition, the following criteria were used for costing the sample projects included in this paper:

1. All costs and cost criteria were also designed or selected to adhere to the following criteria: Cost Categories for which data from each development had to be available are included in Table 1, and include Grading, Roadway, Storm Sewer, Sanitary, Water Main, Erosion-Control Maintenance, Trails, Landscape/Restoration, Amenities, and Contingencies/Engineering/Legal.
2. Unit Costs for each Cost Category are held constant across all projects (Unit Costs were averaged from Engineer's Opinion of Probable Cost data sets, Developer's Pro-Forma, and AES data).
3. Measurement "take-offs" from plans were systematically measured for the following variables: Total Acreage of site, Linear Feet (L.F.) of Roadway, Width of Road Pavement, Width of Right-Of-Way (R.O.W.), Total Number of Lots, Area in Lots (total area covered by lots), Acreage of Open Space, and Linear Feet (L.F.) of Trails.

Most projects had open-space acreage over 50% of the total site acreage when designed as a conservation development. In addition, the conservation plans needed to be responsive to natural resources, aesthetic quality of open spaces, restoration potential of natural resource, and needed to use alternative stormwater management principles. In addition, the projects had to be broadly applicable to other geographic settings, regulatory climates, and market settings in the USA. The cost-comparison tool uses a spreadsheet which allows development projects to be compared individually and in summary. The process for populating the spreadsheet to make the comparison used the following steps:

Table 1: Construction Cost Categories, Calculation Method and Assumptions

Cost Category	Calculation Method	Assumptions	Notes
Grading	(From Take-Offs)	Strip Topsoil = ((Built Acreage) x (12" cut)x ($/c.y.)) + General Lot Grading at $0.20 per s.f. + Clearing & Grubbing = (Average Lot Size x .2 sq. ft.) + Seeding = Area in lots + Erosion Control = Perimeter of Site	Assumes prior agricultural site
Roadway	(From Take-Offs)	(LF Road) x (Pavement Width) + (Curbs, Sidewalks)	
Storm Sewer	(Extrapolated)	LF Road (Conservation = (Total cost of improvement x .5)	Conservation developments are assumed to have alternative storm-water, therefore, less hard infra-structure costs.
Sanitary	(Extrapolated)	LF Road (If lot area is greater than 40,000 sq. ft., no watermain are assumed)	
Watermain	(Extrapolated)	LF Road (If lot area is greater than 40,000 sq. ft., no watermain are assumed)	
Erosion Control Maintenance	(From Take-Offs)	Wrap Entire Perimeter (Actually = sq. rt. of total acreage x 4	
Trails	(From Take-Offs)	Internal Distribution System of Existing Offsite	
Landscape/Restoration	(From Take-Offs)	Per Acre over Entire Site (Conventional = (Developed site acres) x $1,400/AC) (Conservation = ((Developed site acres) x $1,400/AC) + (Open-Space Acres x $ 5,000/AC)))	Typical landscape installation is assumed for developed areas, such as an entry feature, restorationof natural plant communitiesis assured for open-space areas in conservation developments.
Amenities	(From Take-Offs)	LF Roadway (Includes street trees, street lights, asphalt and limestone trails)	
Contingencies/Engineering/Legal	(From Take-Offs)	(25%) x (Total Construction Costs)	

* Cost calculations are based on four previous development pro-forma in the upper-Midwest, supplied by developers

Figure 2a: Probable Costing Spreadsheet - Conventional

PRELIMINARY OPINION OF PROBABLE COST - CONVENTIONAL DEVELOPMENT					DEVELOPMENT DATA	Unit	Amt.	%
Project Name	Token Creek Conservancy Estates		Known Site Ac.	203	Total Site Acreage	AC	203.00	100%
PROJECT #	01-260				Total Open Space	AC	11.11	5%
DATE:	4-Jul-05				Buildable Acreage	AC	203.00	100%
					Built Acreage (Lots + ROW)	AC	191.89	95%
					Constrained Open Space Remaining in O/S	AC	0.00	0%
					Developable Open Space Remaining in O/S	AC	11.11	5%
					Total Lots		307	
					Avg. Lot Size	SF	22,380	
					LF of Roadway	LF	24,800	
					Street Pavement Width	Feet	28.0	
					ROW Width	Feet	60	
					Area in Lots	SF	6,870,719	78%
					Area in ROW	SF	1,488,000	17%

CONVENTIONAL DESIGN

ITEM	BASIS/RULE OF THUMB	(Formula)	AMOUNT	UNIT	DESCRIPTION	UNIT COST	TOTAL COST
GRADING							
	Assumes prior AG. Field-type site	$100/acre	192	AC	CLEARING & GRUBBING	$100.00	$19,189
Assumes 12" deep over (Developed Area?)/entire site, (but sometimes 8"?)			245,267	CY	STRIP TOPSOIL	$1.25	$306,583
	Unit Cost based on +/-12,570 sf lot/$2,500 or $0.20/sf		307	LOTS	GENERAL LOT GRADING	$3,237	$993,862
	Assumes wrap of entire site perimeter	4 x sq.rt. Of Tot Ac.	11,895	LF	SILT FENCING	$1.60	$19,031
	Seeding of Development Area minus Road		158	AC	SEED SITE	$550.00	$86,752
					GRADING SUBTOTAL		**$1,425,418**
ROADWAY							
	Usually 2 tracking drives per site		2	EA	GRAVEL TRACKING DRIVE	$1,000.00	$2,000
	Per LF of CL of Roadway		24,800	LF	SHAPE, ROLL, AND COMP. SUBGRADE	$2.75	$68,200
	2.5 Tons/CY (thickness based on local req's)	assumed 10" thick base x road paved area	53,580	TON	10" THICK CRUSHED LIMESTONE BASE	$10.00	$535,802
	assumes both sides of street	2 x LF Roadway	49,600	LF	30" CURB AND GUTTER	$7.00	$347,200
	2 x LF of roadway		49,600	LF	BACKFILL BEHIND CURB	$0.30	$14,880
sumes construction of Shoulder & Swale is roughly equivelent in price to curb and gutte			0	LF	SHOULDER & SWALE	$7.30	$0
	Width of Pavement x LF of roadway		77,156	SY	2 THICK BINDER COURSE	$3.60	$277,760
			77,156	SY	1-1/2" SURFACE COURSE	$2.55	$196,747
			77,156	SY	TACK COAT	$0.40	$30,862
	(R/W width - Pavement Width) x LF of Road		88,178	SY	PLACE 4" TOPSOIL & RESTORE TERRACE	$2.50	$220,444
	Matches LF of curb x 5' wide = sf of Sidewalk		248000	SF	4" thick sidewalk 5' wide w/base	$2.50	$620,000
Intersection Improvements (does it include: Turn Lane additions/signalization?)			0	EA	STATE HWY INTERSECTION	$648,229.00	$0
					ROADWAY SUBTOTAL		**$2,313,896**
STORM SEWER							
Approx.1/2 of LF of Road (includes all Storm line sizes)				LF	**Average of total Storm Sewer all sizes**	$31.22	$0
	55% of total LF of storm line		6,820	LF	12" STORM SEWER (SPOIL BACKFILL)	$27.50	$187,550
	24% of total LF of storm line		2,976	LF	15" STORM SEWER (SPOIL BACKFILL)	$33.00	$98,208
	18% of total LF of storm line		2,232	LF	18" STORM SEWER (SPOIL BACKFILL)	$38.50	$85,932
	3% of total LF of storm line		372	LF	≥24" STORM SEWER (SPOIL BACKFILL)	$40.70	$15,140
Approx. 1 inlet/96 feet of Storm Sewer Line (includes all inlets)			129	EA	STORM INLET	$1,000.00	$129,167
	Approx. 1 MH per 290 LF of Storm line		43	EA	42/48" STORM MH W/ GRATE	$1,200.00	$51,310
	Avg. 83' per lot		25,481	LF	6" Laterals and Sumpline	$17.00	$433,177
Approx. 1 end section (incl. All sizes) per 430 LF of Storm line				EA	**Average of total End Sections all sizes**	$500.00	$0
	1 12" End Section per 1050 LF of 12" Storm Line		6	EA	12" END SECTION	$350.00	$2,273
	1 15" End Section per 275 LF of 15" Storm Line		11	EA	15" END SECTION	$450.00	$4,870
	1 18" End Section per 345 LF of 18" Storm Line		6	EA	18" END SECTION	$600.00	$3,882
	1 ≥24" End Section per 150 LF of ≥24" Storm Line		2	EA	≥24" END SECTION	$1,000.00	$2,480
	7.5 SY per End Section		197	SY	RIPRAP	$50.00	$9,850
Typ. Allow 5% of site area for Deten. Basins? 1 basin (1.5 ac.) pe		$600/Ac x total site acreage	203	AC	STORMWATER MANAGEMENT BASINS	$600	$121,800
					STORM SEWER SUBTOTAL		**$1,145,639**
SANITARY SEWER							
	1.086 x LF of Road		26,933	LF	8" SAN. SEWER W/SPOIL BACKFILL	$35.00	$942,648
	35 LF per Lot		10,745	LF	4" SANITARY LATERAL	$20.00	$214,900
	1 San MH per 156 LF of San Sewer line		173	EA	48" SAN MH W/CHIMNEY SEALS,FRAME & LIDS	$2,000.00	$345,292
					SANITARY SUBTOTAL		**$1,502,840**
WATERMAIN							
	Total W/L Same as LF of Roadway			**LF**	**Average of total W/L all sizes**	**$57.00**	$0
	.60 x LF Road		14,880	LF	8" WATERMAIN (DI W. SPOIL BACKFILL)	$38.00	$565,440
	.25 x LF Road		6,200	LF	12" WATERMAIN (DI W/GRAN BACKFILL)	$50.00	$310,000
.15 x LF Road (NOTE: May need to add Extension to Ex. Main)			3,720	LF	24" WATERMAIN (DI W/ GRAN. BACKFILL)*	$110.00	$409,200
	1 Hydrant per 575 LF of W/L		20	EA	HYDRANT ASSEMBLIES	$2,500.00	$50,000
	1 Valve per 340 LF of 8" W/L		44	EA	8" GATE VALVES	$800.00	$35,012
	1 Valve per 340 LF of 12" W/L		18	EA	12" GATE VALVES	$1,000.00	$18,235
	1 Valve per 435 LF of 24" W/L		9	EA	24" GATE VALVES	$4,000.00	$34,207
Typically "Loop" req'd with 2 connections (Tapping Tees & Valves)			2	EA	CONNECTION TO EX. WM	$5,000.00	$10,000
	Approx. 35 LF per lot		10,745	LF	1" COPPER LATERAL	$21.00	$225,645
					WATERMAIN SUBTOTAL		**$1,657,739**
EROSION CONTROL MAINTENANCE							
	Approx. $3 per LF of silt fence		11,895	LF	EROSION CONTROL MAINTENANCE	$3.00	$35,684
					MISCELLANEOUS SUBTOTAL		**$35,684**
OFFSITE SANITARY SEWER							
	Connection Distance to Ex. Offsite line		750	LF	8" SAN. SEWER W/SPOIL BACKFILL	$35.00	$26,250
					OFFSITE SANITARY SUBTOTAL		**$26,250**
LANDSCAPE/RESTORATION							
/ac for Landscape/Sod/Seed (usually represents 4% of total construction costs per Proforma Copperleaf			**203**	**AC**	**Generic Landscape**	**$1,400.00**	**$284,200**
					LANDSCAPE/RESTORATION SUBTOTAL		**$284,200**
AMENITIES							
	Per LF of street (Includes both sides of street)		24,800	LF	Street Trees	$15.00	$372,000
	"		24,800	LF	Street Lights	$25.00	$620,000
If no actual takeoff, Avg. 25 LF of 8' wide Asphalt Trail per O/		If no actual takeoff, Total O/S x .25 x 100 LF	278	LF	Asphalt Trails 8' wide	$8.00	$2,222
If no actual takeoff, Avg. 75 LF of 6' wide Limestone Trail per (		If no actual takeoff, Total O/S x .75 x 100 LF	833	LF	Limestone Trails 6' wide	$6.00	$5,000
					AMENITIES SUBTOTAL		**$999,222**
					SUBTOTAL		**$9,390,888**
					CONTINGENCIES/ENG/LEGAL (25%)		**$2,347,722**
					TOTAL OPINION OF COST		**$11,738,610**
	TOTAL SINGLE LOTS-			**307**			
	TOTAL UNITS (DUPLEXES)			**0**			
COST PER UNIT				**$38,237**			
COST PER FOOT				**473**			

Figure 2b: Probable Costing Spreadsheet - Conservation

PRELIMINARY OPINION OF PROBABLE COST - CONSERVATION DEVELOPMENT					DEVELOPMENT DATA	Unit	Amt.	%
Project Name	Token Creek Conservancy Estates		Known Site Ac.	203	Total Site Acreage	AC	203.00	100%
PROJECT #	01-260				Total Open Space	AC	105.83	52%
DATE:	4-Jul-05				Buildable Acreage	AC	203.00	100%
					Built Acreage (Lots + ROW + Multifamily)	AC	97.17	48%
					Constrained Open Space Remaining in O/S	AC	0.00	0%
					Developable Open Space Remaining in O/S	AC	105.83	52%
					Total Lots		340	
					Avg. Lot Size	SF	9,993	
					LF of Roadway	LF	16,700	
					Street Pavement Width	Feet	28.0	
					ROW Width	Feet	50	
					Area in Lots	SF	3,397,680	38%
					Area in ROW	SF	835,000	9%

CONSERVATION DESIGN

ITEM	BASIS/RULE OF THUMB	(Formula)	AMOUNT	UNIT	DESCRIPTION	UNIT COST	TOTAL COST
GRADING							
	Assumes prior AG. Field-type site	$100/acre	97	AC	CLEARING & GRUBBING	$100.00	$9,717
	Assumes 12" deep over (Developed Area?)/entire site, (but sometimes 8"?)		156,766	CY	STRIP TOPSOIL	$1.25	$195,957
	Unit Cost based on +/-12,570 sf lot/$2,500 or $0.20/sf		340	LOTS	GENERAL LOT GRADING	$1,999	$679,536
	Assumes wrap of entire site perimeter	4 x sq.rt. Of Tot Ac.	11,895	LF	SILT FENCING	$1.60	$19,031
	Seeding of Development Area minus Road		78	AC	SEED SITE	$550.00	$42,900
					GRADING SUBTOTAL		**$947,142**
ROADWAY							
	Usually 2 tracking drives per site		2	EA	GRAVEL TRACKING DRIVE	$1,000.00	$2,000
	Per LF of CL of Roadway		16,700	LF	SHAPE, ROLL, AND COMP. SUBGRADE	$2.75	$45,925
	2.5 Tons/CY (thickness based on local req's)	assumed 10" thick base x road paved area	36,080	TON	10" THICK CRUSHED LIMESTONE BASE	$10.00	$360,802
	assumes both sides of street	2 x LF Roadway	33,400	LF	30" CURB AND GUTTER	$7.00	$233,800
	2 x LF of roadway		33,400	LF	BACKFILL BEHIND CURB	$0.30	$10,020
	assumes construction of Shoulder & Swale is roughly equivelent in price to curb and gutter		0	LF	SHOULDER & SWALE	$7.30	$0
	Width of Pavement x LF of roadway		51,956	SY	2 THICK BINDER COURSE	$3.60	$187,040
			51,956	SY	1-1/2" SURFACE COURSE	$2.55	$132,487
			51,956	SY	TACK COAT	$0.40	$20,782
	(R/W width - Pavement Width) x LF of Road		40,822	SY	PLACE 4" TOPSOIL & RESTORE TERRACE	$2.50	$102,056
	Matches LF of curb x 5' wide = sf of Sidewalk		167000	SF	4" thick sidewalk 5' wide w/base	$2.50	$417,500
	Intersection Improvements (does it include: Turn Lane additions/signalization?)		0	EA	STATE HWY INTERSECTION	$648,229.00	$0
					ROADWAY SUBTOTAL		**$1,512,412**
STORM SEWER							
	Approx.1/2 of LF of Road (includes all Storm line sizes)			LF	**Average of total Storm Sewer all sizes**	$31.22	$0
	55% of total LF of storm line		4,593	LF	12" STORM SEWER (SPOIL BACKFILL)	$27.50	$126,294
	24% of total LF of storm line		2,004	LF	15" STORM SEWER (SPOIL BACKFILL)	$33.00	$66,132
	18% of total LF of storm line		1,503	LF	18" STORM SEWER (SPOIL BACKFILL)	$38.50	$57,866
	3% of total LF of storm line		251	LF	≥24" STORM SEWER (SPOIL BACKFILL)	$40.70	$10,195
	Approx. 1 inlet/96 feet of Storm Sewer Line (includes all inlets)		87	EA	STORM INLET	$1,000.00	$86,979
	Approx. 1 MH per 290 LF of Storm line		29	EA	42/48" STORM MH W/ GRATE	$1,200.00	$34,552
	Approx. 1 end section (incl. All sizes) per 430 LF of Storm line			EA	**Average of total End Sections all sizes**	$500.00	$0
	1 12" End Section per 1050 LF of 12" Storm Line		4	EA	12" END SECTION	$350.00	$1,531
	1 15" End Section per 275 LF of 15" Storm Line		7	EA	15" END SECTION	$450.00	$3,279
	1 18" End Section per 345 LF of 18" Storm Line		4	EA	18" END SECTION	$600.00	$2,614
	1 ≥24" End Section per 150 LF of ≥24" Storm Line		2	EA	≥24" END SECTION	$1,000.00	$1,670
	7.5 SY per End Section		133	SY	RIPRAP	$50.00	$6,633
	Typ. Allow 5% of site area for Deten. Basins? 1 basin (1.5 ac.) pe	$600/Ac x total site acreage	203	AC	STORMWATER MANAGEMENT BASINS	$600	$121,800
					STORM SEWER SUBTOTAL		**$519,544**
SANITARY SEWER							
	1.086 x LF of Road		18,136	LF	8" SAN. SEWER W/SPOIL BACKFILL	$35.00	$634,767
	35 LF per Lot		11,900	LF	4" SANITARY LATERAL	$20.00	$238,000
	1 San MH per 156 LF of San Sewer line		116	EA	48" SAN MH W/CHIMNEY SEALS,FRAME & LIDS	$2,000.00	$232,515
					SANITARY SUBTOTAL		**$1,105,282**
WATERMAIN							
	Total W/L Same as LF of Roadway			**LF**	**Average of total W/L all sizes**	**$57.00**	$0
	.60 x LF Road		10,020	LF	8" WATERMAIN (DI W. SPOIL BACKFILL)	$38.00	$380,760
	.25 x LF Road		4,175	LF	12" WATERMAIN (DI W/GRAN BACKFILL)	$50.00	$208,750
	.15 x LF Road (NOTE: May need to add Extension to Ex. Main)		2,505	LF	24" WATERMAIN (DI W/ GRAN. BACKFILL)*	$110.00	$275,550
	1 Hydrant per 575 LF of W/L		20	EA	HYDRANT ASSEMBLIES	$2,500.00	$50,000
	1 Valve per 340 LF of 8" W/L		29	EA	8" GATE VALVES	$800.00	$23,576
	1 Valve per 340 LF of 12" W/L		12	EA	12" GATE VALVES	$1,000.00	$12,279
	1 Valve per 435 LF of 24" W/L		6	EA	24" GATE VALVES	$4,000.00	$23,034
	Typically "Loop" req'd with 2 connections (Tapping Tees & Valves)		2	EA	CONNECTION TO EX. WM	$5,000.00	$10,000
	Approx. 35 LF per lot		11,900	LF	1" COPPER LATERAL	$21.00	$249,900
					WATERMAIN SUBTOTAL		**$1,233,850**
MISCELLANEOUS							
	Approx. $3 per LF of silt fence		11,895	LF	EROSION CONTROL MAINTENANCE	$3.00	$35,684
					MISCELLANEOUS SUBTOTAL		**$35,684**
OFFSITE SANITARY SEWER							
	Connection Distance to Ex. Offsite line		750	LF	8" SAN. SEWER W/SPOIL BACKFILL	$35.00	$26,250
					OFFSITE SANITARY SUBTOTAL		**$26,250**
LANDSCAPE/RESTORATION							
	Remaining (Total - O/S) site acres x $1400/Ac		**97**	**AC**	**Generic Landscape**	**$1,400.00**	**$136,037**
	Total Open Space Acres x $5000/Ac		**106**	**AC**	**Restoration (Avg. Savanna, Prairie, Wetland)**	**$5,000.00**	**$529,155**
					LANDSCAPE/RESTORATION SUBTOTAL		**$665,192**
AMENITIES							
	Per LF of street (Includes both sides of street)		16,700	LF	Street Trees	$15.00	$250,500
	"		16,700	LF	Street Lights	$25.00	$417,500
	If no actual takeoff, Avg. 25 LF of 8' wide Asphalt Trail per O/S	If no actual takeoff, Total O/S x .25 x 100 LF	8,030	LF	Asphalt Trails 8' wide	$8.00	$64,240
	If no actual takeoff, Avg. 75 LF of 6' wide Limestone Trail per C	If no actual takeoff, Total O/S x .75 x 100 LF	0	LF	Limestone Trails 6' wide	$6.00	$0
					AMENITIES SUBTOTAL		**$732,240**
					SUBTOTAL		**$6,777,596**
					CONTINGENCIES/ENG/LEGAL (25%)		**$2,347,722**
					TOTAL OPINION OF COST		**$9,125,318**
	TOTAL SINGLE LOTS-			**310**			
	TOTAL UNITS (Townhouse)			**30**			
COST PER UNIT				**$26,839**			
COST PER FOOT				**546**			

1. Plan measurements ("take offs") are made and entered into the data input chart for the given project.
2. Calculations are run from either direct take-off plan measurements, or by projection. When projecting, start with a known takeoff measure (e.g. LF of Road) to establish estimated values for another cost category (e.g. LF of waterline). This method is necessary at a conceptual level of detail because utilities have not been finalized. This assumes that the LF of roadway will closely correlate to the LF of other utilities that typically follow the roadway layout. Thus, efficiencies that can be realized by using spurred utilities and cross-over layouts with shared main utility lines have not been applied unless both strategies could be used in the conventional and conservation design plans. To correlate the LF of utility runs and LF of roadways, an approximate value is calculated using a multiplier derived from averaging baseline project data (see Costing Method Criteria #1 in Table 1)
3. When all projects are in the cost-comparison tool, generate a summary chart.

Results and Discussions

Single-Development Comparison

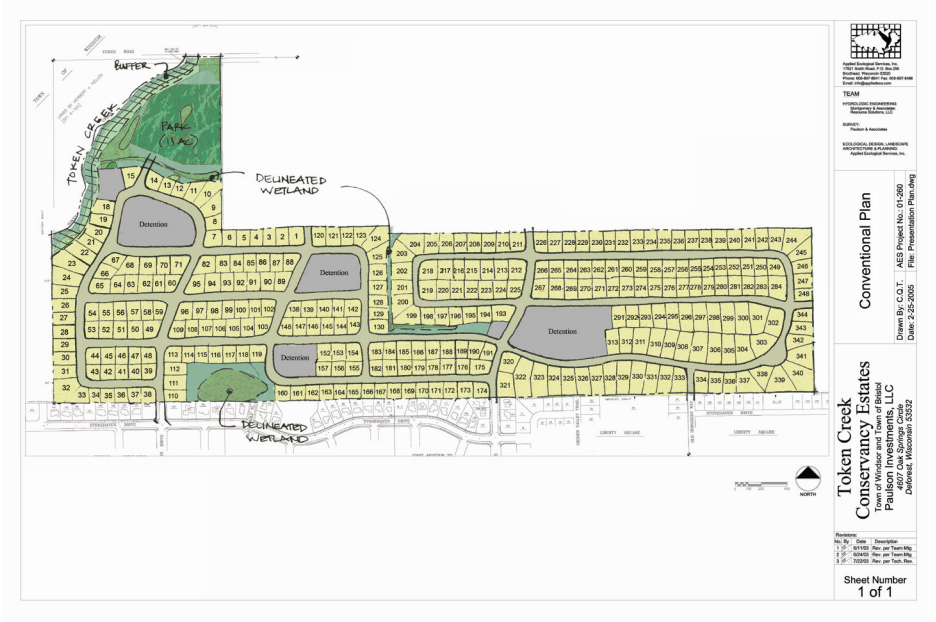
One of the ten projects is highlighted herein to demonstrate the methods used for comparison. This 200^{+}-acre project, identified here as Token Creek Conservancy Estates, is located on the northern edge of Sun Prairie, Wisconsin. There is an existing wetland at the south edge of the site, and Token Creek, a DNR Class III Trout Stream, constitutes the western boundary of the site. This creek is the largest of all tributaries to Lake Mendota in the heart of Madison, Wisconsin. Both conventional and conservation concepts shown here assume city sewer and water. The conventional concept accommodates 307 lots ranging from 15,000 to 25,000 sf, while the conservation concept has 314 ¼-acre lots plus 30 townhouse condominium units. Stormwater management in the conventional plan consists of a typical network of curb & gutter, curb inlets and pipes running into a few detention basins on site. The conservation concept, by contrast, utilizes the Stormwater Treatment Train™ (STT) approach consisting of a series of open prairie, raingardens, bioswales, and wetland biofiltration cells, all contributing to comparatively higher water quality as these natural systems remove sediment, phosphates, nitrogen and other pollutants. The STT™ meets or exceeds requirements for stormwater management, but more importantly, because it promotes infiltration, further addresses the issue of groundwater recharge in maintaining base flow to Token Creek as well as reducing the thermal impact of stormwater runoff on cold-water trout habitat (infiltrated water is naturally cooled before entering the creek).

An example graphic comparison (Figure 1) and probable costing spreadsheets used to compute the cost of conventional and conservation design (Figure 2a and 2b) show the specific elements of a development budget and pro-forma. In this summary of one project (Table 2) the overall averaged savings by using an ecological conservation design for the development was 22%, or $2,613,291. On a per-unit basis the savings was 30% and $11,397. The primary areas of savings in this particular example project included the reduced or nearly eliminated stormwater sewer systems (55% reduction and $626,095 saved), roads (35% reduction and $801,484 saved), and grading (34% reduction and $478,276 saved) while more money was spent in the landscaping category because the additional cost of restoration was added over and above the conventional landscaping budget for the project.

The benefit of being able to compare individual development plans is that each conceptual plan can be easily and promptly compared. This process can quickly inform a design team of where possible excessive costs are included in a plan, and this can focus the team to further refine and do value-added design. The other benefit is that users can apply the averaged savings found in Table 3 to other proposed conventional residential developments to provide other community members, design community members and policy and regulatory persons with the potential benefits of a conservation design approach on the same property.

*The Stormwater Treatment Train™ (STT™) is a registered trademark of Applied Ecological Services, Inc. (AES)

Figure 1: Individual Project Comparison



Conventional Development
Single Family Units: 307 (20,000 SF)
Multi-Family: 0 units
Total Site Acreage: 203 Ac
Open Space: 11.1 Ac (5%)

Conservation Development
Single Family Units: 310 (10,000 SF)
Multi-Family: 30 units
Total Site Acreage: 203 Ac
Open Space: 105.8 Ac (52%)

Table 2: Token Creek Cost Comparison Summary				
Description	Conventional Cost	Conservation Cost	$ Change	% Change
GRADING SUBTOTAL	$1,425,418	$947,142	$478,276	-34%
ROADWAY SUBTOTAL	$2,313,896	$1,512,412	$801,484	-35%
STORM SEWER SUBTOTAL	$1,145,639	$519,544	$626,095	-55%
SANITARY SUBTOTAL	$1,502,840	$1,105,282	$397,558	-26%
WATERMAIN SUBTOTAL	$1,657,739	$1,233,850	$423,889	-26%
EROSION CONTROL SUBTOTAL	$35,684	$35,684	$0	0%
OFFSITE SANITARY SUBTOTAL	$26,250	$26,250	$0	0%
LANDSCAPE/RESTORATION SUBTOTAL	$284,200	$665,192	-$380,992	134%
AMENITIES SUBTOTAL	$999,222	$732,240	$266,982	-27%
CONTINGENCIES/ENG/LEGAL (25%)	$2,347,722	$2,347,722	$0	0%
Totals for Project	**$11,738,610**	**$9,125,318**	$2,613,291	**-22%**
Totals Per Unit	**$38,237**	**$26,839**	$11,397	**-30%**

Multiple-Development Comparison of Ten Projects

Table 3 shows the specific averaged elements of a development budget and proforma. In this summary of ten projects the overall averaged savings by using ecological conservation design for the development was 10%, while on a per-unit basis the savings was 25%. This difference in percentages is attributable to the fact that on seven of the 10 sample projects, more units are being developed with the conservation-development plan than with the conventional plan. On five of the conservation developments, a portion of the additional units take the form of duplex, townhouse or condo units, providing a more diversified mix that reaches different target-market price-points and a broader demographic. Moreover, the conservation developments average 59% open space versus 14% open space on average for the conventional plans.

The primary areas of savings in the 10-project summary included the reduced or nearly eliminated stormwater sewer systems (39% overall, ranging from $6,668 or 3% saved on one project up to $974,689 or 65% on another project), reduced roadway (18% overall, ranging from $130,230 or 15% more spent on conservation development in one project, and $1,464,599 or 60% saved with conservation development in another), and reduced grading (39% overall, ranging from $73,021 or 22% on one project up to $478,276 or 54% on another). On all projects, more money was spent in the landscaping category (147% overall, ranging from $597,616 or 178% more spent on conservation on one project down to $56,500 or 95% more on another) because the additional cost of restoration was added over and above the landscaping budget for the project.

Site preparation, and grading in particular, can be the hardest projected cost to pin down. Estimating software, volumetric equations for projecting cut/fill, difficult topography, and the potential variability in the soils themselves (shrink/swell tendencies, etc.) all tend to play havoc with the calculations necessary for solid, predictable results. With this in mind, the multiple-development comparison was run a second time with an alternative grading scenario in which greater cost is attributed to increased topsoil stripping and more involved lot grading. In the original calculation, conservation lots are stripped of topsoil to a depth of 1' and conventional lots are assumed to have that same square footage of strip plus only 6" average across the remainder of the lot; the alternate grading scenario assumes topsoil strip across the entire developed area with no "tapering off". Likewise the unit cost of $0.20/sf for general lot grading is applied evenly across the entire conventional lot with no tapering off, reflecting more involved lot grading, increased overhead costs, and/or other contingencies. Under this scenario, the cost savings with conservation development increase to a 16% average project savings and a 29% average per-unit savings. This also demonstrates that increases (regardless of cost category) to unit costs or quantities will expand the gap of cost savings between conservation development and conventional development.

Table 3: Multiple Project Cost Comparison Spreadsheet

Project:	P1	P1	P2	P2	P3	P3	P4	P4	P5	P5	P6	P6	P7	P7	P8	P8	P9	P9	P10	P10	PROJECT, BY ITEM CUMULATIVE	Range of Value among projects for each Cost Category (Least/Most Favorable Change; higher $ amounts & negative % favor conservation development)			
	$	%	$	%	$	%	$	%	$	%	$	%	$	%	$	%	$	%	$	%	%	$	%	$	%
Description	Diff.	Change	Diff.	Change	Diff.	Change	Diff.	Change	Diff.	Change	Diff.	Change	Diff.	Change	Diff.	Change	Diff.	Change	Diff.	Change	Change	Least Favorable Change	Least Favorable Change	Most Favorable Change	Most Favorable Change
GRADING SUBTOTAL	$73,021	-22%	$108,602	-54%	$407,958	-49%	$385,099	-38%	$443,022	-35%	$205,163	-22%	$250,729	-45%	$96,088	-39%	$451,234	-50%	$478,276	-34%	-39%	$73,021	-22%	$478,276	-54%
ROADWAY SUBTOTAL	$84,702	-15%	$18,754	-13%	-$16,477	4%	-$130,230	15%	$1,464,599	-54%	$1,187,386	-60%	$205,168	-22%	$9,231	-4%	$9,593	-1%	$801,484	-35%	-18%	-$130,230	15%	$1,464,599	-60%
STORM SEWER SUBTOTAL	$181,611	-53%	$28,398	-33%	$6,648	-3%	$89,676	-17%	$974,689	-65%	$547,184	-51%	$210,289	-43%	$65,501	-44%	$100,491	-27%	$626,095	-55%	-39%	$6,648	-3%	$974,689	-65%
SANITARY SUBTOTAL	$41,614	-10%	-$5,765	6%	$0	0	-$218,464	37%	$850,962	-43%	$224,776	-17%	$54,236	-8%	-$15,502	9%	-$10,915	2%	$397,558	-26%	-5%	-$218,464	37%	$850,962	-43%
WATERMAIN SUBTOTAL	$44,483	-9%	-$6,141	4%	-$63,680	19%	-$232,051	33%	$905,157	-42%	$240,064	-17%	$57,705	-8%	-$16,257	7%	-$11,468	2%	$423,889	-26%	-4%	-$232,051	33%	$905,157	-42%
EROSION CONTROL SUBTOTAL	$0	0%	$0	0%	$0	0%	$0	0%	$0	0%	$0	0%	$0	0%	$0	0%	$2,428	-8%	$0	0%	-1%	$0	0%	$2,428	-8%
OFFSITE SANITARY SUBTOTAL	$0	0%	$0	0%	$0	0	$0	0%	$0	0%	$0	0%	$0	0%	$0	0%	$0	0%	$0	0%	0%	$0	0%	$0	0%
LANDSCAPE/RESTORATION SUBTOTAL	-$56,500	95%	-$74,857	178%	-$277,472	164%	-$400,321	158%	-$407,131	147%	-$597,616	176%	-$160,341	140%	-$93,954	164%	-$220,469	112%	-$380,992	134%	147%	-$597,616	178%	-$56,500	95%
AMENITIES SUBTOTAL	$17,572	-7%	-$16,202	26%	-$94,399	51%	-$226,216	54%	$552,667	-43%	$221,666	-24%	$7,825	-2%	-$15,749	15%	-$56,521	16%	$266,982	-27%	6%	-$226,216	54%	$552,667	-43%
CONTINGENCIES/ENG/LEGAL (25%)	$0	0%	$0	0%	$0	0%	$0	0%	$0	0%	$0	0%	$0	0%	$0	0%	$0	0%	$0	0%	0%	$0	0%	$0	0%
																					AVG Project Cost Savings of Conservation over Conventional development				
By Project Cumulative % Change	$386,503	-12%	$52,789	-5%	-$37,422	1%	-$732,508	13%	$4,783,964	-34%	$2,028,622	-20%	$625,613	-13%	$29,359	-2%	$264,373	-6%	$2,613,291	-22%	-10%	-$732,508	13%	$4,783,964	-34%
																					AVG Cost Savings per Unit				
Per Unit Savings w/Conservation	$6,238	-22%	$2,399	-5%	$51,139	-39%	$15,734	-34%	$2,082	-7%	$10,876	-33%	$6,115	-16%	$11,890	-36%	$17,934	-24%	$11,397	-30%	-25%	$2,082	-5%	$51,139	-39%

Conclusion

Using the ten example projects, this multiple-project comparison shows an average 10% projected development cost-savings for ecologically designed conservation-development concepts over conventional development concepts. When the cost results were divided by the number of lots (on average, there were higher lot counts with ecologically designed conservation developments) the average cost savings per unit was even higher at 16%. Under an alternative scenario where grading costs are higher due to increased topsoil stripping and more involved lot grading, the cost savings range upward to 29% average project cost savings and 28% average per unit cost savings with conservation development.

A number of quantitative elements are clearly critical for this to be possible:

- Smaller lots: The same number or more lots (than are possible under conventional development) can front less roadway with narrower lot widths, and more open space using shallower lot depths
- Shorter roads: This reduces the cost of pavement, curb and gutter, sidewalk, street trees, lamp posts, fire hydrants and other associated utilities
- Narrower roads: This reduces the cost of pavement and shortens lengths of laterals, culverts, etc. (also has a traffic-calming effect, beneficial for local streets)
- Shorter infrastructure runs based on road layout take-offs: This reduces the cost of utilities

Other benefits of ecologically designed conservation-development designs not covered in this study include:

- Smaller lots increase the flexibility of subdivision layout to work around natural resources, orient houses to quality views, and create neighborhoods
- Lots adjacent to quality (restored) open spaces with trails maintain or exceed the value of larger conventional lots (i.e. give people access to more high-quality space than they would otherwise have with a larger conventional lot)
- Large open spaces enable the use of naturalized stormwater management systems, which reduces the need for (and cost of) curbs, gutters, inlets, and pipes, and increases the local water quality
- Large open spaces make better areas for habitat creation, which attracts songbirds, butterflies, etc. for homeowners' enjoyment. Trails allow homeowners to interact with natural areas and their neighbors
- When houses abut open space (the authors strive to have every home back onto or face open space), homeowners have visual access to nature by simply looking out their windows, and have direct physical access to nature by walking out their door. These have shown to also have higher lot values and faster absorption rates

This study indicates significant infrastructure cost-savings using ecologically based conservation-development designs over conventional designs. Ecologically based conservation-development design is cost-effective, and contributes to positive benefits from the open-space systems for stormwater quality, groundwater recharge, connected greenspace and restored habitat, increased biodiversity, farmland preservation, as well as increased pedestrian connectivity and enhanced interaction with nature. These benefits are already established in completed conservation developments such as Prairie Crossing (prairiecrossing.com) and the Sanctuary of Bull Valley (sanctuaryofbv.com), including some of the projects used in this study.

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Appendix H: Baseline Water Quality Characteristics Flint and Spring Creek Watersheds, Illinois

Baseline Water Quality Characteristics
Flint and Spring Creek Watersheds, Illinois

for

Flint/Spring Creek Watershed Partnership
Citizens for Conservation

July 2016

KOT ENVIRONMENTAL CONSULTING, INC.
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EXECUTIVE SUMMARY

Previously, the Illinois EPA listed Flint Creek as being impaired and Spring Creek as not being impaired. The reason that Spring Creek was listed as not being impaired was because it had never been assessed. The impairment of Flint Creek was caused by several factors including other flows into the Creek, low dissolved oxygen, high total phosphorous, and high aquatic algae content. The low dissolved oxygen levels are caused by the large amounts of aquatic algae in the creek causing increased eutrophication. The aquatic algae buildup is due in part to the interruption of flow due to the large number of dams in the creek and their resulting impoundments. Also, contributing to the aquatic algae buildup was the urban runoff and stormwater that increases the amount of phosphorus and other nutrients available in the creek. A review of the available water quality data indicated consistently high values of phosphorus, chloride and total suspended solids. Additionally, Flint Creek had consistently reported high values of biological oxygen demand and fecal coliform.

A water quality monitoring event was conducted in both the Flint and Spring Creek watersheds during the summer of 2015 and was supported by an Illinois EPA 319 grant. This event was the implementation of the approved water quality plan (KOTECI, 2015a) and was conducted following the procedures detailed in the water quality plan and the approved quality assurance project plan (KOTECI, 2015b). The collected data were used to characterize baseline conditions in both watersheds. Data were collected from 30 sampling locations, 25 locations in the Flint Creek watershed and five locations in the Spring Creek watershed. Very little data analysis could be conducted on this first set of data collected. Little more than presenting the data with descriptive statistics could be accomplished. A minimum of three data sets and preferably six data sets are required for any statistical analysis of the data to conduct comparisons and develop trends.

Orthophosphate in both watersheds makes up a significant portion of the total phosphorus available. No orthophosphate values were measured in any of the lakes. The headwaters of the East Branch in Deer Park is the only location where the total phosphorus is significantly greater than the orthophosphate. At the Barrington POTW there is a large influx of phosphorus, mainly in the form of orthophosphate, that is carried on down to the confluence of the East Branch with the Main Branch of Flint Creek and is further assimilated/diluted as the water moves through Barrington Hills and into Lake Barrington at Flint Lake. Phosphorus levels in Spring Creek are very low but the highest value was found at the headwaters in South Barrington. Phosphorus levels decrease as the creek flows North to its confluence with the Fox River.

In a stream system that is unaffected by urbanization, one would expect total phosphorus, orthophosphate, dissolved oxygen and BOD to be interrelated. In this situation orthophosphate would be expected to be low and the dissolved oxygen levels high with BOD having low values. In urbanized streams such as we have with the Flint Creek and to a lesser extent in Spring Creek, this relationship is not always valid.

Chloride in streams is mostly due to urban runoff. In the Flint and Spring Creek watersheds chloride makes up about 32 percent of the TDS values. Local hardness values were estimated to

be about 45 percent, therefore, chloride and hardness make up about 77 percent\of the TDS in the creeks.

Although most of the iron concentrations are above the criteria all of the concentrations are below two mg/L with the exception of two apparent outliers having concentrations of 11 and 5.3 mg/L respectively.

A significant number of the E. coli values are above the 200 colonies/100 mL criteria. The outflow of Baker's Lake has an E. coli value of 1300 colonies/100 mL probably as a result of the heron rookery located in the Lake. A high value of E. coli was also recorded at the Barrington POTW and at the sampling location prior to the confluence with the Main Branch of the Flint Creek. No E. coli values were recorded in the lakes.

Analyte loadings to the Fox River were estimated for those analytes that did not meet water quality criteria. Review of the loading of these constituents to the Fox River provides insight to the overall health of the creeks. Loadings were estimated using discharge measurements and analyte values from the sampling station closest to the Fox River. The estimated loadings reflect the conditions present during this water quality monitoring effort and are likely to change during the course of the year.

The analysis shows that total phosphorus and orthophosphate in the Flint Creek watershed are a problem. Total phosphorus and orthophosphate in the watershed need to be reduced by 82.5 and 94.9 percent respectively to meet water quality criteria loads calculated for conditions encountered during this water quality monitoring event.

Chloride loading to the Fox River is the only analyte in the Flint Creek watershed that meets the estimated water quality criteria loading values. TDS and iron also are over the loadings estimated based on the water quality criteria and their loadings need to be reduced by less than 40 percent to meet the goals.

Analyte loadings from the Spring Creek to the Fox River were estimated to be below the calculated water quality criteria loads for all the analytes with the exception of TDS. TDS needs a 6 percent reduction to meet the goals. This indicates that the Spring Creek was in good health at the time that this water quality monitoring event took place.

The phosphorus loading estimates are an indicator of the degree of urbanization of the Flint Creek watershed and to a lesser extent the Spring Creek watershed. The fate of phosphorus in the watersheds includes uptake and release by vegetation, periphyton and microorganisms; sorption and exchange reactions with soils and sediments; chemical precipitation in the water column; and sedimentation and entrainment. These mechanisms exemplify the combined biological, physical, and chemical nature of phosphorus retention in the stream wetlands and stream itself. The estimated loads to the Fox River represent the amount of phosphorus that can't naturally be assimilated by the streams. Therefore, remedial actions need to be established that will increase the amount of phosphorus that can be assimilated by the watershed or removed from the system.

The Barrington PTOW is the only point source remedial action that removes phosphorus from the system. The PTOW discharge averages about 2 million gallons per day (mgd). During the

low-flow period that was in effect during the water quality monitoring event, PTOW discharge accounted for about three quarters of the Flint Creek flow into the Fox River. Influent total phosphorus levels range from 2 to 3 mg/L and the average total phosphorus discharge concentration was approximately 1.500 to 2.250 mg/L most of which is assimilated by the Flint Creek wetlands and the stream itself. The PTOW is in the process of upgrading its treatment in order to meet the US EPA's new discharge criteria of 0.1 mg/L of total phosphorous. The proposed upgrade is expected to reduce the total phosphorus discharge level to as low as 0.010 mg/L.

The Flint Creek and Spring Creek watershed-based plans (AES, 2007 and 2012) each have a comprehensive list of remedial actions that can be undertaken in each jurisdiction. Each of these remedial actions address the removal of phosphorus, orthophosphate, TDS, and iron by improving the assimilation capacity of the watershed. Chloride is conservative and these actions will have a limited effect on assimilation of chloride. A number of these remedial actions include the maintenance of existing facilities such as detention basins, wetlands and other riparian areas. Private landowners and local environmental organizations are involved in removing invasive species. The CFC has conducted and is conducting extensive prairie and savanna restoration. Most of these remedial actions are relatively inexpensive and are very effective in removing runoff pollutants.

1.0 INTRODUCTION

A significant amount of monitoring data has already been collected from the two watersheds. Most of these data have been collected by entities having ongoing established monitoring programs. These entities include: Lake County Health Department-Lakes Management Unit, Illinois EPA Lake Monitoring Program, Citizens for Conservation, Illinois EPA and Illinois DNR Intensive River Survey Program, and River Watch Citizen Scientists. Additionally, the MS4 monitoring conducted by the jurisdictions within the watersheds has also provided a substantial amount of data and the sampling locations established as part of this effort will form the basis of the proposed monitoring network.

Data was collected to establish baseline conditions for chemical, biological, and physical water quality indicators such as nutrients, suspended solids, water clarity, and dissolved oxygen. Also included, were physical parameters such as habitat characteristics, temperature, oxygen concentration, specific conductance, and pH. These data will be collected annually. Additionally, geochemical characteristics will be established on a five-year basis to monitor the water source and changes in groundwater discharge areas. Habitat characteristics will be assessed by using the Macroinvertebrate Biotic Index (MBI).

Hydraulic performance resulting from significant rain events and/or the implementation of a given best management practice (BMP) will be established. Water quality in streams is most often assessed at different locations following significant precipitation events to determine pollution loads resulting from human activities. Hydraulic conditions will be evaluated by assessing parameters such as peak discharge rate, reduction in total volume discharge, baseflow, and time effects of discharge once enough data has been collected.

1.1 Implementation

This water quality monitoring effort is the implementation of a plan described briefly above and in more detail in the Final Water Quality Monitoring Plan (KOTECI, 2015a) that was developed in 2014 and finalized in 2015. Funding for this implementation was provided by an Illinois EPA grant (Illinois EPA Section 319 FAA 319-1504). At the same time, quality assurance procedures were also implemented relative to this plan as documented in the Final Quality Assurance Project Plan (KOTECI, 2015b). Sampling procedures and standard operating procedures for in field data collection were included in the water quality monitoring plan. In field measurements were conducted and samples were collected by Integrated Lakes Management, Inc. of Waukegan Illinois. Samples were analyzed and laboratory quality assurance procedures referenced in the QAPP were conducted by the McHenry Analytical Water Laboratory, Inc. of McHenry, Illinois and by the Lake County Health Department located in Libertyville, Illinois.

2.0 BACKGROUND

The locations of the Flint and Spring Creek watersheds are presented in Figures 1 and 2. The watershed-based plans were completed in 2007 and 2012 respectively for the Flint and Spring Creek watersheds (AES, 2007 and 2012) and both recommended the implementation of a water quality monitoring program. The following background sections have been paraphrased for the most part from the watershed-based plans.

2.1 Geology

The terrain of the area was formed by glaciation. The most recent glacial event was known as the Wisconsin Episode and ended about 14,000 years ago. During this period the Earth's temperature warmed and the ice slowly retreated leaving behind moraines and glacial ridges where it stood for long periods of time (Hansel, 2005). A tundra-like environment covered by spruce forest was the first ecological community to colonize after the glaciers retreated. As temperatures continued to rise, tundra was replaced by cool moist deciduous forests and eventually by Oak-hickory forests, Oak savannas, marshes, fens, seeps and prairies.

The nearby Fox River was formed at the end of the Wisconsin glaciation as a stream at the edge of the Valparaiso Moraine system and an older moraine to the west. Flint and Spring Creek watersheds are a part of this Valparaiso moraine system, which created the picturesque rolling hills and valleys found here today (Hansel, 2005). The composition of the soils in the watersheds is also a remnant of the ancient ice and movement. Above the bedrock lies a layer of deposits left behind from the glaciers, consisting of unconsolidated materials such as clay, silt, sand, gravel and limestone cobbles. Groundwater, within these deposits, is the main source of water for the residents of the Barrington area.

2.2 Climate

The northern Illinois climate can be described as temperate with cold winters and warm summers where great variation in temperature, precipitation and wind can occur on a daily basis. Lake Michigan does influence the area to some degree but not as much as areas immediately adjacent to the lake where it reduces the heat of summer and buffers (warms) the cold of winter. Surges of polar air move southward or tropical air moves northward causing daily and seasonal temperature fluctuations. The action between these two air masses fosters the development of low pressure centers that generally move eastward and frequently pass over Illinois, resulting in abundant rainfall. Prevailing winds are generally from the West, but are more persistent and blow from a northerly direction during the winter.

2.3 Topography

The Flint Creek watershed generally drains northwest to the Fox River. The highest point (916 feet above sea level) is located in the southernmost tip of the watershed near Crabtree Lake. The lowest point in the watershed (731 feet above sea level) is Flint Creek's confluence with the Fox River. The difference in the highest and lowest points reflects a 185-foot change in elevation.

The watersheds eastern boundary is formed by a ridge line separating the watershed from adjacent watersheds to the east (Indian Creek, Buffalo Creek, and upper salt Creek) that drain to the Des Plaines River. The western boundary of the Flint Creek watershed coincides with the eastern boundary of the spring Creek watershed.

The Spring Creek watershed drains from South to North and eventually to the Fox River within the municipality of Fox River Grove. The highest point in the watershed (948 feet above sea level) is not in the southern tip of the watershed as one might expect but rather along the top of the ridge on the west side of the watershed. As expected the lowest point (731 feet above sea level) is where Spring Creek enters the Fox River. The difference in the highest and lowest points reflects a 217-foot change in elevation. The southern third of the watershed is relatively flat while the northern two thirds contains a variety of ridgelines along the clearly defined Spring Creek Valley

2.4 Watershed Hydrology

Three primary water bodies are located in the Flint Creek watershed (Figure 3). The first and largest water body is Flint Creek that flows for 18.6 miles and drains 17.3 square miles of the western and southern areas of the watershed. The second water body is the East Branch of Flint Creek that flows west for 10.8 miles and drains 8.5 square miles of the southeastern area of the watershed before the confluence with Flint Creek just west of Barrington. The third water body is North Flint Creek that flows west for 15.8 miles and drains 10.7 square miles of the northwestern area of the watershed prior to traveling another 1.7 miles to the confluence of the Fox River.

The headwaters of the main stem of Flint Creek originate in Cook County in a series of detention ponds east of Barrington Road in the far southeast corner of the watershed. From here, a stream channel flows west under Barrington Road and into LaBuys Lake located within the Crabtree Nature Preserve in the southern portion of the watershed. Water leaving the lake flows west before turning north and entering the Hawley, Keene and Hawthorne lake chain. Water exits this chain of Lakes on the north side of Hawley Lake and flows north where it enters Lake County at Lake-Cook Road and eventually joins East Flint Creek just west of Barrington.

East Flint Creek originates at Baker's Lake in Cook County and generally flows north across Lake-Cook Road into Lake Louise. The stream channel that exits Lake Louise flows through the southern portion of Cuba marsh where it joins several smaller tributaries that drain the marsh and Deer Lake/Meadows Lake east of Vila Road. At this point East Flint Creek turns to the west and flows through heavily developed areas in Barrington before joining the main stem of Flint Creek.

After the main stem of Flint Creek and East Flint Creek converge, the main stem continues to the west through large lot residential areas before turning back to the north through additional large lot development and extensive wetland complexes managed by Citizens for Conservation (CFC). The main stem eventually joins North Flint Creek before entering Flint Lake where it continues

as the main stem of Flint Creek for approximately 1.7 miles to the Fox River. Much of this final 1.7 mile reach to the Fox is located within the Grassy Lake Forest Preserve.

The headwaters of North Flint Creek originate in Lake Zurich. Water leaving Lake Zürich flows to the north for a short distance through wetland complexes before entering Echo Lake. From Echo Lake, the stream turns to the west where it flows for several miles through varying residential and open-space land uses before entering grassy Lake. Wynstone tributary enters North Flint Creek just upstream from grassy Lake. It drains Dogbone Lake and its surrounding watershed within the Wynstone golf course. Another small tributary called Honey Lake Drain enters Grassy Lake from the east. Honey Lake Drain actually begins just southeast of Honey Lake as a small feeder stream to the lake. Water exiting Grassy Lake to the west again forms the North Flint Creek stream channel that flows west for another mile before entering main Flint Creek just before it enters Flint Lake.

Spring Creek originates within the relatively new "Woods of South Barrington" residential community in the southeast portion of the watershed (Figure 4) and flows west then north through residential and agricultural land for 1.5 miles before entering Spring Creek Valley Forest Preserve where it flows north for over 7 miles and through four lake/ponds including Penny Road pond, Galvin's Lake, Spring Lake, and Mud Lake. The next 2-mile reach of Spring Creek flows north of County Line Road through a large equestrian area before turning to the northwest through large lot residential areas for another 2 miles than small lot residential for another mile before entering the Fox River.

2.5 Land Use

Prior to European settlement in the 1830s, the Flint and Spring Creek watersheds contained a complex interaction between many natural communities including prairies, savannas, and wetlands. The watersheds were comprised mostly of savanna and upland prairie communities, wetland communities such as marsh, sedge meadows, and what prairies were present around Lake in stream corridors. Today, the land cover is very different due to human induced land use changes (Table 1). European settlement resulted in large tracts of savanna being cleared, prairies tilled for farmland or developed, wetlands drained and streams straightened for agricultural purposes. Many natural areas still exists but many have become degraded as natural processes such as fire are lost and invasive species such as buckthorn and reed canary grass replaced native species

2.6 Groundwater Recharge

Groundwater is one the most important factors affecting the ecology of the watersheds. Groundwater is the base flow of streams and contributes water to many of the ponds lakes and wetlands of the watersheds. This water is supplied by the shallow groundwater system. The system consists of the limestone/dolomite bedrock underlying the watersheds plus the overlying unconsolidated materials left behind by the recession of the glaciers. The unconsolidated materials mainly consists of clay, silt, sand, gravel and the combinations thereof that are saturated with water. Groundwater is in storage in the void spaces between the particles of the

unconsolidated materials. The coarser materials such as sand and gravel form unit/formations called aquifers and are the source of water extracted for human consumption in the area.

Recharge is the process by which precipitation reaches and re-supplies the groundwater. After precipitation reaches the ground a significant portion runs off and/or evaporates. Of the portion that infiltrates the surface soil, most eventually evaporates from the soil or is taken up and used (transpired) by plants. In areas near streams, rivers, ponds and lakes some of the portion that infiltrated the soil will travel through the near surface soils (upper few feet) and become delayed discharges to these water bodies within a few days of the precipitation event. In terms of annual precipitation, runoff and immediate evaporation accounts for approximately 26 and 5 percent of the precipitation respectively. About 69 percent of the precipitation enters the surface soil were 53 percent of the precipitation evaporates from the soil, is transpired by a plants is discharged by shallow subsurface flow. The remaining 16 percent travels downward through the underlying unconsolidated materials, reaches the groundwater and becomes groundwater recharge. Figure 5 shows the location of the recharge areas in the watersheds while Table 2 lists the acreage of each of the recharge characteristics in the watersheds.

2.7 Jurisdictions

Many types of natural resources throughout the United States are protected to some degree under federal, state, and/or local law. In the Chicagoland region, the U. S. Army Corps of Engineers (USACE) and surrounding counties regulate wetlands through Section 404 of the Clean Water Act and local stormwater ordinances respectively. The U. S. Fish and Wildlife Service (USFWS), Illinois Department of Natural Resources (IDNR), Illinois Nature Preserves Commission (INPC), and Forest Preserve Districts protect natural areas and threatened and endangered species. Local municipalities also have codes that address other natural resource issues. Watershed protection in McHenry, Lake, Kane and Cook County's is primarily the responsibility of county and city level government. The jurisdictions pertinent to the Flint and Spring Creek watersheds are listed in Table 3 along with the acreage and percent of watershed area for each jurisdiction.

2.8 Water Quality Assessment

The Federal Clean Water Act requires Illinois and all other states to submit to the US EPA a biannual report of the quality of the state surface and groundwater resources called the *Integrated Water Quality Report.* These reports must also describe how Illinois assessed water quality and whether assessed water's meet or do not meet water quality standards specific to each "Designated Use" of a water body as defined by the Illinois Pollution Control Board (IPCB). When a water body is determined to be impaired, Illinois EPA must list potential reasons for impairment in the 303 (d) impaired waters list. There are seven "Designated Uses" in Illinois; Illinois EPA has assigned five of these uses to the Flint and Spring Creek watersheds as listed in Table 4.

The Illinois EPA lists Flint Creek as being impaired and Spring Creek as not being impaired. The reason that Spring Creek is listed as not being impaired is because it has never been assessed. The

impairment of Flint Creek is caused by several factors including other flows into the Creek, low dissolved oxygen, high total phosphorous, and high aquatic algae content. The low dissolved oxygen levels are caused by the large amounts of aquatic algae in the creek causing increased eutrophication. The aquatic algae buildup is due in part to the interruption of flow due to the large number of dams in the creek and their resulting impoundments. Also, contributing to the aquatic algae buildup is the urban runoff and stormwater that increases the amount of phosphorus and other nutrients available in the creek. A review of the available water quality data indicates consistently high values of phosphorus, chloride and total suspended solids. Additionally, Flint Creek has consistently reported high values of biological oxygen demand and fecal coliform.

3.0 WATER QUALITY MONITORING PLAN

The Plan's immediate objective was to establish baseline water quality conditions. Implementation took place in mid-August 2015. The establishment of baseline water quality conditions of the watersheds and continued monitoring allowed us to realize the following goals; 1) assess the current state of water quality resulting from non-point source pollution within the creeks and lakes; 2) assess changes in water quality to see how well implemented best management practices are working to remove pollutants for meeting water quality targets and ultimately milestones and project goals; and 3) assess the volume of groundwater discharge to the creeks to make preliminary assessments of the viability of the ecological health of the watersheds and of the groundwater supply that is the area's only water resource. The following monitoring program was initiated to achieve the objective and the goals.

3.1 Historical Data

Several jurisdictions and interested organizations have been collecting water quality data from the Flint and Spring Creek watersheds for several years. These data have been reviewed and provided a foundation of the database that is being developed as part of this monitoring program. Six of the jurisdictions have NPDES permits and are participating in the EPA's municipal separate storm sewer systems (MS4) program. Lake Barrington, North Barrington, Deer Park, Barrington, and Barrington Hills are all collecting MS4 data in the Flint Creek watershed and Barrington Hills and South Barrington are collecting MS4 data from the Spring Creek watershed. Additionally, the Citizens for Conservation collects biological data in the Flint Creek watershed and the River Watch organization occasionally collects biological data in both watersheds.

Review of the existing data emphasized the inconsistency of the data collection effort indicating the lack of coordination between the data collection entities. Data were collected at different times of the year and the selected analytes and field measurements were not consistent over the data collection entities. One thing that was evident in reviewing the existing data was that the data collection locations provided good coverage of the Flint and Spring Creek watersheds.

3.2 MS4 Sampling Locations

The MS4 sampling locations provided the basis for the monitoring plan data collection locations. A review of the existing MS4 sampling locations indicated that several jurisdictions were collecting data from the same locations and a few sampling locations did not have optimal placement. Duplicate MS4 sampling locations were eliminated and some of the locations were shifted but were still able to meet jurisdictional requirements for the MS4 permits. Additionally, Lake County has been sampling the major lakes in the Flint Creek watershed and they will continue to do so. Figure 6 shows the Flint and Spring Creek watersheds and identifies the stream branches while Table 5 presents the names of the branches and the acronyms used. The final MS4 sampling stations and their locations are listed in Table 6 and shown in Figure 7. Figures 8 through 14 are stream profiles of Flint Creek and its branches showing the locations of sampling points in greater detail. Figures 15 and 16 are stream profiles of Spring Creek.

The monitoring plan relied on the MS4 sampling stations. Water quality data for the monitoring plan and MS4 data required for NPDES permitting were collected annually in August.

3.3 Recording Stream Gages

Eight sites were selected for installation of recording stream gages. Four stream gages have been installed and four more are planned when funding is available. The stream gage data is used to study the effect of significant storm events on the hydraulics of the creeks, monitor the annual base flow (groundwater discharge), and establish surface flow and base flow trends once sufficient data are available. The stream gage locations are also sampling stations. These eight sampling stations will be sampled semi-annually after a significant precipitation event (>1.0 inches) in addition to the normal sampling event. Stream gage locations are presented in Table 7 and in Figure 17.

3.4 Biological Sampling

The Macroinvertebrate Biotic Index (MBI) and Index of Biotic Integrity (IBI) have been conducted on a fairly regular basis by the Citizens for Conservation and by the River Watch organization. These two entities will continue with their monitoring activities. Lake County has monitored the larger lakes in the Flint Creek watershed and has been reporting the Trophic State Index (TSI) on a regular basis and continued to do so. In addition, we have designated the stream gage station locations as additional sites for collection of biological data. It was expected that biological sampling would occur at each of the eight locations, but was reduced to one location during this monitoring effort due to logistical and funding constraints. All the proposed biological sample stations are shown in Table 8 and in Figure 18.

3.5 Analytes and Field Measurements

Table 9 lists the analytes for which samples were analyzed in the laboratory and the measurements that were taken in the field. A contractor was contracted to conduct field measurements and collect samples. The information in Table 9 is divided into four groups, field measurements, standard water quality analytes, geochemical characterization analytes, and biological assessments. The field measurements are standard measurements that are usually taken in the field with the exception of oxidation-reduction potential (ORP). ORP is required for the geochemical characterization. Data from the standard water quality analyses were used to assess the health of the watershed. Geochemical analysis information was used to establish the type of water, its origin, and anthropogenic impacts. The information may also be used to identify groundwater discharge areas within the watershed once additional data are collected.

3.6 Frequency

Baseline water quality sampling was conducted on August 13 and 14, 2015. All of the analyses and measurements in the four groups shown in Table 9 were conducted during this this sampling event. Results from this effort were used to establish baseline conditions of the Flint and Spring Creek watersheds. Monitoring will take place semi-annually conducting field measurements and analyzing collected samples for the analytes listed in the standard water quality analytes group. Every fifth year the measurements and analysis of analytes in the geochemistry characterization group will be included. All subsequent sampling event results will be compared to baseline conditions to determine if conditions in the watersheds are improving or degrading. Once enough data has been collected (five years or more) statistical analysis will be conducted to establish trends.

Abbreviated sampling will take place after a storm event of one inch or more to evaluate the effect of stormwater runoff on the watersheds during years that monitoring events take place. The stormwater sampling event took place on October 28, 2015. Measurements were conducted and samples collected at the eight stream gage locations. Samples were analyzed for the analytes that are representative of stormwater runoff as shown in Table 9.

4.0 WATER QUALITY MONITORING EVENT LOGISTICS

The water quality sampling event took place on August 13 and 14th 2015. Sampling for the storm water event took place on October 28, 2015. The logistics of the sampling events are described below.

4.1 Chain-of-Custody

Samples are in custody when they are in the custodians view, stored in a secure place with restricted access, or placed in a container secured with custody seals. A chain-of-custody record was signed by each person who had custody of the samples and accompanied the samples at all times. Copies of the chain-of-custody were included in the laboratory and QA/QC reports.

The forms included the following information:

- Site name
- Field coordinator's name and team member names responsible for collection of the listed samples
- Collection date and time of each sample
- Sampling type (e. g., composite or grab)
- Sampling station location
- Number of sample containers shipped
- Date and time of transfer and the name of designated sample custodian at the receiving facility.

The field coordinator, as the designated field sample custodian, was responsible for all sample tracking and chain-of-custody procedures for samples in the field. The sample custodian was responsible for final sample inventory and maintained sample custody documentation. The custodian completed chain-of-custody forms prior to transfer to the laboratory. Upon transferring samples to the laboratory, the field coordinator signed, dated and noted the time of transfer on the chain-of-custody form.

The original chain-of-custody form was transported with the samples to the laboratory. The laboratory designated a sample custodian who was responsible for receiving the samples and documenting their progress through laboratory analytical process. Each custodian ensured that the chain-of-custody and sample tracking forms were properly completed, signed, and initialed upon transfer of the samples.

4.2 Sample Handling and Transport

Sampling coolers and packing materials were supplied by the analytical laboratory. Individual sample containers were placed into sealed plastic bags. Samples were then packed in a cooler lined with a large plastic bag. Glass jars were packed to prevent breakage and separated in the shipping containers by bubble wrap. Ice sealed in plastic bags or "blue ice" were then placed in the cooler to maintain the temperature of approximately 4° C. When the collected samples were placed in the cooler and were ready to be shipped, the chain-of-custody form was placed in a Ziploc bag and taped to the inside lid of the cooler.

Each ice chests was sealed with three chain-of-custody seals. On each side of the cooler a *This End Up* arrow label was attached; a *Fragile* label was attached to the top of the cooler. The coolers were clearly labeled with sufficient information (i. e., name of project, time and dates container was sealed, person sealing the cooler, and company name and address) to enable positive

identification. These packing and shipping procedures were in accordance with U. S. Department of Transportation regulations as specified in 49 CFR 173.6 and 49 CFR 173.24.

Upon receipt of the samples by the laboratory, the laboratory sample custodian inventoried the samples by comparing sample labels to those on the chain-of-custody document. The custodian entered the sample number into a laboratory tracking system by project code and sample designation. The custodian assigned a unique laboratory number to each sample and was responsible for distributing the samples to the appropriate analysts or for storing samples in an appropriate secure area.

4.3 Field Logbook and Forms

All field activities and observations were noted in the field logbook during fieldwork. The field logbook is a bound document containing individual field and sample log forms. Information included personnel, date, time, station designation, sampler, types of samples collected, and general observations. Any changes that occur at the site and the reasons for these changes were documented in the field book. The logbook identified on-site visitors and the number of photographs taken at the sampling location. The field coordinator was responsible for ensuring that the field logbook and all field data forms were correct.

Descriptions of all field activities were clearly written with enough detail so that participants could reconstruct events later if necessary. Feel logbooks described any changes that occurred at the site, in particular, personnel and responsibilities, or deviations from the plan as well as the reasons for the changes. Requirements for logbook entries included the following:

- Logbooks were bound, with consecutively numbered pages.
- Removal of any pages, even if illegible was prohibited.
- Entries were made legibly with black (or dark) waterproof ink.
- Unbiased, accurate language was used.
- Entries were made while activities were in progress or as soon afterward as possible (the date and time that the notation is made was noted, as well as the time of the observation itself.
- Each consecutive day's first entry was made on a new, blank page.
- The date and time, based on a 24-hour clock appeared on each page.
- When field activity was complete, the logbook was entered into the project file.

In addition to the preceding requirements, the person recording the information initialed and dated each page in the field book. If more than one individual made entries on the same page, each recorder initialed and dated each entry. The bottom of the page was signed and dated by the individual who made the last entry. The field team and task leader, after reading the day's entries, also signed and dated the last page of each daily entry in the field logbook.

Logbook corrections were made by drawing a single line through the original entry, allowing the original entry to be read. The corrected entry was written alongside the original. Corrections were initialed and dated.

Type of information that was included in the field logbook and/or field data forms included the following:

- Names of all field staff
- Station name and location
- Date and collection time of each sample
- Observations made during sample collection, including weather conditions, complications, and other details associated with the sampling effort
- Sample description.

Field data sheets and sample description forms were completed for all samples and kept in the project file.

4.4 Field Quality Control Samples

Quality assurance (QA) and Quality control (QC) requirements were instituted during field sampling, laboratory analysis, and data management to ensure that the data quality objectives were met.

4.5 Laboratory Analyses

Laboratory analyses were performed according to the QAPP. Samples were analyzed and measurements made as detailed in the QAPP.

4.6 Data Management and Reporting

During field, laboratory, and data evaluation operations effective data management is the key to providing consistent, accurate, and defensible data and data products. The management and reporting of field and laboratory data generally followed the procedures outlined in the QAPP.

4.7 Sample Numbering

All samples were assigned a unique identification code based on a sample designation scheme designed to suit the needs of the field personnel, data management and data users. Sample identifiers consist of three or four components. The first component is FC or SC identifying the watershed in which the sample was taken, the second component, are the initials of the village that has responsibility for the sample location, and the third component is the sample location number

beginning at number one at the furthest upstream sampling location. The forth component is a Q, T or a B indicating a stream gaging station, a public owned treatment works (PTOW) or a biological sampling location respectively.

Examples of Sample Labels Include:

- FCDP1: Flint Creek watershed, Village of Deer Park, uppermost stream sample location.
- FCB3T: Flint Creek watershed, Village of Barrington, stream sample location at the Barrington PTOW.
- SCBH1Q: Spring Creek watershed, Village of Barrington Hills, uppermost stream sample location having a stream gage.

4.8 Data Management

KOT Environmental Consulting, Inc. used Microsoft Excel, Golden Software Surfer geographic information system (GIS) and Grapher graphing software to manage, summarize, and report the generated data. Data were stored in Excel. These data were accessed to allow the production of shape files with the relevant site functions such as sample locations, stream-reach lengths, and stream gage locations. This greatly reduced the number of files to manage and resulted in the reduction of the data analysis effort. Details of the correct format and protocols for delivery of the validated monitoring data for delivery to the Illinois EPA is provided in the QAPP.

5.0 DATA ANALYSIS

Very little data analysis can be conducted on the first set of data collected. Little more than presenting the data with descriptive statistics can be accomplished. A minimum of three data sets and preferably six data sets are required for any statistical analysis of the data to conduct comparisons and develop trends.

5.1 Chemical Methods

Analytical data was entered into a database in two formats. First, it was placed in the database in its original format without any changes. Secondly, a format was created where the stream branch and sample locations are a function of the analytical results.

A record of descriptive statistics was maintained for each analyte in the second different format. The descriptive statistics included: number of samples, mean, standard deviation, variance, median, minimum, maximum, quantiles, and confidence intervals. This information is of minimal value at the beginning of this program but will increase in importance as more and more data are collected.

Data collected during this monitoring effort are found in Appendix A. Table A1 lists the laboratory qualifiers. Tables A2 through A4 lists the original data collected by McHenry Analytical Laboratories, Lake County Health Department, and Integrated Lakes Management. Table A5 identifies water quality standards. Tables A6 and A7 contain the data results with statistics for the Flint and Spring Creeks respectively. Nine analytes exhibited values above the water quality standards listed in Table A5. These exceedances are shown as graphics presented after Table A7 as Figures A2 through A10.

Accuracy Checks - Two accuracy checks were performed on the data. The first was an anion/cation balance where the values of all the major anions and cations were determined. The sum of the cations in milliequivalents per liter should equal the sum of the anions expressed in the same units. If the analytical work has been done carefully, the differences between the two sums will generally not exceed one or two percent of the total of cations and anions. If the total of anions and cations is less than about 5.00 meq/L a somewhat larger percentage difference can be tolerated. If an analysis is found acceptable on the basis of this check, it can be assumed there are no important errors in concentrations reported for major constituents.

Figure 19 shows the distribution of the cation/anion balances for the 30 samples collected during the monitoring effort. Sample results are numbered from 1 to 30 along the x-axis. Samples 1 to 25 are Flint Creek samples moving downstream from left to right. Samples 26 to 30 are samples taken from Spring Creek also moving from left to right downstream.

The balances at four sampling locations are outliers. The outliers are samples FCB4Q located on the East branch of Flint Creek just before the confluence with the main branch, FCLC5 and FCLC6 located at the inflow and outflow of Lake Louise respectively, and FCLC11 located at the inflow of Flint Lake. Forty seven percent or 14 sample stations exhibit cation/anion balances that do not exceed one or two percent of the test criteria. The remaining 12 stations have cation/anion balances between two and eight percent.

None of the 30 samples have cation plus anion values less than about 5.00 meq/L. The cation plus anion concentrations ranged from 13.5 to 65.1 meq/L with an average value of 26.3 meq/L. Although 47 percent of the samples met the cation/anion balance test criteria, the large amounts of cations and anions in the samples may be responsible for the remaining samples having high cation/anion balances, therefore, invalidating this test.

Another check is using the specific conductivity and total dissolved solids determinations. The TDS value in mg/L should generally be from 0.55 0.75 times the specific conductance in mhos per centimeter for waters of ordinary composition, up to TDS concentrations as high as a few thousand mg/L. Water in which anions are mostly bicarbonates and chloride will have a factor near the lower end of this range, and water high in sulfate may reach or even exceed the upper end.

Figure 20 shows the total dissolved (TDS) solids values as they relate to the to specific conductance criteria listed above. Seven outliers are noted, two of the sampling locations had no value listed for TDS and the remaining five sampling locations listed TDS concentrations of less than four mg/L. The samples having no TDS values were FCLC5 and FCLC11 located at the

inflows of Lake Louise and Flint Lake respectively. Samples having less than four mg/L TDS included FCBH1 located at the headwaters of the main branch of Flint Creek, FCB1 located at the outflow of Baker's Lake, FCS4Q located on the East branch of Flint Creek just before the confluence with the main branch, FCBH4 located on Flint Creek between the confluences of the East branch and the North branch, and SCSB1 located at the headwaters of Spring Creek.

All the remaining samples with the exception of FCDP2 located at the headwaters of the East branch of Flint Creek have TDS values within the criteria. The sample at FCDP2 was slightly below the lower criteria limit. The samples within the criteria are all located closer to the 0.55 SC level than the 0.75 SC level indicating that the anions in the samples are mostly bicarbonate and chloride.

Graphic presentations similar to the above have total dissolved solids and chloride as a function of specific conductivity. In most waters a linear relationship exists between total dissolved solids and specific conductivity as well as between chlorides as a function of specific conductivity.

Figures 21 and 22 present TDS and chloride as a function of specific conductivity respectively. Both figures are the result of comparison between TDS, chloride and specific conductivity for the 30 samples collected during this monitoring effort.

Figure 21 shows TDS as a function of specific conductivity resulting in a linear relationship. This linear relationship is represented by the equation TDS = 589.84SC – 13.518. This model may be used to estimate TDS values from specific conductivity values and has a 98 percent accuracy. Figure 22 shows chloride as a function of specific gravity also resulting in a linear relationship. This relationship is represented by the equation Cl = 250.75SC – 86.368. This model may be used to estimate chloride values from specific conductivity values and has an 84 percent accuracy. Both model accuracies will be improved as data from subsequent monitoring efforts are used to reevaluate these models. The remaining four stream gage stations will have transducers that in addition to measuring water levels on an hourly basis will also record specific conductivity at the same time. The above models will be used to estimate TDS and chloride from these specific conductivity values. This will allow for the determination of how specific conductivity, TDS, and chloride relate to water levels and subsequently stream discharge.

Oxygen - Oxygen is produced during photosynthesis and consumed during respiration and decomposition. Because it requires light, photosynthesis only occurs during daylight hours. Respiration and decomposition on the other hand, occur 24 hours a day. This difference alone can account for large daily variations in dissolved oxygen (DO) concentrations. During the night when photosynthesis cannot counterbalance the loss of oxygen through restoration and decomposition, DO concentrations steadily decline. They are the lowest just before dawn when photosynthesis resumes.

Dissolved oxygen concentrations increase whenever the water flow becomes turbulent, such as in a riffle area, waterfall or dam. Oxygen concentrations are much higher in air, which is about 21% oxygen than in water, which is a tiny fraction of one person oxygen. Where air and water meet the tremendous difference in concentration causes oxygen molecules in the air to dissolve

in water and saturation is reached. More oxygen is dissolved in the water when turbulence caused by rocky bottoms or steep gradients brings more water in contact with surface.

Another physical process that impacts the concentration has to do with the temperature of water and gas saturation. Cold water can hold more gas that is dissolved than warm water so during the summer months, when stream water is warmer, oxygen can be limited by the ability of water to soak up more oxygen. A curve comparing oxygen saturation at different water temperatures can be found in Figure 23. Also shown in the figure, are the dissolved oxygen concentrations for each of the 30 samples collected during a water quality monitoring effort. A review of Figure 23 shows that four of the dissolved oxygen values are above the saturation curve. If the values of these outliers are within 10 percent of their respective saturated values, then the values can be considered valid measurements otherwise they are considered to be measurement errors. The outlier furthest from the saturation curve is the measurement of 11.5 mg/L at FCLC6 which is the inflow to Lake Louise and is 34 percent above the respective saturated value. The next sample is a measurement taken at FCLC 10 located at the outflow from Grassy Lake. The dissolved oxygen value was 10.44 mg/L and is 22 percent above its respective saturated level. The third sample was taken at FCLB5Q located above the confluence of Flint Creek and the Fox River. The value of the oxygen level of this sample was 9.40 mg/L and was 17 percent above the reference value. The fourth sample was taken at SCBH3Q on the Spring Creek just above its confluence with the Fox River. The dissolved oxygen value was 8.76 mg/L which was 3% above its respective saturated value and therefore is a valid measurement and the others are outliers.

Figure 24 shows the relative health of the Flint and Spring Creeks as represented by oxygen levels. Once the outliers have been removed, 70 percent of the oxygen values fall in the good to very good health range. Six of the Flint Creek oxygen values fall in the fair to poor health range while two of the five Spring Creek samples fall in the fair to poor health range. Five of the Flint Creek samples that fall into the fair to poor range are associated with headwaters where there is no or little movement of the water. The samples are FCBH1, FCDP1, FCDP2, FCB1, and FCB2. FCBH1 is the headwaters of the main branch of Flint Creek. FCDP1, FCDP2, and FCB2 represent the headwaters of the East branch of Flint Creek. FCB1 is located at the outflow of Baker's Lake and represents the oxygen levels within the lake. Of the two Spring Creek samples in the fair to poor health range one (SCSB2) is located at the headwaters of Spring Creek where there is no flow. The other sample location is at the outflow of Mud Lake and its associated wetland and represents their oxygen level.

Biological Oxygen Demand - Microorganisms such as bacteria are responsible for decomposing organic waste. When organic matter such as dead plants, leaves, grass clippings, manure, sewage, or even food waste is present in surface water, the bacteria will begin the process of breaking down this waste. When this happens, much of the available dissolved oxygen is consumed by aerobic bacteria, robbing other aquatic organisms of the oxygen they need to live.

Biological Oxygen Demand (BOD) is a measure of the oxygen used by microorganisms to decompose this waste. If there is a large quantity of organic waste in the surface water, there will also be a lot of bacteria present working to decompose this waste. In this case, the demand for

oxygen will be high (due to all the bacteria) so the BOD level will be high. As the waste is consumed or dispersed through the water, BOD levels will begin to decline.

Figure 25 shows the BOD levels relative to the oxygen levels for the 30 samples collected as part of this monitoring effort. A review of figure shows that, in most cases, the oxygen levels are significantly higher than the BOD levels. The cases where the BOD levels are greater than the oxygen levels matched locations that are in the fair to poor health range for oxygen. Additionally, we have two samples where BOD levels were greater than the oxygen levels that were not listed in the fair to poor health range for oxygen. These samples are FCNB7 which represents the outflow of Honey Lake and SCSB1 which is the headwaters of Spring Creek.

Figure 26 shows the relative health of Flint and Spring Creeks with respect to recorded BOD values. Seventy three percent of the BOD samples fall within the Fair: Moderately Clean range. One BOD value falls in the Very Good range but is considered an outlier with a BOD value of 0.04 mg/L. Seven BOD values fall within the Poor: Somewhat Polluted range. Two of the seven values are associated with the headwaters of the East branch of Flint Creek (FCDP1 and FCDP5). One of the seven values represents the headwaters of Spring Creek (SCSB1). The remaining four BOD values defined the South Sub-Branch of the East Branch of the Flint Creek (FCB1, FCLC5, FCLC6, and FCB2).

Chemical Oxygen Demand - Chemical oxygen demand (COD) is the total measurement of all chemicals (organics and inorganics) in surface and waste waters. Sources of COD in stormwater are varied. However, soluble organic compounds are most likely to contribute to escalated COD concentrations. COD measures more than organic constituents, the organic fraction usually predominates and is the constituent of interest.

Figure 27 exhibits the COD levels relative to BOD and oxygen levels. Three outliers in the COD data are evident. The outliers are located at sample FCB3T which has a COD recorded level of less than detection, FCLB4Q for which there was no COD measurement recorded, and SCSB1 which had a recorded value of 3.5 mg/L. FCB3T is located at the Barrington POTW outfall and FCLB4Q is located on the North branch of the Flint Creek at the confluence with the main branch of Flint Creek. SCSB1 is located at the headwaters of the main branch of Spring Creek.

The ratio of COD to BOD is usually a maximum of four times. The average ratio shown in Figure 27 averages 9.6 times and ranges from 3.7 to 28.6 times. This seems very high for COD values in surface waters and might give the impression of anthropogenic pollution. Oil & grease and phenolics were measured as indicators of industrial pollution and both were at or below detection limits of 2.5 and 0.0020 mg/L respectively for all samples. Therefore, the high COD levels are more likely the result of natural organics in the waters of Flint and Spring Creeks. Natural organic matter (NOM) is matter composed of organic compounds that have come from the remains of organisms such as plants and animals and their waste products in the environment. Organic molecules can also be made by chemical reactions that don't involve life. Basic structures are created from cellulose, tannin, cutin, and lignin, along with other various proteins, lipids, and carbohydrates. Organic matter is very important in the movement of nutrients in the environment and plays a role in water retention.

Nutrients - Nitrates and phosphates in a body of water can contribute to high BOD levels. Nitrates and phosphates are plant nutrients and can cause plant life and algae to grow quickly. When plants grow quickly, they also die quickly. This contributes to the organic waste in the water, which is then decomposed by bacteria. This results in a high BOD level. When BOD levels are high, dissolved oxygen (DO) levels decrease because the oxygen that is available in the water is being consumed by the bacteria. Since less dissolved oxygen is available in the water, fish and other aquatic organisms may not survive.

The growth of macrophytes and phytoplankton is stimulated principally by nutrients such as phosphorus and nitrogen. Nutrient-stimulated primary production is of most concern in lakes wet lands and in low flowing water. Generally, phosphorus is the limiting nutrient in freshwater aquatic systems. That is, if all phosphorous is used, plant growth will cease, no matter the amount of nitrogen available. Many bodies of freshwater are currently experiencing influxes of nitrogen and phosphorus from outside sources. The increasing concentration of available phosphorus allows plants to assimilate more nitrogen before the phosphorus is depleted. Thus, if sufficient phosphorus is available, high concentrations of nitrates will lead to phytoplankton (algae) and macrophyte (aquatic plant) production.

Nitrogen - Figure 28 shows the distribution of nitrogen species in the Flint and Spring Creeks. Of total nitrogen, nitrate is available for primary production in streams. Total Kjeldahl Nitrogen (TKN) is the total organic nitrogen plus ammonia. Organic nitrogen in Figure 28 was created by subtracting the ammonia values from the TKN values for the 30 samples collected during this monitoring effort. Creating the organic nitrogen values resulted in 13 outliers. Eight of these outliers were equivalent to outliers in the ammonia data. The ammonia data had seven values that were significantly higher than most of the data. The eighth value was a negative data point. Five other outliers in the organic nitrogen values were to results of ammonia levels higher than TKN levels resulting in negative organic nitrogen values. The nitrate data apparently had three outliers, but these values of 10, 8.5, and 2.8 mg/L coincided with 10 mg/L at FCB3T (Barrington POTW) and dilution downstream to FCB4Q (8.5 mg/L) and FCBH4 (2.8 mg/L).

Phosphorus - Phosphorus is an important plant nutrient that occurs in different forms in the environment. Excess phosphorus in aquatic systems can lead to over fertilization in lakes and streams. This over fertilization results in an overabundance of aquatic plants that in turn can deplete oxygen from the water during the decay processes.

Phosphorus in aquatic systems is usually divided into solid and dissolved forms. These forms function differently in streams and lakes and also have different sources. Total phosphorus includes all the phosphorus found in a water sample. Most of this phosphorus is found in a solid form. Phosphorus resulting from the dissolution of rock and other mineral forms is inorganic. Organic forms of phosphorus originate from biological materials such as plants or animals, their dead remains and waste products.

The fraction of total phosphorous and can pass through a fine filter is called dissolved or soluble reactive phosphorus. Dissolved forms include organic and inorganic molecules. The form that is most readily taken up by aquatic plants is an inorganic molecule called orthophosphate.

Figure 29 shows the distribution of the phosphorus species in the Flint and Spring Creeks. The orthophosphate values had eight outliers in that orthophosphate was not measured in the lake samples. Figure 29 exhibits the same peak as found for the nitrogen species in Figure 28. This peak is caused by the influx of phosphorus species at the outfall of the Barrington POTW and the subsequent dilution downstream. The only unexplained outlier in the total phosphorus data was a 2.4 mg/L value at sampling location FCLB4Q. Dissolved phosphorus data had eight outliers because the dissolved phosphorus values were greater than the total phosphorus values. All the values for the other phosphorus species were below 0.71 mg/L which is a relatively low phosphorus concentration although it is above the recommended limit of 0.05 mg/L for total phosphorus and 0.01 mg/L for dissolved phosphorous.

Figure 30 shows the remediation goals for total phosphorus at each of the sampling stations. As mentioned above, with the exception of the Barrington POTW and FCLB4Q all of the sampling points require a removal of 0.66 mg/L or less of phosphorus to reach their remediation goals. Four of the sampling stations in the Flint Creek watershed have reached their goals. The downstream Spring Creek sampling locations have no total phosphorus above the recommended standard. Total phosphorus is only found in the head water sampling stations at SCSB1 and SCSB2 with 0.06 and 0.04 mg/L respectively that need to be remediated to have the entire watershed be under the recommended standard for total phosphorus.

Coliform Bacteria - Coliform bacteria are a large assemblage of various species of bacteria that are linked together because of the ease of culturing as a single group. They include both fecal coliform bacteria and non-fecal coliform bacteria. Fecal coliforms include both pathogenic, or disease-causing species, and non-pathogenic species. The presence of fecal coliform bacteria indicates contamination of the waterbody by human and/or animal fecal material.

Escherichia coli, commonly called E. coli, is one of the most common species of coliform bacteria. It is a normal component of the large intestines in humans and other warm-blooded animals. It is found in human sewage in high numbers. E. coli is used as an indicator organism because it is easily cultured, and if present in water in defined amounts indicates that sewage may be present. If sewage is present in water, pathogenic or disease-causing organisms may also be present.

Figure 31 shows the distribution of E. coli in the Flint and Spring Creeks. The E. coli data set has eight outliers resulting from the lack of data for the lake samples. The first peak in Figure 30 is sample six (FCB1) and has an E. coli value of 1300 colonies/100 mL. FCB1 monitors the outflow of Baker's Lake and this sampling location also has high outlier values for ammonia, BOD, low levels of oxygen and orthophosphate. These characteristics may be due to the rookery located in Baker's Lake.

The next peak in Figure 31 again reflects the outfall of the Barrington Public Owned Treatment Works. The E. coli value increases slightly at the confluence of the East branch of Flint Creek and the main branch of Flint Creek before becoming diluted further downstream. The E. coli values in Spring Creek are all below the recommended standard of 200 colonies/100 mL.

Outliers - The outliers in the above results were collected to identify sampling locations that require additional data to determine if the outliers actually represent conditions in the field or are the result of analytical error. Figure 32 is a histogram that shows the number of outliers for each sampling location in the Flint and Spring Creek watersheds. Spring Creek location SCBH1Q is the only location that didn't have any outliers. All the rest of the locations had at least one outlier. Sampling location at FCLB4Q located on the North Branch of Flint Creek at the confluence with the Main Branch of Flint Creek had the most outliers with six. Sample location FCLC 11 located in Flint Lake just below the confluence of the North Branch and the main Branch of Flint Creek and may be the result of the influence of the FCLB4Q sample location. Four of the sampling locations (FCBH1, FCDP1, FCB1, and SCSB1) represent samples from stream headwaters. These areas usually have low outflow and seemed to act as a sink for chemicals carried to the streams and storm runoff. These outliers are likely to represent actual field conditions, but more data needs to be collected to verify this conclusion. Samples FCLC5 and FCLC6 represent the inflow and outflow of Lake Louise respectively. Lake Louise as a dam at the FCLC6 that reduces the flow through the lake and allows sediment to build up in the lake, therefore, these outliers may represent field conditions. FCBH4 is located halfway between the confluences of the East Branch and the North Branch of Flint Creek on the Main Branch. There is no obvious reason for there to be outliers at this sample location, therefore, these outliers may represent analytical error. Spring Creek sampling locations SCBH2Q and SCBH3Q may be affected by groundwater discharge in the areas where these sampling points are located.

These outliers suggest that more data needs to be collected to adequately characterize the conditions in Flint and Spring Creeks. Statistically, at a minimum two and a maximum of six more data sets may need to be produced to resolve some of the questions generated by the outliers.

Geochemical Characterization - As mentioned above, analytes for geochemical characterization will be collected every five years. In addition to providing geochemical information, Stiff Diagrams were generated for the 30 samples collected during this monitoring effort (Appendix B, Figures B1 to B30). Stiff diagrams are a graphical representation of the general chemistry of water (Stiff, 1941). A polygonal shape is created from four parallel horizontal axes extending on either side of a vertical axis. Cation and anion concentrations are first converted from mg/L to milliequivalents per liter (meq/L) to account for differences in the charge of different ions, and are then plotted on horizontal axes, with cations to the left of the zero point and anions to the right. Most commonly, sodium and potassium are plotted across from chloride, calcium is plotted opposite carbonate and bicarbonate, magnesium is plotted opposite sulfate and iron and nitrate are located at the bottom of the diagram. This arrangement reflects potential or expected mineralogical sources of each of these dissolved ions in water. The points are then connected to form a polygon, the size and shape of which visually indicate the total ionic concentration and the relative importance of the individual ionic species.

The diagrams can be relatively distinctive for showing water composition differences or similarities. The width of the pattern is an approximation of total ionic strength (Hem, 1985). One feature is the tendency of a pattern to maintain its characteristic shape as the sample becomes diluted. It may be possible to trace the same types of water from a source by studying the patterns.

Stiff diagrams were created for each sample location and are found in Appendix B numbered from B1 through B30. Figures B1 through B25 are sampling locations on the Flint Creek starting at the headwaters at FCBH1 moving downstream to the confluence with the Fox River. The sampling locations on Spring Creek begin at SCSB1 and move downstream to the confluence with the Fox River. The Stiff diagrams for the Spring Creek sampling locations are found in Figures B26 through B30.

General overview of the stiff diagrams for the Flint and Spring Creek's supports the earlier conclusion that the major anions in the two creeks are bicarbonate and chloride. Bicarbonate anions stem from the fact that the area bedrock is composed of limestone and/or dolomite and the overlying soils reflect the chemistry of the bedrock. Chloride is probably the result of the heavy use of road salt in the area during the winter months. The typical diagram of the two watersheds has a significant number of sodium, potassium and chloride ions followed by a reduced number of calcium and bicarbonate ions. This in turn is followed by a lower amount of magnesium and sulfate ions and ending with a limited amount of iron and nitrate ions. This configuration results in a diagram of a long triangle wide at the top and coming to a point at the bottom.

Diagrams shown in Figure B1 and Figure B2 characterize the water in Flint Creek downstream to the confluence with the East Branch of the Flint Creek in Barrington. The East Branch of Flint Creek has two sub-branches; the South Sub-Branch with headwaters in Baker's Lake and the North Sub-Branch with headwaters in the Deer Park area. FCB1 is the outflow of Baker's Lake and has high concentrations of sodium and potassium cations as well as chloride anions. This is probably due to the fact that Baker's Lake receives drainage from the surrounding area and, therefore, has a high salt concentration. The high sodium, potassium and chloride ions are reduced back to normal by the time the flow reaches Lake Louise. Lake Louise exhibits the stiff diagram configuration that is representative of the two watersheds. By the time the sub-branch reaches the confluence with the East branch, the diagrams loose a small amount of calcium, magnesium and bicarbonate.

The headwaters of the South Sub-Branch also exhibit a high sodium, potassium and chloride ion concentration probably due to the stagnant water in this area which acts as a sink for these ions. Further downstream the diagrams returned to a more representative structure with minor differences.

FCB3T is located at the outfall of the Barrington Public Owned Treatment Works (POTW). Discharge from the plant is probably responsible for the increased in the sodium, potassium and chloride ions exhibited in this diagram. The diagram also exhibits slight increases in the magnesium and sulfate ions. This trend is carried on down to the next sampling point which is FCB4Q located just prior to the confluence of the East Branch with the Main Branch of Flint Creek.

FCBH4 located downstream from the confluence exhibits characteristics of the co-mingling of the Main Branch of Flint Creek waters with the East branch water in that the sodium, potassium and chloride ions are reduced and are further reduced by the time the flow reaches FCLB3Q prior to the confluence of the North Branch. At this point the diagram is again representative of the two watersheds.

FCLC7 is located in Lake Zürich which is the headwaters of the North Branch of Flint Creek and has a normal diagram configuration. This location is followed by FCLC8 located in Echo Lake where there is a slight increase in sodium potassium and chloride ions. These concentrations further increase at location FCNB1 located halfway between Echo Lake and the confluence of the North Sub-Branch of Flint Creek. FCNB2 is located on the North Sub-Branch of the Flint Creek just before the confluence with the North Branch. The configuration of the diagram at this point is also representative of the two watersheds. FCNB4 is located on the North branch just above Grassy Lake and exhibits a slight reduction in sodium and potassium ions.

Sample location FCLC9 represents Honey Lake in the South Sub-Branch of the North Branch of Flint Creek. Honey Lake seems to have a small decrease in sodium, potassium and chloride ions and also a slight decrease in calcium ions. FCNB7 is located at the outflow of Honey Lake and exhibits the same characteristic diagram as that of Honey Lake. FCLC10 is located downstream from FCNB7 in Grassy Lake. The Grassy Lake diagram also exhibits the same characteristics as the Honey Lake diagram. Sample location at FCLB4Q is located directly before the confluence of the North Branch and the Main Branch of Flint Creek and has a diagram similar to the diagrams of the other locations on the North Branch.

Sample FCLC11 is located in the Flint Lake just below the confluence of the North Branch and the Main Branch of Flint Creek. Although the discharge of the Main Branch of Flint Creek is significantly greater than that of the North Branch, the characteristics of the FCLC11 diagram are more similar to those of the North Branch then they are of the Main Branch of Flint Creek. The exception is that the FCLC11 diagram has a slight increase in bicarbonate ions. Sample location FCLC12 is located at the outflow of Flint Lake and exhibits an increase in calcium and magnesium ions. This may be due to groundwater discharge in the area, but requires more information to verify. Sample location FCLB5Q is located between Flint Lake and the confluence of the Flint Creek with the Fox River. The stiff diagram representative of this location changes slightly from the Flint Lake sample and conforms more to the general diagram representing the Flint and Spring Creek watersheds.

The headwaters of Spring Creek are represented by SCSB1 of the Main Branch and SCSB2 of the North Sub-Branch of Spring Creek. The diagram of SCSB1 conforms to the general diagram of the area watersheds consisting of larger amounts of sodium, potassium and chloride ions followed by a reduced number of calcium and bicarbonate ions and a further reduction of magnesium and sulfate ions forming an elongated triangle ending at the low amount of iron and nitrate ions in the sample. Sample SCSB2 exhibits an increase in the calcium and bicarbonate ions. Sample SCBH1Q is located above Galvin's Lake and exhibits the characteristic diagram of SCSB1. This is probably due to the low flow of the North Sub-Branch of Spring Creek. Sample SCBH2Q is located at the outflow of Spring/Mud Lake and the diagram from the sample

location exhibits an increase in bicarbonate ions that may be a result of groundwater discharge. Sample SCBH3Q located above the confluence with the Fox River has a stiff diagram that has a significant reduction of the sodium, potassium and chloride ions with a corresponding increase of calcium and bicarbonate ions also probably do to groundwater discharge in the area between SCBH2Q and SCBH3Q. Again, more information is needed to verify the existence of groundwater discharge.

Storm Event - A storm event that was predicted to have at least 1 inch of rainfall on October 28, 2015 was selected for the storm event sampling. Actual recorded rainfall from three monitoring stations near the Flint and Spring Creek watersheds ranged from 0.46 to 0.62 inches with an average value of 0.54 inches of rainfall. Samples were collected from each of the eight stream Gage locations listed in Table 7 and analyzed for the storm event parameters listed in Table 9.

Storm event data were compared to monitoring data to ascertain the difference between a storm event and average conditions as represented by the data collected during the water quality monitoring event. Stormwater data are presented in Appendix C. The analytical data and the field data are listed in Tables C1 and C2. The results of the comparisons are summarized in Table C3 and the graphics resulting from the comparisons of each measured parameter are presented in Figures C1 through C14. Oil & Grease was measured during both the monitoring event and the storm event and in both cases the values were below detection limits, therefore, no comparison could be made.

A graphical method was used to make the comparisons. Each measurement parameter value for the storm event was divided by its counterpart in the monitoring data. If the resulting value was one then there was no difference between the storm event data and a monitoring data. Resulting values below one indicated that the monitoring data was greater than the storm event data and the reverse was true if the results were greater than one. Figure C1 shows the results of the comparison between storm event data and monitoring event data for pH. The red line in the figure represents the points of equal value. Points located on this line that indicate that there was no difference between the storm event and the monitoring event because the storm event data divided by the monitoring event data would be equal to one. Points below the red line indicate that the monitoring data was higher than the storm event data and that the storm event had no effect on the measured parameter. Points above the red line indicate that the storm event data divided by the monitoring event data was greater than one and that these measured parameters indicate that the storm event had an effect greater than the monitoring event.

Table C3 is a summary of the storm event comparison results. For each measured parameter it was indicated how many points were above, below or equal to the red line. The results indicate that 49 points or 44.5 percent of the points were above the line and, 55 points or 50 percent of the points were below the line and that six points or 5.5 percent were on the red line. The points on the red line indicate that there was no difference between the storm event and the monitoring event for the measured parameter. The points above the line indicate measured parameters that were greater during the storm event then during the monitoring event. The reverse is true for the measured parameters that had points below the line that indicate that the monitoring event was greater than the storm event.

The storm event results are presented graphically in Figure 15. A review of Figure 15 identifies five outliers. Removal of these outliers results in Figure 16. Figure 16 shows that a linear relationship exists between the storm event data and the monitoring event data. This resulted in developing a model for the relationship that would accurately represent the relationship 93.5 percent of the time. The equation for the mode is SD = 0.989MD + 4.674 where SD is equal to the storm event data and MD represents the monitoring event data. The slope of 0.989 is less than one and indicates that overall there was no difference between the storm event and the monitoring event.

5.2 Biological Methods

Monitoring the biological (fish and macroinvertebrates), components of the stream system is useful for assessing the success of water quality and habitat improvements. Fish and macroinvertebrates are chosen because they're relatively easy to sample/identify and affect specific and predictable responses to human induced changes to the landscape, stream habitat, and water quality. Two indices were used as part of the water quality monitoring program for the Flint and Spring Creek Watersheds. These indices are: Index of Biotic Integrity (IBI) and Macro invertebrate Biotic Index (MBI). These indices will be used as part of the baseline characterization of the watersheds. They will also be used before and after major restoration projects in the watersheds. Several years' worth of data need to be collected before any statistical analyses of the biological data can be conducted.

5.2.1 Index of Biotic Integrity (IBI)

The IBI is designed to assess biological health directly through several attributes of fish communities in streams. Qualified personnel will be used to perform the fish collection and identification. After the fish have been collected and identified, the data is used to evaluate 12 metrics and a rating is assigned to each metric based on whether it deviates strongly from, somewhat from, or closely approximates the expected values. The sum of the ratings gives a total IBI score for this site. The best possible IBI score is 60 (Table 10).

No IBI testing was conducted because of the lack of qualified personnel available to do the testing. Because of the difficulty of finding qualified personnel, this testing will not be included in future monitoring events.

5.2.2 Macroinvertebrate Biotic Index (MBI)

The MBI is designed to rate water quality using macroinvertebrates' for taxa tolerance to degree and extent of organic pollution in streams. Qualified personnel were used to perform the macroinvertebrate collection and identification. Each taxon is assigned a known tolerance value to pollution. The MBI is calculated by taking an average of tolerance ratings weighted by the

number of individuals in the sample. Scores lower than 5.7 represent good water quality well scores greater than 5.7 indicate poor water quality (see Table 11).

MBI testing was only conducted at one location because of the unavailability of qualified personnel to conduct more tests. This test was conducted just upstream of FCBH2Q in the wetland south of County Line Road (Figure 33). The test resulted in a MBI score of 6.58 indicating poor water quality. Stream oxygen levels at FCBH2Q where 6.64 mg/L indicating very good oxygen health. BOD values at the same location where 3.75 mg/L indicating that the health of the stream was fair to moderately clean. Total phosphorus levels at the same location where 0.31 mg/L or significantly higher than the 0.050 mg/L recommended standard. Because of the high oxygen and low BOD levels the health of the stream seems to be much better than that suggested by the MBI score.

It is expected that additional MBI testing will occurred this spring.

5.2.3 Trophic State Index (TSI)

Most water quality samples related to pollutant loading are taken in stream systems because the data provides estimates of pollutant loading following differently sized rain events. In lakes however, the water is usually slow to cycle through the system and different techniques are needed to assess water quality. Biologists and limnologists often used "productivity" of a lake to access its health. Productivity is measured via the Trophic State Index (TSI), an index that uses phosphorus concentrations as the primary means to assess lake health. The Illinois Standard for Total Phosphorus (TP) is 0.05 mg/L while the Lake County average in lakes is 0.113 mg/L. When phosphorus levels exceed 0.05 mg/L, lake-wide algal blooms can occur. Increases in algal blooms lead to decreased water clarity, decreased light penetration, and increased total suspended solids.

The Lake County Health Department Lakes Management Unit (LMU) monitored the lakes in the Flint Creek watershed as part of this monitoring program. LMU categorized the lakes as oligotrophic (TSI <40), mesotrophic (TSI 40 – 49), eutrophic (TSI 50 – 69) and hypereutrophic (TSI > 70). TSI values greater than 70 indicated that the Lake is in poor health. The resulting TSI values are listed in Table 12. Grassy Lake, Lake Louise, and Flint Lake are classified as hypereutrophic. Honey Lake and Echo Lake were classified as eutrophic while Lake Zürich was classified as mesotrophic. Three of the lakes: Lake Zürich, Grassy Lake, and Lake Louise had oxygen levels above 5.00 mg/L indicating very good health. The remaining three lakes: Honey Lake, Echo Lake, and Flint Lake had oxygen levels in the 4.00 to 5.00 mg/L indicating good health. All of the lakes with the exception of Lake Louise and Flint Lake BOD values between 2.00 and 5.00 mg/L indicating fair to moderately clean conditions. Lake Louise has a BOD value of 7.40 mg/L poor to somewhat polluted conditions while Flint Lake has a BOD value of 2.00 mg/L indicating very good conditions. Lake Zürich and Honey Lake have the lowest TSI values and corresponding lowest total phosphorus levels with 0.021 and 0.039 mg/L respectively. Both values are below the recommended standard of 0.05 mg/L for phosphorus. The rest of the lakes

have phosphorus levels above the recommended standard. Phosphorus levels for the lakes increase with the TSI values for the lakes in the order that they are listed in the table. This is because the total phosphorus value is an integral component of the calculation of TSI values.

No TSI values were available for Baker Lake located in Cook County nor for any of the lakes located in the Spring Creek watershed. In future monitoring events chlorophyll a and total nitrogen will be added to the analyte list so that TSI values for these lakes can be established.

5.3 Physical Methods

In characterizing the watersheds there are two physical attributes that were monitored. These attributes were clarity and stream discharge. Clarity turned out to not be an important factor because of the shallowness of the creeks in the summer when the monitoring activities take place. Clarity will not be measured in the future.

Stream discharge was estimated at each sampling point during the data collection process. In addition, data were available from two recording stream gages on the Flint Creek that were installed in August 2014. A year's worth of data from these gages were available at the time baseline data collection began.

Methods used to estimate stream discharge are not as accurate as actual measurements of stream discharge, but they provide a relatively good idea of flow through the watersheds. Flint Creek discharge began at the headwaters at location FCBH1 with the flow of 0.05 cubic feet per second (cfs) that increased to 0.18 cfs at FCBH2Q. The East Branch and it's sub-branches had very low flow until receiving the outflow of the Barrington POTW. Flow at this point of the East Branch was 7.05 cfs and was reduced to 1.76 cfs shortly thereafter at the confluence of the East Branch and the main Branch of Flint Creek at FCB4Q. This difference in discharge over such a short distance is probably due to measurement error in one or both measurements. At this point of the East Branch there is no diversion of the stream flow and the area is not a known recharge area.

Downstream from the East branch confluence flow is increased to 2.90 cfs at FCBH4 and just before the confluence with the North Branch the flow increases to 2.99 cfs at FCLB3Q. The North Branch and its sub-branches contribute a small amount of flow to the Flint Creek. Flow is estimated at 0.43 cfs at FCLB4Q at the confluence of the North Branch with the Flint Creek. Passing through Flint Lake and the wetlands prior to reaching FCLB5Q the flow increases to 4.02 cfs. This increase is probably due to groundwater discharge.

The headwaters of Spring Creek at SCSB1 has a flow of 3.00 cfs and the headwaters of the North Branch of the Spring Creek (SCSB2) have a flow of 0.01 cfs. The Spring Creek flows through an area of high recharge characteristics. After the confluence with the North Branch, Spring Creek flows North to Route 68 and FCBH1Q where the flow was estimated to be 1.31 cfs. Loss of flow can be attributed to groundwater recharge or possibly measurement error. Spring Creek flow increases at SCBH2Q to 2.17 cfs possibly due to groundwater discharge in the Spring Lake/Mud Lake area with associated wetlands. Flow is again lost between SCBH2Q and SCBH3Q where the flow was estimated to be 1.52 cfs before the confluence with the Fox River

It was hypothesized that storm water hydrographs represent the flow characteristics of a watershed and that all hydrographs from a given watershed are similar. Urbanized watersheds yield storm water hydrographs with a very steep rising limb. Overall improvement of a watershed's health would be indicated by a reduced slope of the hydrograph's rising limb.

Stream gages located at FCLB3Q and FCLB5Q located on the Flint Creek have been monitoring water levels since November 2014. The location at FCLB5Q is located upstream from the confluence of Flint Creek and the Fox River and is considered to be representative of the Flint Creek watershed. Figure 34 is the water level hydrograph recorded at FCLB5Q during the year 2015. The hypothesis was tested by analyzing the data recorded to generate this hydrograph. Storm data from the six high peak events (shown in Figure 34) were separated and the slopes of the rising limbs calculated. The slopes were statistically analyzed using analysis of variance techniques to determine if they were equal at the 95 percent level. The rising limb slopes of the high peaks were determined to be statistically equal. The same procedure was followed on selected low peaks (shown in Figure 34) and the low peaks slopes were also found to be statistically equal.

A test was performed to determine if the slopes of the high peaks were equal to the slopes of the low peaks. The average slopes of the high and the low peaks were established and then statistically compared to determine if they were equal. The results indicated that the high and low peak slopes were equal. Subsequently, it was determined that the average slope representing the high and low peaks was equal to 0.259 with an accuracy of 97.7 percent.

The rising limb slopes of water level hydrographs established during future monitoring events will be determined in the above manner and compared to the baseline slope of 0.259. Subsequent slopes statistically above 0.259 indicate further degradation of the creek while slopes that are statistically less than 0.259 indicate an improvement in the Creek conditions.

Once the stream gages on Spring Creek are installed, the above procedures will be conducted on the data collected from the gage located at SCBH3Q located above the confluence of Spring Creek with the Fox River.

6.0 OBSERVATIONS

In this section there is an overview of the observations made during data analysis. These observations include a summary of the watershed geography, the current environmental chemistry, the distribution of critical analytes in the watersheds, the distribution of critical analytes in the major creek branches, estimates of analyte loading to the Fox River, and remedial actions that need to be implemented.

6.1 Geography

The Flint Creek watershed contains the Main Branch of Flint Creek, the East Branch of Flint Creek, and the North Branch of Flint Creek. The headwaters of the Main Branch of Flint Creek are located in Barrington Hills in the area of the intersection of Route 59 and Route 68. The Creek flows under Lake-Cook Road just West of Hart Road where it reaches the confluence of

the East Branch west of the Barrington High School athletic fields and West of Hart road. The Creek continues its flow North and enters Lake Barrington where it reaches the confluence of the North Branch just before flowing into the Flint Lake. The creek exits the Lake and flows past the Lake Barrington administrative offices, under Kelsey Road and on 0.6 miles to the confluence with the Fox River.

The East Branch headwaters are located in Deer Park and flow through Cuba Marsh before entering Jewel Pond. The North-Branch of the East Branch has its headwaters located in Baker's Lake in the village of Barrington. This branch flows northward through Lake Louise before entering Jewel Pond where it combines with the flow of the East Branch. The East Branch flow continues westward through Barrington past the Barrington POTW and Barrington High School before joining the Main Branch of Flint Creek just West of Hart road.

The headwaters of the North Branch are located in the Village of Lake Zürich within Lake Zürich. Flow exits Lake Zürich and flows North to Echo Lake. From Echo Lake the flow is North and then westward before turning to the South West and entering Honey Lake in the village of North Barrington. The flow is West from Honey Lake and enters Grassy Lake where it takes a turn to the southwest and enters Flint Lake just north of Woodland Drive in Lake Barrington. The south end of Flint Lake is the confluence of the Main Branch and the North Branch of Flint Creek.

The headwaters of both the Main Branch and the North Branch of Spring Creek are located in South Barrington along Route 59. The Main Branch headwaters are located at Regency Drive while the North Branch headwaters are located just north of Penny Road. Confluence of the North Branch with the Main Branch is located approximately 0.3 miles south of Penny Road Pond. Spring Creek flows North into Barrington Hills and enters Galvin's Lake about 0.3 miles north of Route 68. The Creek flows North East and then North West before entering Spring/Mud Lake just south of Lake Cook Road. Flow continues North-Northwest and enters the Fox River Grove and crosses Lincoln Avenue before continuing another 0.2 miles to the confluence with the Fox River.

6.2 Environment

The baseline characteristics of both the Flint and Spring Creek watersheds have been established. At this point any remedial actions conducted in either watershed can be evaluated and their effectiveness can be determined. Certain chemical characteristics are common to urbanized watersheds and are evaluated to ascertain the health of the watershed. These chemical characteristics include phosphorus, oxygen, biological oxygen demand, chloride, total dissolved solids, E. coli, and in the case of the Flint and Spring Creek watersheds, iron. Table 13 summarizes the analytical data collected during this monitoring effort that have analyzed values above criteria. In addition to the analytes listed, total dissolved phosphorus was not included because of a number of questionable values. Orthophosphate is a component of dissolved phosphorus and is the nutrient that limits aquatic growth. Orthophosphate was measured and is included in the list of analytes in Table 13. Also, cadmium and lead values were above their respective criteria in the lake samples. This was due to the detection limits during analysis being higher than the critical values.

Phosphorus is probably the most important of these characteristics and orthophosphate, the mineral form of phosphorus, is the limiting nutrient in aquatic systems. Excessive aquatic growth resulting from too much phosphorus in the system affects the oxygen balance in the system. A healthy aquatic system requires a high oxygen content and subsequently a low BOD. Phosphorus sources in the watersheds include pesticides, fertilizers, animal wastes, and bird wastes. These materials are washed into the creeks during stormwater runoff events and result in non-point source pollution. The only significant point source pollution in the Flint Creek watershed is the Barrington POTW. There are no point source pollution sources in the Spring Creek watershed. Chloride is naturally occurring in aquatic systems but the excessive chloride experienced in urbanized watersheds can affect aquatic life. Chloride content in urbanized watersheds has been increasing over recent history because of road salt being washed into the streams. Chloride is conservative, meaning that it does not degrade in the environment but collects in the sediment and is carried in the water column.

Primary sources for total dissolved solids in aquatic systems are agricultural and residential runoff, leaching of soil contamination and point source water pollution discharge from sewage treatment plants. The most common chemical constituents are calcium, phosphates, nitrates, sodium, potassium and chloride that are found in general stormwater runoff and runoff from deicing salts. In the Flint and Spring Creek area, water hardness may account for as much as 50 percent of the TDS value and water hardness plus chloride may account for a little over 70 percent of the TDS value.

Iron levels in both watersheds are above the water quality limits in most cases. Iron is not particularly unknown in the area because the area's groundwater has high concentrations of iron that needs to be treated before use. Also the soils in the area have a high iron content Therefore, iron is mostly the result of runoff and groundwater discharge to the streams.

Fecal pollution of surface waters in the Flint and Spring Creek watersheds was measured by the concentration of E. coli in the water because E. coli is believed to live only in the intestines and waste of humans and other warm-blooded animals, and quickly die outside its host. The presence of E. coli in water also serves as a marker for other potentially more harmful organisms that may accompany it. However, recent studies have reported that E. coli can become naturalized to soil, sand, sediments, and algae and, therefore, bringing into question its usefulness as an indicator.

6.3 Watersheds

Figures 35 through 38 show the distribution of the analytes listed in Table 13 in the Flint and Spring Creeks. The distribution of total phosphorous, orthophosphate, dissolved oxygen, and biological oxygen demand are shown in Figure 35. Chloride and total dissolved solids are presented in Figure 36. The distribution of iron and E. coli are presented in Figures 37 and 38 respectively.

Figure 35 shows that the orthophosphate in both watersheds makes up a significant portion of the total phosphorus available. No orthophosphate values were measured in any of the lakes. The headwaters of the East Branch in Deer Park is the only location where the total phosphorus is

significantly greater than the orthophosphate. At the Barrington POTW there is a large influx of phosphorus, mainly in the form of orthophosphate, that is carried on down to the confluence of the East Branch with the Main Branch of Flint Creek and is further diluted as the water moves through Barrington Hills and into Lake Barrington at Flint Lake. Phosphorus levels in Spring Creek are very low but the highest value was found in the headwaters in South Barrington. Phosphorus values decrease as the creek flows North to its confluence with the Fox River.

In a stream system that is unaffected by urbanization, one would expect orthophosphate, dissolved oxygen and BOD to be interrelated. In such a situation, total phosphorus and orthophosphate would be expected to be low and the dissolved oxygen levels high with BOD having low values. In urbanized streams such as we have with the Flint Creek and to a lesser extent in Spring Creek, this relationship is not always valid as can be seen in Figure 35.

Figure 36 shows the relationship between chloride and TDS in the Flint and Spring Creeks. Chloride in streams is mostly due to urban runoff. In the Flint and Spring Creek watersheds chloride makes up about 32 percent of the TDS values. Local hardness values were estimated to be about 45 percent, therefore, chloride and hardness make up about 77 percent\of the TDS in the creeks.

Figure 37 shows the distribution of iron in the creeks. Although most of the iron concentrations are above the criteria all of the concentrations are below two mg/L with the exception of two apparent outliers having concentrations of 11 and 5.3 mg/L respectively.

The distribution of E. coli in the two watersheds shown in figure 38. A significant number of the E. coli values are above the 200 colonies/100 mL criteria. The outflow of Baker's Lake has an E. coli value of 1300 colonies/100 mL probably as a result of the heron rookery located in the Lake. A high value of E. coli was also recorded at the Barrington POTW and at the sampling location prior to the confluence with the Main Branch of the Flint Creek. No E. coli values were recorded in the lakes.

6.4 Branches

The phosphorus/oxygen relationship in the Main Branch of Flint Creek is presented in Figure 39. Again, the figure shows that orthophosphate makes up a significant portion of the total phosphorus in the stream. No orthophosphate was measured in Flint Lake but the total phosphorus levels measured at the inflow and outflow of the lake were relatively high at 0.35 and 0.48 mg/L respectively. The outflow value was as high as the total phosphorus in the sample taken downstream from the confluence of the East Branch and the Barrington POTW.
BOD values were below the criteria throughout the Main Branch. Oxygen levels were low in the headwaters of the branch located in Barrington Hills and downstream from the confluence of the East Branch and the Barrington POTW. The rest of the oxygen levels were above the 5.0 mg/L criteria. In the Lake Barrington stretch of the Main Branch from the confluence of the North Branch to the confluence with the Fox River the oxygen levels were high and the BOD levels were low. Total phosphorus levels within this reach of the Creek seem to be a contradiction in that they are relatively high.

Figure 40 presents the distribution of chloride and TDS within the Main Branch. Two of the Barrington Hills samples have no hardness values because the reported values were 0.22 and 0.3 mg/L respectively and were considered outliers. The Lake Barrington inflow to Flint Lake (FCLC11) is also questionable because the previous sample (FCLB3Q) and the inflow from the North Branch are located just above the inflow to the Lake and both have significantly high TDS values.

The distribution of iron in the Main Branch is shown in Figure 41. The headwaters of the Main Branch in Barrington Hills has a relatively high iron content of 1.5 mg/L which is reduced as the creek flows through Barrington Hills and into Lake Barrington and inflows to Flint Lake. The outflow of Flint Lake seems to be an outlier in that it has an iron content 1.91 mg/L.

E. coli distribution in that Main Branch is presented in Figure 42. The headwaters of the Main Branch has an E. coli concentration of just over 500 colonies/100 mL and the concentration increases to about 650 colonies/100 mL at Lake-Cook Road. After the confluence with the East Branch containing the discharge from the Barrington POTW, the downstream values seem to be unusually low at 325 colonies/100 mL. E. coli values were not determined in the Flint Lake samples so the influence of the influent from the North Branch is not shown.

The phosphorus/oxygen relationship in the East Branch is shown in Figure 43. The Deer Park headwaters of the East Branch has a relatively high total phosphorous concentration. This concentration is significantly reduced in the immediate downstream portion of the headwaters. The Barrington headwater of the East branch is located at the outflow of Baker's Lake and has a large concentration of total phosphorous which is slightly reduced in Lake Louise and increases again at the outflow of Jewel Pond. The Barrington POTW has a total phosphorus output of just over 3 mg/L with an orthophosphate level of just under 3 mg/L. These values are not significantly reduced by the time the East Branch meets the confluence of the Main Branch of Flint Creek. The oxygen level is very low and the BOD level is very high at the headwaters in Deer Park. This is again the case at the headwaters in Barrington that represents the condition in Baker's Lake. The low oxygen level and high BOD level in Baker's Lake is probably the result of the presence of the heron rookery. Lake Louise has high oxygen levels but also has high BOD values. The oxygen level is again low at the outflow of Jewel Pond with a corresponding high level of BOD. The oxygen level is increased and the BOD level is decreased in the discharge of the Barrington POTW and remains the same as the East Branch flows in the Main Branch.

TDS and chloride distribution for the East Branch are shown in Figure 44. The headwaters located in Deer Park exhibit high TDS values with relatively low chloride values. Baker's Lake has a very high chloride level probably due to runoff from the surrounding area. Baker's Lake also has a TDS level of a little over 3 mg/L which is an outlier. The discharge from the Barrington PTOW has a high TDS value and this is further reflected in the downstream sample before entering the Main Branch.

The iron distribution is shown in Figure 45. The iron value at the headwaters of the Deer Park portion of the branch has been previously identified as an outlier. The iron value in the Deer Park portion of the branch is reduce downstream. The iron in Baker's Lake is 1.5 mg/L and remains

approximately the same through Lake Louise and Jewel Pond and is reduced during treatment at the Barrington POTW.

As mentioned before, the E. coli level in Baker's Lake is exceedingly high due to the presence of the heron rookery (Figure 46). The discharge from the Barrington PTOW has a high E. coli value and this is further reflected in the downstream sample before entering the Main Branch.

The phosphorus/oxygen relationship in the North Branch is shown in Figure 47. Orthophosphate was not measured in the Lake Zürich, Echo Lake, Honey Lake, and Grassy Lake samples. Although the phosphorus levels in the North Branch are relatively high, the BOD values are low and the oxygen levels are high. The exception to this is the sample of the outflow of Honey Lake where both the oxygen level and the BOD level are about the same.

Chloride and TDS distribution is shown in Figure 48. Chloride and TDS values begin to increase as the flow leaves Lake Zürich peaking as it enters North Barrington. The chloride and TDS concentrations remain fairly level through North Barrington and Grassy Lake. At the confluence with the Main Branch chloride and TDS were measured at 0.07 and 0.11 mg/L respectively and are considered outliers.

The North Branch iron values are shown in Figure 49. The distribution of iron is relatively low except for the sample taken prior to the confluence with the Main Branch. The value of iron in the sample was 5.3 mg/L which is the highest level of iron reported in either watershed and is considered an outlier.

The E. coli distribution is shown in Figure 50. E. coli was not measured in Lake Zürich or Echo Lake but the downstream sample has an E. coli value of 361 colonies/100 mL. E. coli was not measured in Honey or Grassy Lake but the rest of the E. coli samples in the North Branch were below the criteria.

The phosphorus/oxygen relationship in Spring Creek is presented in Figure 51. The oxygen and BOD levels are not what you would expect considering the low phosphorus level. Oxygen level in the headwaters of the Main Branch of Spring Creek is high but then for some reason the BOD value is slightly higher. Oxygen value and the North Branch headwaters is low (2.42 mg/L) and the BOD level is slightly higher at 2.81 mg/L. The oxygen level is above 6.0 mg/L at Route 68 and then drops to 0.46 mg/L at the outflow of Spring/Mud Lake before reaching a super saturated level of 8.76 mg/L before reaching the Fox River. With the exception of the initial high BOD value in the headwaters the remaining BOD values are below the criteria.

Spring Creek chloride and TDS distribution is shown in Figure 52. The TDS value at the headwaters in South Barrington is considered an outlier because it was reported as having a concentration of 0.01 mg/L. Chloride and TDS our highest in the Route 68 samples and then decreased downstream.

Iron distribution in the Spring Creek is shown in Figure 53. Iron concentrations in the Spring Creek samples are relatively low (below 1.4 mg/L) with the highest levels being in the headwaters and then decreasing downstream.

E. coli levels are low in the headwaters an increase in the Route 68 sample (Figure 54). There is a significant reduction in E. coli values at the outflow of Spring/Mud Lake (11 colonies/100 mL) before increasing again downstream. All the E. coli values recorded in the Spring Creek are below the criteria.

The baseline characteristics for the Flint and Spring Creek watersheds have been established. This is the first attempt to identify these characteristics. Several more monitoring events will be required to solidify the results and begin statistical analyses to establish trends. At the same time outliers will be evaluated to determine if they were indeed outliers, analytical errors or actual values. Data from the additional monitoring events will help us solidify the watershed characteristics and improve the ability to determine the efficiencies of remedial actions.

6.5 Loading

Analyte loadings to the Fox River were estimated for those analytes that did not meet water quality criteria. Review of the loading of these constituents to the Fox River provides insight to the overall health of the creeks. Loadings were estimated using discharge measurements and analyte values from the sampling station closest to the Fox River. The estimated loadings reflect the conditions present during this water quality monitoring effort and are likely to change during the course of the year.

Table 14 shows the loadings to the Fox River of total phosphorous, orthophosphate, chloride, TDS, and iron for both the Flint and the Spring creeks. Also presented are the loadings calculated based on water quality criteria for the aforementioned analytes. Comparing the estimated loadings values to those calculated using water quality criteria provides a good picture of the health of the creeks. The analysis shows that total phosphorus and orthophosphate in the Flint Creek watershed are a problem. Total phosphorus and orthophosphate in the watershed need to be reduced by 82.5 and 94.9 percent respectively to meet water quality criteria loads calculated for conditions encountered during this water quality monitoring event.

Chloride loading to the Fox River is the only analyte in the Flint Creek watershed that meets the estimated water quality criteria loading values. TDS and iron also are over the loadings estimated based on the water quality criteria and their loadings need to be reduced by less than 40 percent to meet the goals.

Analyte loadings from the Spring Creek to the Fox River were estimated to be below the calculated water quality criteria loads for all the analytes with the exception of TDS. TDS needs a 6 percent reduction to meet the goals. This indicates that the Spring Creek was in good health at the time that this water quality monitoring event took place.

6.6 Remedial Actions

The phosphorus loading estimates are an indicator of the degree of urbanization of the Flint Creek watershed and to a lesser extent the Spring Creek watershed. The fate of phosphorus in the watersheds includes uptake and release by vegetation, periphyton and microorganisms; sorption and exchange reactions with soils and sediments; chemical precipitation in the water column; and sedimentation and entrainment. These mechanisms exemplify the combined biological, physical, and chemical nature of phosphorus retention in the stream wetlands and stream itself.

The estimated loads to the Fox River represent the amount of phosphorus that cannot be naturally assimilated by the streams. Therefore, remedial actions need to be established that will increase the amount of phosphorus that can be assimilated by the watershed or removed from the system.

The Barrington PTOW is the only point source remedial action that removes phosphorus from the system. The PTOW discharge averages about 2 million gallons per day (mgd). During the low-flow period that was in effect during the water quality monitoring event, PTOW discharge accounted for about three quarters of the Flint Creek flow into the Fox River. Influent total phosphorus levels were about 2.0 to 3.0 mg/L and the average total phosphorus discharge concentration was approximately 1.500 to 2.250 mg/L most of which was assimilated by the Flint Creek wetlands and the stream itself. The PTOW is in the process of upgrading its treatment in order to meet the US EPA's new discharge criteria of 0.1 mg/L of total phosphorous. The proposed upgrade is expected to reduce the total phosphorus discharge level to as low as 0.010 mg/L.

The Flint Creek and Spring Creek watershed-based plans (AES, 2007 and 2012) each have a comprehensive list of remedial actions that can be undertaken in each jurisdiction. Each of these remedial actions address the removal of phosphorus, orthophosphate, TDS, and iron by improving the assimilation capacity of the watershed. Chloride is conservative and these actions will have a limited effect on assimilation of chloride. A number of these remedial actions include the maintenance of existing facilities such as detention basins, wetlands and other riparian areas. Private landowners and local environmental organizations are involved in removing invasive species. The CFC has conducted and is conducting extensive prairie and savanna restoration. Most of these remedial actions are relatively inexpensive and are very effective in removing runoff pollutants.

Storm water runoff through the watersheds needs to be addressed. Remedial actions that increase the time it takes for the storm water to flow through the system need to be implemented. Remedial actions that address this problem are identified in the watershed- based plans for each jurisdiction. These remedial actions include detention basin retrofits; pond, lake and wetland retrofits; wetland restoration; and stream and riparian area restoration. The jurisdictions are encouraged to implement these remedial actions and fit them into their budgets.

7.0 SOCIAL INDICATORS, INFORMATION, EDUCATION

Social indicator measures have been introduced, information disseminated and educational programs developed in the Flint Creek/Spring Creek watershed areas by the Citizens for

Conservation (CFC) for many years. CFC is the sponsor of FSCWP. Although CFC's efforts for introducing social indicator measures by disseminating information and putting together educational programs are not totally centered on the watersheds, the watersheds are still included as an important part of their efforts. Examples are the development of a rain garden program that is sponsored by CFC and FSCWP. The watershed partnerships help municipalities, corporations and individuals design rain gardens for their properties while CFC sponsors a program to provide plants for rain gardens and for other green projects. Additionally, CFC also sponsors a lecture series centered on disseminating information on nature and green infrastructure. A recent lecture sponsored by CFC presented the local water cycle and how applying green infrastructure techniques were beneficial to the process was presented by FSCWP personnel. The Barrington Area Council of Governments (BACOG) and FSCWP have recently created a video describing the Barrington area water resources for fourth graders in the Barrington Area School District.

Since the baseline characterization of the two watersheds has been completed a survey will be conducted to assess the local population's views on local water resources if funding is available. This survey will be disseminated electronically by the jurisdictions within the watersheds. The results of this survey will establish a baseline for two metrics that will be monitored. These metrics are the number of people that submit the survey and responses to the survey questions. The number of people submitting a completed survey will be a measure of the community's interest in their water resource. The responses to the questions in the survey will be an indicator of the community's knowledge of their local water resource.

In the meantime, attention will be turned to implementing applicable social indicator measures for disseminating watershed information and contributing to watershed education by following the strategy presented in the Watershed-Based Plans.

7.1 Information and Education Plan

Water quality improvement is the primary goal address by the watershed plans. Flood damage reduction and natural resource protection are secondary goals the cumulative actions of thousands of individuals in the watershed can either improve water quality, flooding and natural resources or cause them to become further degraded. Addressing these issues requires the efforts of individuals and communities watershed-wide. When people begin to understand the issues related to water quality, flood reduction and natural resource protection/enhancement they slowly begin to change their behaviors and activities thereby improving the overall health of the watershed.

A successful Information & Education (I&E) plan first raises awareness among stakeholders of watershed issues and problems. This is followed by education and actions that stakeholders can take to address the issues and problems. I&E plans include the following components:

- Defined I&E goals and objectives.
- Identify and analyze the target audiences.
- Create the messages for each audience.
- Package the message to various audiences.
- Distribute the message.

- Evaluate the I&E program.

CFC has included these components in their activities since their incorporation. Now that the baseline characteristics of both the Flint and Spring Creeks have been established the results will be incorporated into their conservation activities.

7.2 Recommended Information & Education Programs

Development of an effective I&E plan begins by defining I&E goals and objectives. FCWP and SCWP specifically address watershed information and education issues by developing an education goal. This goal is to foster appreciation and stewardship of the watershed through education.

The recommended target audience for education action was selected based on the need to reach each goal or objective. The target audience is a group of people who are intended to be reached by a particular message. The target audience of the watershed can include people of all demographics, locations, occupations, watershed roles, and ages. The general target audiences selected to meet watershed goals and objectives include riparian and other landowners, residents, local government (i.e. municipalities and townships), homeowners associations, developers businesses, lake property owners, and high schools. Each audience has specific needs and requirements, and can impact the watershed on different levels.

Creating and distributing a message for each audience will be done through development of actions to address that I&E program needs related to the watershed goals and objectives. The I&E's needs for the Flint and spring Creek watersheds were revealed through a comprehensive survey. A summary of the surveys can be found in the Watershed-Based plans. An I&E Plan Matrix was developed to help implement an I&E plan for each watershed. Not only do the matrices include education actions, they also include

- Primary goals address by each actions;
- Target audiences;
- Best package (vehicles) for the action message for delivery to the target audience,
- Lead and supporting organizations; and
- Potential outcomes (measurable behavior change).

As with any plan, the I&E plan will be regularly evaluated to provide feedback regarding the effectiveness of the outreach efforts. Evaluation conducted early on in the effort will help determine which programs are working and which are not. Based on this information, money and time can be saved by focusing on the programs that work and doing away with and/or refining those that do not.

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Figures

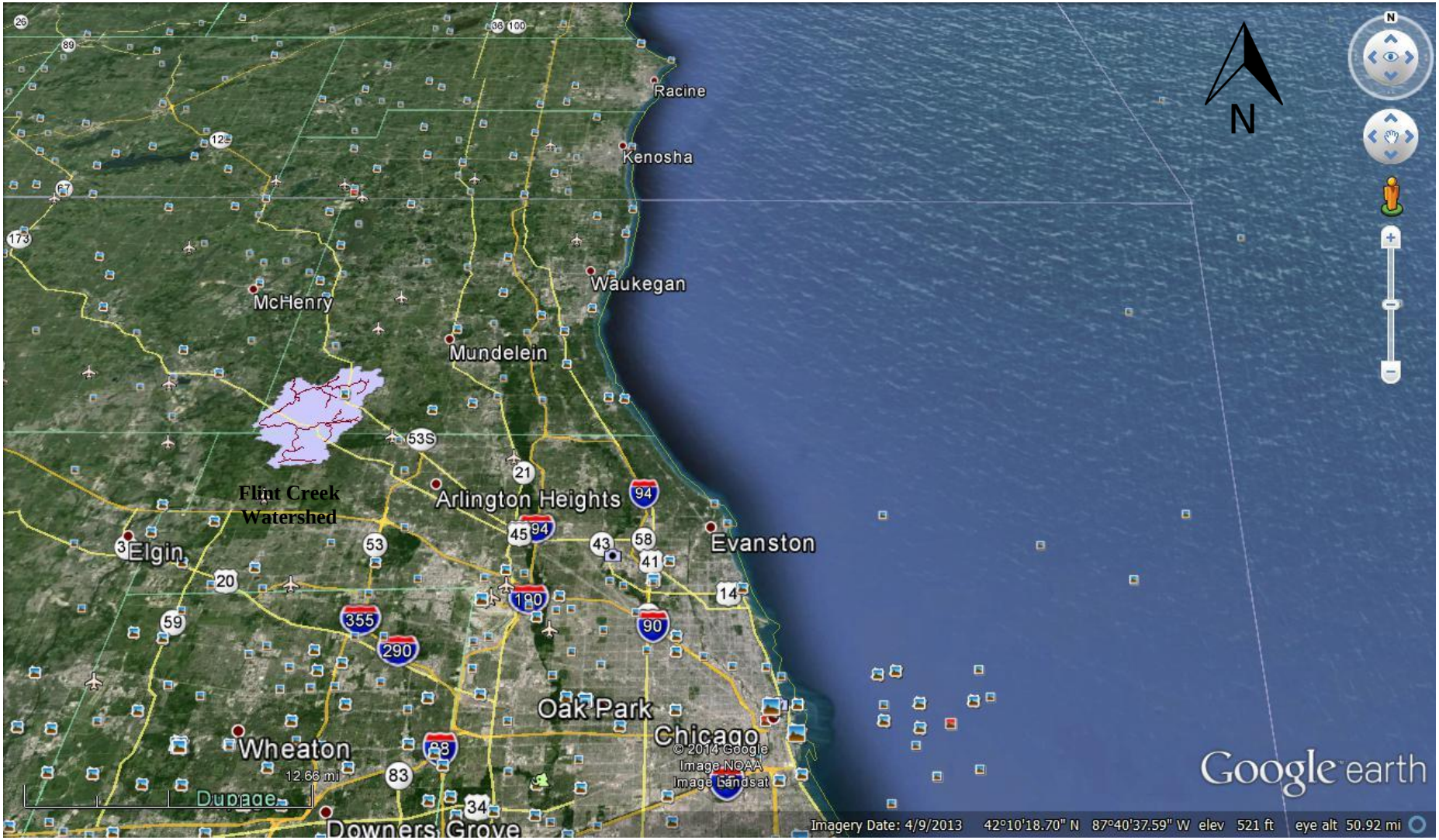


Figure 1 Flint Creek Watershed Location

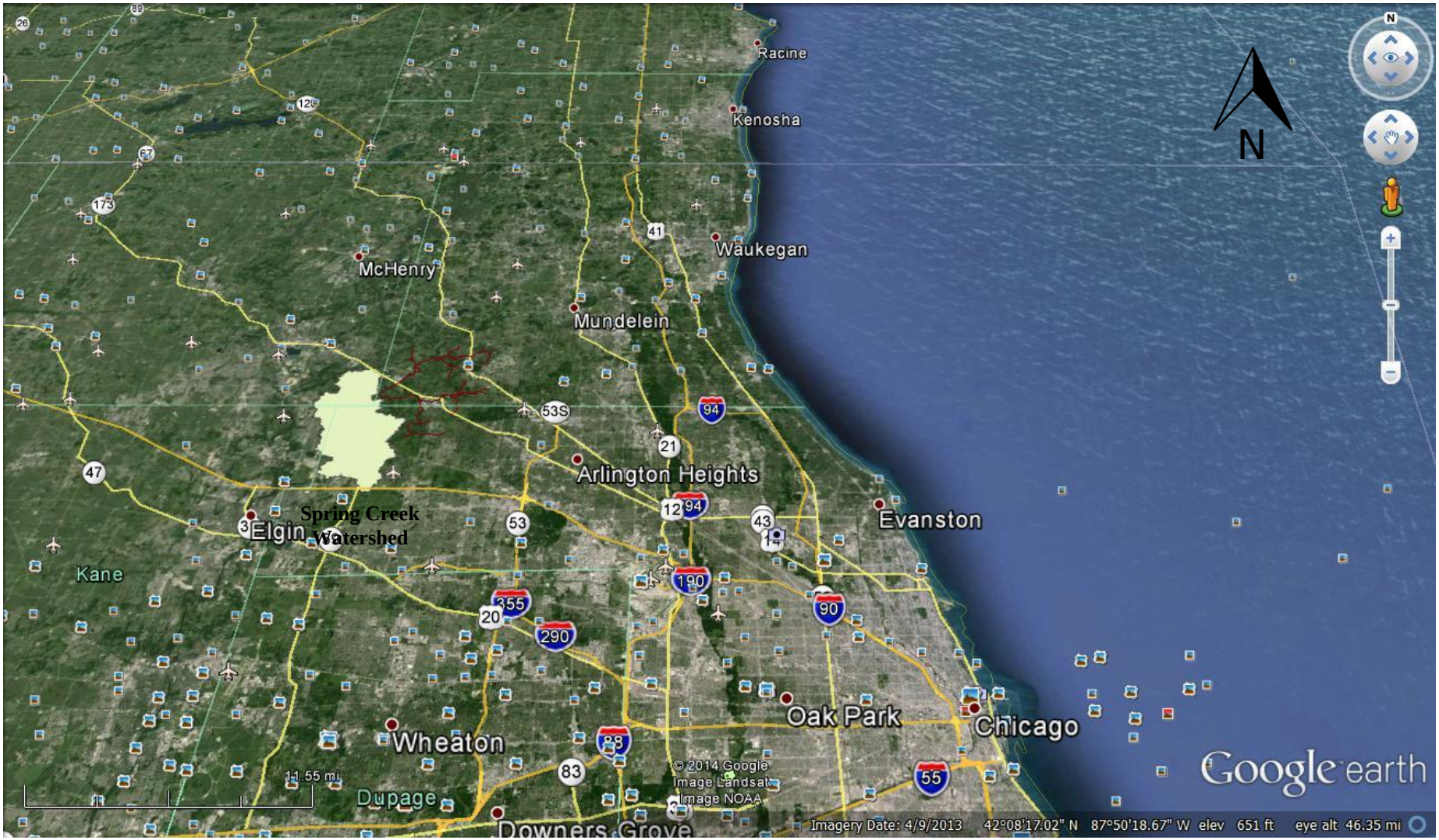


Figure 2 Spring Creek Watershed Location

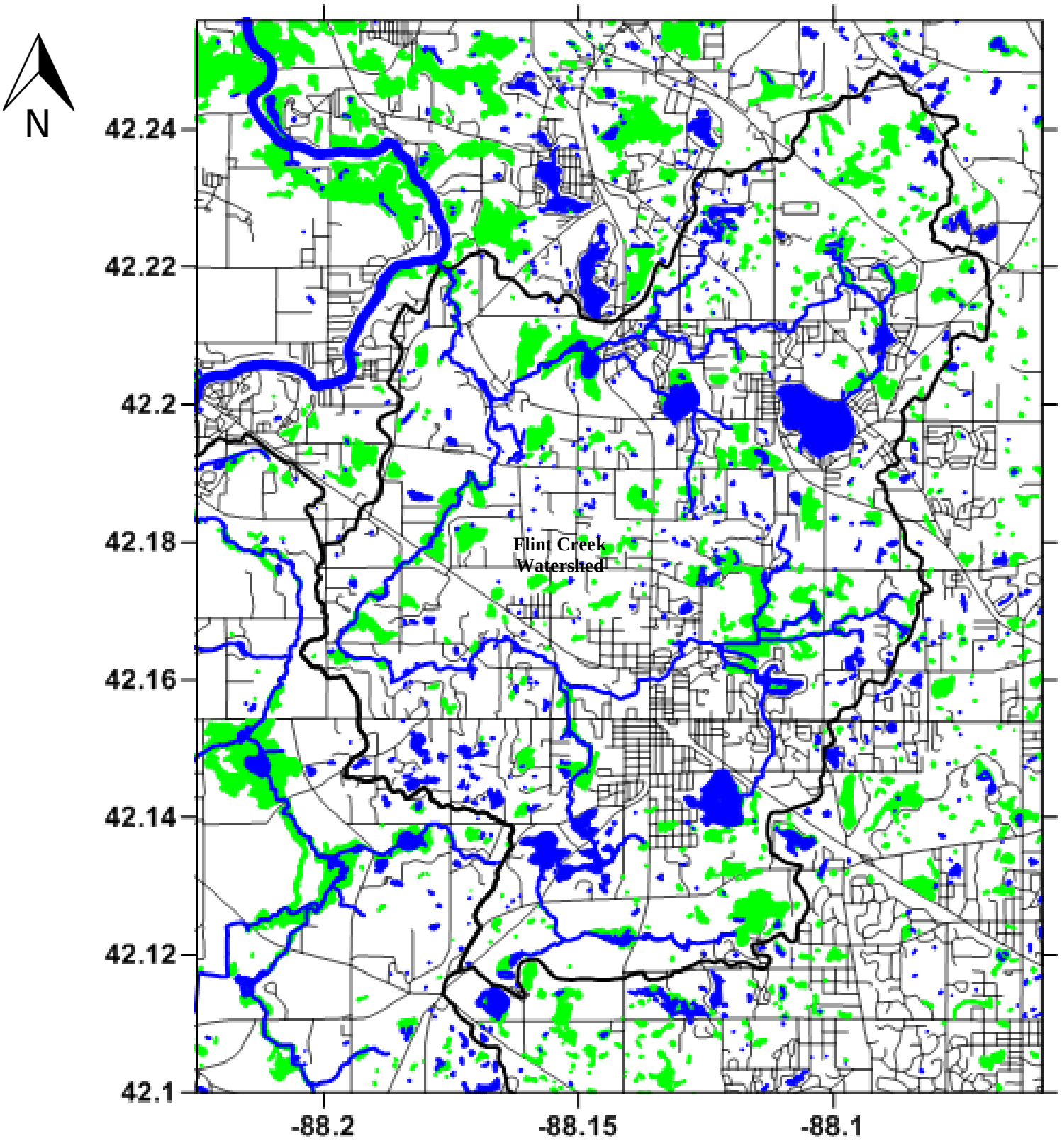


Figure 3 Flint Creek Watershed

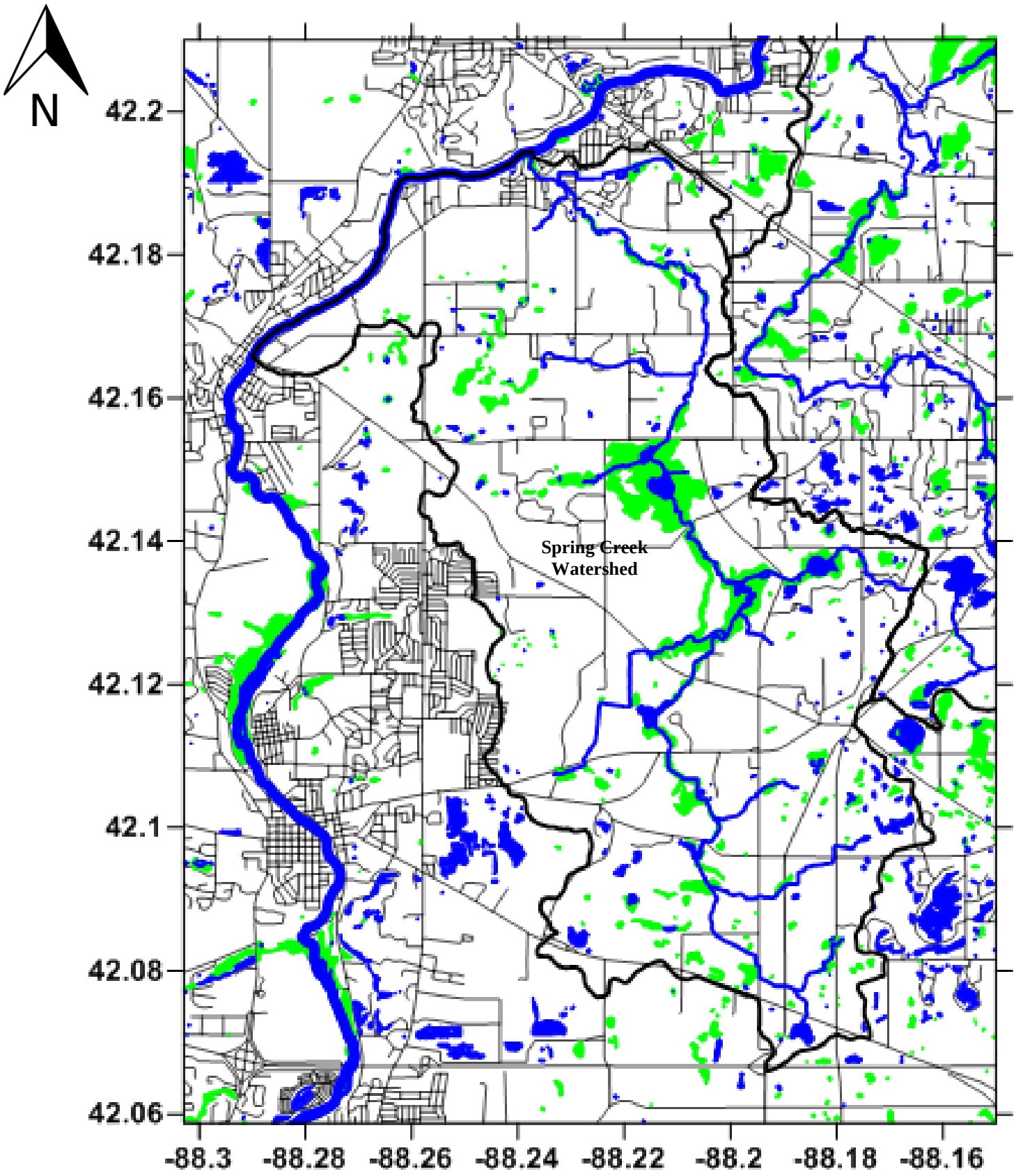


Figure 4 Spring Creek Watershed

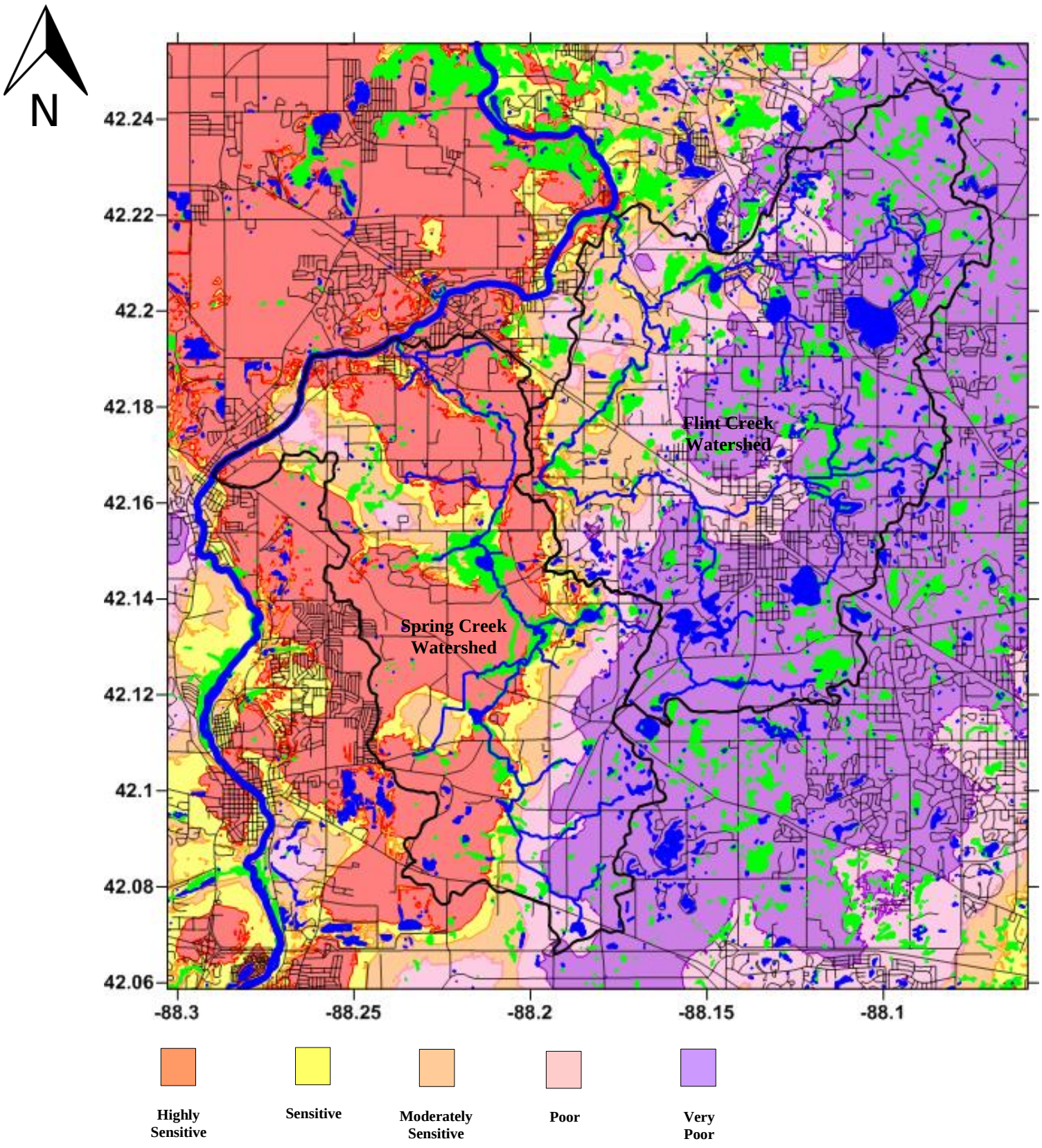


Figure 5 Recharge Area Characteristics in the Flint and Spring Creeks

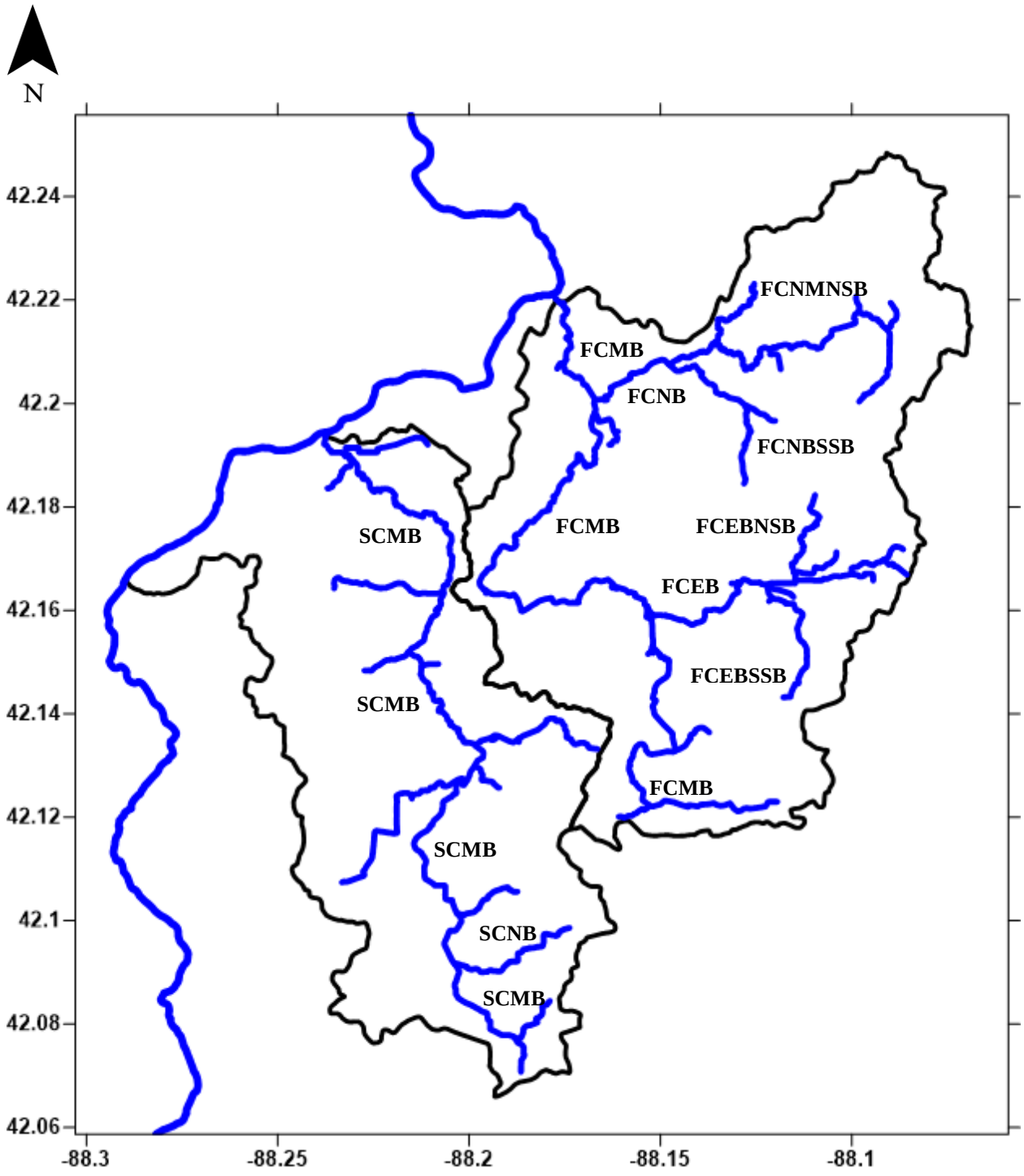


Figure 6 Stream Branches Flint and Spring Creek

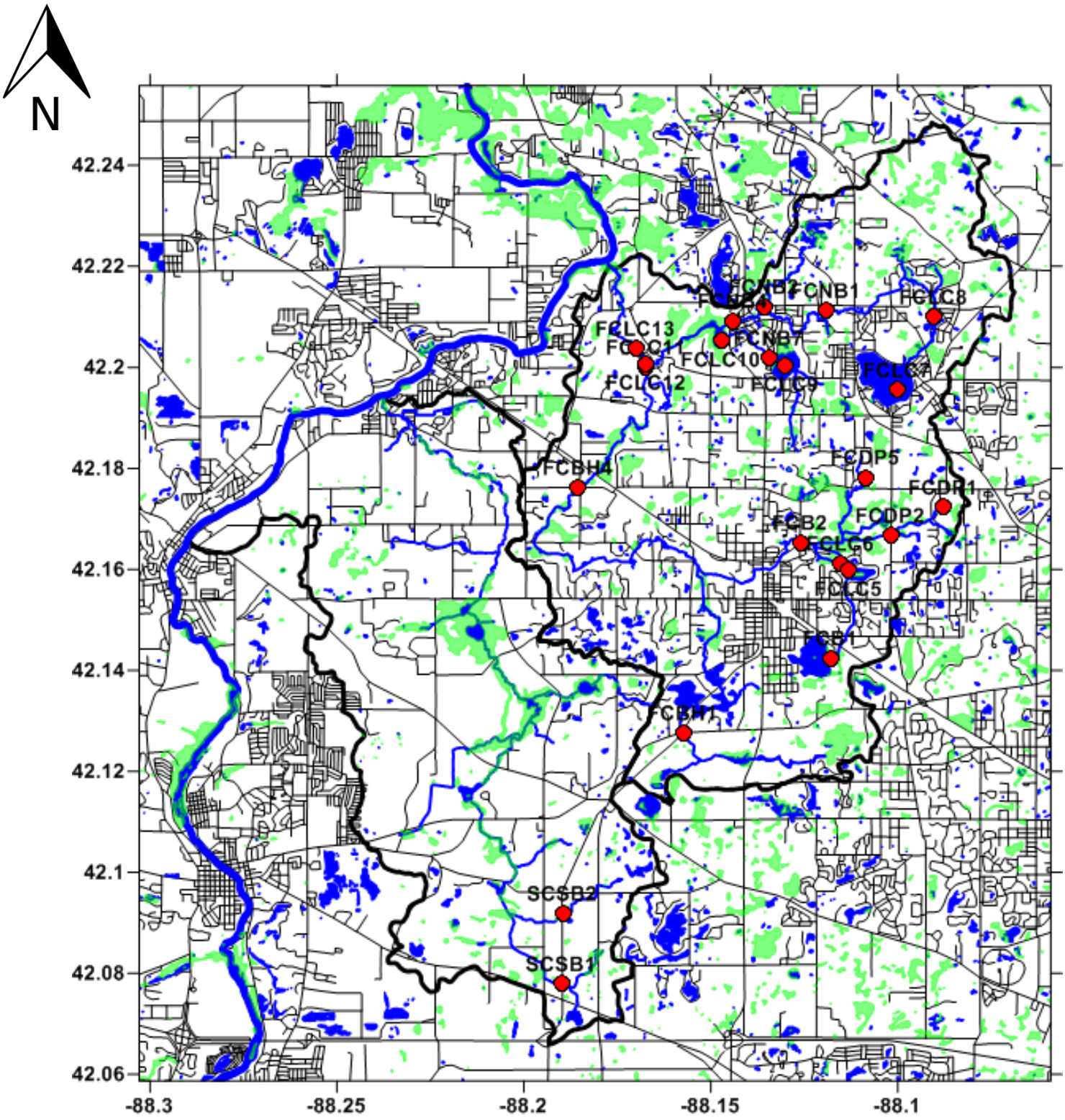


Figure 7 MS4 Sampling Station Locations

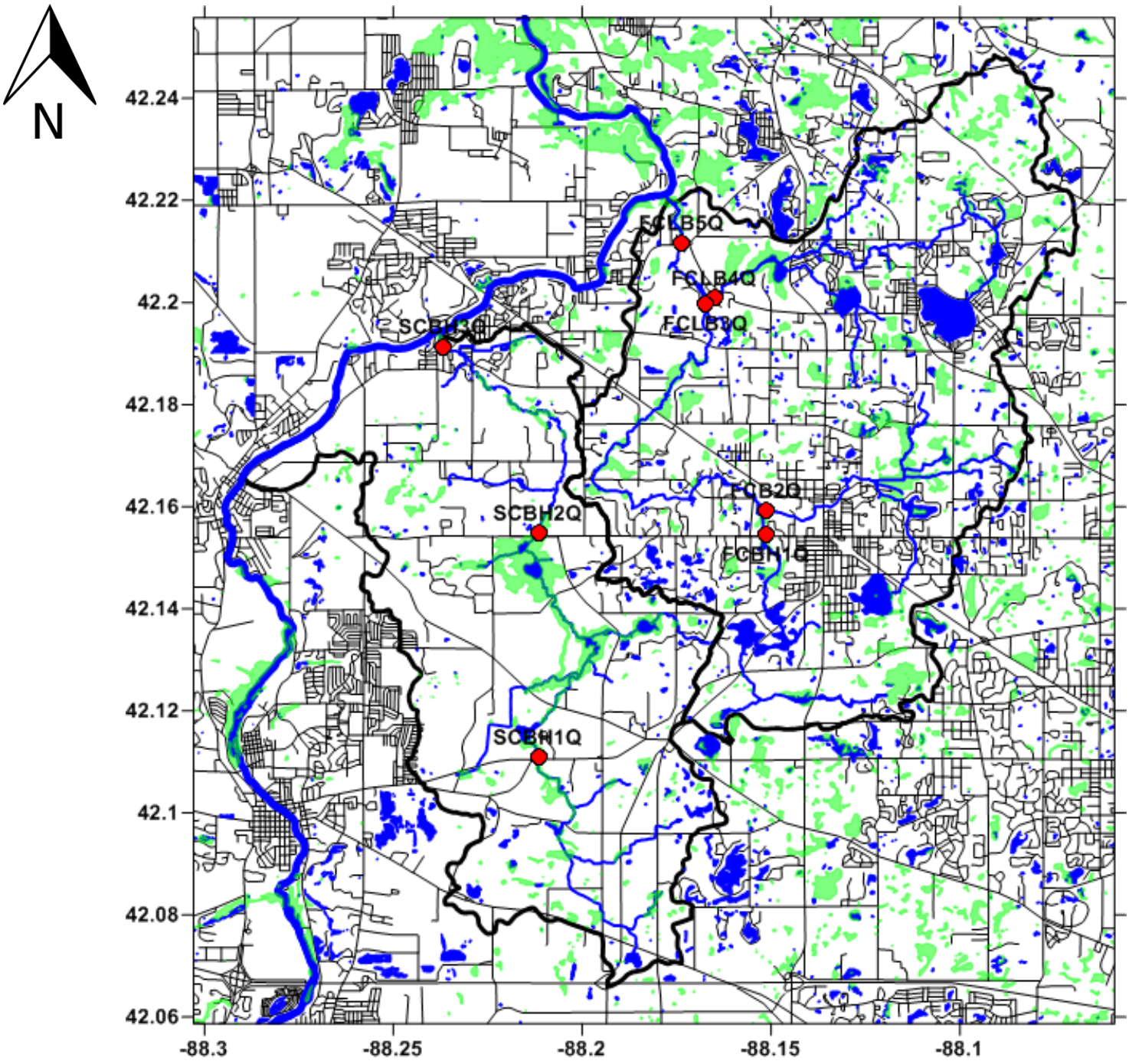


Figure 8 Stream Gage/Sampling Station Locations

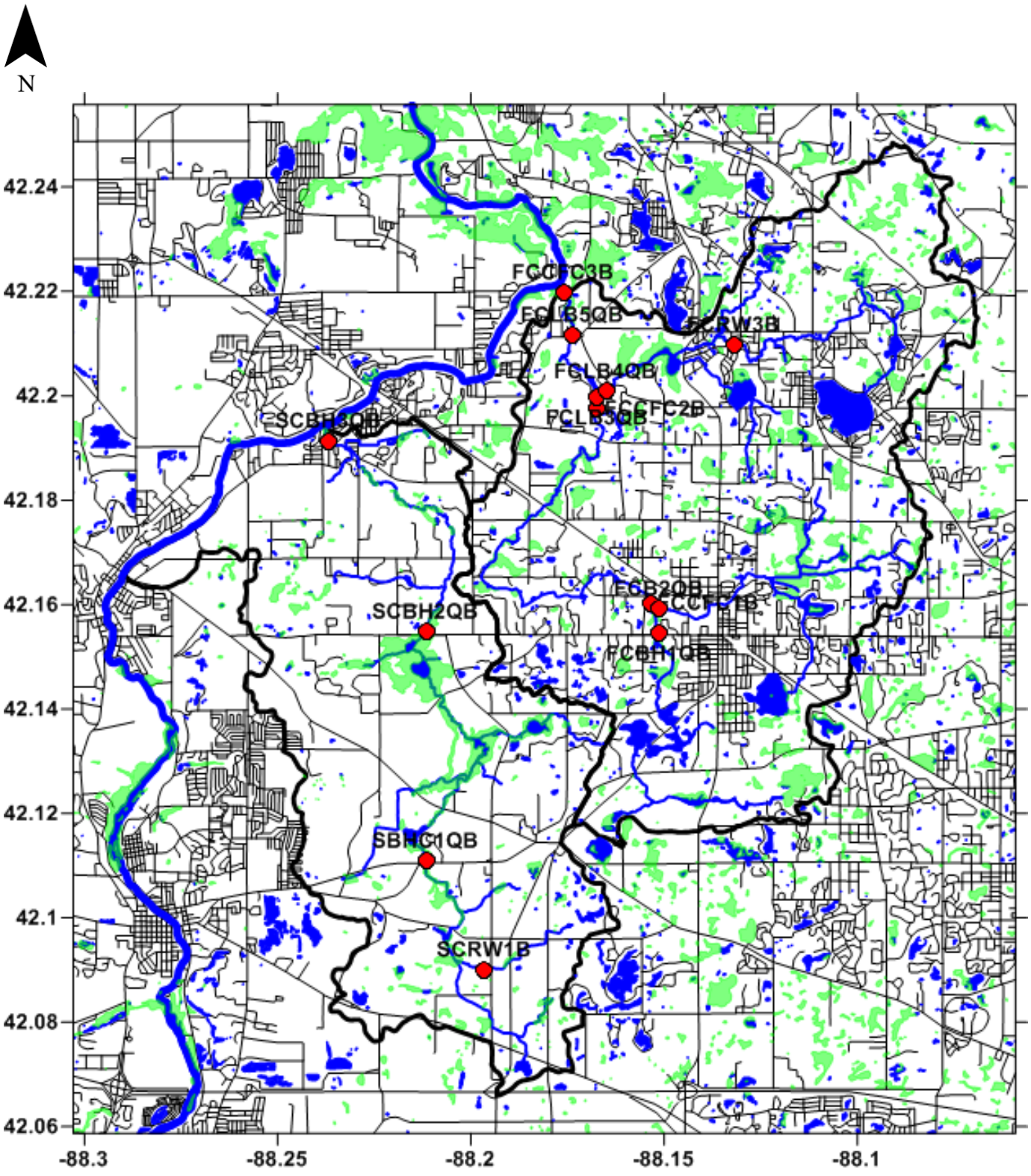


Figure 9 Biological Sampling Station Locations

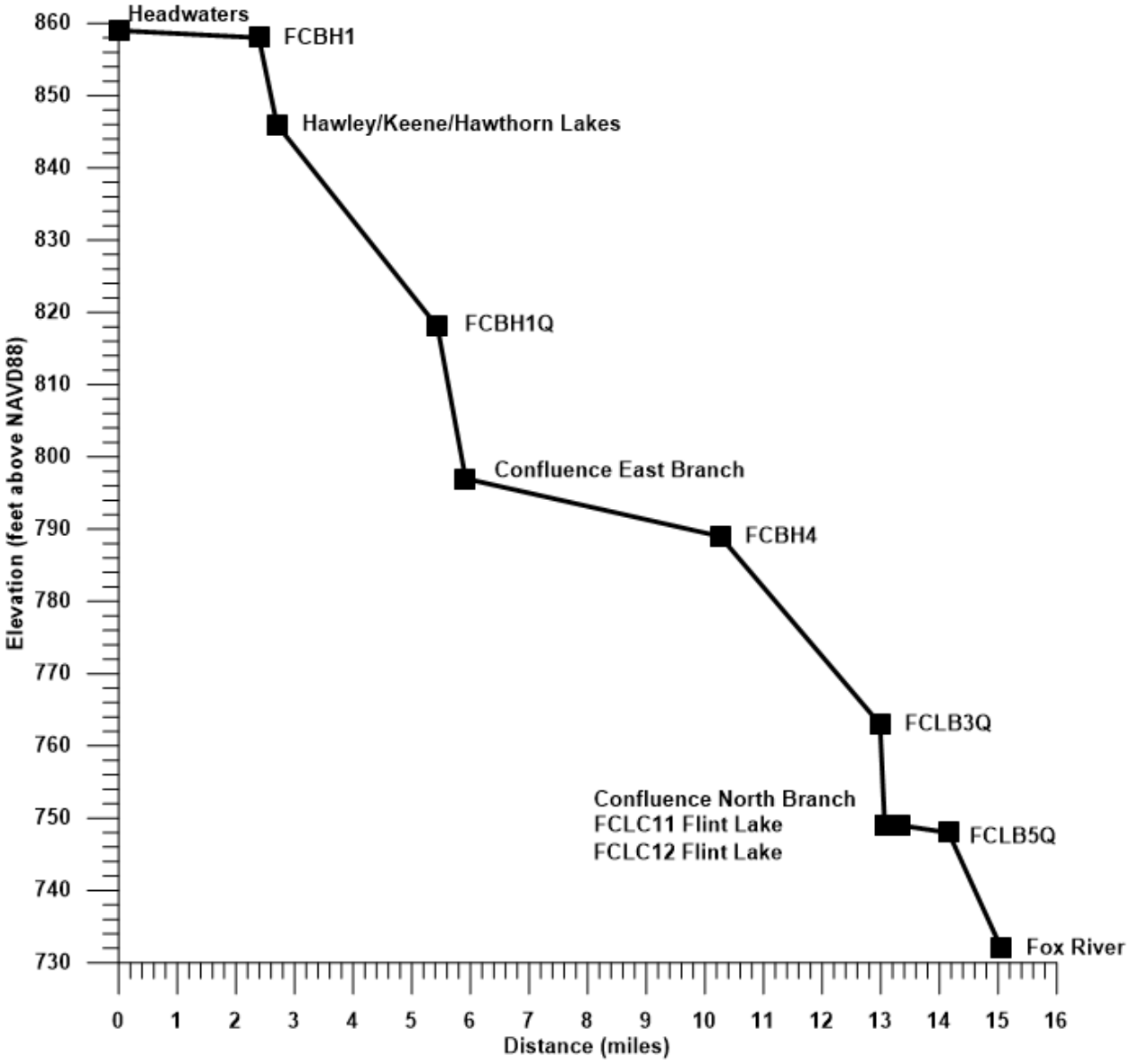


Figure 10 Stream Profile – Flint Creek

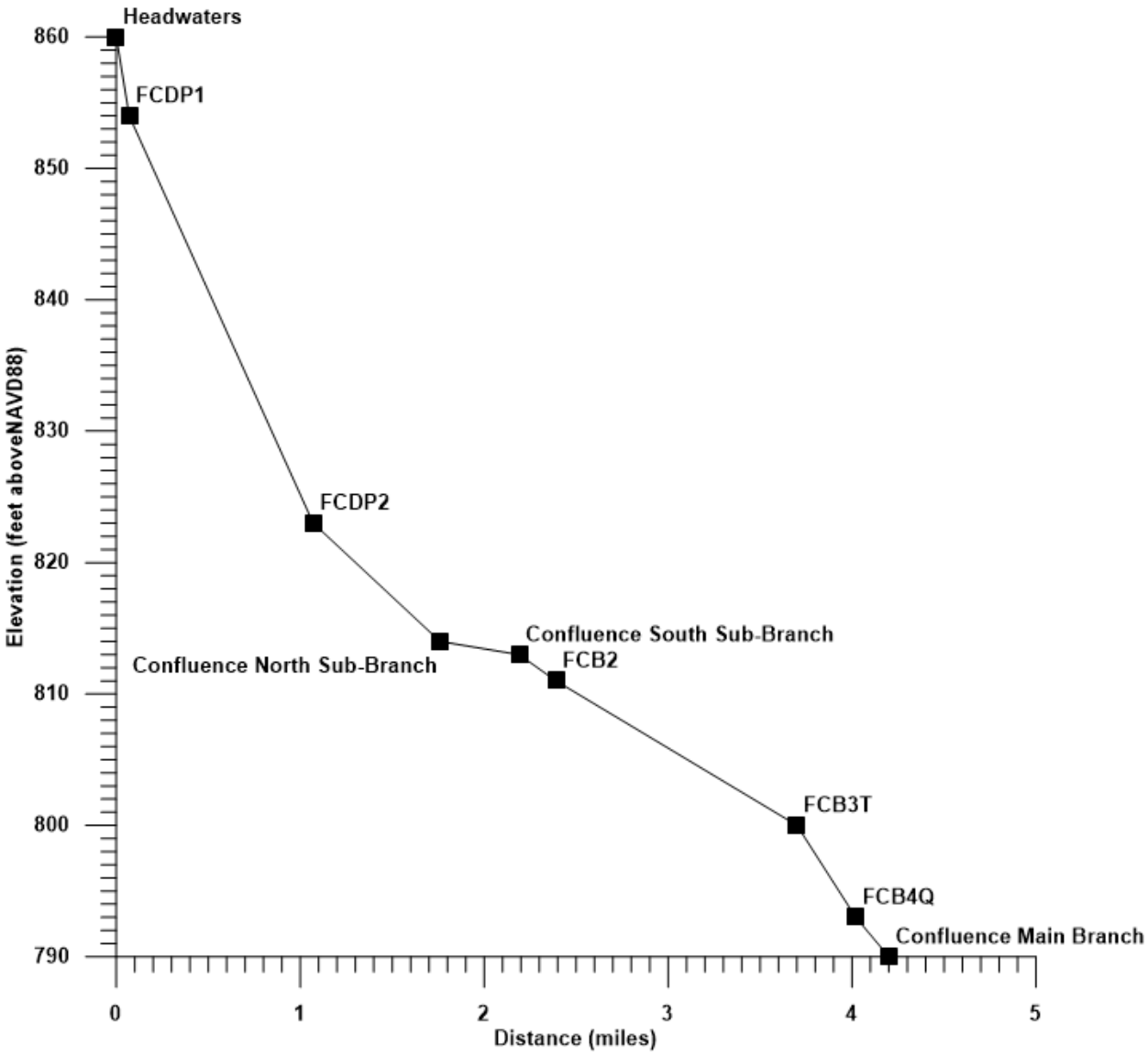


Figure 11 Stream Profile - East Branch Flint Creek

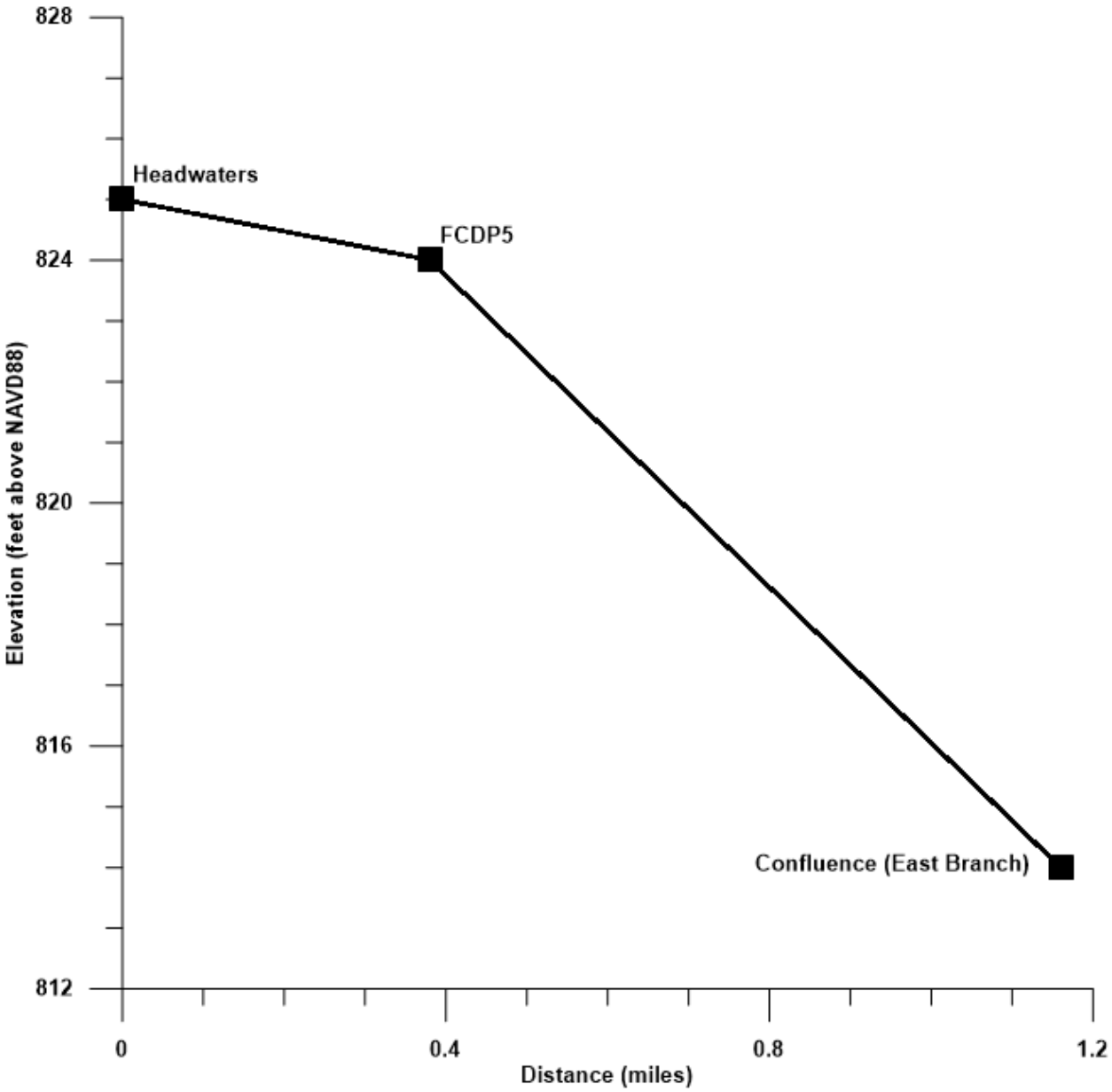


Figure 12 Stream Profile - North Sub-Branch East Branch Flint Creek

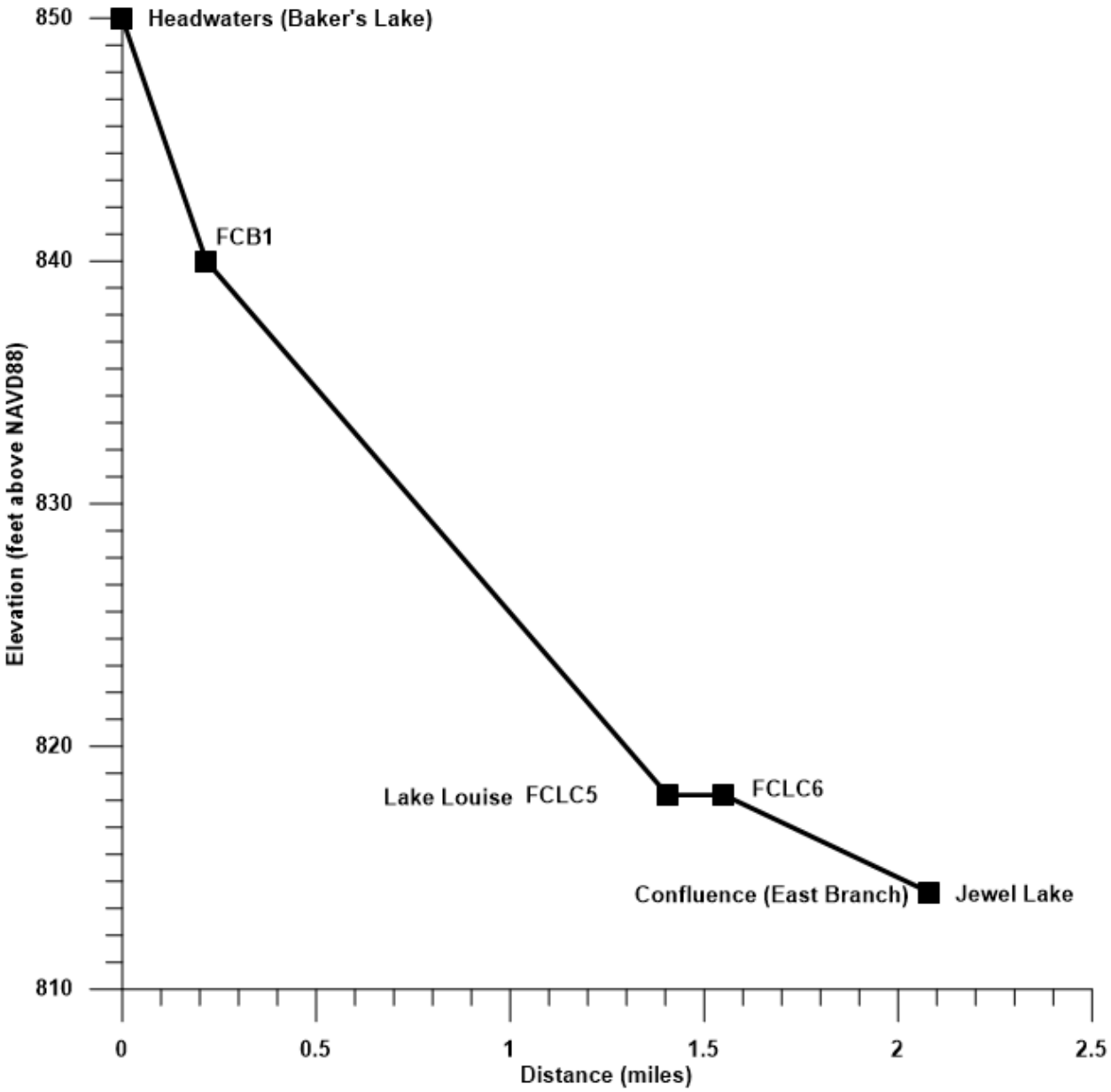


Figure 13 Stream Profile - South Sub-Branch East Branch Flint Creek

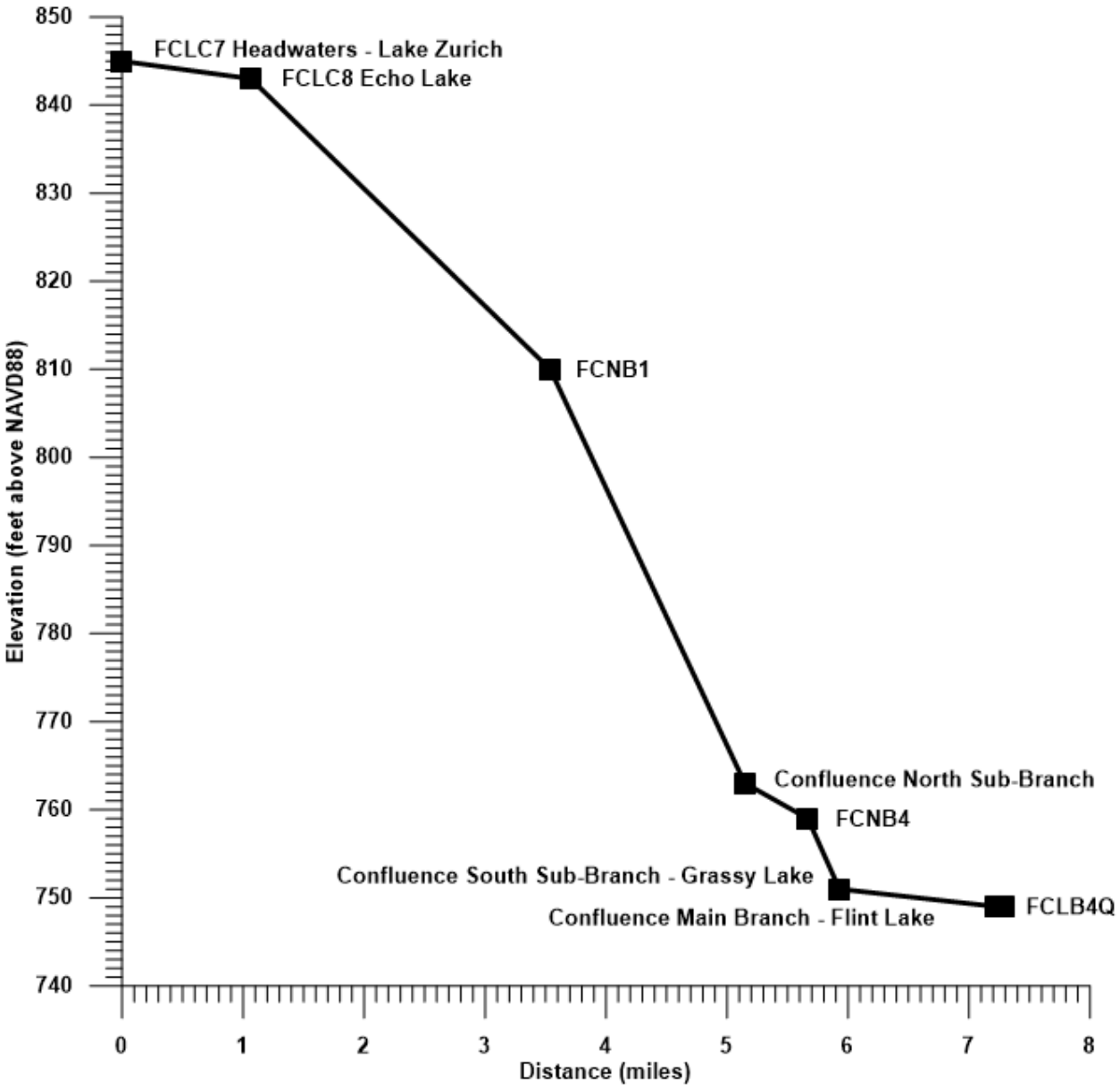


Figure 14 Stream Profile - North Branch Flint Creek

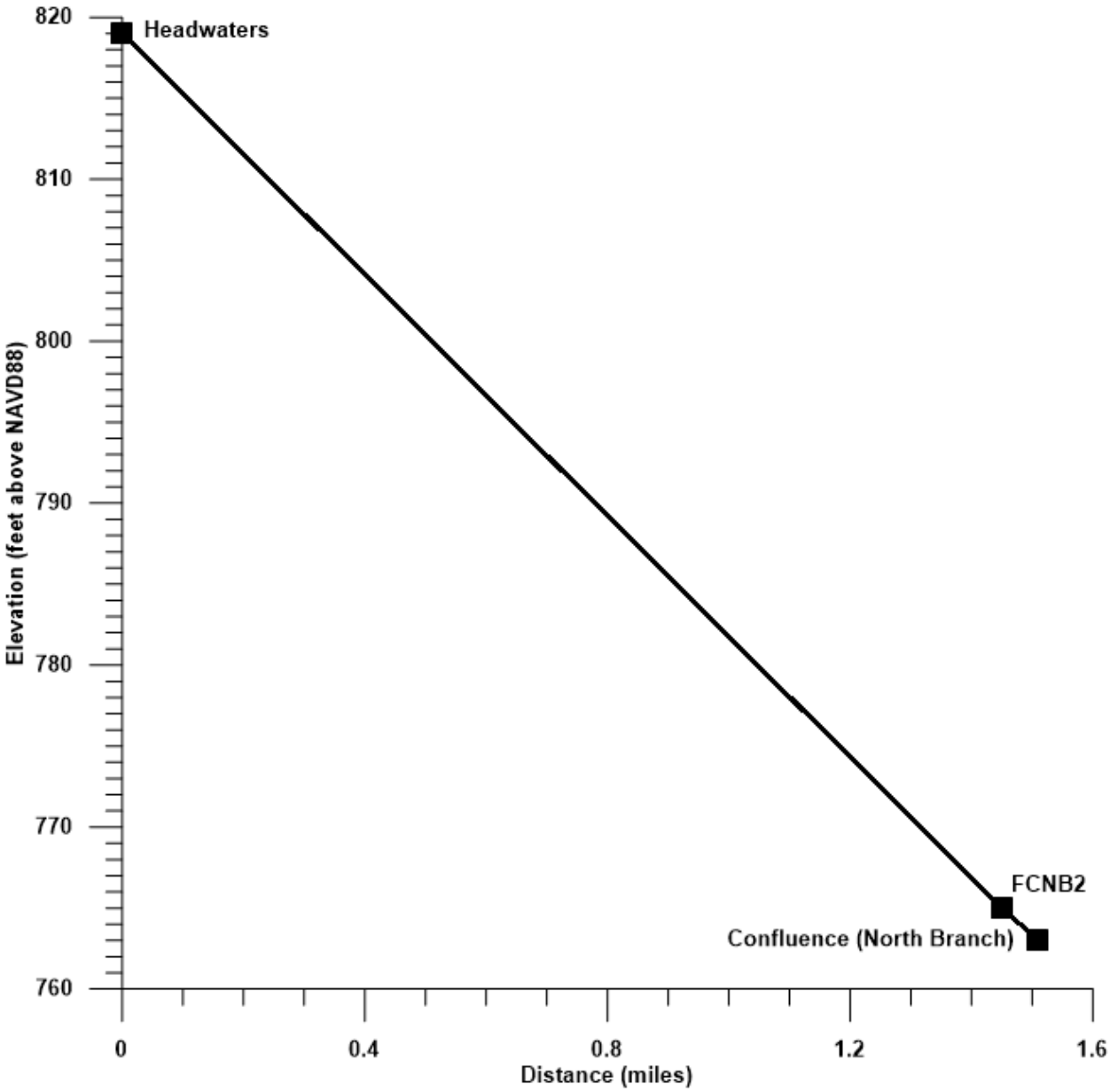


Figure 15 Stream Profile - North Sub-Branch North Branch Flint Creek

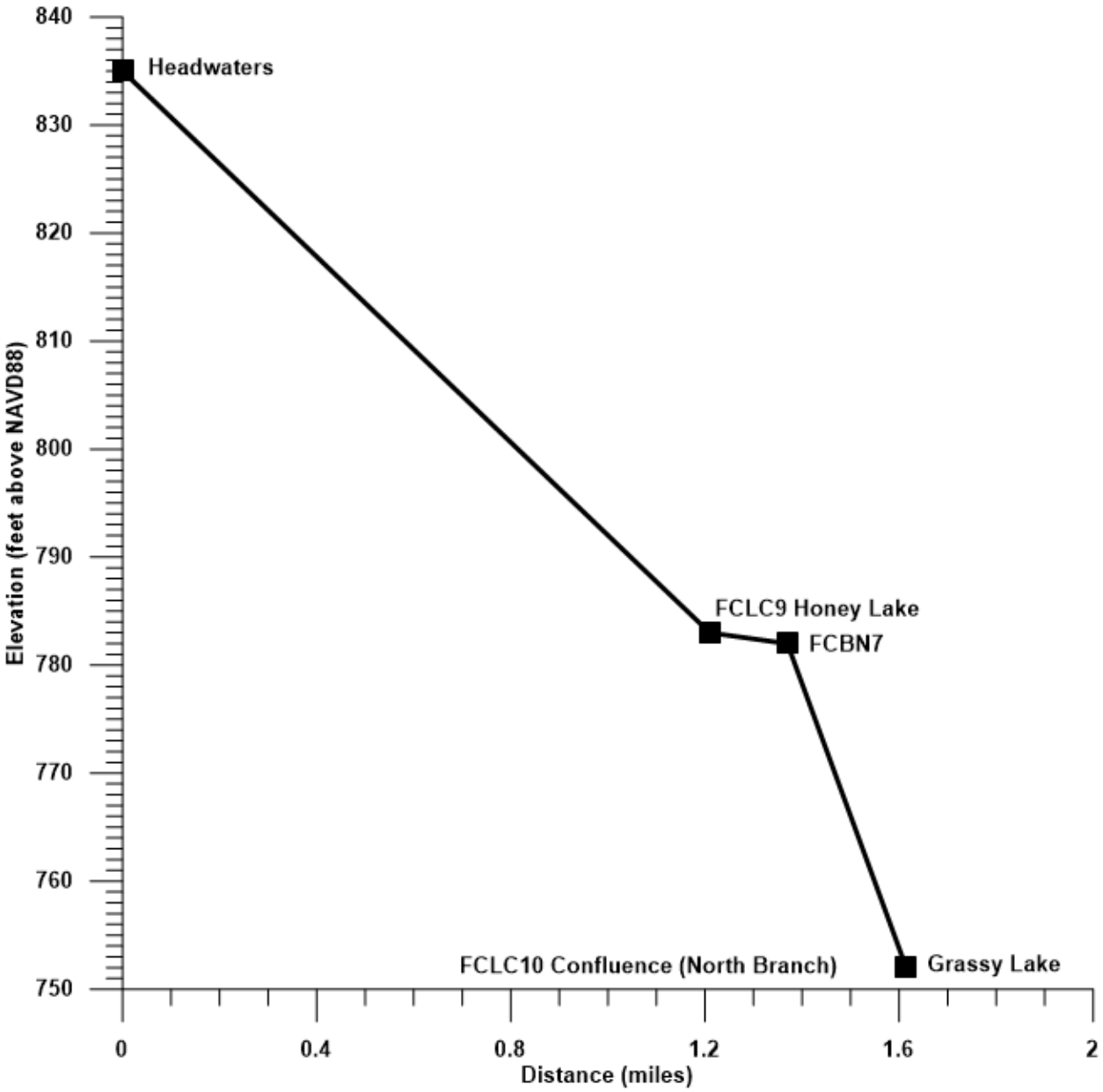


Figure 16 Stream Profile - South Sub-Branch South Branch Flint Creek

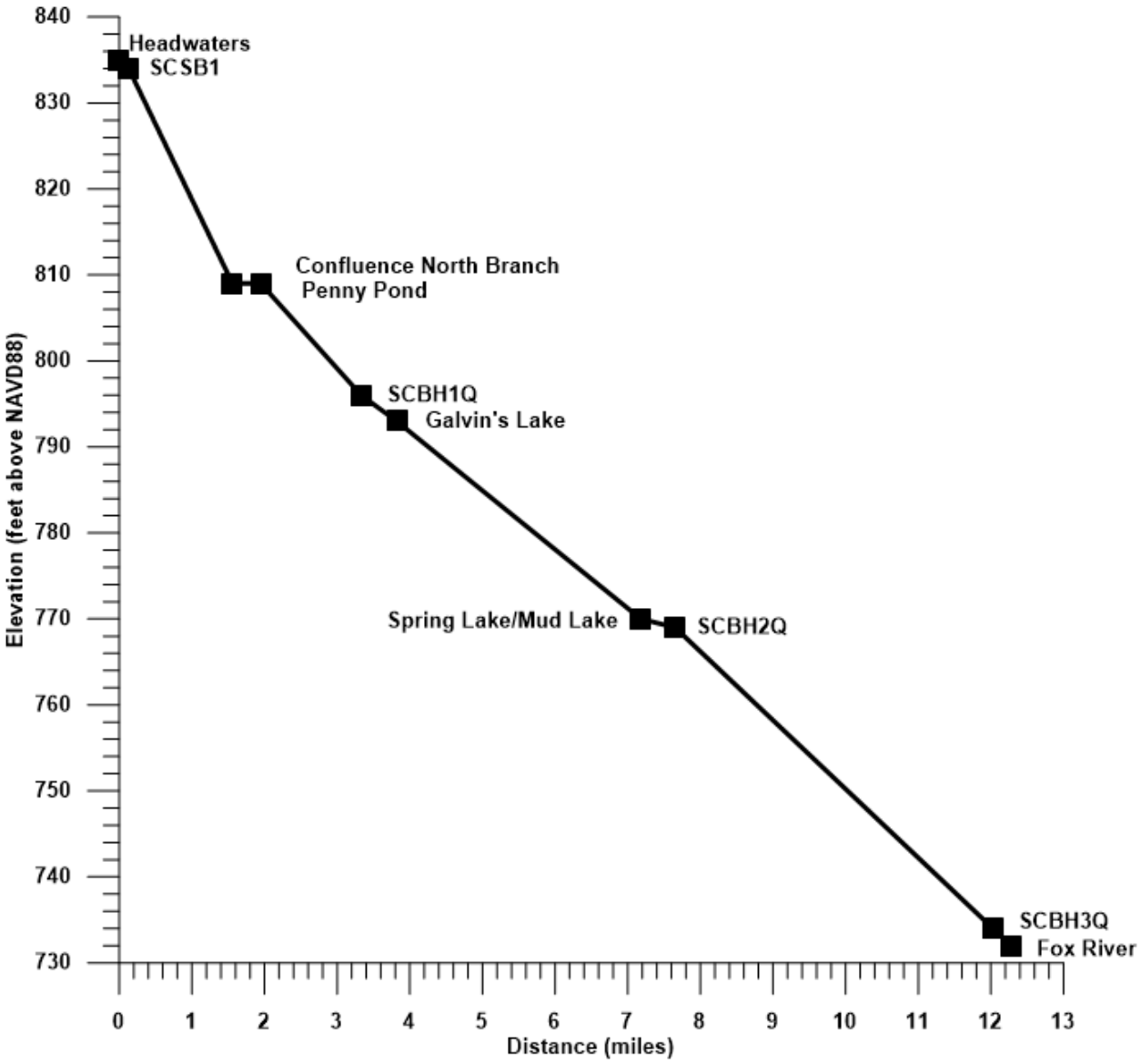


Figure 17 Stream Profile - Spring Creek

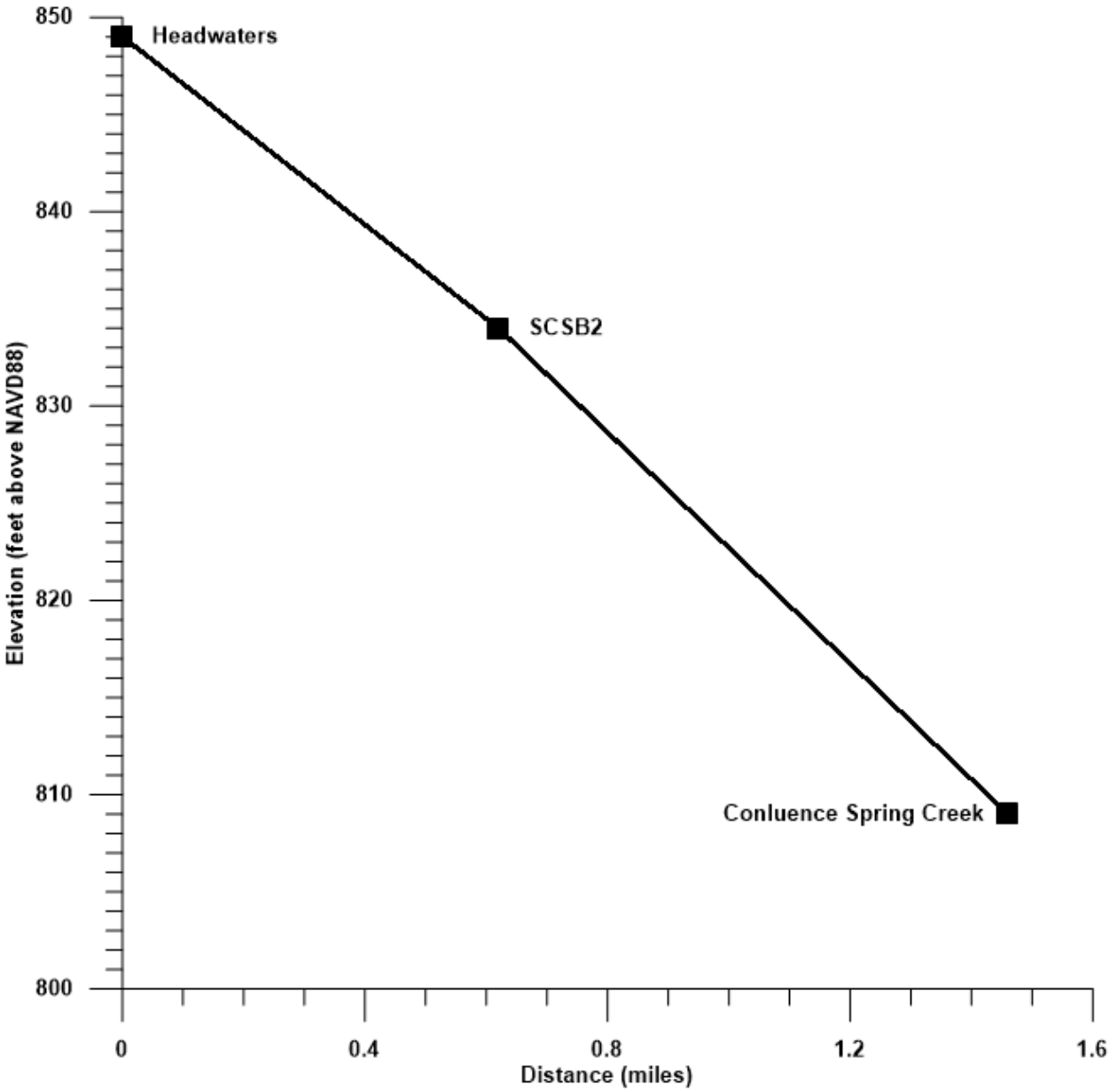


Figure 18 Stream Profile - North Branch Spring Creek

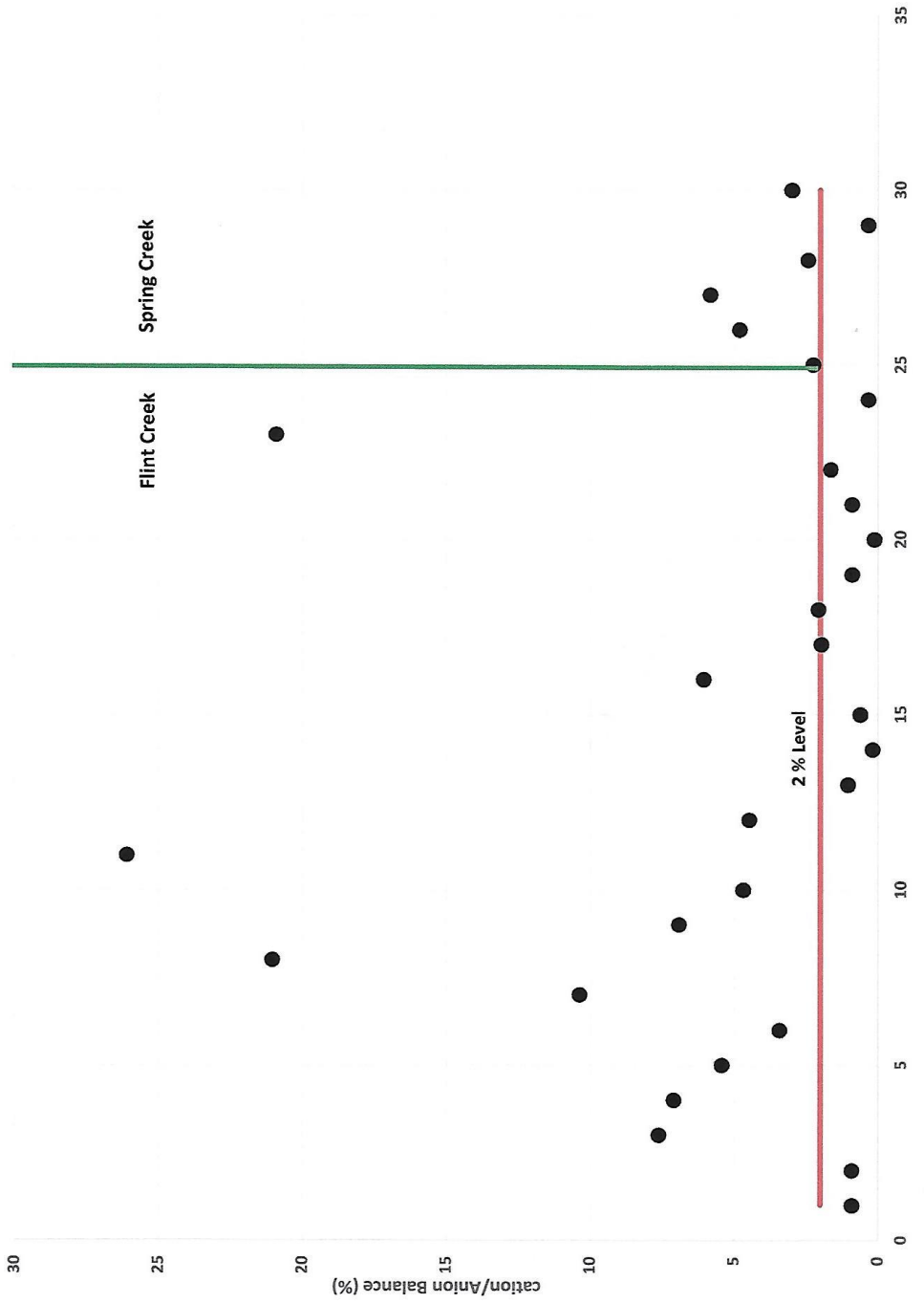


Figure 19 Cation/Anion Balance Test

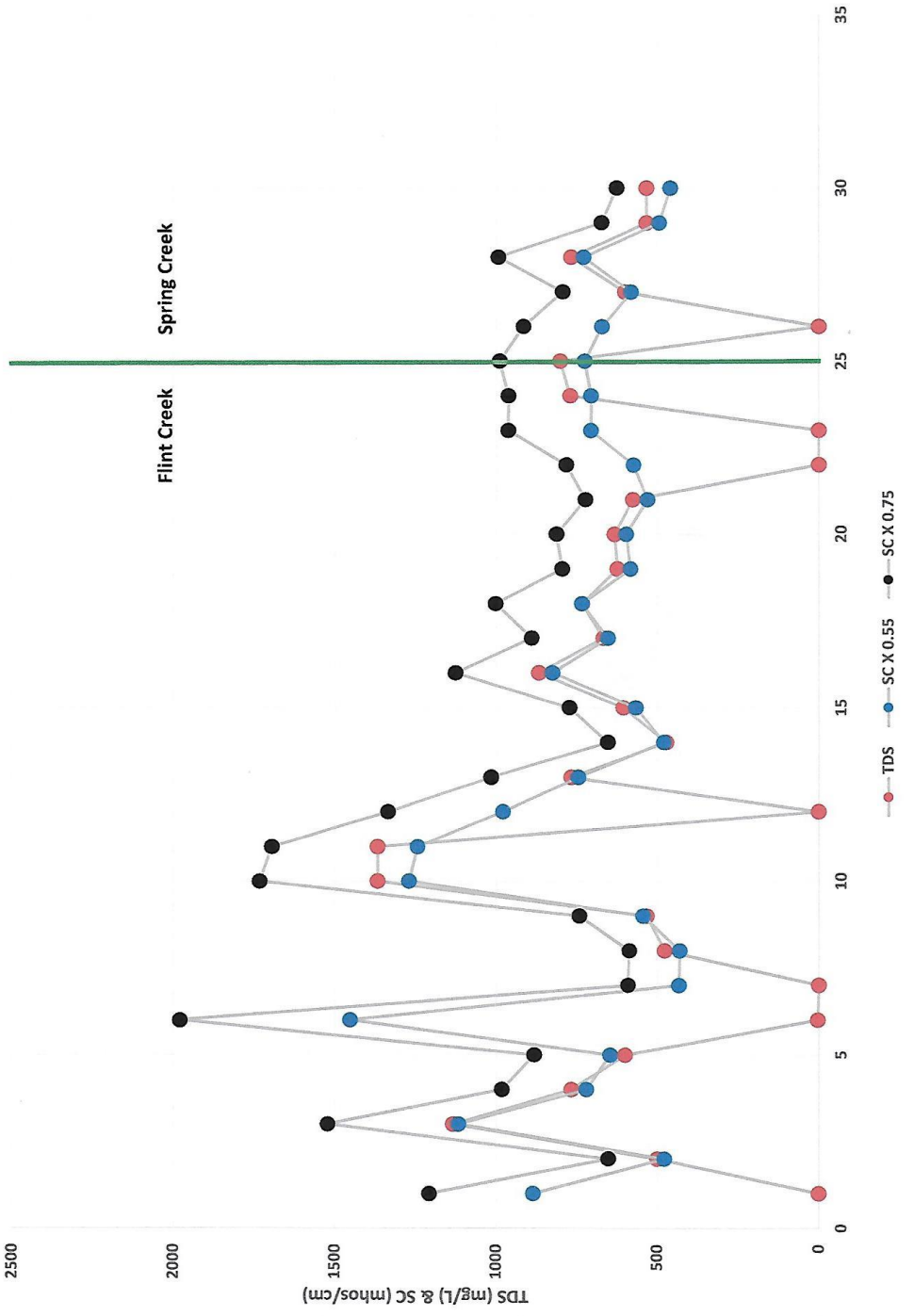


Figure 20 Total Dissolved Solids/Specific Conductivity Test

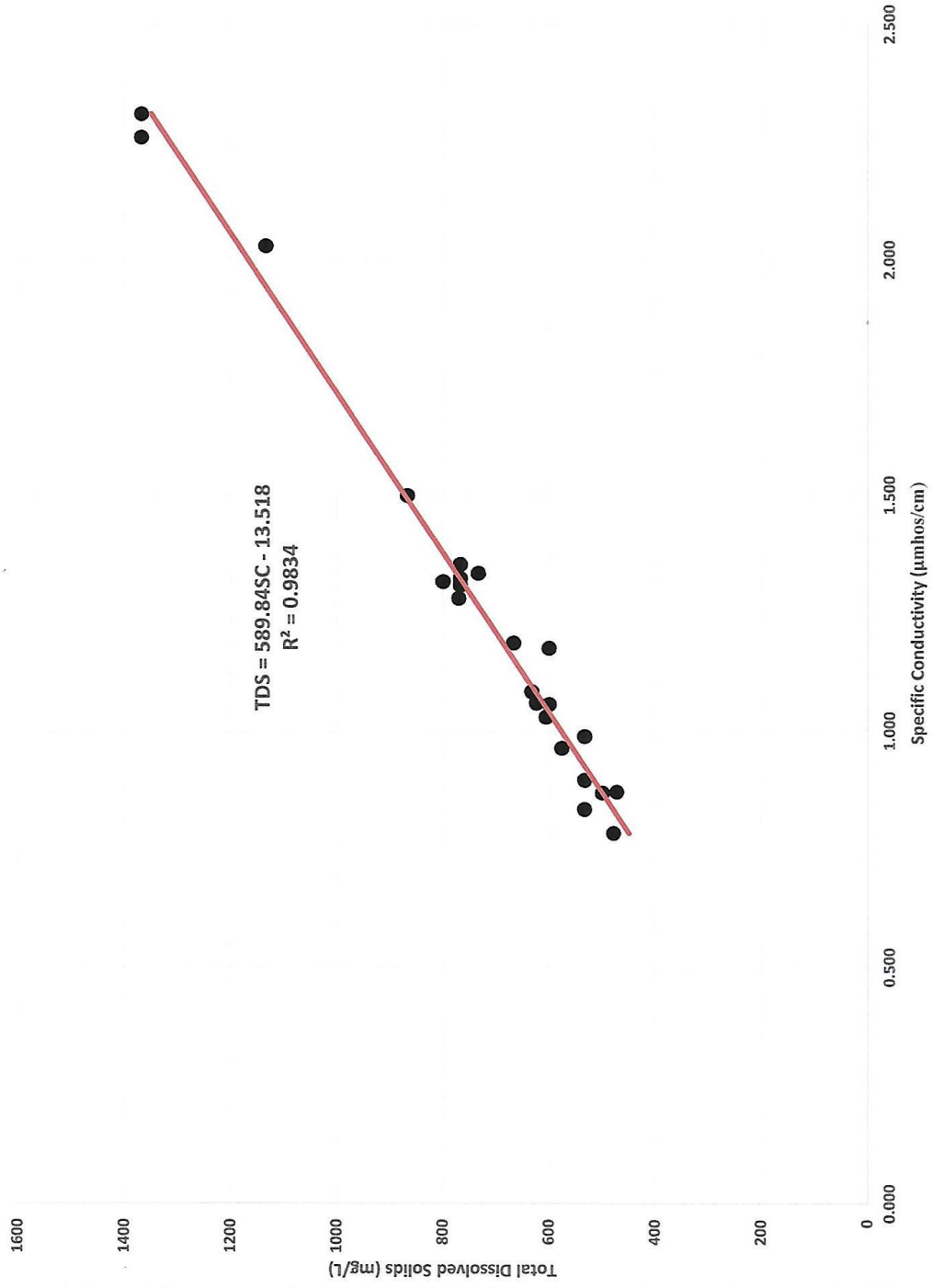


Figure 21 Total Dissolved Solids as a Function of Specific Conductivity

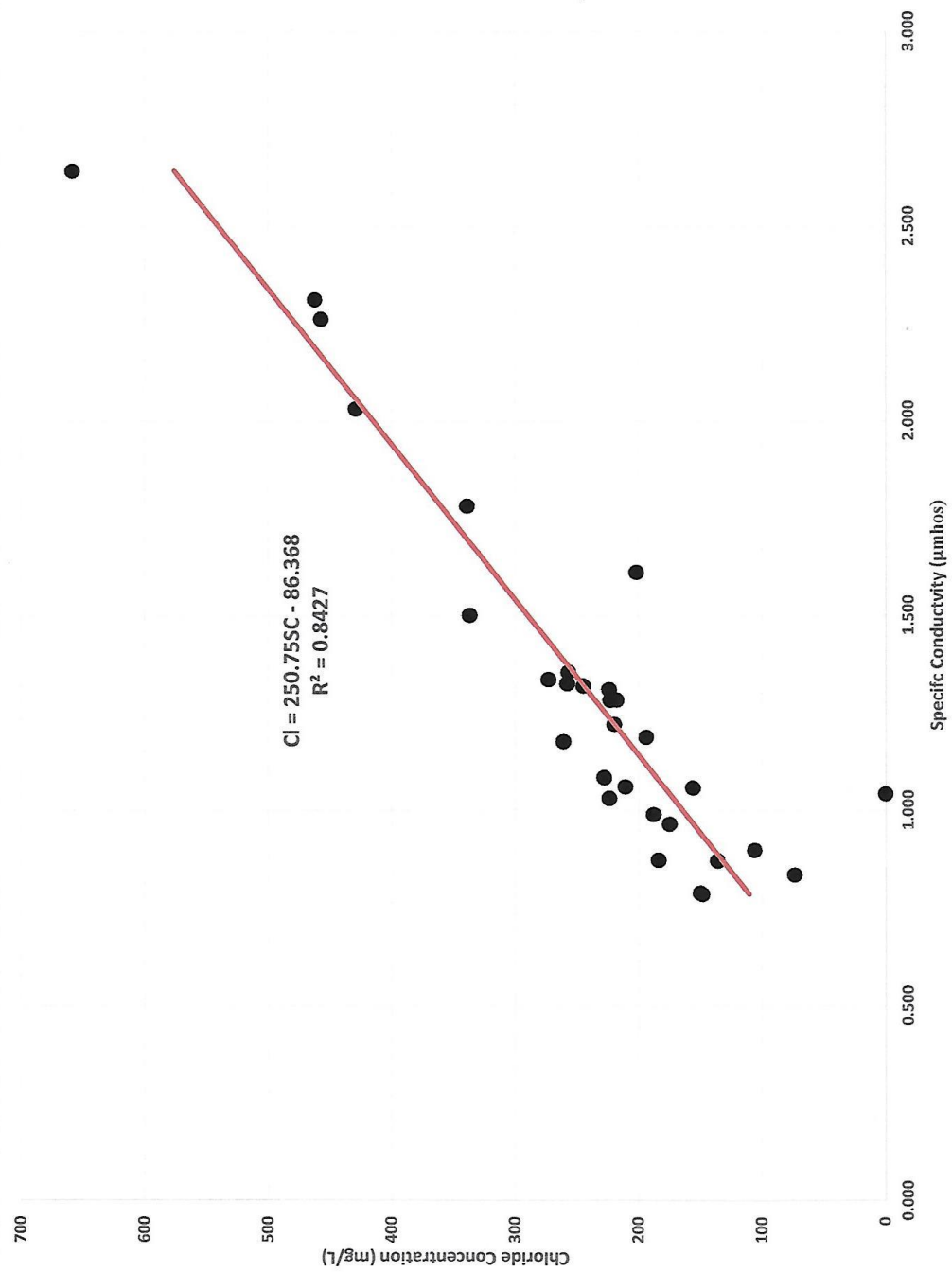


Figure 22 Chloride as a Function of Specific Conductivity

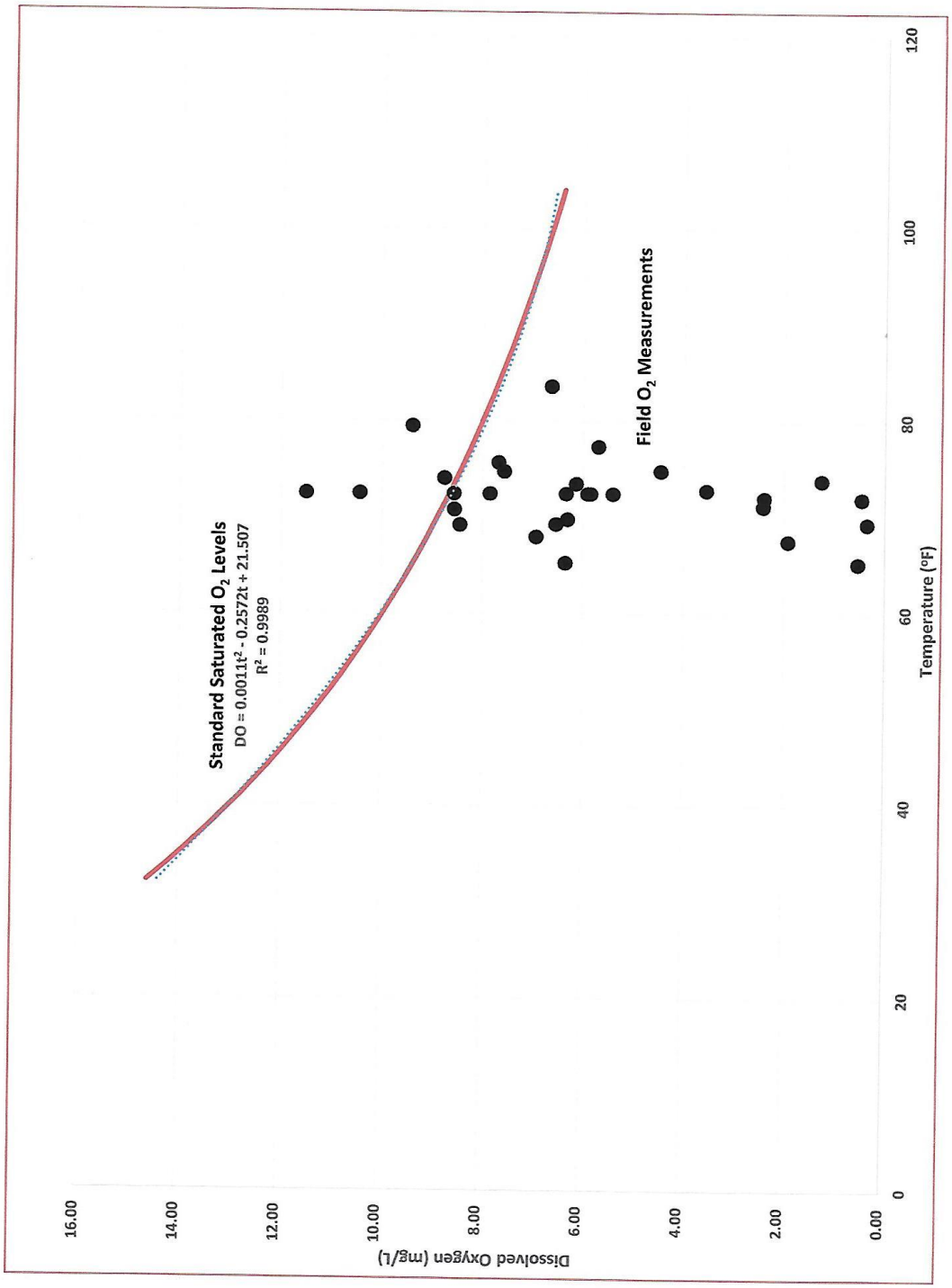


Figure 23 Oxygen Results Relative to Saturated Oxygen Levels

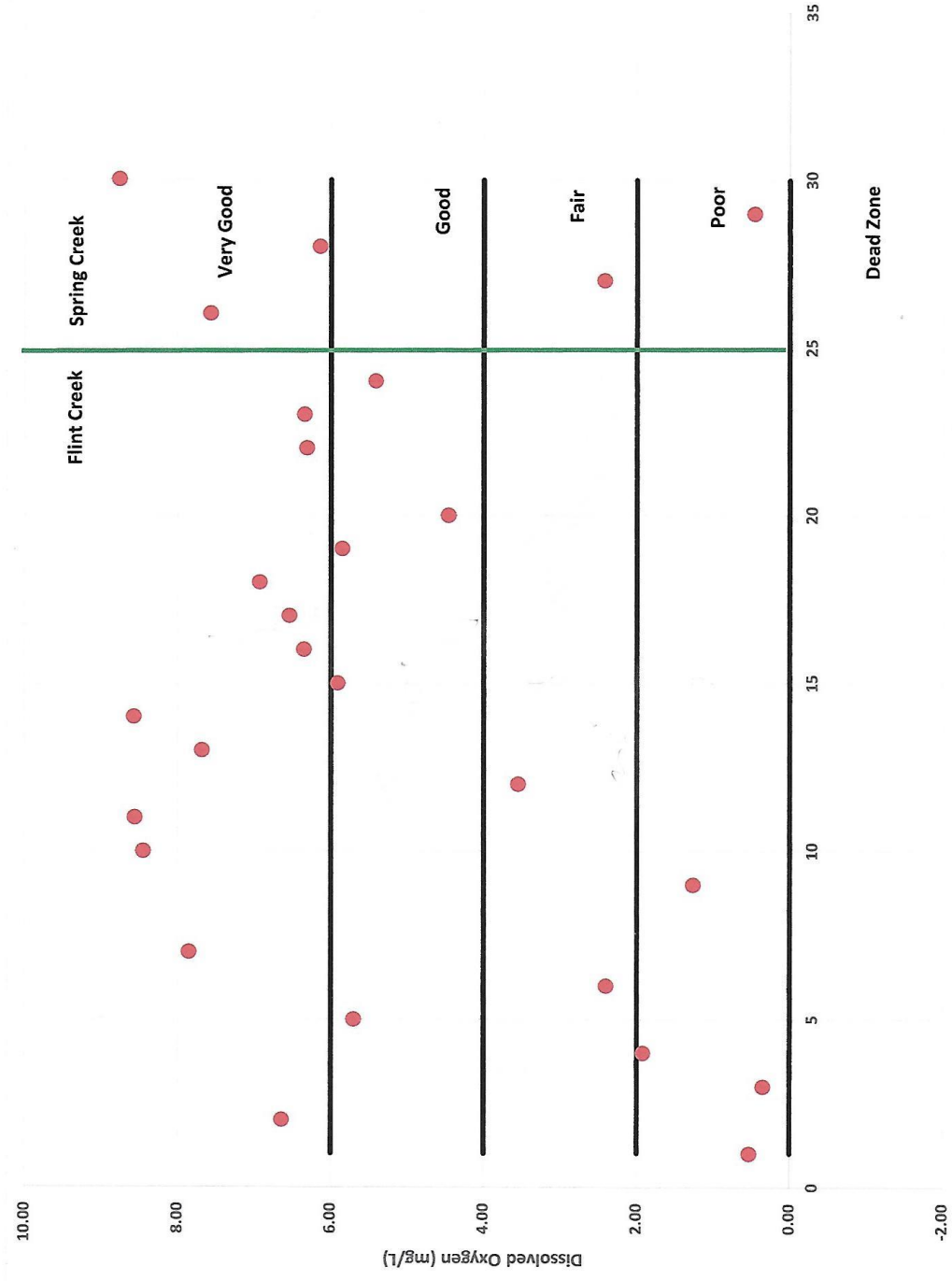


Figure 24 Oxygen Levels Relative to Stream Health

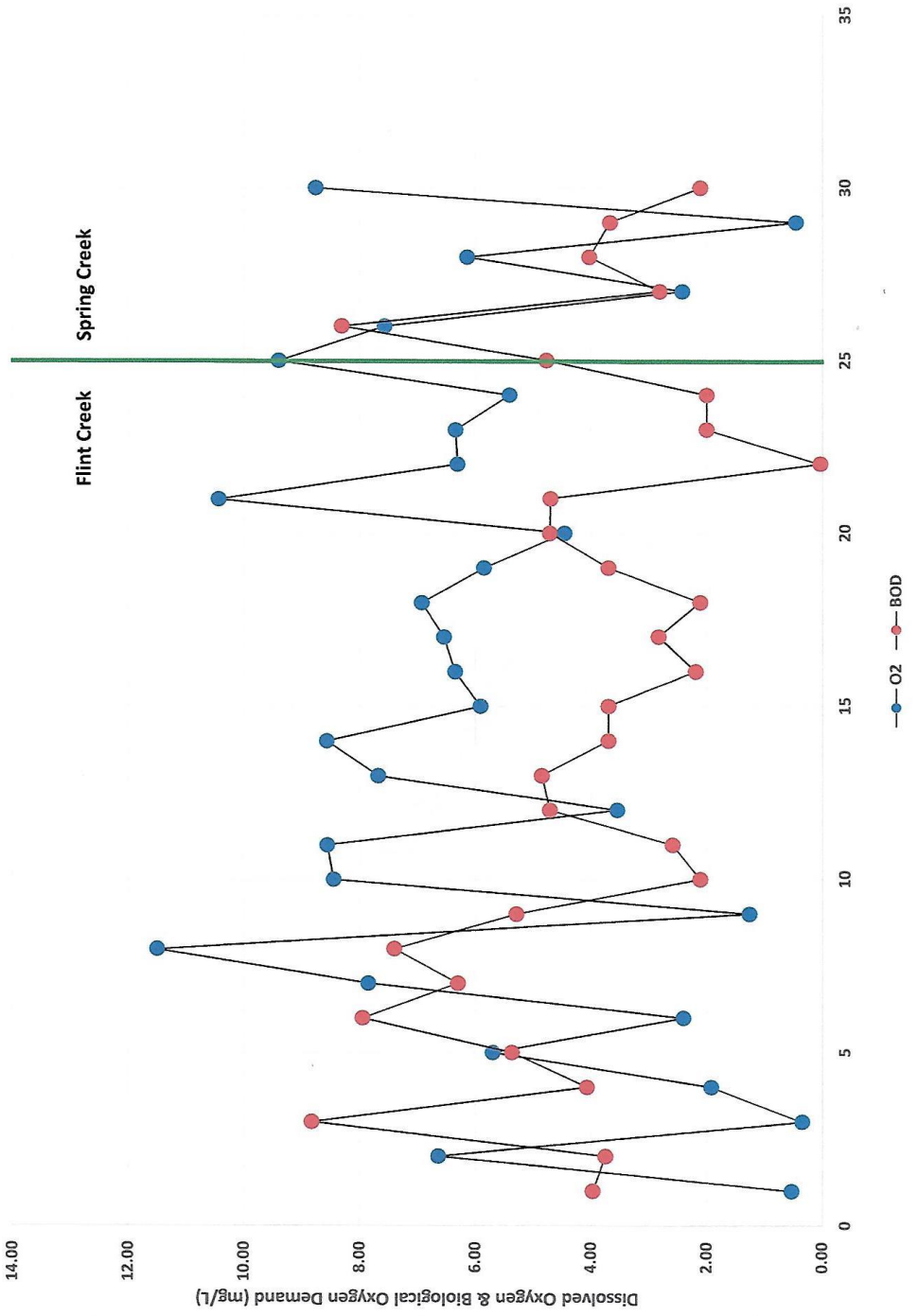


Figure 25 Oxygen Levels Relative to Biological Oxygen Demand Values

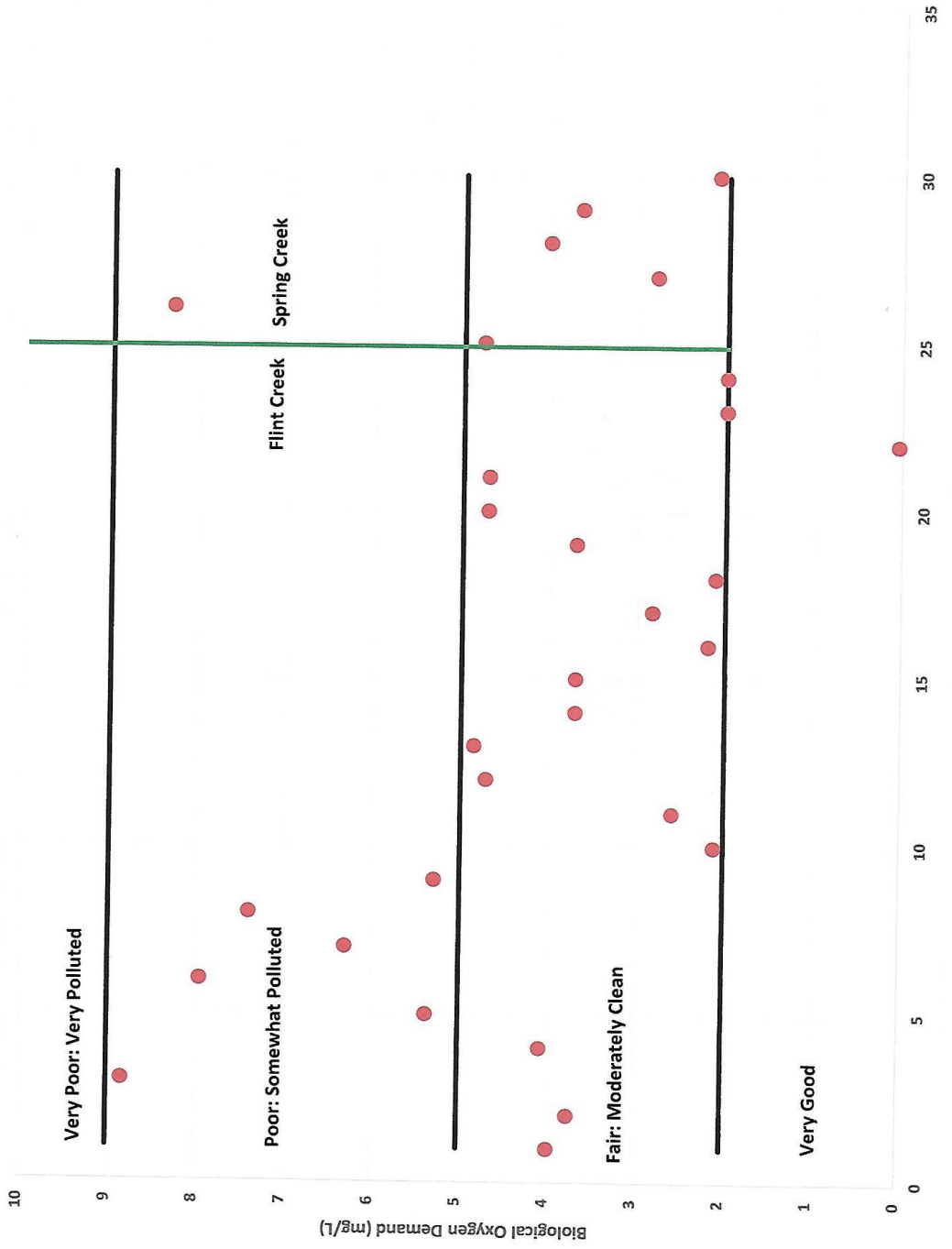


Figure 26 Biological Oxygen Demand Levels Relative to Stream Health

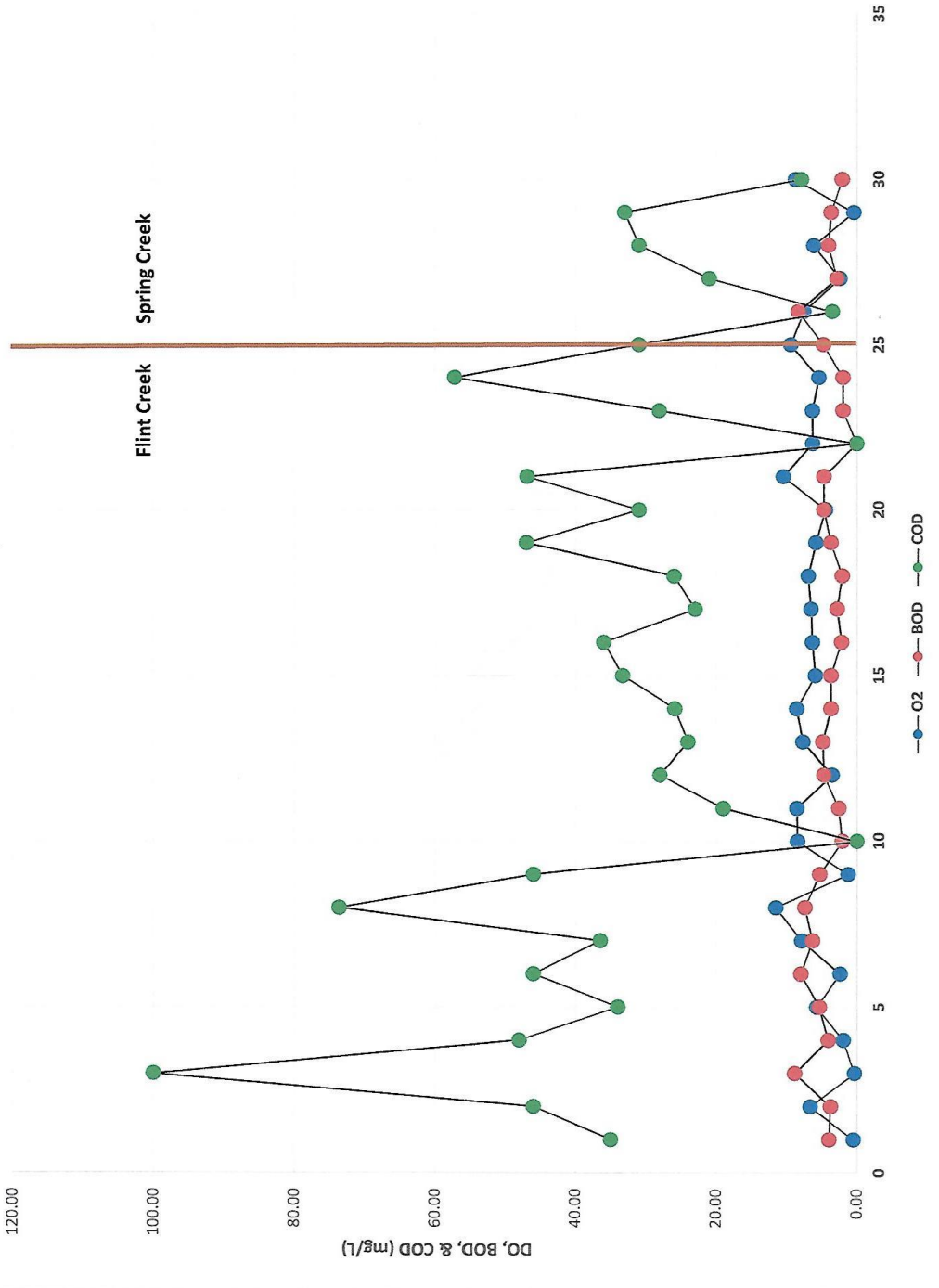


Figure 27 COD, BOD, and Oxygen Levels in Flint and Spring Creeks

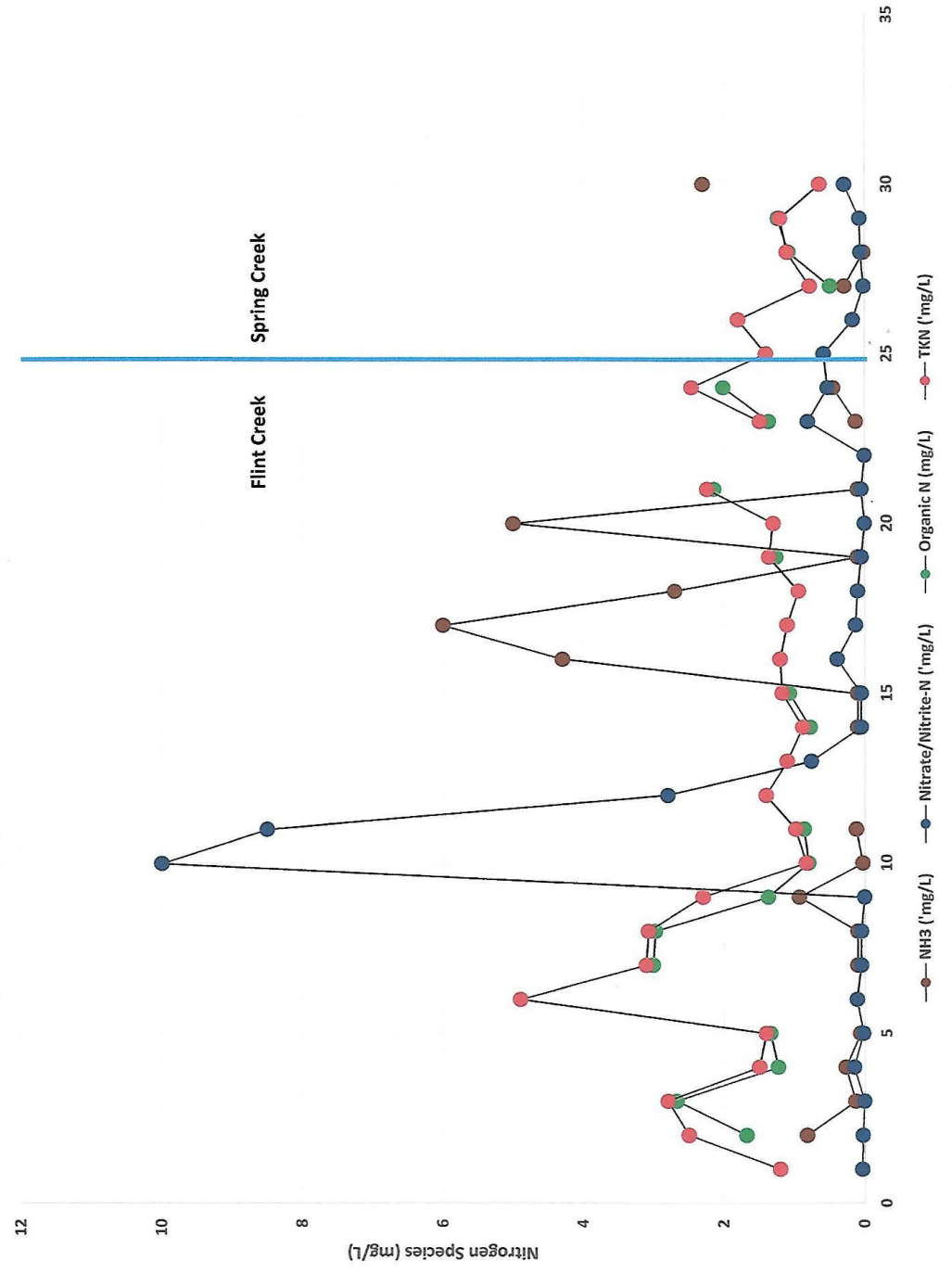


Figure 28 Nitrogen Species

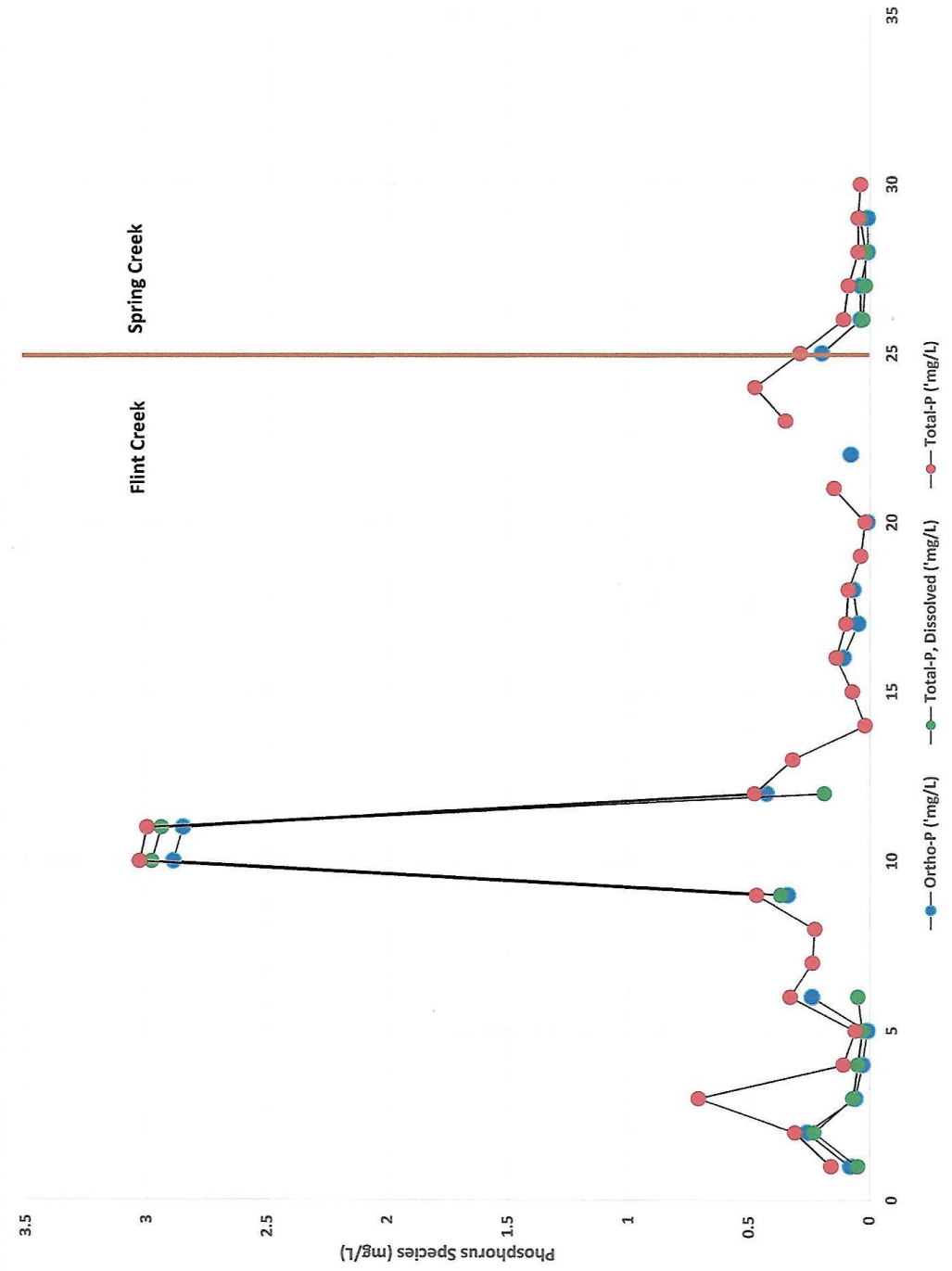


Figure 29 Phosphorus Species

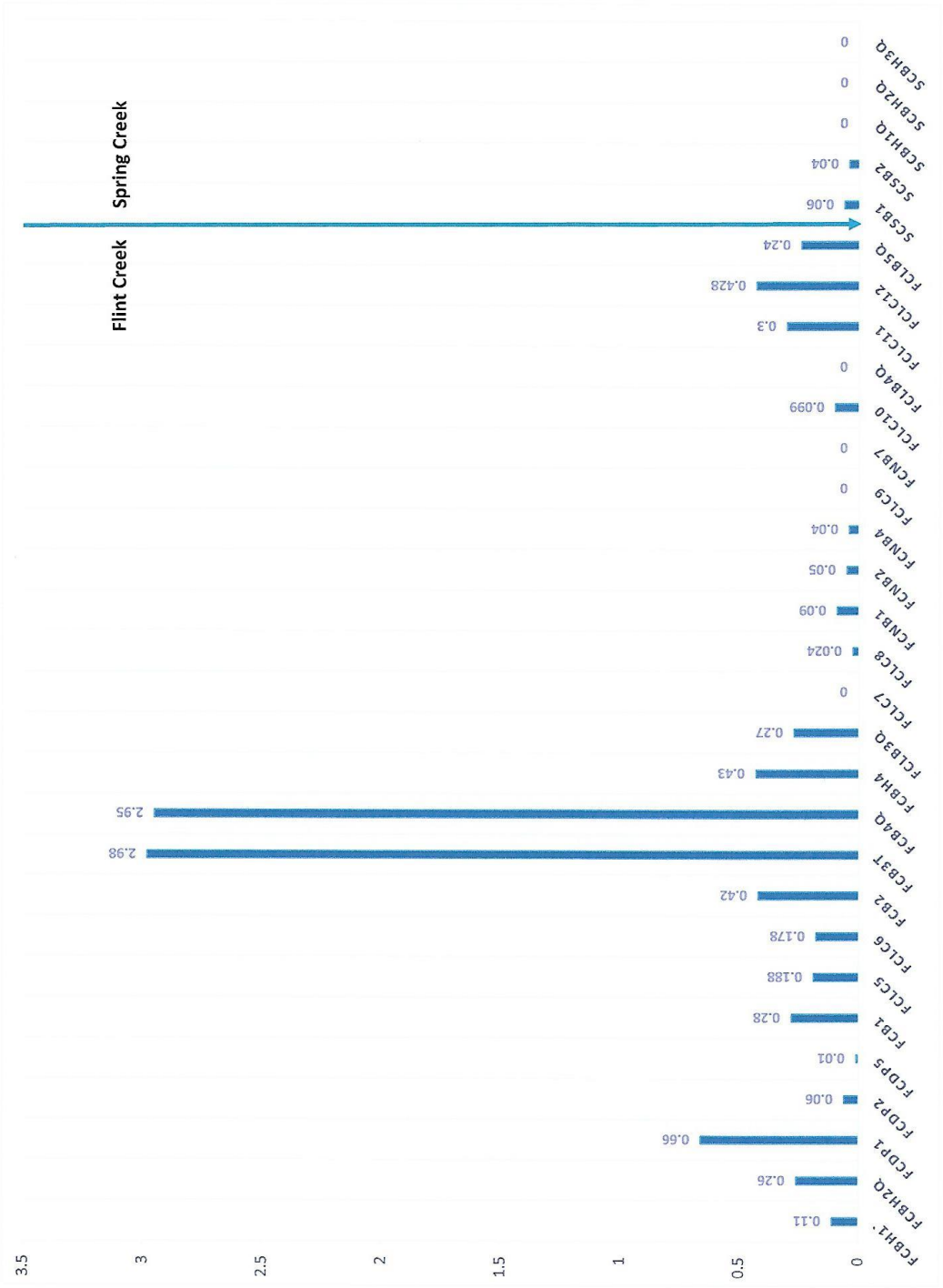


Figure 30 Total Phosphorus Remediation Goals (mg/L)

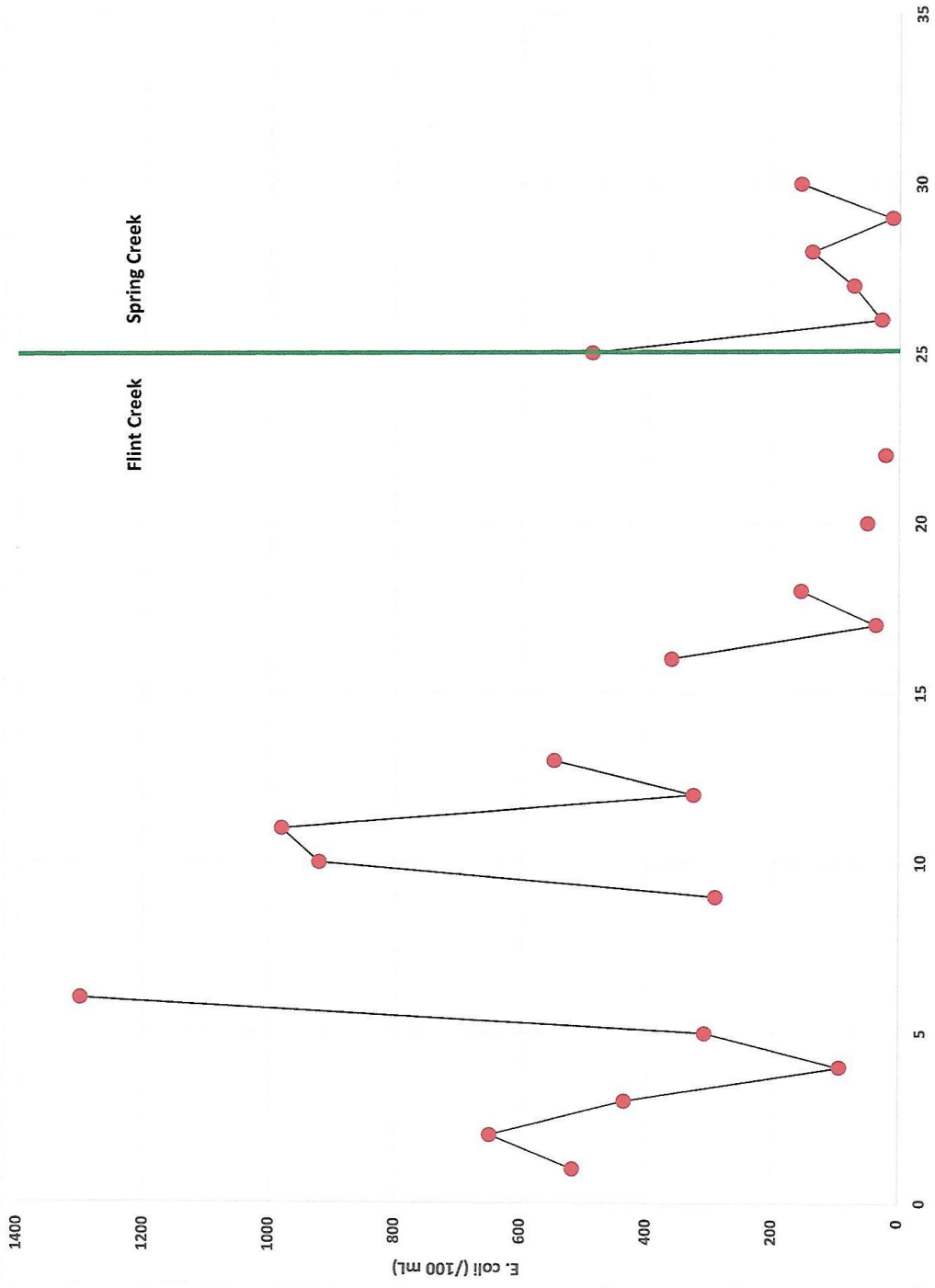


Figure 31 E. coli Levels in Flint and Spring

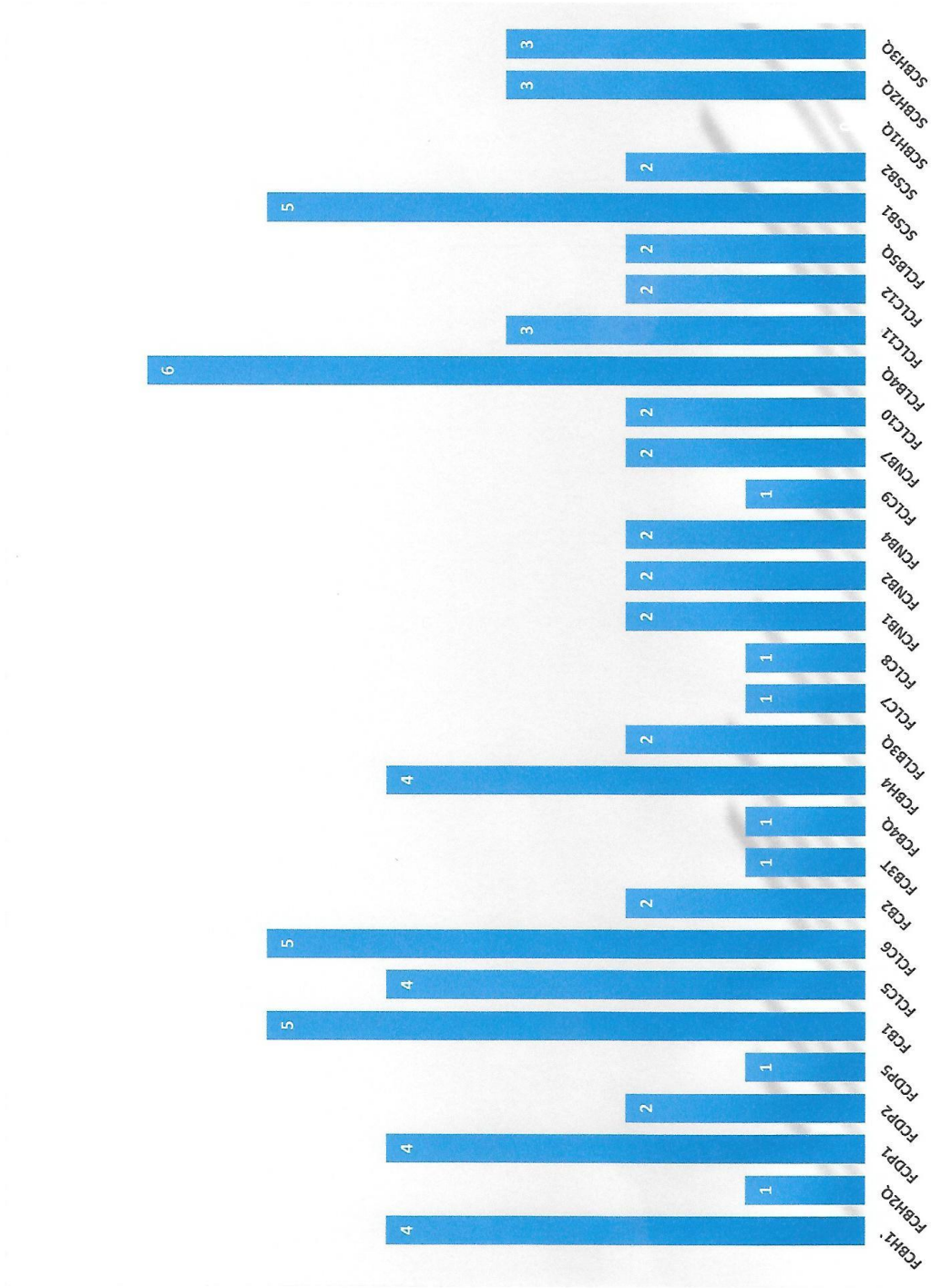


Figure 32 Outliers per Sample Location

RiverWatch Site Report

Thursday, January 28, 2016
12:40:00 PM

Flint Cr

Overall Water Quality Score:
Very Poor

Overall Water Quality Trend:
Trends Not Available

*Miminum of 5 samples required to calculate water quality trends

Site Location Information

SiteID	Waterbody	Watershed	County	Topo Map Name	IEPA Stream Code	HUC 12 Watershed	Upstream Dam?	Upstream Wastewater Treatment?	Pipes Entering Stream?	Channelized?	Local Land Use
R0204202	Flint Cr	FOX	Cook	Barrington	IL_DTZS-01	071200061104	No	No	No	Yes	Forest, Grassland,

Site Summary Report for All Years Sampled

Avg. Bugs Collected	Avg Taxa Richness	Avg EPT Rich.	Avg MBI	Avg Taxa Score	Avg EPT Score	Avg MBI Score	IEPA Stream Status	IEPA Priority Nutrient Reduction	IEPA Priority Stream For Protection	IDNR Biologically Significant Stream	IDNR Bio Diversity Score	IDNR Bio Integrity Score
19.0	8.0	1.0	6.6	Poor	Very Poor	Very Poor	Impaired	Yes	No	No		

Figure 33 River Watch Site Report

Figure 33 River Watch Site Report (Continued)

Biological Site Report for Each Sample

Field Date	Total Organisms Sampled	Taxa Richness	Taxa Richness Score	Taxa Richness Percentile for Year	EPT Taxa Richness	EPT Taxa Richness Score	EPT Percentile for Year	MBI	MBI Score	MBI Percentile for Year	Accepted into Database?
7/9/2015	19	8	Poor	24	1	Very Poor	8	6.58	Very Poor	13	☐
Field Date	**Total Organisms Sampled**	**Taxa Richness**	**Taxa Richness Score**	**Taxa Richness Percentile for Year**	**EPT Taxa Richness**	**EPT Taxa Richness Score**	**EPT Percentile for Year**	**MBI**	**MBI Score**	**MBI Percentile for Year**	**Accepted into Database?**

Macroinvertebrates of Special Interest

Field Date	Native Mussels	Zebra Mussels	Fingernail Clams	Asian Clams	Chinese Mystery Snail	Rusty Crayfish
7/9/2015	☐	☐	☐	☐	☐	☐
FieldDate	**Native Mussels**	**Zebra Mussels**	**Fingernail Clams**	**Asian Clams**	**Chinese Mystery Snail**	**Rusty Crayfish**

Habitat Site Report for Each Sample

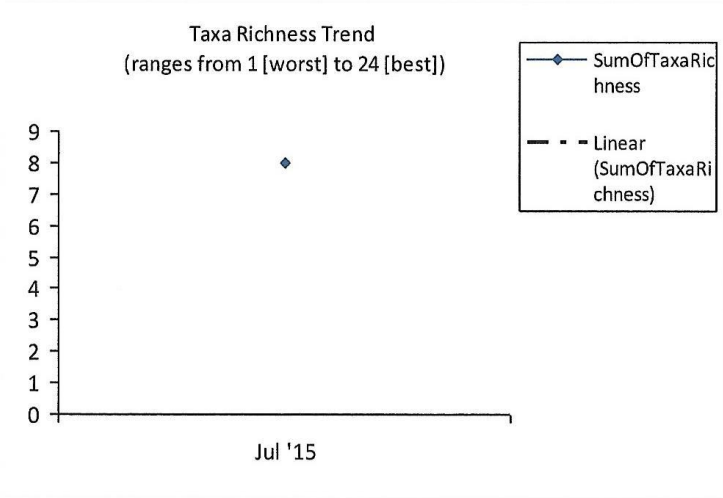
Field Date	Canopy Cover	Algal Coverage	Stream Siltation	Bedrock	Boulder	Clay	Cobble	Gravel	Sand	Silt	Disch. (CFS)	UpSt. Dam	Waste Water	Pipes Entering	Chann. ?
7/9/2015	0%	0%	76-100%	0%	0%	0%	0%	0%	0%	76-100%	25.8	☐	☐	☐	☑

Field Date	Canopy Cover	Algal Coverage	Stream Siltation	Bedrock	Boulder	Clay	Cobble	Gravel	Sand	Silt	Disch. (CFS)	UpSt. Dam	Waste Water	Pipes Entering	Chann. ?

Chemical Site Report for Each Sample (if applicable)

Field Date	Dissolved Oxygen PPM	Nitrate PPM	Phosphate PPM	Water Temp. Deg. Celsius	pH	Biological Oxygen Demand	Fecal Coliform Bacteria	Accepted into Database?
7/9/2015				10.0			☐	☐

Field Date	Dissolved Oxygen PPM	Nitrate PPM	Phosphate PPM	Water Temp. Deg. Celsius	pH	Biological Oxygen Demand	Fecal Coliform Bacteria	Accepted into Database?



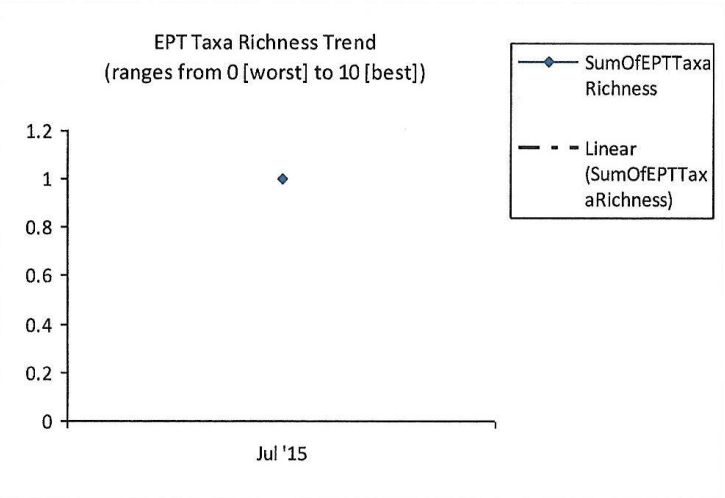


Figure 33 River Watch Site Report (Continued)

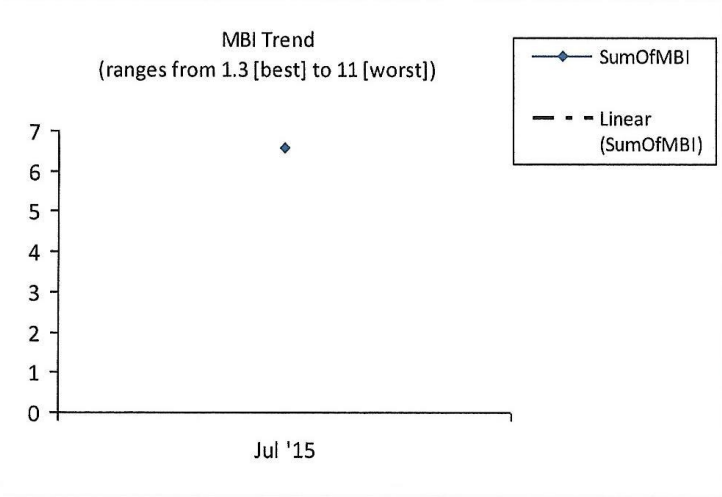


Figure 33 River Watch Site Report (Continued)

Stream Quality Metrics Definitions

Term	Definition	Response to Sedimentation	Response to Nutrient Pollution	Response to Toxic Pollution
Accepted into Database	Whether or not a specific RiverWatch sample satisfied all of the quality assurance requirements.	N/A	N/A	N/A
Algal Coverage	Proportion of stream bottom covered by filamentous algae.	Decreases	Increases	Variable
Biological Oxygen Demand	Amount of dissolved oxygen used by organisms in the stream in parts/million.	Variable	Increases	Decreases
Correlation	Measures if a significant relationship exists between a water quality metric and time sampled using Pearson's Correlation Coefficient. Values closer to "0" indicate no significant trend, while values closer to "1" and "-1" indicate significant positive and negative relationships through time.	N/A	Increasingly positive MBI correlation, increasingly negative Taxa Richness correlation	Increasingly negative Taxa and EPT Taxa Richness correlation.
Dissolved Oxygen PPM	Concentration of dissolved oxygen in the stream in parts/million. Must be above 5 ppm in healthy streams.	Variable	Decreases	Variable

EPT Percentile	The percentile rank of the EPT Taxa Richness in a given year. For example, if the EPT Taxa Richness was 3 in 2009, it scored better than 58% of other RiverWatch stream sites sampled in 2009 for EPT Taxa Richness.	Decreases	Decreases	Decreases
EPT Taxa Richness	Variety of sensitive stoneflies, mayflies, and caddisflies present in sample. EPT Taxa Richness ranges from 0 different kinds (worst) to over five different kinds (best).	Decreases	Decreases	Decreases
Fecal Coliform Bacteria	A measure of whether the concentration of fecal coliform bacteria is present in the stream. A "postive" measurement typically indicates that colonies are present in a concentration greater than or equal to 20/colonies per 100 ml.	Variable	Increases	Deceases
IDNR Bio Diversity Score	Species richness of fish, macroinvertebrates, and mussels as monitored by the Illinois Department of Natural Resouces and Illinois Natural History Survey. The diversity score is rated A through E, with "A" denoting the highest biodiversity.	Variable	Decreases	Variable
IDNR Bio Integrity Score	Intactness of fish, macroinvertebrates, and mussel communities as monitored by the Illinois Department of Natural Resouces and Illinois Natural History Survey using multimetric indices. The diversity score is rated A through E, with "A" denoting the highest degree of biointegrity.	Decreases	Decreases	Decreases
IDNR Biologically Significant Stream	Biologically significant streams have at least two different taxonomic groups (fish, macroinvertebrates, or mussels) that are highly diverse and/or intact as monitored by the Illinois Department of Natural Resource and Illinois Natural History Survey. These stream segments are unique resources in the state and the biological communities present must be protected at the stream reach, as well as upstream of the reach.	No	No	No
IEPA Priority Nutrient Reduction	Watersheds identified by the Illinois Nutrient Reduction Strategy as a priority to reduce nutrient pollution runoff.	N/A	Yes	N/A
IEPA Priority Stream for Protection	Stream segment identified by the Illinois Environmental Protection Agency as having the potential to become impaired by non-point source pollution, and thefore is a priority area for activities that protect the beneficial uses of the stream.	Yes	Yes	Yes
IEPA Stream Status	The stream's current status under the Clean Water Act, as monitored by the Illinois Environmental Protection Agency. "impariedˮ stream receive a TMDL (total maximum daily load) for specific pollutants identified as causing the impairement.	Impaired	Impaired	Impaired

Figure 33 River Watch Site Report (Continued)

MBI	Macroinvertebrate Biotic Index (MBI) is the average tolerance to organic (nutrient) pollution of macroinvertebrates in the sample. Higher quality streams have more sensitive macroinvertebrates, which have low tolerance values. Low quality stream have more tolerant macroinvertrates,which have high tolerance values. MBI ranges from 0 (best) to 11 (worst).	Variable	Increases	Variable
MBI Percentile	The percentile rank for MBI in a given year. For example, if the MBI was 5.45 in 2009, it scored better than 58% of other RiverWatch stream sites sampled in 2009 for MBI.	Variable	Decreases	Variable
Nitrate PPM	Concentration of nitrate in the stream in parts/million. Must be below 15 ppm in healthy streams.	Variable	Increases	Variable
pH	Concentration of hydrogen ions in the water, determines whether the stream is acidic or basic. Must be between 6.5 and 9 in a healthy stream.	Variable	Variable	Variable
Phosphate PPM	Concentration of phosphorous in the stream in parts/million. Must be below 0.05 mg/L in a healthy stream.	Increases	Increases	Variable
Stream Siltation	Proportion of stream bottom covered by silt.	Increases	Variable	Variable
Taxa Richness	Variety of macroinvertebrates in the sample. Taxa Richness ranges from 0 different kinds of macroinvertebrates (worst) to > 20 different kinds (best).	Decreases	Decreases	Decreases
Taxa Richness Percentile	The percentile rank of the Taxa Richness in a given year. For example, if the Taxa Richness was 12 in 2009, it scored better than 58% of other RiverWatch stream sites sampled in 2009 for Taxa Richness.	Decreases	Decreases	Decreases
Temperature	Temperature of the stream water, must be below 32°C in a healthy stream.	Variable	Variable	Variable
RiverWatch Metric	**Definition**	**Response to Sedimentation**	**Response to Nutrient Pollution**	**Response to Toxic Pollution**

Figure 33 River Watch Site Report (Continued)

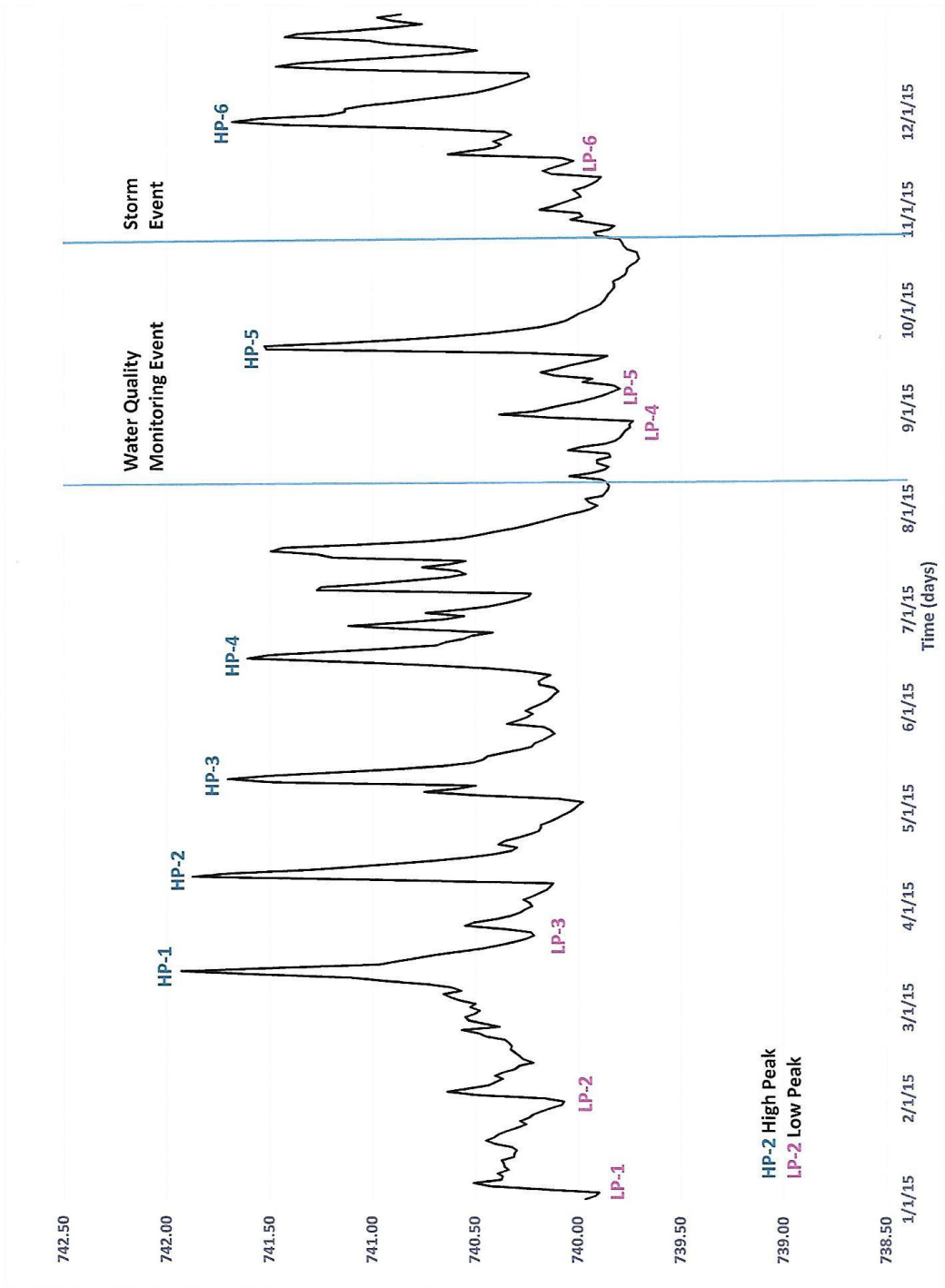


Figure 34 2015 Water Level Hydrograph at FCLB5Q

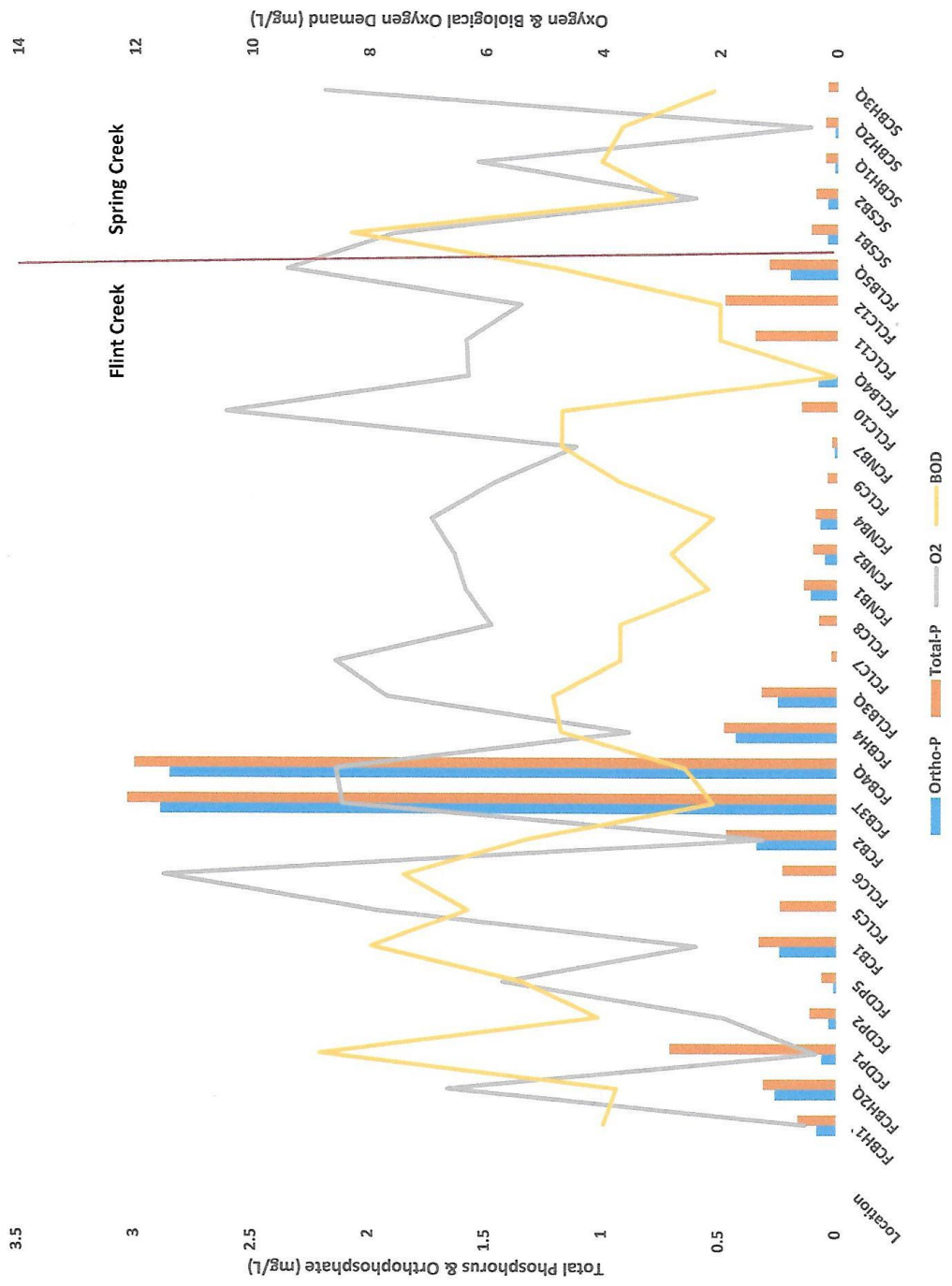


Table 35 Phosphorus/Oxygen Distribution in Flint and Spring Creeks

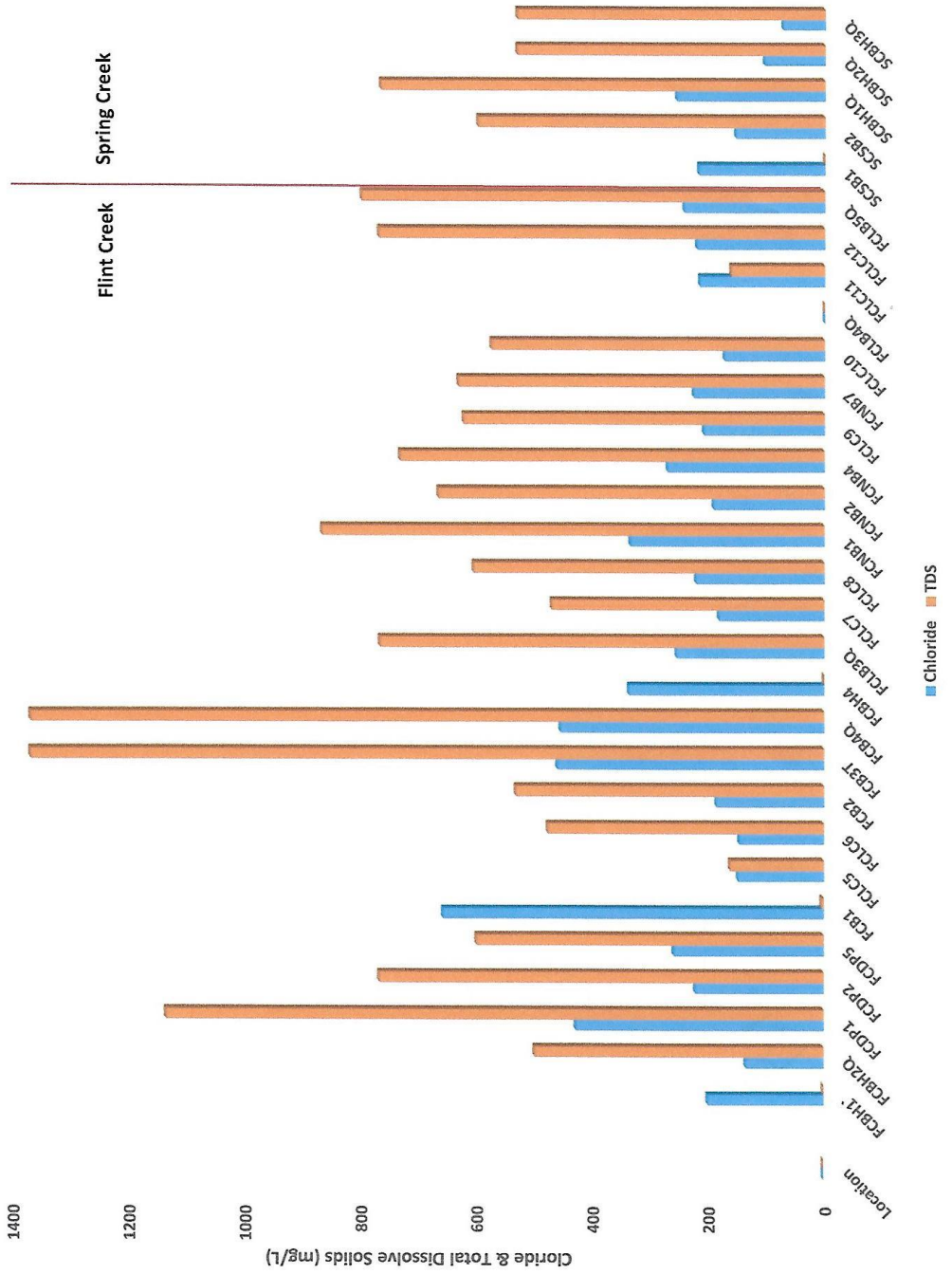


Figure 36 Chloride and TDS Distribution in Flint and Spring Creeks

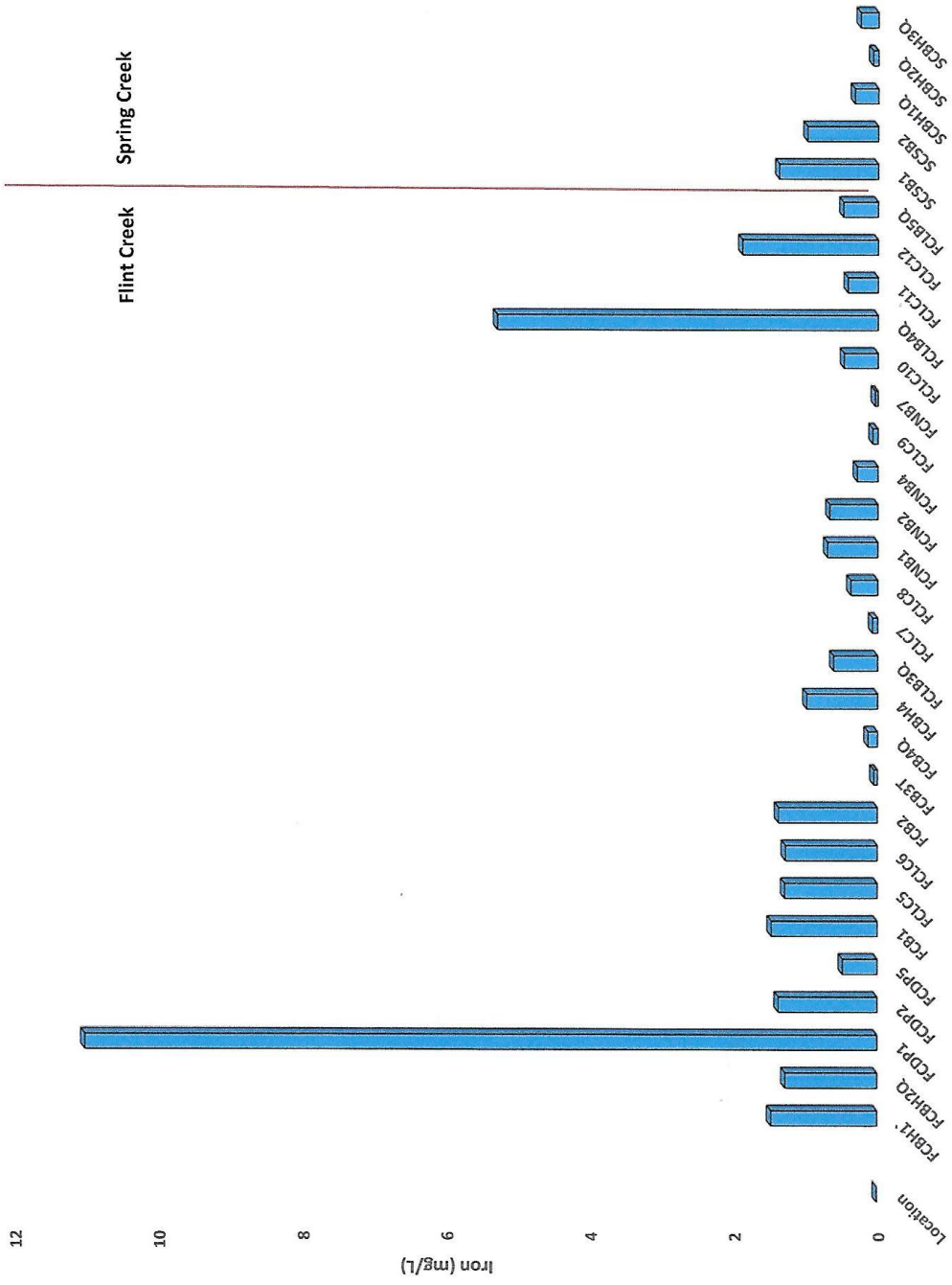


Figure 37 Iron Distribution in the Flint and Spring Creeks

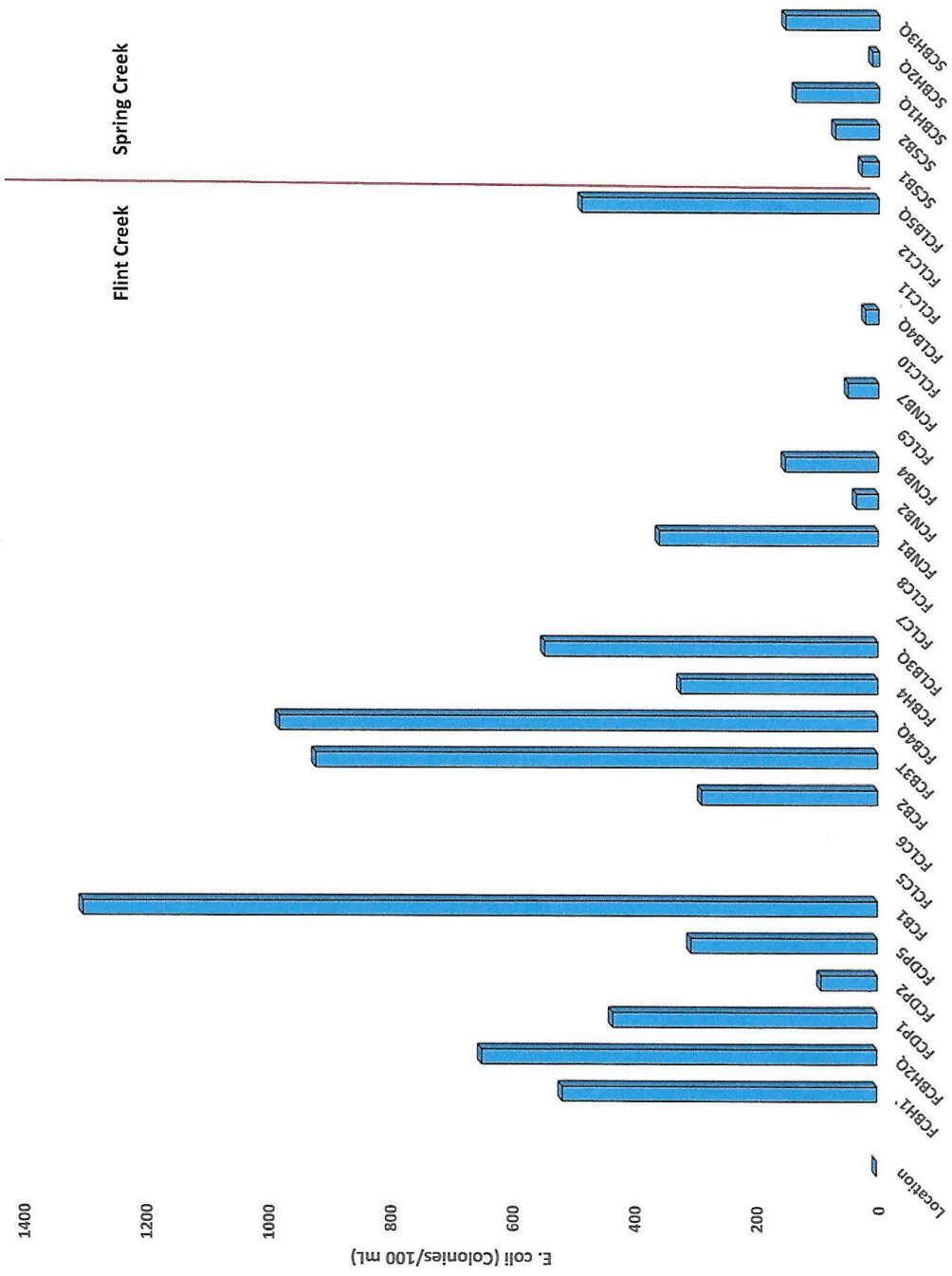


Figure 38 E. coli Distribution in Flint and Spring Creeks

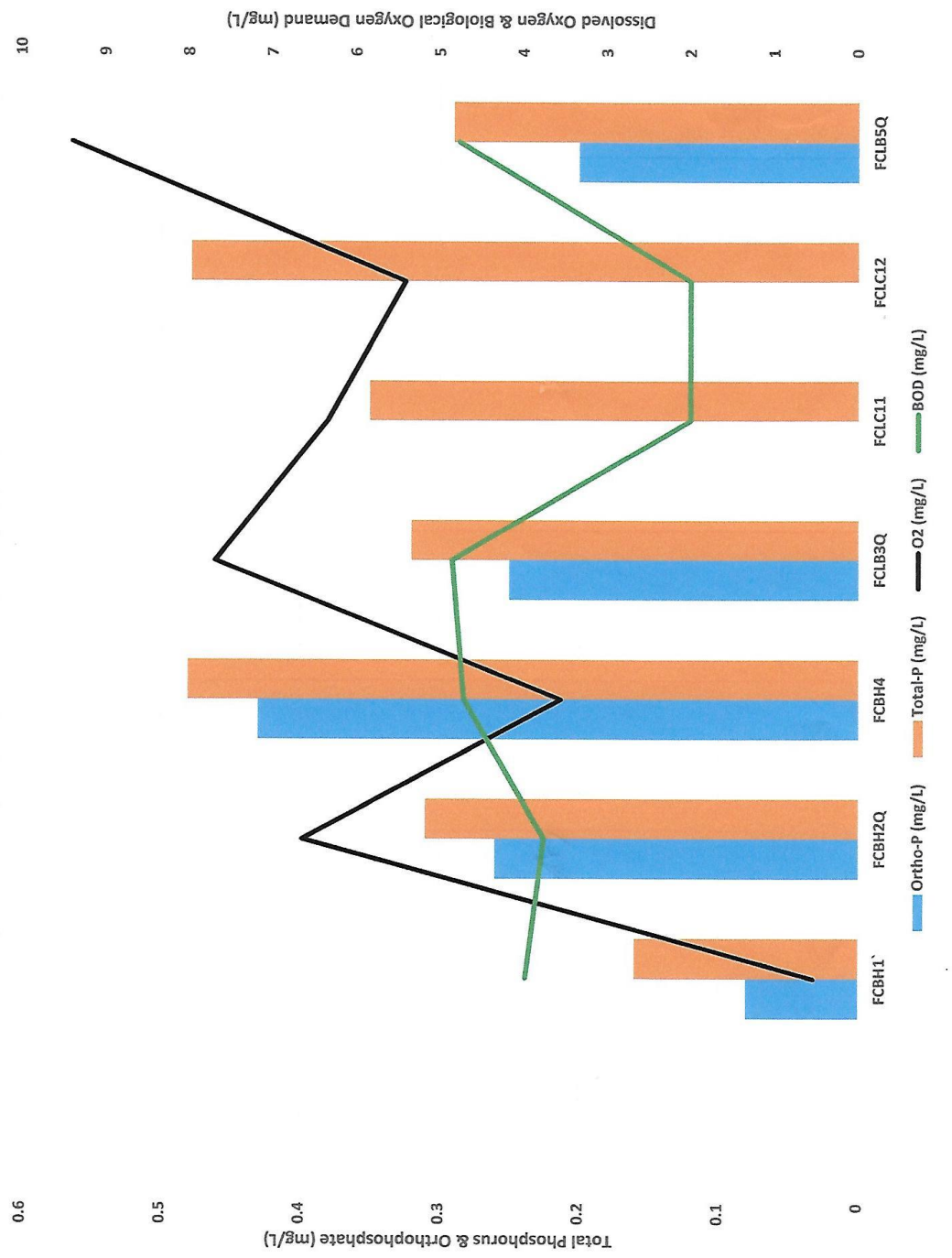


Figure 39 Phosphorus/Oxygen Distribution in the Main Branch

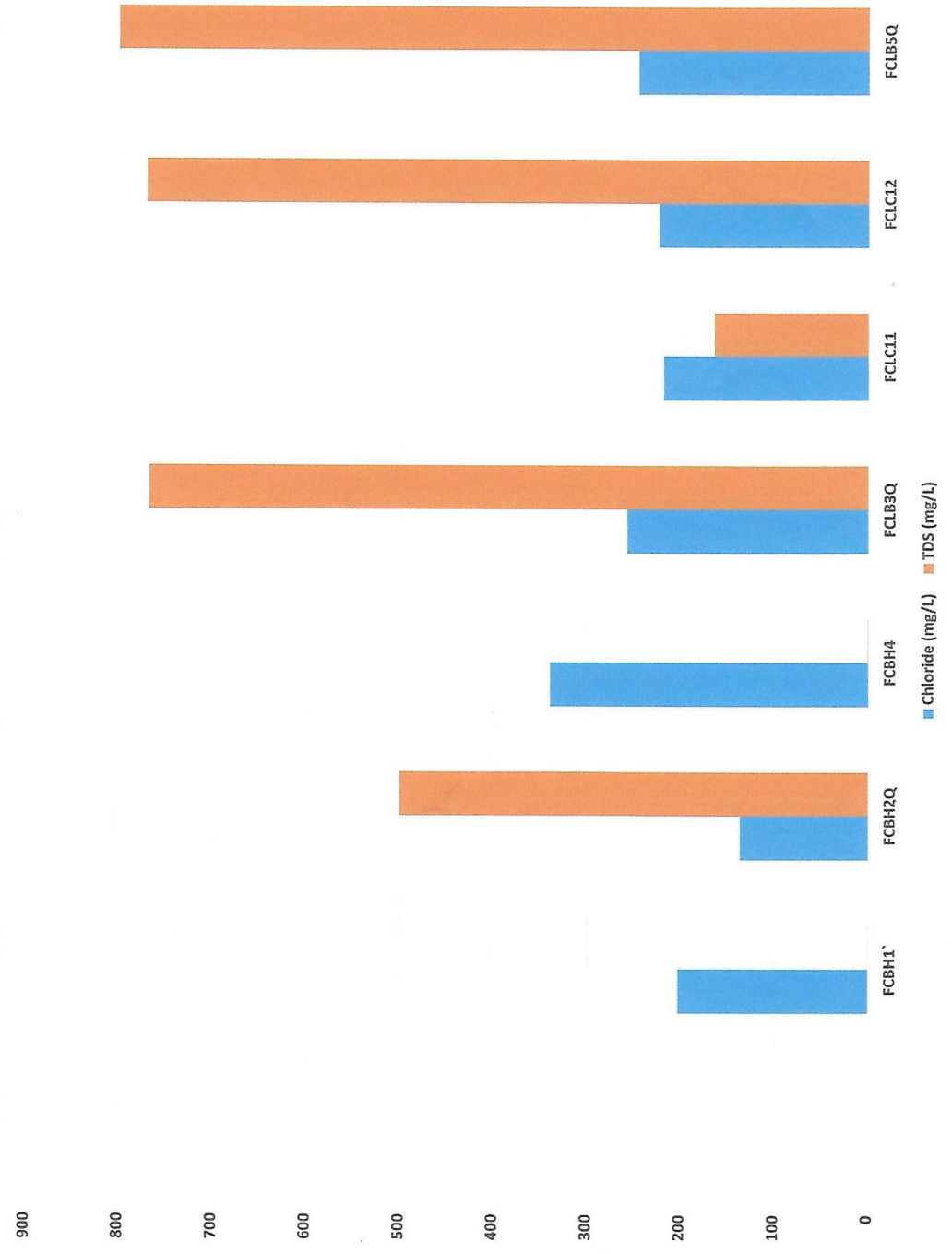


Figure 40 Chloride and TDs Distribution in the Main Branch

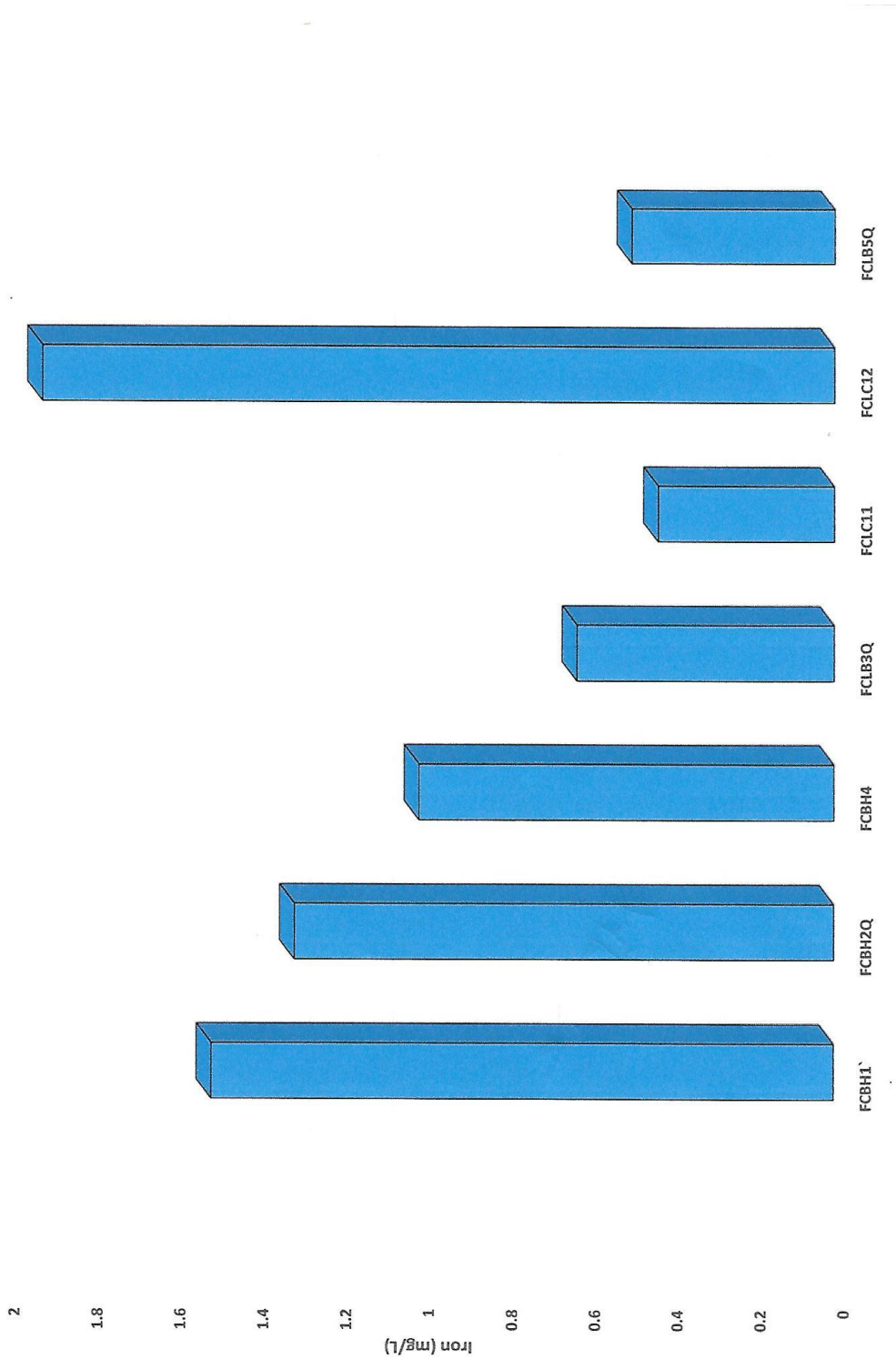


Figure 41 Iron Distribution in the Main Branch

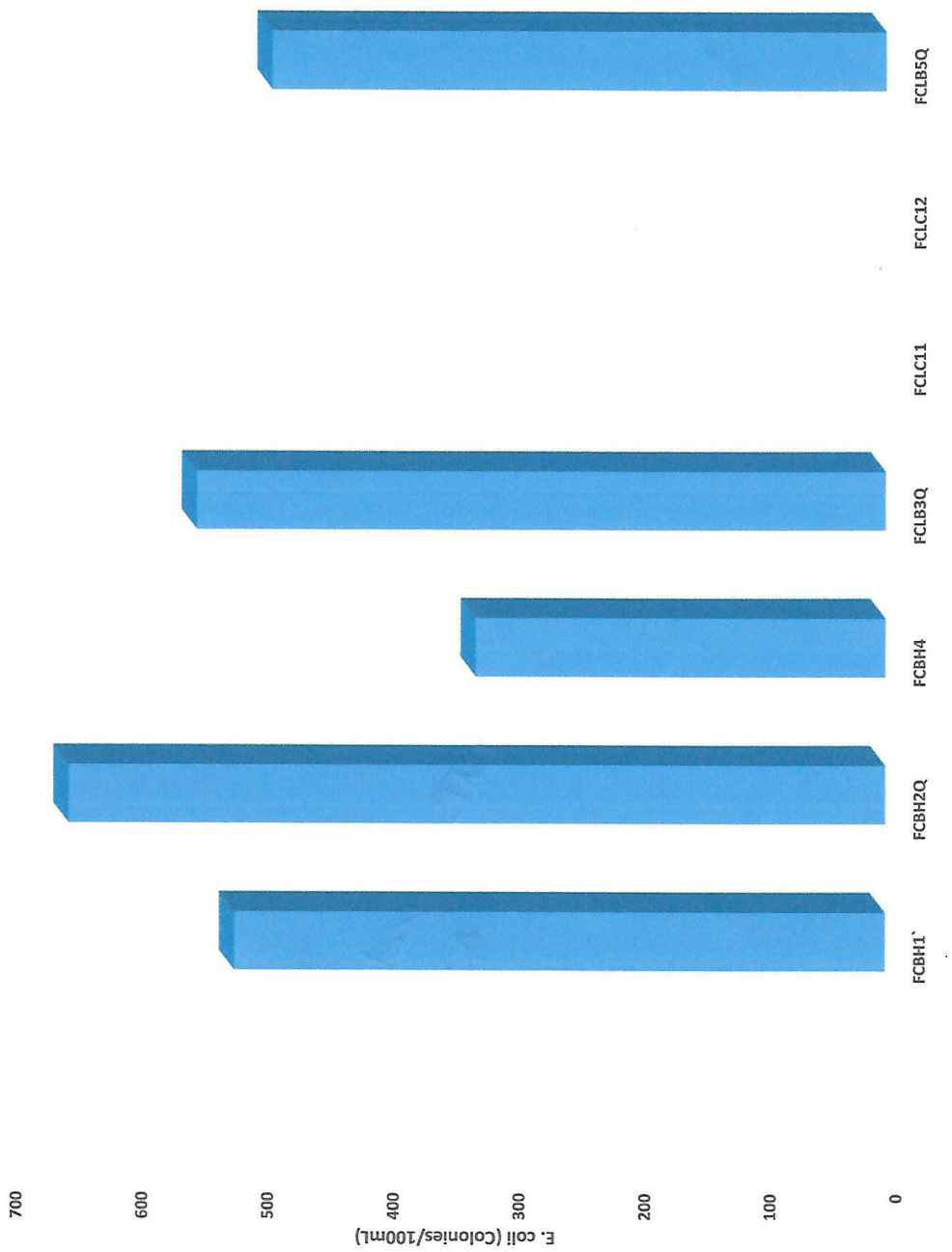


Figure 42 E. coli Distribution in the Main Branch

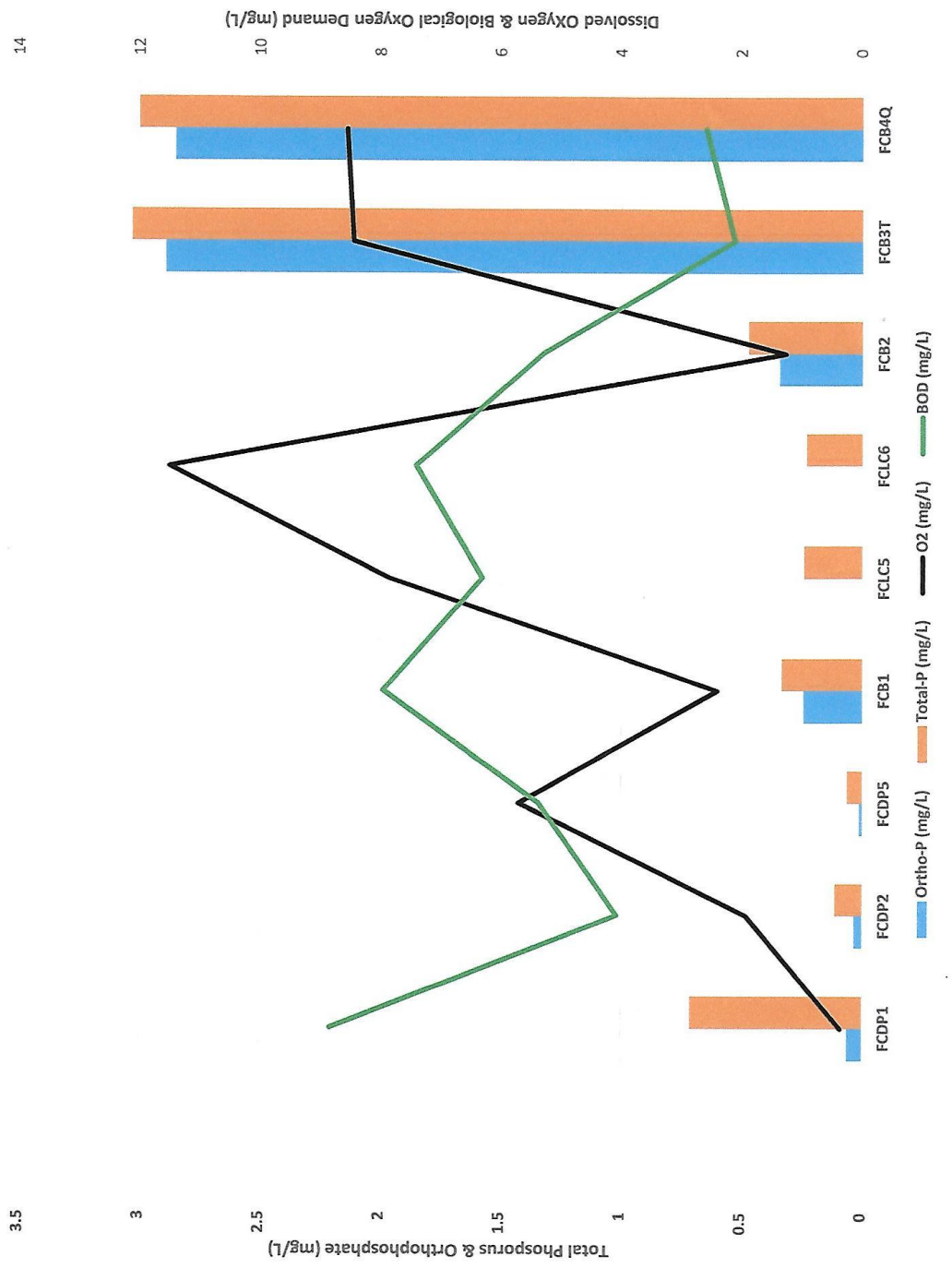


Figure 43 Phosphorus/Oxygen Distribution in the East Branch

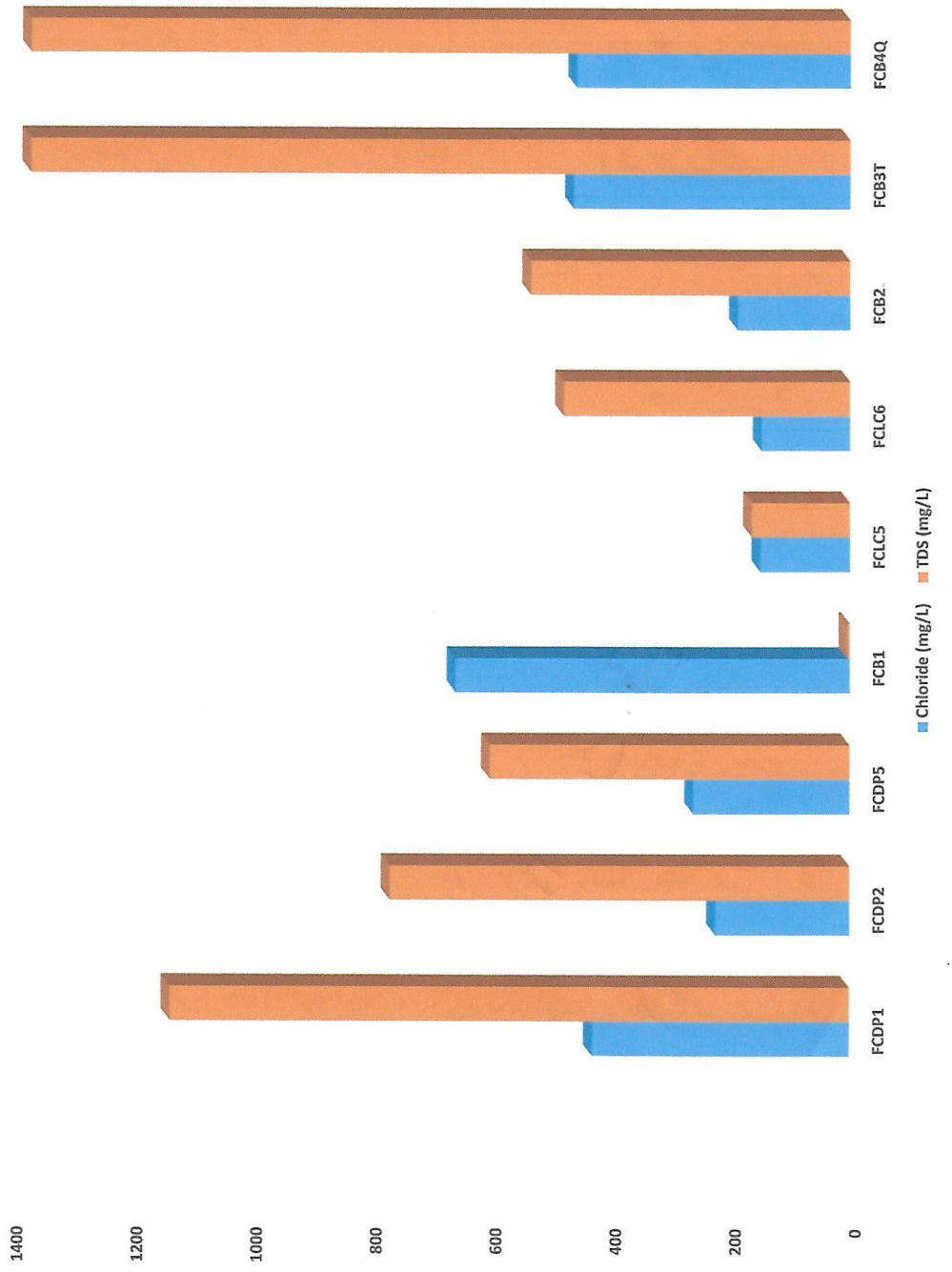


Figure 44 Chloride and TDS Distribution in the East Branch

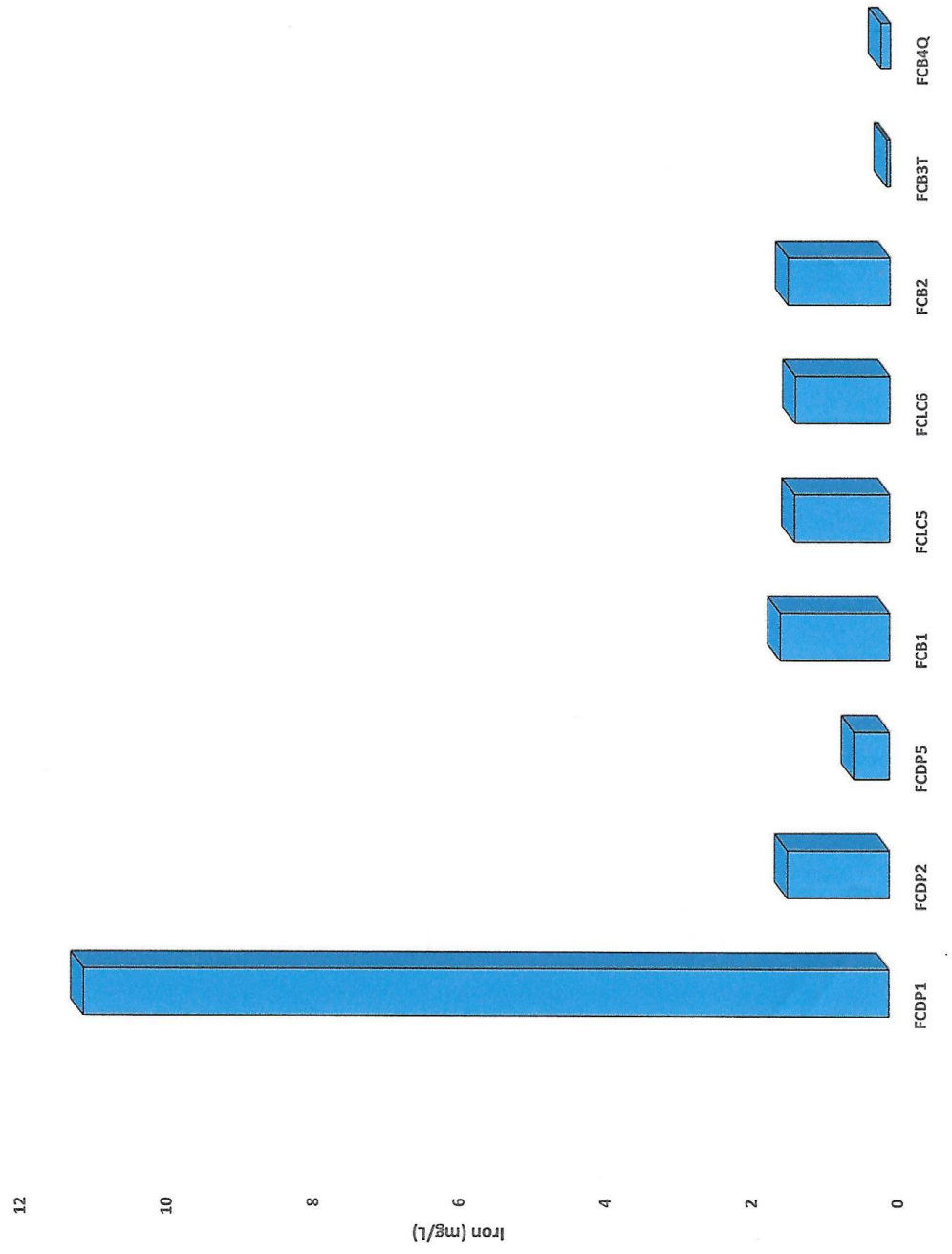


Figure 45 Iron Distribution in the East Branch

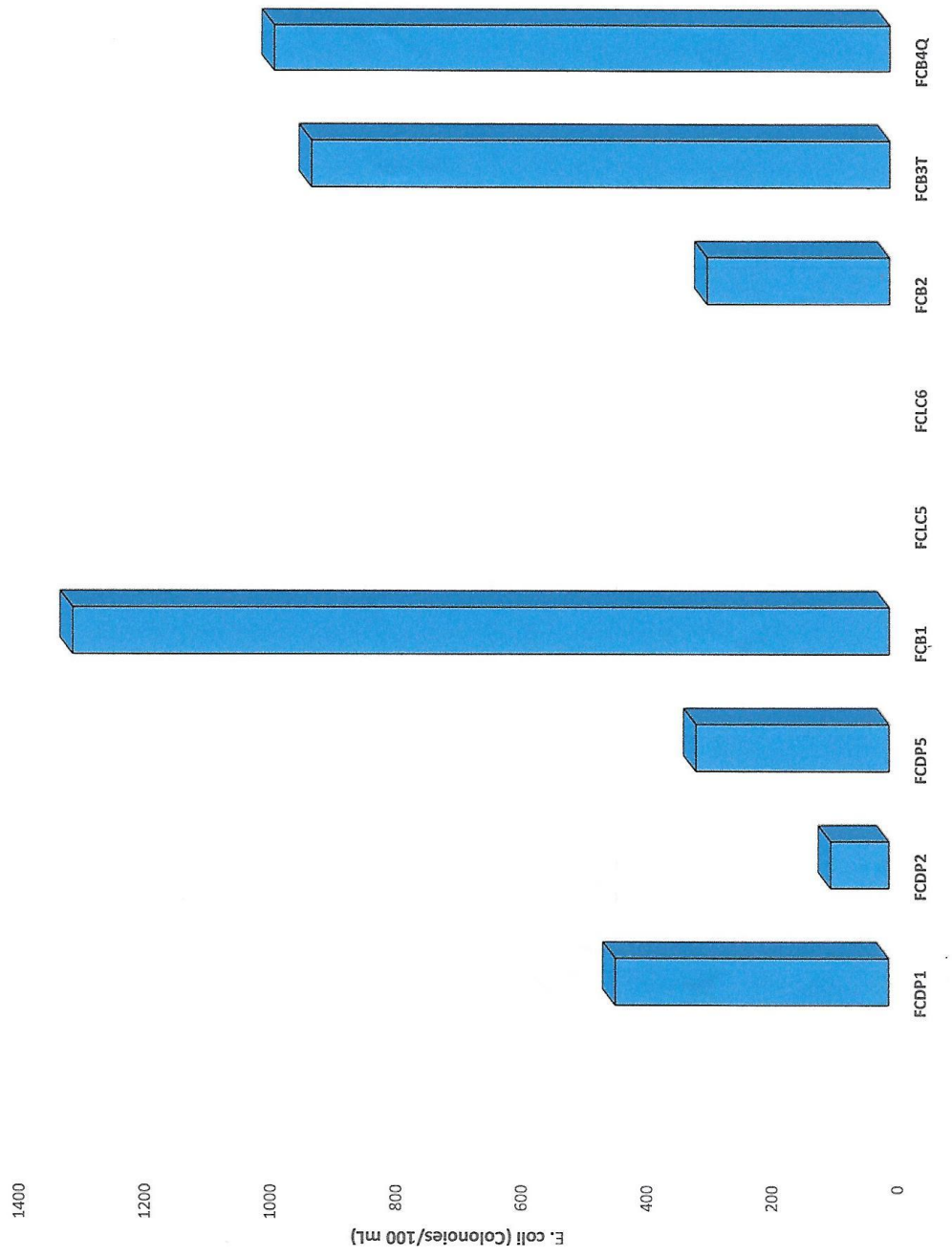


Figure 46 E. coli Distribution in the East Branch

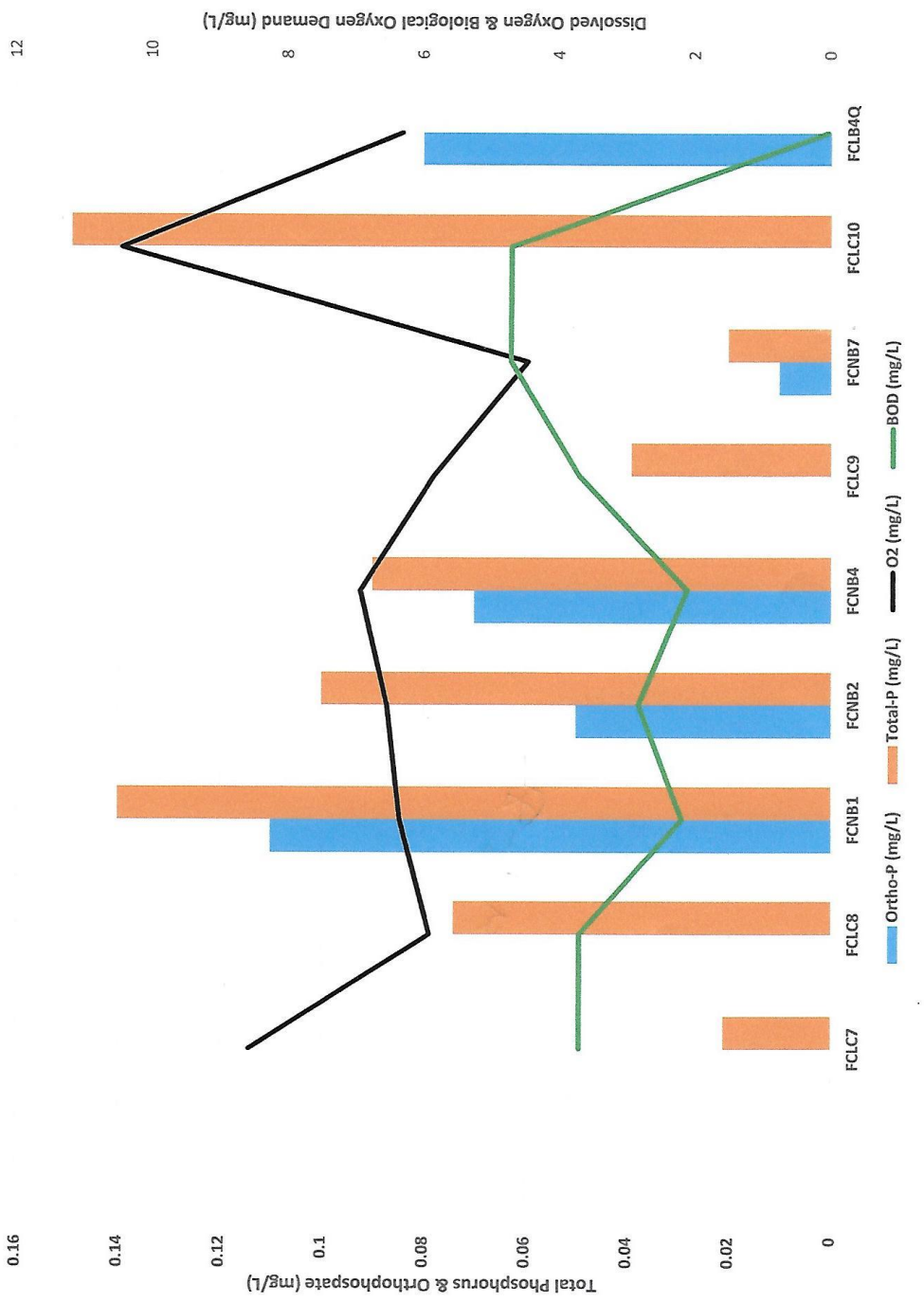


Figure 47 Phosphorus/Oxygen Distribution in the North Branch

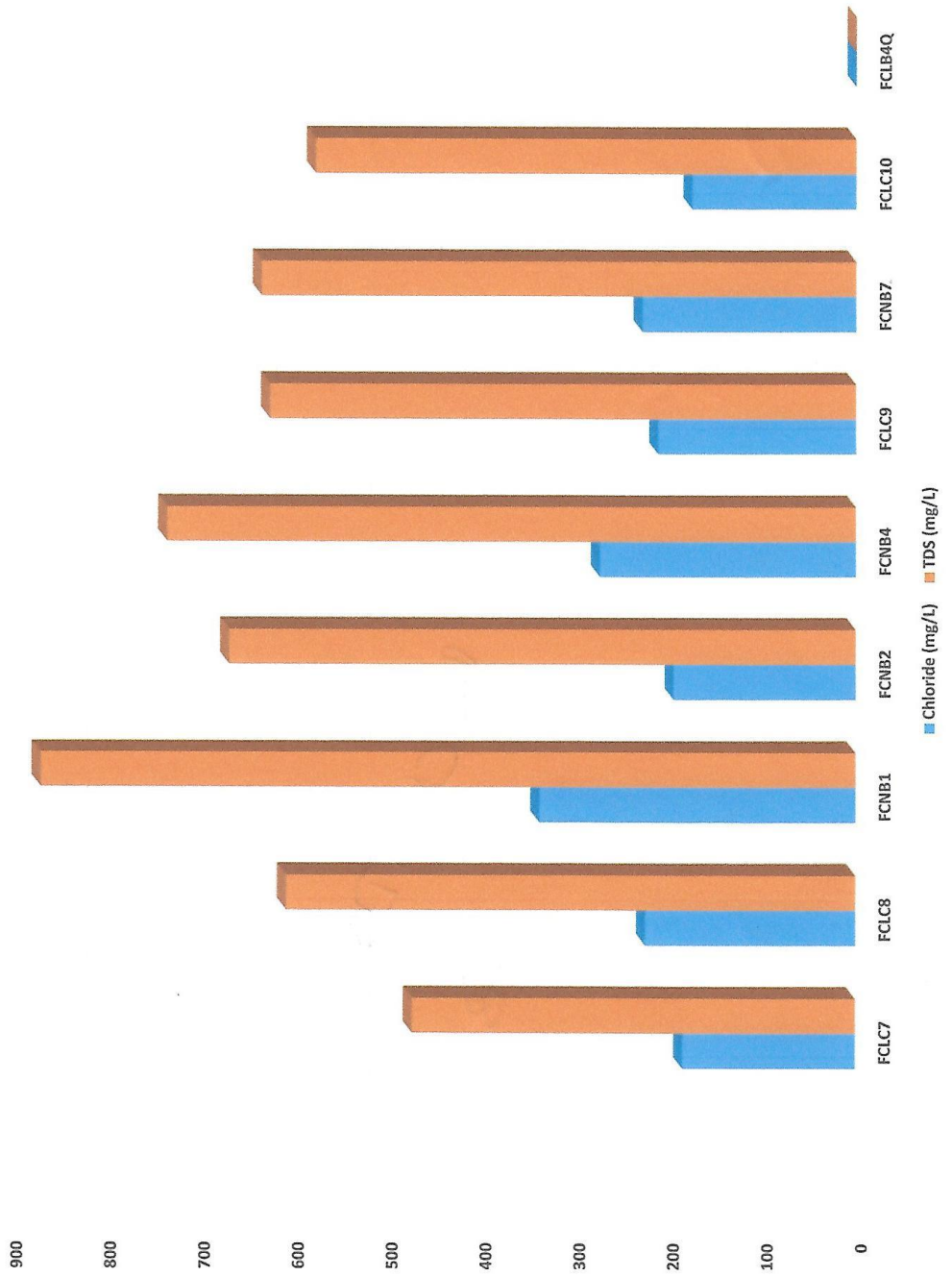


Figure 48 Chloride and TDS Distribution in the North Branch

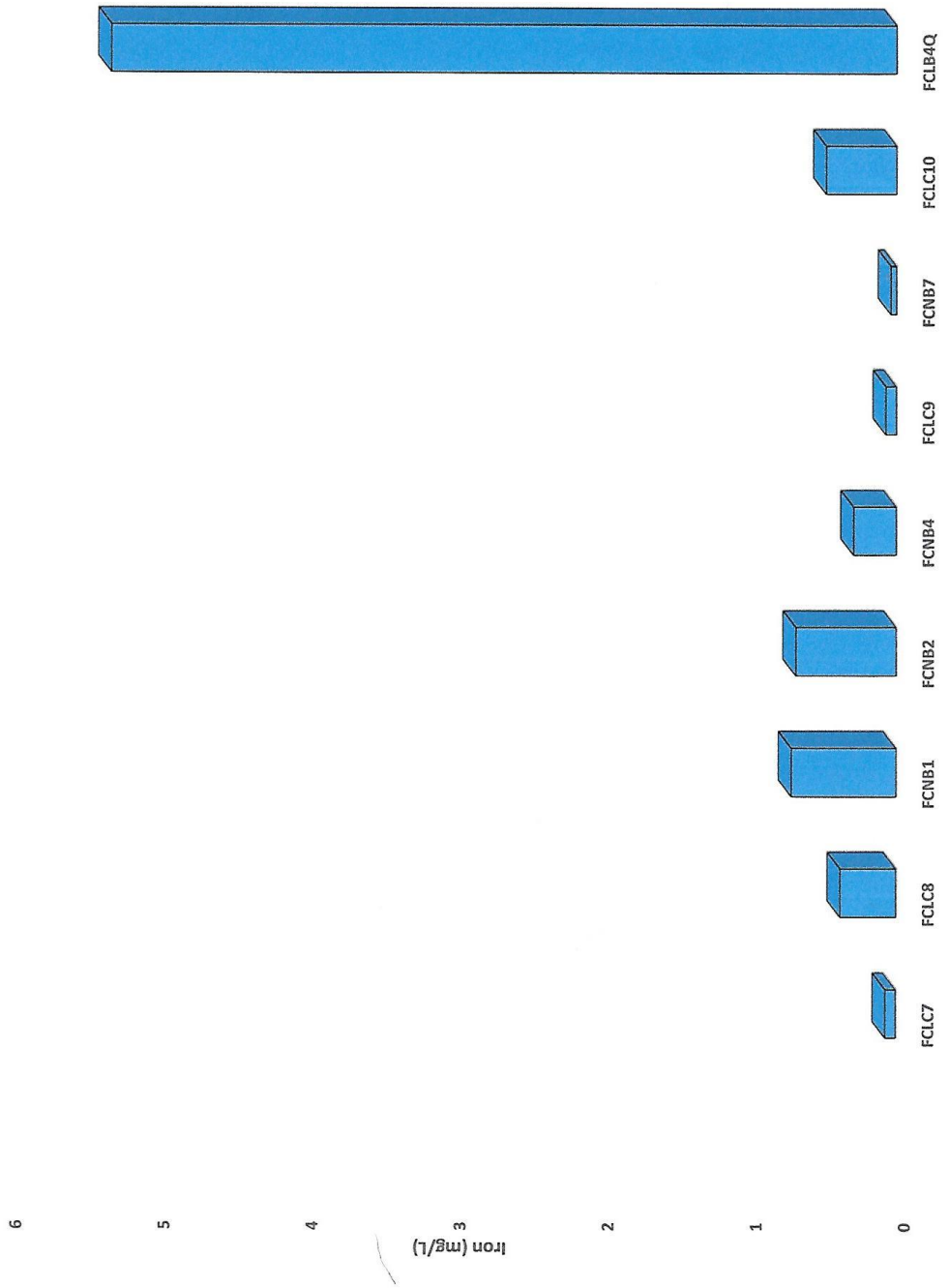


Table 49 Iron Distribution in the North Branch

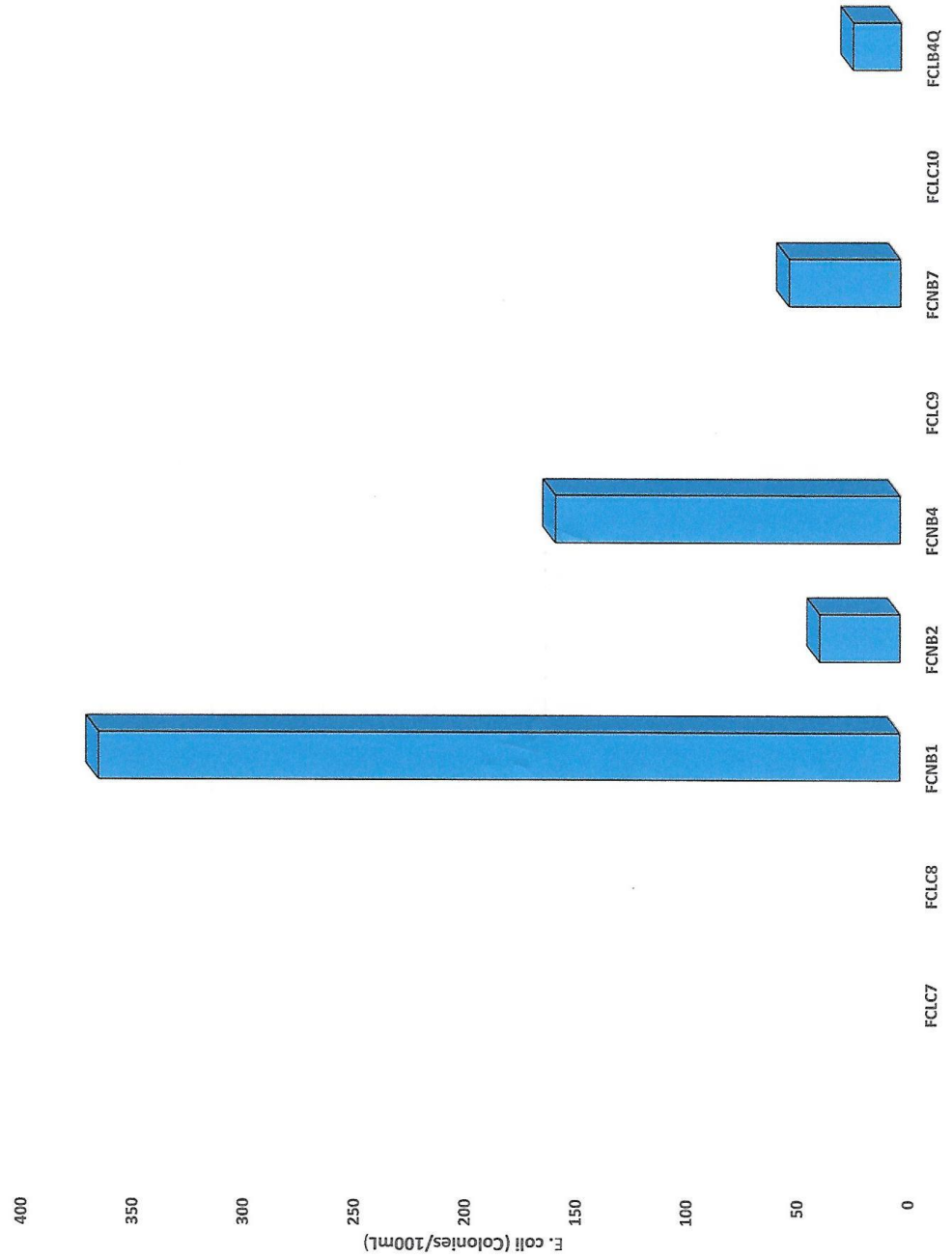


Table 50 E. coli Distribution in the North Branch

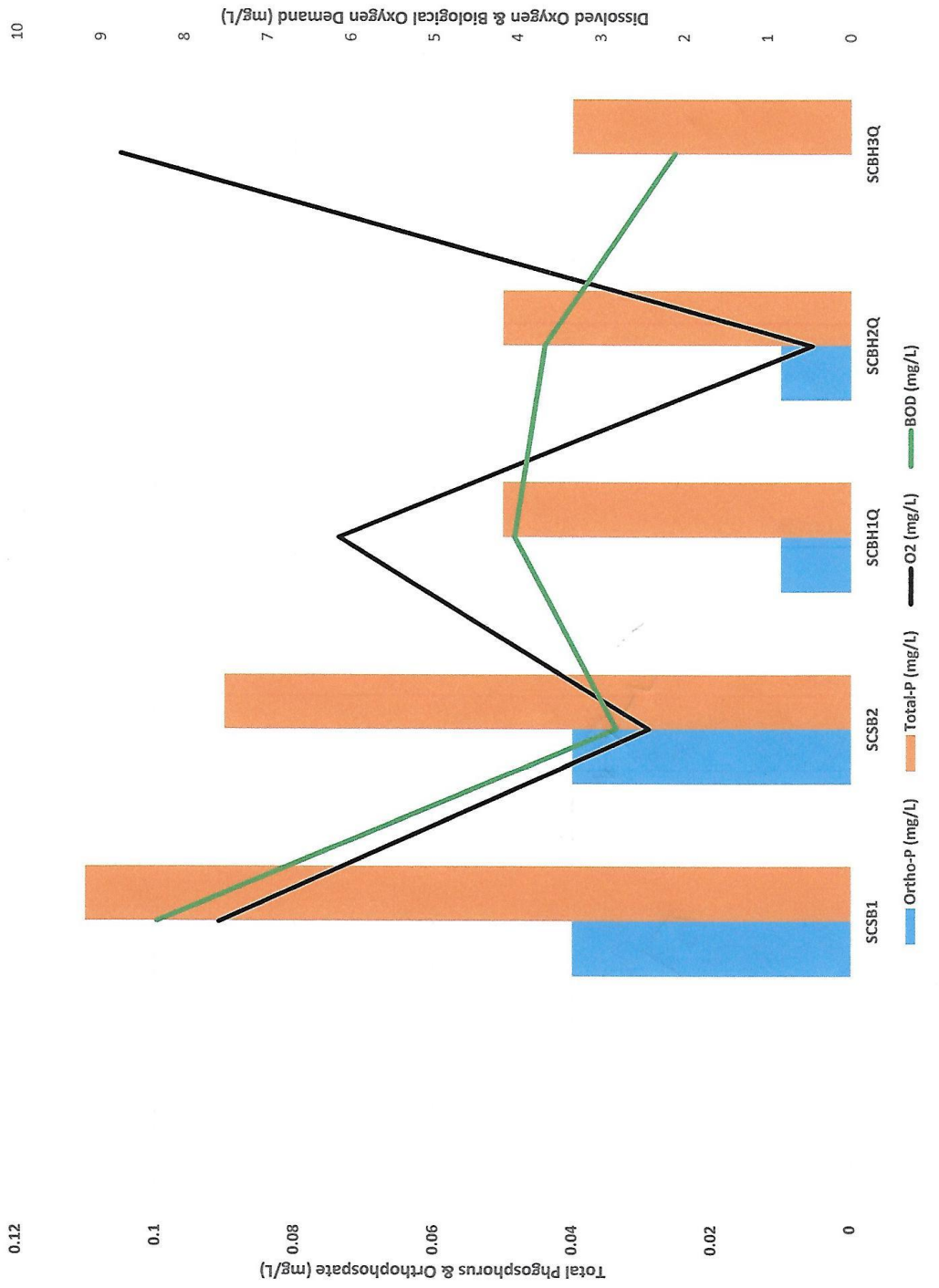


Figure 51 Phosphorus/Oxygen Distribution in Spring Creek

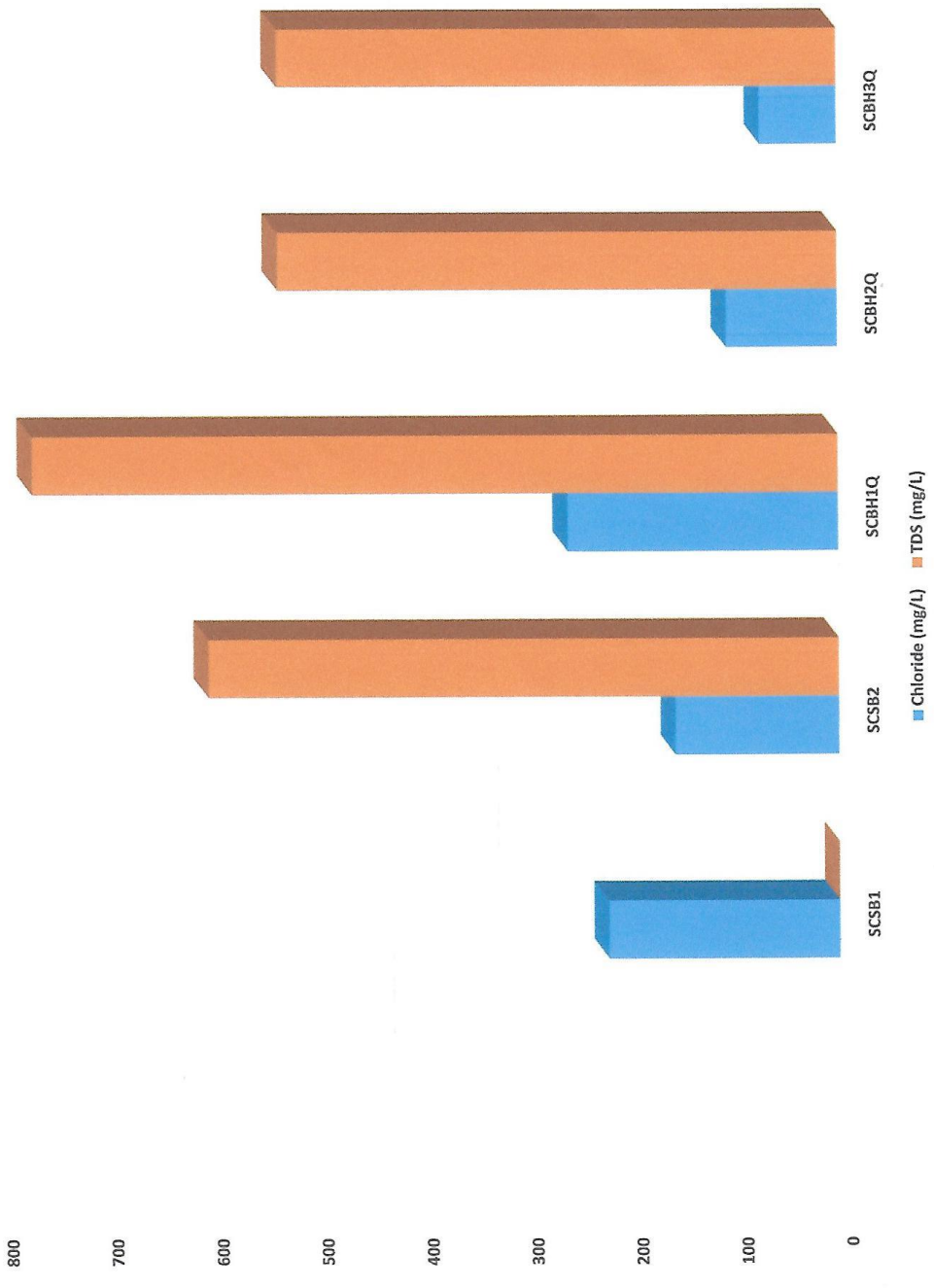


Figure 52 Chloride and TDS Distribution in Spring Creek

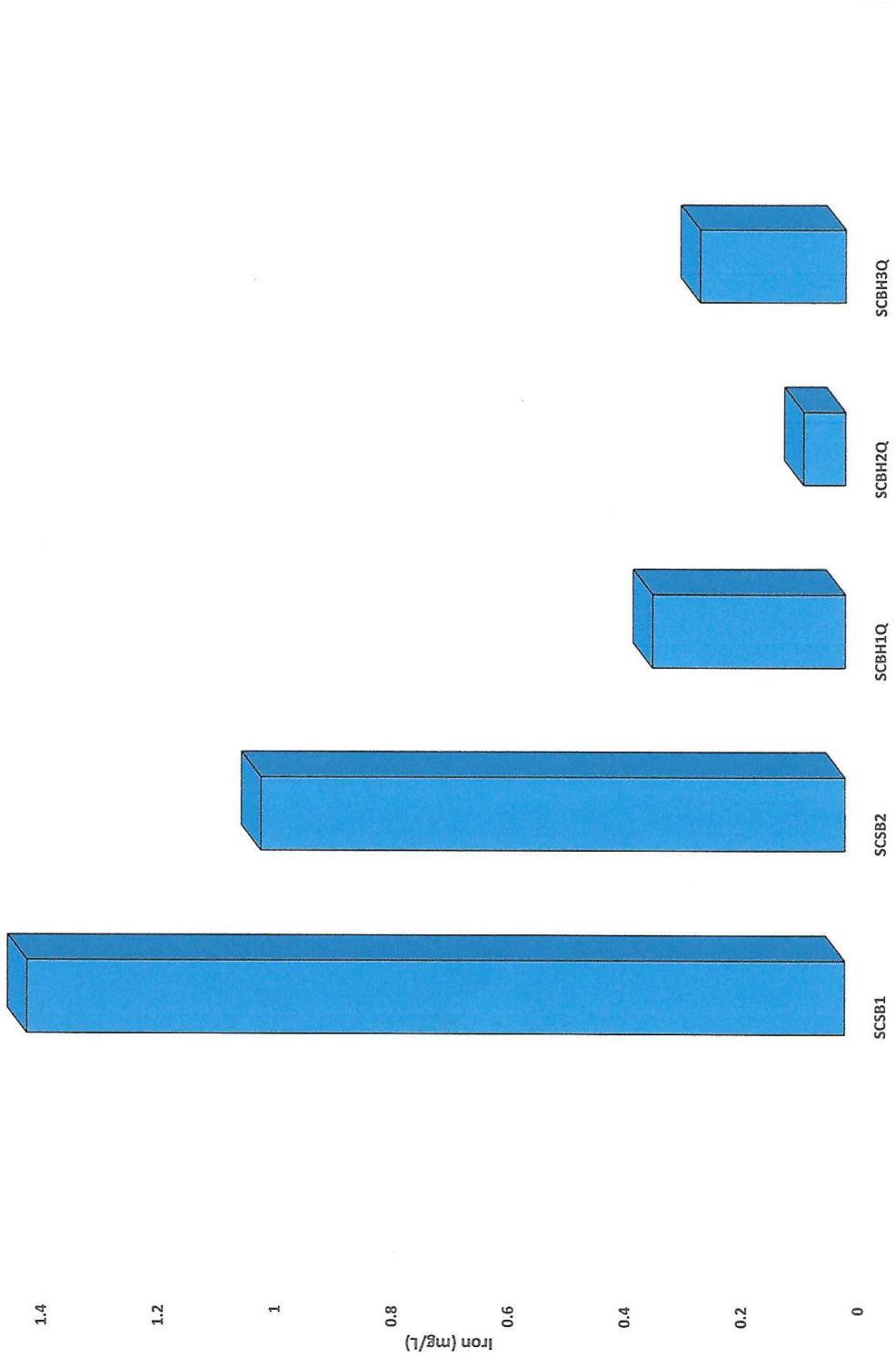


Figure 53 Iron Distribution in Spring Creek

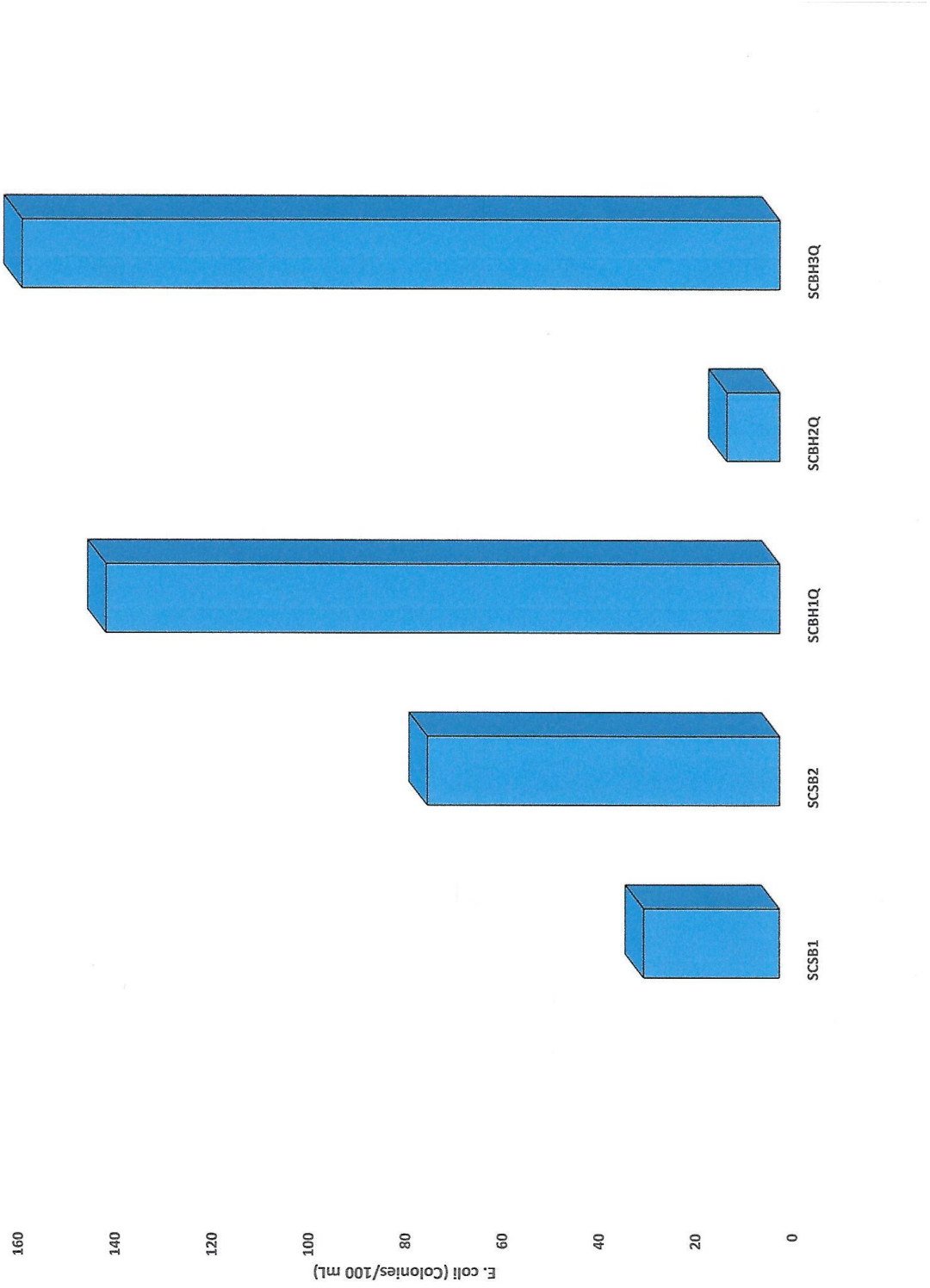


Figure 54 E. coli Distribution in Spring Creek

Tables

Land Use	Area (acres)	Percent of Watersheds
Agricultural	2,334.7	5.7
Cemetery	42.0	0.1
Forests and Grasslands	8,651.4	21.3
Equestrian	961.3	2.4
Governmental and Institutional	641.8	1.6
Industrial	499.9	1.2
Multifamily Residential	172.7	0.4
Single Family Residential	17,683.7	43.5
Office Space	176.4	0.4
Public and Privately Open Space	1,865.5	4.6
Retail/Commercial	740.6	1.8
Transportation	2,876.0	7.1
Utilities/Waste Facilities	200.6	0.5
Water	1,838.6	4.5
Wetlands	1,946.2	4.8
Total	40,632.5	100.0

Table 1 Land Use Classifications and Acreage for the Combined Flint and Spring Creek Watersheds

Recharge Characteristics	Flint Creek (acres)	Spring Creek (acres)
Highly Sensitive	90	8,800
Sensitive	900	2,200
Moderately Sensitive	4,100	1,900
Poor to Very Poor	18,234	4,358

Table 2 Distribution of Recharge Areas

Jurisdiction	Watershed Acreage		Percent of Watershed Area	
	Flint	Spring	Flint	Spring
Cook County	5,952	11,776	25	68
Kane County		1,255		7
Lake County	17,364	102	74	1
McHenry County	58	4106	0	24
Algonquin Township	58	4104	Zero	
Barrington Township	4773	11,654	20	67
Cuba Township	10,450	100	45	1
Dundee Township		1267		7
Ela Township	6895		30	
Hanover Township		114		1
Palatine Township	1198		5	
Algonquin	12		0	
Barrington	2919		12	
Barrington Hills	4428	12,588	19	73
Carpentersville		265		2
Deer Park	1177		5	
East Dundee		107		1
Fox River Grove		305		2
Hawthorn Woods	604		3	
Hoffman Estates		716		4
Inverness	897		4	
Lake Barrington	1896		8	
Lake Zürich	2479		11	
North Barrington	2825		12	
South Barrington		1568		9
Tower lakes	3		0	

Table 3 County, Township, and Municipal Jurisdictions in the Flint and Spring Creek Watersheds

Watershed	Use Attainment	Causes	Sources
Flint Creek	Aquatic Life	Other Flows, Dissolved Oxygen, Total Phosphorous, & Aquatic Algae	Aquatic Algae, Impoundments, Dams, & Urban Runoff
	Fish Consumption		
	Primary Contact		
	Secondary Contact		
	Aesthetic Quality		
Spring Creek	Aquatic Life	Not Assessed	Not Assessed
	Fish Consumption		
	Primary Contact		
	Secondary Contact		
	Aesthetic Quality		

Table 4 IEPA Water Quality Assessment Summary

Stream Branch	**Acronym**
Flint Creek:	**FC**
Flint Creek Main Branch	FCMB
Flint Creek East Branch	FCEB
Flint Creek East Branch North Sub-Branch	FCEBNSB
Flint Creek East Branch South Sub-Branch	FCEBSSB
Flint Creek North Branch	FCNB
Flint Creek North Branch North Sub-Branch	FCNBNSB
Flint Creek North Branch South Sub-Branch	FCNBSSB
Spring Creek:	**SC**
Spring Creek Main Branch	SCMB
Spring Creek North Branch	SCNB

Table 5 Stream Branch Acronyms

	Sampling Stations	Latitude	Longitude
Barrington	FCB1	42.1449	-88.1153
	FCB2	42.1653	-88.1260
	FCB3T	42.1582	-88.1453
Barrington Hills	FCBH1	42.1276	-88.1574
	FCBH4	42.1762	-88.1854
Deer Park	FCDP1	42.1723	-88.0877
	FCDP2	42.1667	-88.1019
	FCDP5	42.1781	-88.1085
North Barrington	FCNB1	42.2112	-88.1190
	FCNB2	42.2120	-88.1357
	FCNB4	42.2092	-88.1440
	FCNB7	42.2018	-88.1344
South Barrington	SCSB1	42.0779	-88.1899
	SCSB2	42.0918	-88.1896
Lake County	FCLC5	42.1599	-88.1131
	FCLC6	42.1611	-88.1152
	FCLC7	42.1955	-88.1000
	FCLC8	42.2100	-88.0903
	FCLC9	42.2004	-88.1301
	FCLC10	42.2053	-88.1472
	FCLC11	42.2007	-88.1672
	FCLC12	42.2037	-88.1703

Table 6 Sampling Stations and Locations

Responsible Jurisdiction	Sampling/Stream Gaging Stations	Latitude	Longitude
Barrington Hills	SCBH1Q	42.1105	-88.2116
	SCBH2Q	42.1543	-88.2116
	SCBH3Q	42.1913	-88.2367
	FCBH2Q	42.1544	-88.1520
Barrington	FCB2Q	42.1591	-88.1512
Lake Barrington	FCLB3Q*	42.1996	-88.167o
	FCLB4Q	42.2007	-88.1660
	FCLB5Q*	42.2114	-88.1735

* Installed Stream Gages

Table 7 Stream Gage and Sampling Station Locations

Responsible Jurisdiction	Biological Sampling Stations	Latitude	Longitude
Barrington Hills	SCBH1QB	42.1105	-88.2116
	SCBH2QB	42.1543	-88.2116
	SCBH3QB	42.1913	-88.2367
	FCBH2QB	42.1544	-88.1520
Barrington	FCB2QB	42.1591	-88.1510
Lake Barrington	FCLB3QB	42.1996	-88.1671
	FCLB4QB	42.2007	-88.1660
	FCLB5QB	42.2114	-88.1735
Citizens for Conservation	FCCFC1B	42.1603	-88.1536
	FCCFC2B	42.1975	-88.1673
	FCCFC3B	42.2198	-88.1760
River Watch	SCRW1B	42.0900	-88.1964
	FCRW3B	42.2097	-88.1319

Table 8 Biological Sampling Station Locations

Group	Test	Frequency		
		Annually	Storm Events	Every 5 Years
Field Measurements	pH	**X**	**X**	
	Specific Conductivity	**X**	**X**	
	Dissolved Oxygen	**X**	**X**	
	Clarity	**X**	**X**	
	Temperature	**X**	**X**	
	Stream Discharge	**X**	**X**	
	Oxidation Reduction Potential			**X**
Standard Water Quality Analytes	Ammonia	**X**		
	Chloride	**X**		
	Fluoride	**X**		
	Total Suspended Solids	**X**	**X**	
	Total Dissolved Solids	**X**	**X**	
	Total Coliform	**X**	**X**	
	Fecal Coliform	**X**	**X**	
	Biological Oxygen Demand	**X**	**X**	
	Chemical Oxygen Demand	**X**	**X**	
	Total Kjeldahl Nitrogen	**X**	**X**	
	Nitrate	**X**	**X**	
	Total Phosphorous	**X**	**X**	
	Dissolved Phosphorous	**X**	**X**	
	Cadmium	**X**		
	Copper	**X**		
	Lead	**X**		
	Potassium	**X**		
	Zinc	**X**		
	Phenolics	**X**		
	Oil & Grease	**X**	**X**	
Geochemical Characterization Analytes	Alkalinity			**X**
	Orthophosphate			**X**
	Sulfate			**X**
	Aluminum			**X**
	Barium			**X**
	Calcium			**X**
	Iron			**X**
	Magnesium			**X**
	Manganese			**X**
	Sodium			**X**
Biological Assessment	Trophic State Index	**X**		
	Index of Biotic Integrity	**X**		
	Macroinvertebrate Biotic Index	**X**		

Table 9 Analytes and Field Measurements

IBI	Class	BSC Category	Biotic Response Quality Description
51 – 60	A	Unique Aquatic Resource	Excellent. Comparable to the best situations without human disturbance.
41 – 50	B	Highly Valued Aquatic Resource	Good. Good fishery for important game fish species; species richness may be somewhat below expectations for streams size or geographic region.
31 – 40	C	Moderate Aquatic Resource	Fair. Fisheries consist predominantly of Bullhead, sunfish, and carp. Species diversity and number of intolerant fish reduced. Trophic structure skewed with increased frequency of omnivores, green sunfish or tolerant species.
21 – 30	D	Limited Aquatic Resource	Poor. Fishery predominantly for carp; fish community dominated by omnivores and tolerant forms. Species richness may be notably lower than expected for geographic area, streams size or available habitat
≤ 20	E	Respected Aquatic Resource.	Very poor. Few fish of any species present; no sport fishery exists.

Table 10 Biological Stream Characterization (BSC) Criteria for the Classification of Illinois Streams

Macroinvertebrate Biotic Index	Water Quality
≤ 4.35	Excellent
≥ 4.36 to ≤ 5.0	Good
≥ 5.1 to ≤ 5.7	Fair
≥ 5.71 to ≤ 6.25	Poor
≥ 6.26	Very poor

Table 11 Water Quality Correlation to Macroinvertebrate Biotic Index (MB I) Score

Lake	Average Total Phosphorus (mg/L)	Trophic State Index (Percent)	Lake County Ranking
Lake Zurich	0.021	48.19 (Mesotrophic)	18/173
Honey Lake	0.059	59.69 (Eutrophic)	53/173
Echo Lake	0.079	67.20 (Eutrophic)	87/173
Grassy Lake	0.161	77.42 (Hypereutrophic)	142/173
Lake Louise	0.181	79.08 (Hypereutrophic)	145/173
Flint Lake	0.500	93.76 (Hypereutrophic)	171/173

Table 12 Trophic State of Lakes in the Flint Creek Watershed

Location	Ortho-P (mg/L)	Total-P (mg/L)	O2 (mg/L)	BOD (mg/L)	Chloride (mg/L)	TDS (mg/L)	Iron (mg/L)	E. Coli (Col./100mL)	Branch
FCBH1`	0.08	0.16	0.53	3.97	202	0.22	1.5	517.2	Main Branch
FCBH2Q	0.26	0.31	6.64	3.75	136	500	1.3	648.8	
FCDP1	0.06	0.71	0.35	8.83	429	1133	11	435.2	
FCDP2	0.03	0.11	1.92	4.07	224	767	1.4	93.4	
FCDP5	0.01	0.06	5.7	5.37	261	600	0.49	307.6	
FCB1	0.24	0.33	2.40	7.95	658	3.52	1.5	1299.7	East Branch
FCLC5		0.238	7.85	6.3	150	164	1.31		
FCLC6		0.228	11.5	7.4	148	478	1.30		
FCB2	0.34	0.47	1.26	5.29	188	533	1.4	290.9	
FCB3T	2.89	3.03	8.45	2.11	462	1367	0.048	920.8	
FCB4Q	2.85	3	8.56	2.59	457	1367	0.13	980.4	
FCBH4	0.43	0.48	3.55	4.71	339	0.3	1	325.5	Main Branch
FCLB3Q	0.25	0.32	7.68	4.85	257	767	0.62	547.5	
FCLC7		0.021	8.57	3.7	184	472	0.07		
FCLC8		0.074	5.91	3.7	224	606	0.38		
FCNB1	0.11	0.14	6.35	2.19	337	867	0.71	360.9	
FCNB2	0.05	0.1	6.54	2.83	194	667	0.68	36.4	North Branch
FCNB4	0.07	0.09	6.93	2.11	273	733	0.29	155.3	
FCLC9		0.039	5.85	3.7	211	624	0.07		
FCNB7	0.01	0.02	4.46	4.71	228	633	0.037	50.4	
FCLC10		0.149	10.44	4.7	175	576	0.48		
FCLB4Q	0.08		6.31	0.04	0.07	0.11	5.3	21.64	
FCLC11		0.35	6.34	2	218	164	0.43		Main Branch
FCLC12		0.478	5.41	2	223	770	1.91		
FCLB5Q	0.2	0.29	9.40	4.77	245	800	0.49	488.4	
SCSB1	0.04	0.11	7.57	8.31	220	0.01	1.4	28.1	
SCSB2	0.04	0.09	2.42	2.81	156	600	1	72.7	Spring Creek
SCBH1Q	0.01	0.05	6.14	4.03	258	767	0.33	139.1	
SCBH2Q	0.01	0.05	0.46	3.67	106	533	0.072	11	
SCBH3Q		0.04	8.76	2.11	73.4	533	0.25	156.5	
Criteria:	**0.01**	**0.05**	**> 5.0**	**< 5.0**	**250**	**500**	**0.3**	**200**	

Jurisdictions:
Main Branch – Barrington Hills and Lake Barrington
East Branch – Deer Park and Barrington
North Branch – Lake Zurich, North Barrington, and Lake Barrington
Spring Creek – South Barrington, Barrington Hills, and Fox River Grove

Table 13 Data for Analyte Values that are Above Water Quality Criteria

Analyte	Loading (Pounds/Day)	Loading Goals (Pounds/Day)	Load Reduction To Meet Goals (%)
Flint Creek:			
Phosphorus	6.3	1.1	82.5
Orthophosphate	4.3	0.22	94.9
Chloride	5,300	5,410	0
Total Dissolved Solids	17,300	10,800	37.6
Iron	10.6	6.5	38.7
Spring Creek:			
Phosphorus	0.33	0.41	0
Orthophosphate	0.08	0.08	0
Chloride	600	2,040	0
Total Dissolved Solids	4,360	4100	6.0
Iron	2.0	2.4	0

Table 14 Analyte Loading to the Fox River

Appendix A - Monitoring Data

Table A1 Laboratory Qualifiers

A	Absent
A1	Depletion of method blanks were over the recommended depletion of less than 0.20 mg/L. All other QC shows the run be in control. Results qualified and reported.
B	Glucose-glutamic acids check standard associated with this sample failed to meet acceptance criteria (198+ or -30.5 mg/L BOD) in initial tests.
C	LSC/LFB was exceeded high. Non-detect results reported and considered to be biased high.
D	DUP associated with analytical batch failed to meet acceptance criteria of less than 20% RPD.
E	MS and or MSD associated with analytical batch failed to meet acceptance criteria due to matrix effects.
F	Analyte failed to meet the required acceptance criteria for relative percent difference (RPD) of 20% between the MS and MSD.
G	Required depletion of sample dilutions did not meet method requirements for any dilution associated with this sample. Sample was reanalyzed after the expiration of the regulatory whole time. Result may be biased low.
H	This test was performed after expiration of the appropriate regulatory/advisory “hold time.”
I	Required depletion of sample dilutions did not meet method requirements for any dilution associated with this sample. Sample result was calculated using the dilution that was closest to 2.0 mg/L of depletion.
J	Estimated value: value between the Method Detection Limit and Method Reporting Limit.
K	LCS/LFB was exceeded low. Result is reported, biased low, and exceeds the (MRL) Maximum Regulatory Limit.
L	Turbidity of sample exceeded 1.0 NTU after sample was held in laboratory for 18 hours w/a pH of less than 2.0. Sample subcontracted.
P	Present
Pc	Chemical preservation discrepancy noted at the time of analysis.
Q1	Matrix bike failed % recovery.
Q2	Matrix bike duplicate failed % recovery.
Q3	Matrix spike/matrix spike duplicate both failed % recovery.
U	Parameter was analyzed for, but not detected above the reporting limit.
W	No hair, insect parts or metal shavings were found in the above listed samples.
Y	LRB was greater than the LOQ for the batch associated with this sample.
Z	LRB was greater than the LOD for the batch associated with the sample.

Table A2 Original Data – McHenry Analytical Laboratory

Client ID	Result	Result Qualifier	Unit of Measure	Parameter Name	RDL
Trip Blank	0		100ml	E Coli	2.2
Trip Blank	0		mg/L	Fluoride by EPA 300.0 Rev. 2.1	0.35
Trip Blank	0		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75
Trip Blank	-0.71		mg/L	Chloride by Lachat 10-117-07-1-A	1
Trip Blank	0		mg/L	Ortho-P by SM4500P,B,F	0.01
Trip Blank	-0.01		mg/L	Total-P, Dissolved by SM4500P-F, 1999	0.01
Trip Blank	2		mg/L	Alkalinity by SM 2320B	4
Trip Blank	0.41	I	mg/L	BOD by SM5210B, 2001	2
Trip Blank	-0.03		mg/L	Nitrogen Ammonia by SM4500NH3,G -1997	0.05
Trip Blank	0.2		mg/L	TSS by SM2540D,1997	2
Trip Blank	0		mg/L	TDS by SM2540C	20
Trip Blank	-0.01		mg/L	Total-P by SM4500P-F, 1999	0.01
TRIP BLANK	<2.3	U	mg/L	Oil & Grease - total	5.5
TRIP BLANK	0.12		mg/L	Calcium	0.05
TRIP BLANK	0.0042	J	mg/L	Iron	0.01
TRIP BLANK	<0.040	U	mg/L	Potassium	0.5
TRIP BLANK	0.044	J	mg/L	Magnesium	0.05
TRIP BLANK	0.32	J	mg/L	Sodium	0.5
TRIP BLANK	0.0069	J	mg/L	Aluminum	0.01
TRIP BLANK	<0.00067	U	mg/L	Barium	0.001
TRIP BLANK	0.0001	J	mg/L	Cadmium	0.001
TRIP BLANK	0.0005	J	mg/L	Copper	0.003
TRIP BLANK	0.00035	J	mg/L	Manganese	0.001
TRIP BLANK	0.00062	J	mg/L	Lead	0.001
TRIP BLANK	0.0094		mg/L	Zinc	0.006
TRIP BLANK	<0.0025	U	mg/L	Nitrate/Nitrite-N	0.02
TRIP BLANK	<0.0020	U	mg/L	Phenolics	0.005
TRIP BLANK	<0.26	U	mg/L	Total Kjeldahl Nitrogen (TKN)	1
TRIP BLANK	<3.2	U	mg/L	COD	6
Field Blank	0		100ml	E Coli	2.2
Field Blank	0		mg/L	Fluoride by EPA 300.0 Rev. 2.1	0.35
Field Blank	0		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75
Field Blank	0.27		mg/L	Chloride by Lachat 10-117-07-1-A	1
Field Blank	0		mg/L	Ortho-P by SM4500P,B,F	0.01
Field Blank	0.01	E	mg/L	Total-P, Dissolved by SM4500P-F, 1999	0.01
Field Blank	2		mg/L	Alkalinity by SM 2320B	4
Field Blank	0	I	mg/L	BOD by SM5210B, 2001	2
Field Blank	-0.03		mg/L	Nitrogen Ammonia by SM4500NH3,G -1997	0.05
Field Blank	0		mg/L	TSS by SM2540D,1997	2
Field Blank	0		mg/L	TDS by SM2540C	20
Field Blank	-0.01		mg/L	Total-P by SM4500P-F, 1999	0.01

Table A2 Original Data – McHenry Analytical Laboratory (Continued)

Client ID	Result	Result Qualifer	Unit of Measure	Parameter Name	RDL
FIELD BLANK	<2.5	U	mg/L	Oil & Grease - total	5.9
FIELD BLANK	0.11	J	mg/L	Calcium	0.2
FIELD BLANK	<0.0024	U	mg/L	Iron	0.01
FIELD BLANK	0.18	J	mg/L	Potassium	0.5
FIELD BLANK	0.077	J	mg/L	Magnesium	0.1
FIELD BLANK	0.67	J	mg/L	Sodium	1.5
FIELD BLANK	0.0023	J	mg/L	Aluminum	0.01
FIELD BLANK	<0.00067	U	mg/L	Barium	0.001
FIELD BLANK	<0.000053	U	mg/L	Cadmium	0.001
FIELD BLANK	0.00053	J	mg/L	Copper	0.003
FIELD BLANK	<0.00012	U	mg/L	Manganese	0.001
FIELD BLANK	<0.000084	U	mg/L	Lead	0.001
FIELD BLANK	0.0012	J	mg/L	Zinc	0.006
FIELD BLANK	<0.0025	U	mg/L	Nitrate/Nitrite-N	0.02
FIELD BLANK	<0.0020	U	mg/L	Phenolics	0.005
FIELD BLANK	<0.26	U	mg/L	Total Kjeldahl Nitrogen (TKN)	1
FIELD BLANK	<3.2	U	mg/L	COD	6
Equipment Blank	0		100ml	E Coli	2.2
Equipment Blank	0		mg/L	Fluoride by EPA 300.0 Rev. 2.1	0.35
Equipment Blank	0		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75
Equipment Blank	0.28		mg/L	Chloride by Lachat 10-117-07-1-A	1
Equipment Blank	0		mg/L	Ortho-P by SM4500P,B,F	0.01
Equipment Blank	0.01		mg/L	Total-P, Dissolved by SM4500P-F, 1999	0.01
Equipment Blank	2		mg/L	Alkalinity by SM 2320B	4
Equipment Blank	0.07	I	mg/L	BOD by SM5210B, 2001	2
Equipment Blank	-0.02		mg/L	Nitrogen Ammonia by SM4500NH3,G -1997	0.05
Equipment Blank	0		mg/L	TSS by SM2540D,1997	2
Equipment Blank	33		mg/L	TDS by SM2540C	20
Equipment Blank	0.01		mg/L	Total-P by SM4500P-F, 1999	0.01
EQUIPMENT BLANK	<0.000053	U	mg/L	Cadmium	0.001
EQUIPMENT BLANK	0.0012	J	mg/L	Copper	0.003
EQUIPMENT BLANK	0.0006	J	mg/L	Manganese	0.001
EQUIPMENT BLANK	<0.000084	U	mg/L	Lead	0.001
EQUIPMENT BLANK	0.0026	J	mg/L	Zinc	0.006
EQUIPMENT BLANK	<0.0025	U	mg/L	Nitrate/Nitrite-N	0.02
EQUIPMENT BLANK	<0.0020	U	mg/L	Phenolics	0.005
EQUIPMENT BLANK	<0.26	U	mg/L	Total Kjeldahl Nitrogen (TKN)	1
EQUIPMENT BLANK	<3.2	U	mg/L	COD	6
FCNB1	360.9		100ml	E Coli	2.2
FCNB1	31.35		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75

Table A2 Original Data – McHenry Analytical Laboratory (Continued)

Client ID	Result	Result Qualifer	Unit of Measure	Parameter Name	RDL
FCNB1	0.16		mg/L	Fluoride by EPA 300.0 Rev. 2.1	0.35
FCNB1	337		mg/L	Chloride by Lachat 10-117-07-1-A	10
FCNB1	0.11		mg/L	Ortho-P by SM4500P,B,F	0.01
FCNB1	0.11		mg/L	Total-P, Dissolved by SM4500P-F, 1999	0.01
FCNB1	238		mg/L	Alkalinity by SM 2320B	4
FCNB1	2.19		mg/L	BOD by SM5210B, 2001	2
FCNB1	0.03		mg/L	Nitrogen Ammonia by SM4500NH3,G -1997	0.05
FCNB1	4.3		mg/L	TSS by SM2540D,1997	2
FCNB1	867		mg/L	TDS by SM2540C	20
FCNB1	0.14		mg/L	Total-P by SM4500P-F, 1999	0.01
FCNB1	<2.4	U	mg/L	Oil & Grease - total	5.7
FCNB1	65		mg/L	Calcium	0.2
FCNB1	0.71		mg/L	Iron	0.01
FCNB1	3.8		mg/L	Potassium	0.5
FCNB1	35		mg/L	Magnesium	0.1
FCNB1	160		mg/L	Sodium	1.5
FCNB1	0.16		mg/L	Aluminum	0.01
FCNB1	0.057		mg/L	Barium	0.001
FCNB1	<0.000053	U	mg/L	Cadmium	0.001
FCNB1	0.0043		mg/L	Copper	0.003
FCNB1	0.091		mg/L	Manganese	0.001
FCNB1	<0.000084	U	mg/L	Lead	0.001
FCNB1	0.0042	J	mg/L	Zinc	0.006
FCNB1	0.39		mg/L	Nitrate/Nitrite-N	0.02
FCNB1	<0.0020	U	mg/L	Phenolics	0.005
FCNB1	1.2		mg/L	Total Kjeldahl Nitrogen (TKN)	1
FCNB1	36		mg/L	COD	6
FCNB1 DUP	313		100ml	E Coli	2.2
FCNB1 DUP	31.5		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75
FCNB1 DUP	0.15		mg/L	Fluoride by EPA 300.0 Rev. 2.1	0.35
FCNB1 DUP	317		mg/L	Chloride by Lachat 10-117-07-1-A	10
FCNB1 DUP	0.11		mg/L	Ortho-P by SM4500P,B,F	0.01
FCNB1 DUP	0.11		mg/L	Total-P, Dissolved by SM4500P-F, 1999	0.01
FCNB1 DUP	236		mg/L	Alkalinity by SM 2320B	4
FCNB1 DUP	2.15		mg/L	BOD by SM5210B, 2001	2
FCNB1 DUP	0.04		mg/L	Nitrogen Ammonia by SM4500NH3,G -1997	0.05
FCNB1 DUP	4.7		mg/L	TSS by SM2540D,1997	2
FCNB1 DUP	900		mg/L	TDS by SM2540C	20
FCNB1 DUP	0.14		mg/L	Total-P by SM4500P-F, 1999	0.01
FCNB1 DUP	<2.4	U	mg/L	Oil & Grease - total	5.5
FCNB1 DUP	69		mg/L	Calcium	0.2

Table A2 Original Data – McHenry Analytical Laboratory (Continued)

Client ID	Result	Result Qualifer	Unit of Measure	Parameter Name	RDL
FCNB1 DUP	0.66		mg/L	Iron	0.01
FCNB1 DUP	3.9		mg/L	Potassium	0.5
FCNB1 DUP	37		mg/L	Magnesium	0.1
FCNB1 DUP	170		mg/L	Sodium	1.5
FCNB1 DUP	0.15		mg/L	Aluminum	0.01
FCNB1 DUP	0.055		mg/L	Barium	0.001
FCNB1 DUP	0.00014	J	mg/L	Cadmium	0.001
FCNB1 DUP	0.0037		mg/L	Copper	0.003
FCNB1 DUP	0.091		mg/L	Manganese	0.001
FCNB1 DUP	0.00041	J	mg/L	Lead	0.001
FCNB1 DUP	0.004	J	mg/L	Zinc	0.006
FCNB1 DUP	0.36		mg/L	Nitrate/Nitrite-N	0.02
FCNB1 DUP	<0.0020	U	mg/L	Phenolics	0.005
FCNB1 DUP	1.1		mg/L	Total Kjeldahl Nitrogen (TKN)	1
FCNB1 DUP	38	Q3	mg/L	COD	6
FCNB2	36.4		100ml	E Coli	2.2
FCNB2	25.8		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75
FCNB2	0.19		mg/L	Fluoride by EPA 300.0 Rev. 2.1	0.35
FCNB2	194		mg/L	Chloride by Lachat 10-117-07-1-A	10
FCNB2	0.05		mg/L	Ortho-P by SM4500P,B,F	0.01
FCNB2	0.06		mg/L	Total-P, Dissolved by SM4500P-F, 1999	0.01
FCNB2	236		mg/L	Alkalinity by SM 2320B	4
FCNB2	2.83		mg/L	BOD by SM5210B, 2001	2
FCNB2	0.1		mg/L	Nitrogen Ammonia by SM4500NH3,G -1997	0.05
FCNB2	6		mg/L	TSS by SM2540D,1997	2
FCNB2	667		mg/L	TDS by SM2540C	20
FCNB2	0.1		mg/L	Total-P by SM4500P-F, 1999	0.01
FCNB2	<2.5	U	mg/L	Oil & Grease - total	5.8
FCNB2	64		mg/L	Calcium	0.2
FCNB2	0.68		mg/L	Iron	0.01
FCNB2	20		mg/L	Potassium	0.5
FCNB2	36		mg/L	Magnesium	0.1
FCNB2	83		mg/L	Sodium	1.5
FCNB2	0.095		mg/L	Aluminum	0.01
FCNB2	0.11		mg/L	Barium	0.001
FCNB2	<0.000053	U	mg/L	Cadmium	0.001
FCNB2	0.003		mg/L	Copper	0.003
FCNB2	0.26		mg/L	Manganese	0.001
FCNB2	0.00025	J	mg/L	Lead	0.001
FCNB2	0.0036	J	mg/L	Zinc	0.006
FCNB2	0.13		mg/L	Nitrate/Nitrite-N	0.02

Table A2 Original Data – McHenry Analytical Laboratory (Continued)

Client ID	Result	Result Qualifer	Unit of Measure	Parameter Name	RDL
FCNB2	<0.0020	U	mg/L	Phenolics	0.005
FCNB2	1.1		mg/L	Total Kjeldahl Nitrogen (TKN)	1
FCNB2	23		mg/L	COD	6
FCNB4	155.3		100ml	E Coli	2.2
FCNB4	27.92		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75
FCNB4	0.16		mg/L	Fluoride by EPA 300.0 Rev. 2.1	0.35
FCNB4	273		mg/L	Chloride by Lachat 10-117-07-1-A	10
FCNB4	0.07		mg/L	Ortho-P by SM4500P,B,F	0.01
FCNB4	0.08		mg/L	Total-P, Dissolved by SM4500P-F, 1999	0.01
FCNB4	220		mg/L	Alkalinity by SM 2320B	4
FCNB4	2.11		mg/L	BOD by SM5210B, 2001	2
FCNB4	0.01		mg/L	Nitrogen Ammonia by SM4500NH3,G -1997	0.05
FCNB4	2.7		mg/L	TSS by SM2540D,1997	2
FCNB4	733		mg/L	TDS by SM2540C	20
FCNB4	0.09		mg/L	Total-P by SM4500P-F, 1999	0.01
FCNB4	<2.5	U	mg/L	Oil & Grease - total	5.8
FCNB4	62		mg/L	Calcium	0.2
FCNB4	0.29		mg/L	Iron	0.01
FCNB4	6.8		mg/L	Potassium	0.5
FCNB4	34		mg/L	Magnesium	0.1
FCNB4	140		mg/L	Sodium	1.5
FCNB4	0.064		mg/L	Aluminum	0.01
FCNB4	0.059		mg/L	Barium	0.001
FCNB4	<0.000053	U	mg/L	Cadmium	0.001
FCNB4	0.0036		mg/L	Copper	0.003
FCNB4	0.086		mg/L	Manganese	0.001
FCNB4	0.00017	J	mg/L	Lead	0.001
FCNB4	0.0029	J	mg/L	Zinc	0.006
FCNB4	0.1		mg/L	Nitrate/Nitrite-N	0.02
FCNB4	<0.0020	U	mg/L	Phenolics	0.005
FCNB4	0.94	J	mg/L	Total Kjeldahl Nitrogen (TKN)	1
FCNB4	26		mg/L	COD	6
FCNB7	50.4		100ml	E Coli	2.2
FCNB7	19.25		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75
FCNB7	0.13		mg/L	Fluoride by EPA 300.0 Rev. 2.1	0.35
FCNB7	228		mg/L	Chloride by Lachat 10-117-07-1-A	10
FCNB7	0.01		mg/L	Ortho-P by SM4500P,B,F	0.01
FCNB7	0.01		mg/L	Total-P, Dissolved by SM4500P-F, 1999	0.01
FCNB7	180		mg/L	Alkalinity by SM 2320B	4
FCNB7	4.71		mg/L	BOD by SM5210B, 2001	2
FCNB7	-0.03		mg/L	Nitrogen Ammonia by SM4500NH3,G -1997	0.05

Table A2 Original Data – McHenry Analytical Laboratory (Continued)

Client ID	Result	Result Qualifer	Unit of Measure	Parameter Name	RDL
FCNB7	5		mg/L	TSS by SM2540D,1997	2
FCNB7	633		mg/L	TDS by SM2540C	20
FCNB7	0.02		mg/L	Total-P by SM4500P-F, 1999	0.01
FCNB7	<2.5	U	mg/L	Oil & Grease - total	5.8
FCNB7	49		mg/L	Calcium	0.2
FCNB7	0.037		mg/L	Iron	0.01
FCNB7	4.8		mg/L	Potassium	0.5
FCNB7	27		mg/L	Magnesium	0.1
FCNB7	130		mg/L	Sodium	1.5
FCNB7	0.006	J	mg/L	Aluminum	0.01
FCNB7	0.38		mg/L	Barium	0.001
FCNB7	<0.000053	U	mg/L	Cadmium	0.001
FCNB7	0.0032		mg/L	Copper	0.003
FCNB7	0.028		mg/L	Manganese	0.001
FCNB7	0.00015	J	mg/L	Lead	0.001
FCNB7	0.0021	J	mg/L	Zinc	0.006
FCNB7	<0.0025	U	mg/L	Nitrate/Nitrite-N	0.02
FCNB7	<0.0020	U	mg/L	Phenolics	0.005
FCNB7	1.3		mg/L	Total Kjeldahl Nitrogen (TKN)	1
FCNB7	31		mg/L	COD	6
SCBH3Q	156.5		100ml	E Coli	2.2
SCBH3Q	37.61		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75
SCBH3Q	0.17		mg/L	Fluoride by EPA 300.0 Rev. 2.1	0.35
SCBH3Q	73.4		mg/L	Chloride by Lachat 10-117-07-1-A	1
SCBH3Q	0.03		mg/L	Ortho-P by SM4500P,B,F	0.01
SCBH3Q	0.04		mg/L	Total-P, Dissolved by SM4500P-F, 1999	0.01
SCBH3Q	282		mg/L	Alkalinity by SM 2320B	4
SCBH3Q	2.11		mg/L	BOD by SM5210B, 2001	2
SCBH3Q	-0.03		mg/L	Nitrogen Ammonia by SM4500NH3,G -1997	0.05
SCBH3Q	2.3		mg/L	TSS by SM2540D,1997	2
SCBH3Q	533		mg/L	TDS by SM2540C	20
SCBH3Q	0.04		mg/L	Total-P by SM4500P-F, 1999	0.01
SCBH3Q	<2.5	U	mg/L	Oil & Grease - total	5.8
SCBH3Q	76		mg/L	Calcium	0.2
SCBH3Q	0.25		mg/L	Iron	0.01
SCBH3Q	2.5		mg/L	Potassium	0.5
SCBH3Q	41		mg/L	Magnesium	0.1
SCBH3Q	41		mg/L	Sodium	1.5
SCBH3Q	0.033		mg/L	Aluminum	0.01
SCBH3Q	0.067		mg/L	Barium	0.001
SCBH3Q	<0.000053	U	mg/L	Cadmium	0.001

Table A2 Original Data – McHenry Analytical Laboratory (Continued)

Client ID	Result	Result Qualifer	Unit of Measure	Parameter Name	RDL
SCBH3Q	0.0015	J	mg/L	Copper	0.003
SCBH3Q	0.017		mg/L	Manganese	0.001
SCBH3Q	0.00013	J	mg/L	Lead	0.001
SCBH3Q	0.0035	J	mg/L	Zinc	0.006
SCBH3Q	0.29		mg/L	Nitrate/Nitrite-N	0.02
SCBH3Q	<0.0020	U	mg/L	Phenolics	0.005
SCBH3Q	0.64	J	mg/L	Total Kjeldahl Nitrogen (TKN)	1
SCBH3Q	7.9		mg/L	COD	6
FCLB4Q	21.64		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75
FCLB4Q	0.18		mg/L	Fluoride by EPA 300.0 Rev. 2.1	0.35
FCLB4Q	210		mg/L	Chloride by Lachat 10-117-07-1-A	10
FCLB4Q	0.07		mg/L	Ortho-P by SM4500P,B,F	0.01
FCLB4Q	0.08		mg/L	Total-P, Dissolved by SM4500P-F, 1999	0.01
FCLB4Q	178		mg/L	Alkalinity by SM 2320B	4
FCLB4Q	3.03		mg/L	BOD by SM5210B, 2001	2
FCLB4Q	0.04		mg/L	Nitrogen Ammonia by SM4500NH3,G -1997	0.05
FCLB4Q	4		mg/L	TSS by SM2540D,1997	2
FCLB4Q	600		mg/L	TDS by SM2540C	20
FCLB4Q	0.11		mg/L	Total-P by SM4500P-F, 1999	0.01
FCLB4Q	<2.4	U	mg/L	Oil & Grease - total	5.6
FCLB4Q	46		mg/L	Calcium	0.2
FCLB4Q	0.28		mg/L	Iron	0.01
FCLB4Q	5.3		mg/L	Potassium	0.5
FCLB4Q	29		mg/L	Magnesium	0.1
FCLB4Q	110		mg/L	Sodium	1.5
FCLB4Q	0.055		mg/L	Aluminum	0.01
FCLB4Q	0.06		mg/L	Barium	0.001
FCLB4Q	<0.000053	U	mg/L	Cadmium	0.001
FCLB4Q	0.0031		mg/L	Copper	0.003
FCLB4Q	0.16		mg/L	Manganese	0.001
FCLB4Q	<0.000084	U	mg/L	Lead	0.001
FCLB4Q	0.0032	J	mg/L	Zinc	0.006
FCLB4Q	0.14		mg/L	Nitrate/Nitrite-N	0.02
FCLB4Q	<0.0020	U	mg/L	Phenolics	0.005
FCLB4Q	1.4		mg/L	Total Kjeldahl Nitrogen (TKN)	1
FCLB4Q	31		mg/L	COD	6
FCLB3Q	547.5		100ml	E Coli	2.2
FCLB3Q	57.86		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75
FCLB3Q	0.3		mg/L	Fluoride by EPA 300.0 Rev. 2.1	0.35
FCLB3Q	257		mg/L	Chloride by Lachat 10-117-07-1-A	10
FCLB3Q	0.25		mg/L	Ortho-P by SM4500P,B,F	0.01

Table A2 Original Data – McHenry Analytical Laboratory (Continued)

Client ID	Result	Result Qualifer	Unit of Measure	Parameter Name	RDL
FCLB3Q	0.25		mg/L	Total-P, Dissolved by SM4500P-F, 1999	0.02
FCLB3Q	240		mg/L	Alkalinity by SM 2320B	4
FCLB3Q	4.85		mg/L	BOD by SM5210B, 2001	2
FCLB3Q	0.04		mg/L	Nitrogen Ammonia by SM4500NH3,G -1997	0.05
FCLB3Q	15		mg/L	TSS by SM2540D,1997	2
FCLB3Q	767		mg/L	TDS by SM2540C	20
FCLB3Q	0.32		mg/L	Total-P by SM4500P-F, 1999	0.02
FCLB3Q	<2.6	U	mg/L	Oil & Grease - total	6.1
FCLB3Q	69		mg/L	Calcium	0.2
FCLB3Q	0.62		mg/L	Iron	0.01
FCLB3Q	5.7		mg/L	Potassium	0.5
FCLB3Q	36		mg/L	Magnesium	0.1
FCLB3Q	130		mg/L	Sodium	1.5
FCLB3Q	0.22		mg/L	Aluminum	0.01
FCLB3Q	0.052		mg/L	Barium	0.001
FCLB3Q	<0.000053	U	mg/L	Cadmium	0.001
FCLB3Q	0.0053		mg/L	Copper	0.003
FCLB3Q	0.12		mg/L	Manganese	0.001
FCLB3Q	0.0009	J	mg/L	Lead	0.001
FCLB3Q	0.0073		mg/L	Zinc	0.006
FCLB3Q	0.76		mg/L	Nitrate/Nitrite-N	0.02
FCLB3Q	<0.0020	U	mg/L	Phenolics	0.005
FCLB3Q	1.1		mg/L	Total Kjeldahl Nitrogen (TKN)	1
FCLB3Q	24		mg/L	COD	6
FCLB5Q	488.4		100ml	E Coli	2.2
FCLB5Q	50.34		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75
FCLB5Q	0.3		mg/L	Fluoride by EPA 300.0 Rev. 2.1	0.35
FCLB5Q	245		mg/L	Chloride by Lachat 10-117-07-1-A	10
FCLB5Q	0.2		mg/L	Ortho-P by SM4500P,B,F	0.01
FCLB5Q	0.2		mg/L	Total-P, Dissolved by SM4500P-F, 1999	0.02
FCLB5Q	236		mg/L	Alkalinity by SM 2320B	4
FCLB5Q	4.77		mg/L	BOD by SM5210B, 2001	2
FCLB5Q	0.1		mg/L	Nitrogen Ammonia by SM4500NH3,G -1997	0.05
FCLB5Q	14		mg/L	TSS by SM2540D,1997	2
FCLB5Q	800		mg/L	TDS by SM2540C	20
FCLB5Q	0.29		mg/L	Total-P by SM4500P-F, 1999	0.02
FCLB5Q	<2.6	U	mg/L	Oil & Grease - total	6
FCLB5Q	67		mg/L	Calcium	0.2
FCLB5Q	0.49		mg/L	Iron	0.01
FCLB5Q	5.8		mg/L	Potassium	0.5
FCLB5Q	36		mg/L	Magnesium	0.1

Table A2 Original Data – McHenry Analytical Laboratory (Continued)

Client ID	Result	Result Qualifer	Unit of Measure	Parameter Name	RDL
FCLB5Q	130		mg/L	Sodium	1.5
FCLB5Q	0.14		mg/L	Aluminum	0.01
FCLB5Q	0.054		mg/L	Barium	0.001
FCLB5Q	<0.000053	U	mg/L	Cadmium	0.001
FCLB5Q	0.0042		mg/L	Copper	0.003
FCLB5Q	0.14		mg/L	Manganese	0.001
FCLB5Q	0.0013		mg/L	Lead	0.001
FCLB5Q	0.0055	J	mg/L	Zinc	0.006
FCLB5Q	0.58		mg/L	Nitrate/Nitrite-N	0.02
FCLB5Q	<0.0020	U	mg/L	Phenolics	0.005
FCLB5Q	1.4		mg/L	Total Kjeldahl Nitrogen (TKN)	1
FCLB5Q	31		mg/L	COD	6
FCLB5Q Dup	613.1		100ml	E Coli	2.2
FCLB5Q Dup	50.67		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75
FCLB5Q Dup	0.3		mg/L	Fluoride by EPA 300.0 Rev. 2.1	0.35
FCLB5Q Dup	245		mg/L	Chloride by Lachat 10-117-07-1-A	10
FCLB5Q Dup	0.19		mg/L	Ortho-P by SM4500P,B,F	0.01
FCLB5Q Dup	0.2		mg/L	Total-P, Dissolved by SM4500P-F, 1999	0.01
FCLB5Q Dup	234		mg/L	Alkalinity by SM 2320B	4
FCLB5Q Dup	4.87		mg/L	BOD by SM5210B, 2001	2
FCLB5Q Dup	0.09		mg/L	Nitrogen Ammonia by SM4500NH3,G -1997	0.05
FCLB5Q Dup	15		mg/L	TSS by SM2540D,1997	2
FCLB5Q Dup	767		mg/L	TDS by SM2540C	20
FCLB5Q Dup	0.3		mg/L	Total-P by SM4500P-F, 1999	0.01
FCLB5Q DUP	5.6		mg/L	Oil & Grease - total	5.6
FCLB5Q DUP	67		mg/L	Calcium	0.2
FCLB5Q DUP	0.42		mg/L	Iron	0.01
FCLB5Q DUP	6		mg/L	Potassium	0.5
FCLB5Q DUP	37		mg/L	Magnesium	0.1
FCLB5Q DUP	140		mg/L	Sodium	1.5
FCLB5Q DUP	0.16		mg/L	Aluminum	0.01
FCLB5Q DUP	0.054		mg/L	Barium	0.001
FCLB5Q DUP	<0.000053	U	mg/L	Cadmium	0.001
FCLB5Q DUP	0.0041		mg/L	Copper	0.003
FCLB5Q DUP	0.14		mg/L	Manganese	0.001
FCLB5Q DUP	0.00079	J	mg/L	Lead	0.001
FCLB5Q DUP	0.0054	J	mg/L	Zinc	0.006
FCLB5Q DUP	0.59		mg/L	Nitrate/Nitrite-N	0.02
FCLB5Q DUP	<0.0020	U	mg/L	Phenolics	0.005
FCLB5Q DUP	1.3		mg/L	Total Kjeldahl Nitrogen (TKN)	1
FCLB5Q DUP	33		mg/L	COD	6

Table A2 Original Data – McHenry Analytical Laboratory (Continued)

Client ID	Result	Result Qualifer	Unit of Measure	Parameter Name	RDL
Equipment Blank 2	54.6		100ml	E Coli	2.2
Equipment Blank 2	0		mg/L	Fluoride by EPA 300.0 Rev. 2.1	0.35
Equipment Blank 2	0		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75
Equipment Blank 2	0.55	E	mg/L	Chloride by Lachat 10-117-07-1-A	1
Equipment Blank 2	0		mg/L	Ortho-P by SM4500P,B,F	0.01
Equipment Blank 2	2		mg/L	Alkalinity by SM 2320B	4
Equipment Blank 2	0.01		mg/L	Total-P, Dissolved by SM4500P-F, 1999	0.01
Equipment Blank 2	0.77	I	mg/L	BOD by SM5210B, 2001	2
Equipment Blank 2	0		mg/L	TSS by SM2540D,1997	2
Equipment Blank 2	0		mg/L	TDS by SM2540C	20
Equipment Blank 2	-0.03		mg/L	Nitrogen Ammonia by SM4500NH3,G -1997	0.05
Equipment Blank 2	-0.01		mg/L	Total-P by SM4500P-F, 1999	0.01
EQUIPMENT BLANK #2	<2.5	U	mg/L	Oil & Grease - total	5.8
EQUIPMENT BLANK #2	0.44		mg/L	Calcium	0.05
EQUIPMENT BLANK #2	0.035		mg/L	Iron	0.01
EQUIPMENT BLANK #2	0.75		mg/L	Potassium	0.5
EQUIPMENT BLANK #2	0.056		mg/L	Magnesium	0.05
EQUIPMENT BLANK #2	0.73		mg/L	Sodium	0.5
EQUIPMENT BLANK #2	0.0098	J	mg/L	Aluminum	0.01
EQUIPMENT BLANK #2	<0.00067	U	mg/L	Barium	0.001
EQUIPMENT BLANK #2	0.00016	J	mg/L	Cadmium	0.001
EQUIPMENT BLANK #2	0.0042		mg/L	Copper	0.003
EQUIPMENT BLANK #2	0.0013		mg/L	Manganese	0.001
EQUIPMENT BLANK #2	0.00099	J	mg/L	Lead	0.001
EQUIPMENT BLANK #2	0.014		mg/L	Zinc	0.006
EQUIPMENT BLANK #2	<0.0025	U	mg/L	Nitrate/Nitrite-N	0.02
EQUIPMENT BLANK #2	0.0037	J	mg/L	Phenolics	0.005
EQUIPMENT BLANK #2	<0.26	U	mg/L	Total Kjeldahl Nitrogen (TKN)	1
EQUIPMENT BLANK #2	<3.2	Q3, U	mg/L	COD	6
Trip Blank 2	0		100ml	E Coli	2.2
Trip Blank 2	0		mg/L	Fluoride by EPA 300.0 Rev. 2.1	0.35
Trip Blank 2	0		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75
Trip Blank 2	0.04		mg/L	Chloride by Lachat 10-117-07-1-A	1
Trip Blank 2	0		mg/L	Ortho-P by SM4500P,B,F	0.01
Trip Blank 2	2		mg/L	Alkalinity by SM 2320B	4
Trip Blank 2	0		mg/L	Total-P, Dissolved by SM4500P-F, 1999	0.01
Trip Blank 2	0.29	I	mg/L	BOD by SM5210B, 2001	2
Trip Blank 2	0		mg/L	TSS by SM2540D,1997	2
Trip Blank 2	33		mg/L	TDS by SM2540C	20

Table A2 Original Data – McHenry Analytical Laboratory (Continued)

Client ID	Result	Result Qualifer	Unit of Measure	Parameter Name	RDL
Trip Blank 2	-0.03		mg/L	Nitrogen Ammonia by SM4500NH3,G -1997	0.05
Trip Blank 2	0		mg/L	Total-P by SM4500P-F, 1999	0.01
TRIP BLANK #2	<2.4	U	mg/L	Oil & Grease - total	5.5
TRIP BLANK #2	0.058		mg/L	Calcium	0.05
TRIP BLANK #2	0.0051	J	mg/L	Iron	0.01
TRIP BLANK #2	<0.040	U	mg/L	Potassium	0.5
TRIP BLANK #2	<0.024	U	mg/L	Magnesium	0.05
TRIP BLANK #2	0.1	J	mg/L	Sodium	0.5
TRIP BLANK #2	0.004	J	mg/L	Aluminum	0.01
TRIP BLANK #2	<0.00067	U	mg/L	Barium	0.001
TRIP BLANK #2	0.000068	J	mg/L	Cadmium	0.001
TRIP BLANK #2	0.0017	J	mg/L	Copper	0.003
TRIP BLANK #2	<0.00012	U	mg/L	Manganese	0.001
TRIP BLANK #2	0.00015	J	mg/L	Lead	0.001
TRIP BLANK #2	0.0052	J	mg/L	Zinc	0.006
TRIP BLANK #2	<0.0025	U	mg/L	Nitrate/Nitrite-N	0.02
TRIP BLANK #2	<0.0020	U	mg/L	Phenolics	0.005
TRIP BLANK #2	<0.26	U	mg/L	Total Kjeldahl Nitrogen (TKN)	1
TRIP BLANK #2	<3.2	U	mg/L	COD	6
Trip Blank 3	0		100ml	E Coli	2.2
Trip Blank 3	0		mg/L	Fluoride by EPA 300.0 Rev. 2.1	0.35
Trip Blank 3	0		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75
Trip Blank 3	0.16		mg/L	Chloride by Lachat 10-117-07-1-A	1
Trip Blank 3	0		mg/L	Ortho-P by SM4500P,B,F	0.01
Trip Blank 3	2		mg/L	Alkalinity by SM 2320B	4
Trip Blank 3	-0.01		mg/L	Total-P, Dissolved by SM4500P-F, 1999	0.01
Trip Blank 3	0.55	I	mg/L	BOD by SM5210B, 2001	2
Trip Blank 3	0.2		mg/L	TSS by SM2540D,1997	2
Trip Blank 3	33		mg/L	TDS by SM2540C	20
Trip Blank 3	-0.04		mg/L	Nitrogen Ammonia by SM4500NH3,G -1997	0.05
Trip Blank 3	0		mg/L	Total-P by SM4500P-F, 1999	0.01
TRIP BLANK #3	<2.4	U	mg/L	Oil & Grease - total	5.5
TRIP BLANK #3	0.033	J	mg/L	Calcium	0.05
TRIP BLANK #3	0.005	J	mg/L	Iron	0.01
TRIP BLANK #3	<0.040	U	mg/L	Potassium	0.5
TRIP BLANK #3	<0.024	U	mg/L	Magnesium	0.05
TRIP BLANK #3	0.053	J	mg/L	Sodium	0.5
TRIP BLANK #3	0.0026	J	mg/L	Aluminum	0.01
TRIP BLANK #3	<0.00067	U	mg/L	Barium	0.001
TRIP BLANK #3	<0.000053	U	mg/L	Cadmium	0.001
TRIP BLANK #3	0.0009	J	mg/L	Copper	0.003
TRIP BLANK #3	<0.00012	U	mg/L	Manganese	0.001

Table A2 Original Data – McHenry Analytical Laboratory (Continued)

Client ID	Result	Result Qualifer	Unit of Measure	Parameter Name	RDL
TRIP BLANK #3	<0.000084	U	mg/L	Lead	0.001
TRIP BLANK #3	0.005	J	mg/L	Zinc	0.006
TRIP BLANK #3	<0.0025	U	mg/L	Nitrate/Nitrite-N	0.02
TRIP BLANK #3	<0.0020	U	mg/L	Phenolics	0.005
TRIP BLANK #3	<0.26	U	mg/L	Total Kjeldahl Nitrogen (TKN)	1
TRIP BLANK #3	<3.2	U	mg/L	COD	6
Field Blank 2	0		100ml	E Coli	2.2
Field Blank 2	0		mg/L	Fluoride by EPA 300.0 Rev. 2.1	0.35
Field Blank 2	0		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75
Field Blank 2	0.52		mg/L	Chloride by Lachat 10-117-07-1-A	1
Field Blank 2	0		mg/L	Ortho-P by SM4500P,B,F	0.01
Field Blank 2	2		mg/L	Alkalinity by SM 2320B	4
Field Blank 2	0		mg/L	Total-P, Dissolved by SM4500P-F, 1999	0.01
Field Blank 2	0.23	I	mg/L	BOD by SM5210B, 2001	2
Field Blank 2	0		mg/L	TSS by SM2540D,1997	2
Field Blank 2	0		mg/L	TDS by SM2540C	20
Field Blank 2	-0.03		mg/L	Nitrogen Ammonia by SM4500NH3,G -1997	0.05
Field Blank 2	0.01		mg/L	Total-P by SM4500P-F, 1999	0.01
FIELD BLANK #2	<2.5	U	mg/L	Oil & Grease - total	5.8
FIELD BLANK #2	0.029	J	mg/L	Calcium	0.05
FIELD BLANK #2	0.0065	J	mg/L	Iron	0.01
FIELD BLANK #2	<0.040	U	mg/L	Potassium	0.5
FIELD BLANK #2	<0.024	U	mg/L	Magnesium	0.05
FIELD BLANK #2	0.054	J	mg/L	Sodium	0.5
FIELD BLANK #2	0.0022	J	mg/L	Aluminum	0.01
FIELD BLANK #2	<0.00067	U	mg/L	Barium	0.001
FIELD BLANK #2	<0.000053	U	mg/L	Cadmium	0.001
FIELD BLANK #2	<0.00014	U	mg/L	Copper	0.003
FIELD BLANK #2	<0.00012	U	mg/L	Manganese	0.001
FIELD BLANK #2	<0.000084	U	mg/L	Lead	0.001
FIELD BLANK #2	0.0045	J	mg/L	Zinc	0.006
FIELD BLANK #2	<0.0025	U	mg/L	Nitrate/Nitrite-N	0.02
FIELD BLANK #2	0.0025	J	mg/L	Phenolics	0.005
FIELD BLANK #2	<0.26	U	mg/L	Total Kjeldahl Nitrogen (TKN)	1
FIELD BLANK #2	<3.2	U	mg/L	COD	6
Field Blank 3	0		100ml	E Coli	2.2
Field Blank 3	0		mg/L	Fluoride by EPA 300.0 Rev. 2.1	0.35
Field Blank 3	0		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75
Field Blank 3	0.07		mg/L	Chloride by Lachat 10-117-07-1-A	1
Field Blank 3	0		mg/L	Ortho-P by SM4500P,B,F	0.01

Table A2 Original Data – McHenry Analytical Laboratory (Continued)

Client ID	Result	Result Qualifer	Unit of Measure	Parameter Name	RDL
Field Blank 3	2		mg/L	Alkalinity by SM 2320B	4
Field Blank 3	0		mg/L	Total-P, Dissolved by SM4500P-F, 1999	0.01
Field Blank 3	0.53	I	mg/L	BOD by SM5210B, 2001	2
Field Blank 3	0.2		mg/L	TSS by SM2540D,1997	2
Field Blank 3	0		mg/L	TDS by SM2540C	20
Field Blank 3	-0.03		mg/L	Nitrogen Ammonia by SM4500NH3,G -1997	0.05
Field Blank 3	0		mg/L	Total-P by SM4500P-F, 1999	0.01
FIELD BLANK #3	<2.5	U	mg/L	Oil & Grease - total	5.8
FIELD BLANK #3	0.033	J	mg/L	Calcium	0.05
FIELD BLANK #3	0.022		mg/L	Iron	0.01
FIELD BLANK #3	<0.040	U	mg/L	Potassium	0.5
FIELD BLANK #3	<0.024	U	mg/L	Magnesium	0.05
FIELD BLANK #3	0.066	J	mg/L	Sodium	0.5
FIELD BLANK #3	0.0025	J	mg/L	Aluminum	0.01
FIELD BLANK #3	<0.00067	U	mg/L	Barium	0.001
FIELD BLANK #3	<0.000053	U	mg/L	Cadmium	0.001
FIELD BLANK #3	0.00079	J	mg/L	Copper	0.003
FIELD BLANK #3	<0.00012	U	mg/L	Manganese	0.001
FIELD BLANK #3	<0.000084	U	mg/L	Lead	0.001
FIELD BLANK #3	0.0053	J	mg/L	Zinc	0.006
FIELD BLANK #3	<0.0025	U	mg/L	Nitrate/Nitrite-N	0.02
FIELD BLANK #3	<0.0020	U	mg/L	Phenolics	0.005
FIELD BLANK #3	<0.26	U	mg/L	Total Kjeldahl Nitrogen (TKN)	1
FIELD BLANK #3	<3.2	U	mg/L	COD	6
FCB1	1299.7		100ml	E Coli	2.2
FCB1	0.09		mg/L	Fluoride by EPA 300.0 Rev. 2.1	0.35
FCB1	50.4		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75
FCB1	658		mg/L	Chloride by Lachat 10-117-07-1-A	10
FCB1	0.24		mg/L	Ortho-P by SM4500P,B,F	0.01
FCB1	286		mg/L	Alkalinity by SM 2320B	4
FCB1	0.05		mg/L	Total-P, Dissolved by SM4500P-F, 1999	0.01
FCB1	7.95		mg/L	BOD by SM5210B, 2001	2
FCB1	13		mg/L	TSS by SM2540D,1997	2
FCB1	1433		mg/L	TDS by SM2540C	20
FCB1	3.52		mg/L	Nitrogen Ammonia by SM4500NH3,G -1997	0.1
FCB1	0.33		mg/L	Total-P by SM4500P-F, 1999	0.02
FCB1	<2.4	U	mg/L	Oil & Grease - total	5.6
FCB1	84		mg/L	Calcium	0.05
FCB1	1.5		mg/L	Iron	0.01
FCB1	12		mg/L	Potassium	0.5

Table A2 Original Data – McHenry Analytical Laboratory (Continued)

Client ID	Result	Result Qualifer	Unit of Measure	Parameter Name	RDL
FCB1	52		mg/L	Magnesium	0.05
FCB1	420		mg/L	Sodium	0.5
FCB1	0.16		mg/L	Aluminum	0.01
FCB1	0.075		mg/L	Barium	0.001
FCB1	0.00011	J	mg/L	Cadmium	0.001
FCB1	0.006		mg/L	Copper	0.003
FCB1	0.37		mg/L	Manganese	0.001
FCB1	0.00066	J	mg/L	Lead	0.001
FCB1	0.0092		mg/L	Zinc	0.006
FCB1	0.11		mg/L	Nitrate/Nitrite-N	0.02
FCB1	0.0043	J	mg/L	Phenolics	0.005
FCB1	4.9		mg/L	Total Kjeldahl Nitrogen (TKN)	1
FCB1	46		mg/L	COD	6
FCBH1	517.2		100ml	E Coli	2.2
FCBH1	0.16		mg/L	Fluoride by EPA 300.0 Rev. 2.1	0.35
FCBH1	8.87		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75
FCBH1	202		mg/L	Chloride by Lachat 10-117-07-1-A	10
FCBH1	0.08		mg/L	Ortho-P by SM4500P,B,F	0.01
FCBH1	240		mg/L	Alkalinity by SM 2320B	4
FCBH1	0.05		mg/L	Total-P, Dissolved by SM4500P-F, 1999	0.01
FCBH1	3.97		mg/L	BOD by SM5210B, 2001	2
FCBH1	15		mg/L	TSS by SM2540D,1997	2
FCBH1	600		mg/L	TDS by SM2540C	20
FCBH1	0.22		mg/L	Nitrogen Ammonia by SM4500NH3,G -1997	0.05
FCBH1	0.16		mg/L	Total-P by SM4500P-F, 1999	0.01
FCBH1	<2.6	U	mg/L	Oil & Grease - total	6
FCBH1	79		mg/L	Calcium	0.05
FCBH1	1.5		mg/L	Iron	0.01
FCBH1	2.7		mg/L	Potassium	0.5
FCBH1	36		mg/L	Magnesium	0.05
FCBH1	87		mg/L	Sodium	0.5
FCBH1	0.22		mg/L	Aluminum	0.01
FCBH1	0.049		mg/L	Barium	0.001
FCBH1	0.000084	J	mg/L	Cadmium	0.001
FCBH1	0.0026	J	mg/L	Copper	0.003
FCBH1	1.3		mg/L	Manganese	0.001
FCBH1	0.00096	J	mg/L	Lead	0.001
FCBH1	0.0099		mg/L	Zinc	0.006
FCBH1	0.035		mg/L	Nitrate/Nitrite-N	0.02
FCBH1	<0.0020	U	mg/L	Phenolics	0.005

Table A2 Original Data – McHenry Analytical Laboratory (Continued)

Client ID	Result	Result Qualifer	Unit of Measure	Parameter Name	RDL
FCBH1	1.2		mg/L	Total Kjeldahl Nitrogen (TKN)	1
FCBH1	35		mg/L	COD	6
FCBH4	325.5		100ml	E Coli	2.2
FCBH4	0.43		mg/L	Fluoride by EPA 300.0 Rev. 2.1	0.35
FCBH4	86.3		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75
FCBH4	339		mg/L	Chloride by Lachat 10-117-07-1-A	10
FCBH4	0.43		mg/L	Ortho-P by SM4500P,B,F	0.01
FCBH4	290		mg/L	Alkalinity by SM 2320B	4
FCBH4	0.19		mg/L	Total-P, Dissolved by SM4500P-F, 1999	0.01
FCBH4	4.71		mg/L	BOD by SM5210B, 2001	2
FCBH4	33		mg/L	TSS by SM2540D,1997	2
FCBH4	1100		mg/L	TDS by SM2540C	20
FCBH4	0.3		mg/L	Nitrogen Ammonia by SM4500NH3,G -1997	0.05
FCBH4	0.48		mg/L	Total-P by SM4500P-F, 1999	0.02
FCBH4	<2.6	U	mg/L	Oil & Grease - total	6
FCBH4	100		mg/L	Calcium	0.05
FCBH4	1		mg/L	Iron	0.01
FCBH4	9.9		mg/L	Potassium	0.5
FCBH4	53		mg/L	Magnesium	0.05
FCBH4	210		mg/L	Sodium	0.5
FCBH4	0.59		mg/L	Aluminum	0.01
FCBH4	0.063		mg/L	Barium	0.001
FCBH4	0.00014	J	mg/L	Cadmium	0.001
FCBH4	0.01		mg/L	Copper	0.003
FCBH4	0.16		mg/L	Manganese	0.001
FCBH4	0.0029		mg/L	Lead	0.001
FCBH4	0.025		mg/L	Zinc	0.006
FCBH4	2.8		mg/L	Nitrate/Nitrite-N	0.1
FCBH4	0.0035	J	mg/L	Phenolics	0.005
FCBH4	1.4		mg/L	Total Kjeldahl Nitrogen (TKN)	1
FCBH4	28		mg/L	COD	6
SCSB1	28.1		100ml	E Coli	2.2
SCSB1	0.25		mg/L	Fluoride by EPA 300.0 Rev. 2.1	0.35
SCSB1	99.66		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75
SCSB1	220		mg/L	Chloride by Lachat 10-117-07-1-A	10
SCSB1	0.04		mg/L	Ortho-P by SM4500P,B,F	0.01
SCSB1	180		mg/L	Alkalinity by SM 2320B	4
SCSB1	0.03		mg/L	Total-P, Dissolved by SM4500P-F, 1999	0.01
SCSB1	8.31		mg/L	BOD by SM5210B, 2001	2
SCSB1	66		mg/L	TSS by SM2540D,1997	2

Table A2 Original Data – McHenry Analytical Laboratory (Continued)

Client ID	Result	Result Qualifer	Unit of Measure	Parameter Name	RDL
SCSB1	733		mg/L	TDS by SM2540C	20
SCSB1	0.01		mg/L	Nitrogen Ammonia by SM4500NH3,G -1997	0.05
SCSB1	0.11		mg/L	Total-P by SM4500P-F, 1999	0.01
SCSB1	<2.8	U	mg/L	Oil & Grease - total	6.6
SCSB1	78		mg/L	Calcium	0.05
SCSB1	1.4		mg/L	Iron	0.01
SCSB1	5.9		mg/L	Potassium	0.5
SCSB1	34		mg/L	Magnesium	0.05
SCSB1	140		mg/L	Sodium	0.5
SCSB1	1		mg/L	Aluminum	0.01
SCSB1	0.077		mg/L	Barium	0.001
SCSB1	0.000068	J	mg/L	Cadmium	0.001
SCSB1	0.0043		mg/L	Copper	0.003
SCSB1	0.1		mg/L	Manganese	0.001
SCSB1	0.0015		mg/L	Lead	0.001
SCSB1	0.011		mg/L	Zinc	0.006
SCSB1	0.17		mg/L	Nitrate/Nitrite-N	0.02
SCSB1	0.005		mg/L	Phenolics	0.005
SCSB1	1.8		mg/L	Total Kjeldahl Nitrogen (TKN)	1
SCSB1	3.5	J	mg/L	COD	6
SCSB2	72.7		100ml	E Coli	2.2
SCSB2	0.21		mg/L	Fluoride by EPA 300.0 Rev. 2.1	0.35
SCSB2	17.04		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75
SCSB2	156		mg/L	Chloride by Lachat 10-117-07-1-A	10
SCSB2	0.04		mg/L	Ortho-P by SM4500P,B,F	0.01
SCSB2	262		mg/L	Alkalinity by SM 2320B	4
SCSB2	0.02		mg/L	Total-P, Dissolved by SM4500P-F, 1999	0.01
SCSB2	2.81		mg/L	BOD by SM5210B, 2001	2
SCSB2	4.3		mg/L	TSS by SM2540D,1997	2
SCSB2	0.29		mg/L	Nitrogen Ammonia by SM4500NH3,G -1997	0.05
SCSB2	600		mg/L	TDS by SM2540C	20
SCSB2	0.09		mg/L	Total-P by SM4500P-F, 1999	0.01
SCSB2	<2.5	U	mg/L	Oil & Grease - total	5.7
SCSB2	79		mg/L	Calcium	0.05
SCSB2	1		mg/L	Iron	0.01
SCSB2	3.1		mg/L	Potassium	0.5
SCSB2	35		mg/L	Magnesium	0.05
SCSB2	98		mg/L	Sodium	0.5
SCSB2	0.034		mg/L	Aluminum	0.01
SCSB2	0.058		mg/L	Barium	0.001

Table A2 Original Data – McHenry Analytical Laboratory (Continued)

Client ID	Result	Result Qualifer	Unit of Measure	Parameter Name	RDL
SCSB2	<0.000053	U	mg/L	Cadmium	0.001
SCSB2	0.0017	J	mg/L	Copper	0.003
SCSB2	0.78		mg/L	Manganese	0.001
SCSB2	0.00013	J	mg/L	Lead	0.001
SCSB2	0.0044	J	mg/L	Zinc	0.006
SCSB2	0.016	J	mg/L	Nitrate/Nitrite-N	0.02
SCSB2	0.005		mg/L	Phenolics	0.005
SCSB2	0.78	J	mg/L	Total Kjeldahl Nitrogen (TKN)	1
SCSB2	21		mg/L	COD	6
SCBH1Q	139.1		100ml	E Coli	2.2
SCBH1Q	0.19		mg/L	Fluoride by EPA 300.0 Rev. 2.1	0.35
SCBH1Q	60.49		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75
SCBH1Q	258		mg/L	Chloride by Lachat 10-117-07-1-A	10
SCBH1Q	0.01		mg/L	Ortho-P by SM4500P,B,F	0.01
SCBH1Q	202		mg/L	Alkalinity by SM 2320B	4
SCBH1Q	0.02		mg/L	Total-P, Dissolved by SM4500P-F, 1999	0.01
SCBH1Q	4.03		mg/L	BOD by SM5210B, 2001	2
SCBH1Q	12		mg/L	TSS by SM2540D,1997	2
SCBH1Q	0.02		mg/L	Nitrogen Ammonia by SM4500NH3,G -1997	0.05
SCBH1Q	767		mg/L	TDS by SM2540C	20
SCBH1Q	0.05		mg/L	Total-P by SM4500P-F, 1999	0.01
SCBH1Q	<2.4	U	mg/L	Oil & Grease - total	5.6
SCBH1Q	75		mg/L	Calcium	0.05
SCBH1Q	0.33		mg/L	Iron	0.01
SCBH1Q	4.4		mg/L	Potassium	0.5
SCBH1Q	34		mg/L	Magnesium	0.05
SCBH1Q	150		mg/L	Sodium	0.5
SCBH1Q	0.18		mg/L	Aluminum	0.01
SCBH1Q	0.072		mg/L	Barium	0.001
SCBH1Q	0.000054	J	mg/L	Cadmium	0.001
SCBH1Q	0.0029	J	mg/L	Copper	0.003
SCBH1Q	0.085		mg/L	Manganese	0.001
SCBH1Q	0.00041	J	mg/L	Lead	0.001
SCBH1Q	0.0059	J	mg/L	Zinc	0.006
SCBH1Q	0.057		mg/L	Nitrate/Nitrite-N	0.02
SCBH1Q	0.004	J	mg/L	Phenolics	0.005
SCBH1Q	1.1		mg/L	Total Kjeldahl Nitrogen (TKN)	1
SCBH1Q	31	Q2	mg/L	COD	6
SCBH2Q	11		100ml	E Coli	2.2
SCBH2Q	0.15		mg/L	Fluoride by EPA 300.0 Rev. 2.1	0.35

Table A2 Original Data – McHenry Analytical Laboratory (Continued)

Client ID	Result	Result Qualifer	Unit of Measure	Parameter Name	RDL
SCBH2Q	0.15		mg/L	Fluoride by EPA 300.0 Rev. 2.1	0.35
SCBH2Q	35.47		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75
SCBH2Q	106		mg/L	Chloride by Lachat 10-117-07-1-A	10
SCBH2Q	0.01		mg/L	Ortho-P by SM4500P,B,F	0.01
SCBH2Q	236		mg/L	Alkalinity by SM 2320B	4
SCBH2Q	0.04		mg/L	Total-P, Dissolved by SM4500P-F, 1999	0.01
SCBH2Q	3.67		mg/L	BOD by SM5210B, 2001	2
SCBH2Q	1		mg/L	TSS by SM2540D,1997	2
SCBH2Q	-0.03		mg/L	Nitrogen Ammonia by SM4500NH3,G -1997	0.05
SCBH2Q	533		mg/L	TDS by SM2540C	20
SCBH2Q	0.05		mg/L	Total-P by SM4500P-F, 1999	0.01
SCBH2Q	<2.6	U	mg/L	Oil & Grease - total	6
SCBH2Q	75		mg/L	Calcium	0.05
SCBH2Q	0.072		mg/L	Iron	0.01
SCBH2Q	2.3		mg/L	Potassium	0.5
SCBH2Q	37		mg/L	Magnesium	0.05
SCBH2Q	67		mg/L	Sodium	0.5
SCBH2Q	0.077		mg/L	Aluminum	0.01
SCBH2Q	0.056		mg/L	Barium	0.001
SCBH2Q	<0.000053	U	mg/L	Cadmium	0.001
SCBH2Q	0.0012	J	mg/L	Copper	0.003
SCBH2Q	0.23		mg/L	Manganese	0.001
SCBH2Q	0.00016	J	mg/L	Lead	0.001
SCBH2Q	0.0062		mg/L	Zinc	0.006
SCBH2Q	0.071		mg/L	Nitrate/Nitrite-N	0.02
SCBH2Q	0.0048	J	mg/L	Phenolics	0.005
SCBH2Q	1.2		mg/L	Total Kjeldahl Nitrogen (TKN)	1
SCBH2Q	33		mg/L	COD	6
FCBH4 DU	365.4		100ml	E Coli	2.2
FCBH4 DU	0.43		mg/L	Fluoride by EPA 300.0 Rev. 2.1	0.35
FCBH4 DU	82.02		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75
FCBH4 DU	343		mg/L	Chloride by Lachat 10-117-07-1-A	10
FCBH4 DU	0.43		mg/L	Ortho-P by SM4500P,B,F	0.01
FCBH4 DU	286		mg/L	Alkalinity by SM 2320B	4
FCBH4 DU	0.38		mg/L	Total-P, Dissolved by SM4500P-F, 1999	0.02
FCBH4 DU	4.29		mg/L	BOD by SM5210B, 2001	2
FCBH4 DU	28		mg/L	TSS by SM2540D,1997	2
FCBH4 DU	0.29		mg/L	Nitrogen Ammonia by SM4500NH3,G -1997	0.05
FCBH4 DU	1067		mg/L	TDS by SM2540C	20
FCBH4 DU	0.5		mg/L	Total-P by SM4500P-F, 1999	0.02
FCBH4 DU	<2.6	U	mg/L	Oil & Grease - total	6.1

Table A2 Original Data – McHenry Analytical Laboratory (Continued)

Client ID	Result	Result Qualifer	Unit of Measure	Parameter Name	RDL
FCBH4 DUP	<2.6	U	mg/L	Oil & Grease - total	6.1
FCBH4 DUP	100		mg/L	Calcium	0.05
FCBH4 DUP	0.82		mg/L	Iron	0.01
FCBH4 DUP	9.7		mg/L	Potassium	0.5
FCBH4 DUP	52		mg/L	Magnesium	0.05
FCBH4 DUP	210		mg/L	Sodium	0.5
FCBH4 DUP	0.45		mg/L	Aluminum	0.01
FCBH4 DUP	0.06		mg/L	Barium	0.001
FCBH4 DUP	0.000086	J	mg/L	Cadmium	0.001
FCBH4 DUP	0.0072		mg/L	Copper	0.003
FCBH4 DUP	0.15		mg/L	Manganese	0.001
FCBH4 DUP	0.0021		mg/L	Lead	0.001
FCBH4 DUP	0.016		mg/L	Zinc	0.006
FCBH4 DUP	2.7		mg/L	Nitrate/Nitrite-N	0.04
FCBH4 DUP	<0.0020	U	mg/L	Phenolics	0.005
FCBH4 DUP	1.6		mg/L	Total Kjeldahl Nitrogen (TKN)	1
FCBH4 DUP	15		mg/L	COD	6
FCBH1Q	648.8		100ml	E Coli	2.2
FCBH1Q	0.21		mg/L	Fluoride by EPA 300.0 Rev. 2.1	0.35
FCBH1Q	5.84		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75
FCBH1Q	136		mg/L	Chloride by Lachat 10-117-07-1-A	10
FCBH1Q	0.26		mg/L	Ortho-P by SM4500P,B,F	0.01
FCBH1Q	200		mg/L	Alkalinity by SM 2320B	4
FCBH1Q	0.23		mg/L	Total-P, Dissolved by SM4500P-F, 1999	0.02
FCBH1Q	3.75		mg/L	BOD by SM5210B, 2001	2
FCBH1Q	6		mg/L	TSS by SM2540D,1997	2
FCBH1Q	0.82		mg/L	Nitrogen Ammonia by SM4500NH3,G -1997	0.05
FCBH1Q	500		mg/L	TDS by SM2540C	20
FCBH1Q	0.31		mg/L	Total-P by SM4500P-F, 1999	0.02
FCBH1Q	<2.4	Pc, U	mg/L	Oil & Grease - total	5.6
FCBH1Q	60		mg/L	Calcium	0.05
FCBH1Q	1.3		mg/L	Iron	0.01
FCBH1Q	2.9		mg/L	Potassium	0.5
FCBH1Q	29		mg/L	Magnesium	0.05
FCBH1Q	82		mg/L	Sodium	0.5
FCBH1Q	0.1		mg/L	Aluminum	0.01
FCBH1Q	0.035		mg/L	Barium	0.001
FCBH1Q	0.000084	J	mg/L	Cadmium	0.001
FCBH1Q	0.0018	J	mg/L	Copper	0.003

Table A2 Original Data – McHenry Analytical Laboratory (Continued)

Client ID	Result	Result Qualifer	Unit of Measure	Parameter Name	RDL
FCBH1Q	0.26		mg/L	Manganese	0.001
FCBH1Q	0.00053	J	mg/L	Lead	0.001
FCBH1Q	0.0061		mg/L	Zinc	0.006
FCBH1Q	0.026		mg/L	Nitrate/Nitrite-N	0.02
FCBH1Q	<0.0020	U	mg/L	Phenolics	0.005
FCBH1Q	2.5		mg/L	Total Kjeldahl Nitrogen (TKN)	1
FCBH1Q	46		mg/L	COD	6
FCB4Q	980.4		100ml	E Coli	2.2
FCB4Q	0.76		mg/L	Fluoride by EPA 300.0 Rev. 2.1	0.35
FCB4Q	1038.78		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75
FCB4Q	457		mg/L	Chloride by Lachat 10-117-07-1-A	10
FCB4Q	2.85		mg/L	Ortho-P by SM4500P,B,F	0.01
FCB4Q	312		mg/L	Alkalinity by SM 2320B	4
FCB4Q	2.94		mg/L	Total-P, Dissolved by SM4500P-F, 1999	0.1
FCB4Q	2.59		mg/L	BOD by SM5210B, 2001	2
FCB4Q	3		mg/L	TSS by SM2540D,1997	2
FCB4Q	0.12		mg/L	Nitrogen Ammonia by SM4500NH3,G -1997	0.05
FCB4Q	1367		mg/L	TDS by SM2540C	20
FCB4Q	3		mg/L	Total-P by SM4500P-F, 1999	0.1
FCB4Q	<2.3	U	mg/L	Oil & Grease - total	5.5
FCB4Q	120		mg/L	Calcium	0.05
FCB4Q	0.13		mg/L	Iron	0.01
FCB4Q	16		mg/L	Potassium	0.5
FCB4Q	61		mg/L	Magnesium	0.05
FCB4Q	290		mg/L	Sodium	0.5
FCB4Q	0.038		mg/L	Aluminum	0.01
FCB4Q	0.05		mg/L	Barium	0.001
FCB4Q	0.000085	J	mg/L	Cadmium	0.001
FCB4Q	0.012		mg/L	Copper	0.003
FCB4Q	0.025		mg/L	Manganese	0.001
FCB4Q	0.00063	J	mg/L	Lead	0.001
FCB4Q	0.044		mg/L	Zinc	0.006
FCB4Q	8.5		mg/L	Nitrate/Nitrite-N	0.2
FCB4Q	<0.0020	U	mg/L	Phenolics	0.005
FCB4Q	0.98	J	mg/L	Total Kjeldahl Nitrogen (TKN)	1
FCB4Q	19		mg/L	COD	6
FCB3T	108.6		100ml	E Coli	2.2
FCB3T	920.8		100ml	E Coli	2.2
FCB3T	0.76		mg/L	Fluoride by EPA 300.0 Rev. 2.1	0.35
FCB3T	111.97		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75

Table A2 Original Data – McHenry Analytical Laboratory (Continued)

Client ID	Result	Result Qualifer	Unit of Measure	Parameter Name	RDL
FCB3T	462		mg/L	Chloride by Lachat 10-117-07-1-A	10
FCB3T	2.89		mg/L	Ortho-P by SM4500P,B,F	0.01
FCB3T	310		mg/L	Alkalinity by SM 2320B	4
FCB3T	2.98		mg/L	Total-P, Dissolved by SM4500P-F, 1999	0.1
FCB3T	2.11		mg/L	BOD by SM5210B, 2001	2
FCB3T	0.7		mg/L	TSS by SM2540D,1997	2
FCB3T	0.03		mg/L	Nitrogen Ammonia by SM4500NH3,G -1997	0.05
FCB3T	1367		mg/L	TDS by SM2540C	20
FCB3T	3.03		mg/L	Total-P by SM4500P-F, 1999	0.1
FCB3T	<2.4	U	mg/L	Oil & Grease - total	5.5
FCB3T	110		mg/L	Calcium	0.05
FCB3T	0.048		mg/L	Iron	0.01
FCB3T	17		mg/L	Potassium	0.5
FCB3T	61		mg/L	Magnesium	0.05
FCB3T	300		mg/L	Sodium	0.5
FCB3T	0.01		mg/L	Aluminum	0.01
FCB3T	0.045		mg/L	Barium	0.001
FCB3T	0.000069	J	mg/L	Cadmium	0.001
FCB3T	0.012		mg/L	Copper	0.003
FCB3T	0.0091		mg/L	Manganese	0.001
FCB3T	0.00048	J	mg/L	Lead	0.001
FCB3T	0.046		mg/L	Zinc	0.006
FCB3T	10		mg/L	Nitrate/Nitrite-N	0.2
FCB3T	<0.0020	U	mg/L	Phenolics	0.005
FCB3T	0.83	J	mg/L	Total Kjeldahl Nitrogen (TKN)	1
FCB3T	<3.2	U	mg/L	COD	6
FCB2	290.9		100ml	E Coli	2.2
FCB2	0.17		mg/L	Fluoride by EPA 300.0 Rev. 2.1	0.35
FCB2	16.27		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75
FCB2	188		mg/L	Chloride by Lachat 10-117-07-1-A	10
FCB2	0.34	E	mg/L	Ortho-P by SM4500P,B,F	0.01
FCB2	172		mg/L	Alkalinity by SM 2320B	4
FCB2	0.37		mg/L	Total-P, Dissolved by SM4500P-F, 1999	0.02
FCB2	5.29	H	mg/L	BOD by SM5210B, 2001	2
FCB2	6.7		mg/L	TSS by SM2540D,1997	2
FCB2	0.93		mg/L	Nitrogen Ammonia by SM4500NH3,G -1997	0.05
FCB2	533		mg/L	TDS by SM2540C	20
FCB2	0.47		mg/L	Total-P by SM4500P-F, 1999	0.02
FCB2	<2.4	U	mg/L	Oil & Grease - total	5.6

Table A2 Original Data – McHenry Analytical Laboratory (Continued)

Client ID	Result	Result Qualifer	Unit of Measure	Parameter Name	RDL
FCB2	52		mg/L	Calcium	0.05
FCB2	1.4		mg/L	Iron	0.01
FCB2	3.3		mg/L	Potassium	0.5
FCB2	30		mg/L	Magnesium	0.05
FCB2	120		mg/L	Sodium	0.5
FCB2	0.02		mg/L	Aluminum	0.01
FCB2	0.045		mg/L	Barium	0.001
FCB2	0.000075	J	mg/L	Cadmium	0.001
FCB2	0.0029	J	mg/L	Copper	0.003
FCB2	0.74		mg/L	Manganese	0.001
FCB2	<0.000084	U	mg/L	Lead	0.001
FCB2	0.0041	J	mg/L	Zinc	0.006
FCB2	0.0035	J	mg/L	Nitrate/Nitrite-N	0.02
FCB2	0.0047	J	mg/L	Phenolics	0.005
FCB2	2.3		mg/L	Total Kjeldahl Nitrogen (TKN)	1
FCB2	46		mg/L	COD	6
FCDP1	435.2		100ml	E Coli	2.2
FCDP1	0.16		mg/L	Fluoride by EPA 300.0 Rev. 2.1	0.35
FCDP1	27.56		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75
FCDP1	429		mg/L	Chloride by Lachat 10-117-07-1-A	10
FCDP1	0.06		mg/L	Ortho-P by SM4500P,B,F	0.01
FCDP1	302		mg/L	Alkalinity by SM 2320B	4
FCDP1	0.07		mg/L	Total-P, Dissolved by SM4500P-F, 1999	0.01
FCDP1	8.83		mg/L	BOD by SM5210B, 2001	2
FCDP1	79		mg/L	TSS by SM2540D,1997	2
FCDP1	0.13		mg/L	Nitrogen Ammonia by SM4500NH3,G -1997	0.05
FCDP1	1133		mg/L	TDS by SM2540C	20
FCDP1	0.71		mg/L	Total-P by SM4500P-F, 1999	0.01
FCDP1	<8.3	U	mg/L	Oil & Grease - total	19
FCDP1	100		mg/L	Calcium	0.05
FCDP1	11		mg/L	Iron	0.01
FCDP1	4		mg/L	Potassium	0.5
FCDP1	39		mg/L	Magnesium	0.05
FCDP1	300		mg/L	Sodium	0.5
FCDP1	0.19		mg/L	Aluminum	0.01
FCDP1	0.073		mg/L	Barium	0.001
FCDP1	0.00013	J	mg/L	Cadmium	0.001
FCDP1	0.015		mg/L	Copper	0.003
FCDP1	1.1		mg/L	Manganese	0.001
FCDP1	0.00023	J	mg/L	Lead	0.001

Table A2 Original Data – McHenry Analytical Laboratory (Continued)

Client ID	Result	Result Qualifer	Unit of Measure	Parameter Name	RDL
FCDP1	0.0079		mg/L	Zinc	0.006
FCDP1	<0.0025	U	mg/L	Nitrate/Nitrite-N	0.02
FCDP1	0.0063		mg/L	Phenolics	0.005
FCDP1	2.8		mg/L	Total Kjeldahl Nitrogen (TKN)	1
FCDP1	100		mg/L	COD	6
FCDP2	93.4		100ml	E Coli	2.2
FCDP2	0.17		mg/L	Fluoride by EPA 300.0 Rev. 2.1	0.35
FCDP2	25.69		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75
FCDP2	224		mg/L	Chloride by Lachat 10-117-07-1-A	10
FCDP2	0.03		mg/L	Ortho-P by SM4500P,B,F	0.01
FCDP2	278		mg/L	Alkalinity by SM 2320B	4
FCDP2	0.05		mg/L	Total-P, Dissolved by SM4500P-F, 1999	0.01
FCDP2	4.07		mg/L	BOD by SM5210B, 2001	2
FCDP2	14		mg/L	TSS by SM2540D,1997	2
FCDP2	0.27		mg/L	Nitrogen Ammonia by SM4500NH3,G -1997	0.05
FCDP2	767		mg/L	TDS by SM2540C	20
FCDP2	0.11		mg/L	Total-P by SM4500P-F, 1999	0.01
FCDP2	<2.5	Pc, U	mg/L	Oil & Grease - total	5.9
FCDP2	80		mg/L	Calcium	0.05
FCDP2	1.4		mg/L	Iron	0.01
FCDP2	7		mg/L	Potassium	0.5
FCDP2	48		mg/L	Magnesium	0.05
FCDP2	140		mg/L	Sodium	0.5
FCDP2	0.21		mg/L	Aluminum	0.01
FCDP2	0.049		mg/L	Barium	0.001
FCDP2	0.000085	J	mg/L	Cadmium	0.001
FCDP2	0.0032		mg/L	Copper	0.003
FCDP2	0.91		mg/L	Manganese	0.001
FCDP2	0.00033	J	mg/L	Lead	0.001
FCDP2	0.021		mg/L	Zinc	0.006
FCDP2	0.15		mg/L	Nitrate/Nitrite-N	0.02
FCDP2	0.0031	J	mg/L	Phenolics	0.005
FCDP2	1.5		mg/L	Total Kjeldahl Nitrogen (TKN)	1
FCDP2	48		mg/L	COD	6
FCDP5	307.6		100ml	E Coli	2.2
FCDP5	0.14		mg/L	Fluoride by EPA 300.0 Rev. 2.1	0.35
FCDP5	22.8		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75
FCDP5	261		mg/L	Chloride by Lachat 10-117-07-1-A	10
FCDP5	0.01		mg/L	Ortho-P by SM4500P,B,F	0.01
FCDP5	152		mg/L	Alkalinity by SM 2320B	4
FCDP5	0.03		mg/L	Total-P, Dissolved by SM4500P-F, 1999	0.01

Table A2 Original Data – McHenry Analytical Laboratory (Continued)

Client ID	Result	Result Qualifer	Unit of Measure	Parameter Name	RDL
FCDP5	5.37		mg/L	BOD by SM5210B, 2001	2
FCDP5	12		mg/L	TSS by SM2540D,1997	2
FCDP5	0.06		mg/L	Nitrogen Ammonia by SM4500NH3,G -1997	0.05
FCDP5	600		mg/L	TDS by SM2540C	20
FCDP5	0.06		mg/L	Total-P by SM4500P-F, 1999	0.01
FCDP5	<2.4	U	mg/L	Oil & Grease - total	5.6
FCDP5	49		mg/L	Calcium	0.05
FCDP5	0.49		mg/L	Iron	0.01
FCDP5	3.4		mg/L	Potassium	0.5
FCDP5	21		mg/L	Magnesium	0.05
FCDP5	180		mg/L	Sodium	0.5
FCDP5	0.18		mg/L	Aluminum	0.01
FCDP5	0.044		mg/L	Barium	0.001
FCDP5	0.00019	J	mg/L	Cadmium	0.001
FCDP5	0.0035		mg/L	Copper	0.003
FCDP5	0.074		mg/L	Manganese	0.001
FCDP5	0.00043	J	mg/L	Lead	0.001
FCDP5	0.0079		mg/L	Zinc	0.006
FCDP5	0.018	J	mg/L	Nitrate/Nitrite-N	0.02
FCDP5	0.0025	J	mg/L	Phenolics	0.005
FCDP5	1.4		mg/L	Total Kjeldahl Nitrogen (TKN)	1
FCDP5	34		mg/L	COD	6
Equipment Blank 3	0		100ml	E Coli	2.2
Equipment Blank 3	0		mg/L	Fluoride by EPA 300.0 Rev. 2.1	0.35
Equipment Blank 3	0		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75
Equipment Blank 3	1.36	E	mg/L	Chloride by Lachat 10-117-07-1-A	1
Equipment Blank 3	0.01		mg/L	Ortho-P by SM4500P,B,F	0.01
Equipment Blank 3	2		mg/L	Alkalinity by SM 2320B	4
Equipment Blank 3	0.01		mg/L	Total-P, Dissolved by SM4500P-F, 1999	0.01
Equipment Blank 3	0.83	I	mg/L	BOD by SM5210B, 2001	2
Equipment Blank 3	0		mg/L	TSS by SM2540D,1997	2
Equipment Blank 3	-0.02		mg/L	Nitrogen Ammonia by SM4500NH3,G -1997	0.05
Equipment Blank 3	0		mg/L	TDS by SM2540C	20
Equipment Blank 3	0		mg/L	Total-P by SM4500P-F, 1999	0.01
EQUIPMENT BLANK 3	<2.4	U	mg/L	Oil & Grease - total	5.6
EQUIPMENT BLANK 3	0.25		mg/L	Calcium	0.1
EQUIPMENT BLANK 3	0.033		mg/L	Iron	0.01
EQUIPMENT BLANK 3	<0.040	U	mg/L	Potassium	0.5
EQUIPMENT BLANK 3	0.049	J	mg/L	Magnesium	0.05
EQUIPMENT BLANK 3	0.18	J	mg/L	Sodium	0.5
EQUIPMENT BLANK 3	0.013		mg/L	Aluminum	0.01

Table A2 Original Data – McHenry Analytical Laboratory (Continued)

Client ID	Result	Result Qualifer	Unit of Measure	Parameter Name	RDL
EQUIPMENT BLANK 3	0.0017		mg/L	Barium	0.001
EQUIPMENT BLANK 3	0.00018	J	mg/L	Cadmium	0.001
EQUIPMENT BLANK 3	0.0016	J	mg/L	Copper	0.003
EQUIPMENT BLANK 3	0.0041		mg/L	Manganese	0.001
EQUIPMENT BLANK 3	0.0011		mg/L	Lead	0.001
EQUIPMENT BLANK 3	0.016		mg/L	Zinc	0.006
EQUIPMENT BLANK 3	<0.0025	U	mg/L	Nitrate/Nitrite-N	0.02
EQUIPMENT BLANK 3	0.0025	J	mg/L	Phenolics	0.005
EQUIPMENT BLANK 3	<0.26	U	mg/L	Total Kjeldahl Nitrogen (TKN)	1
EQUIPMENT BLANK 3	<3.2	U	mg/L	COD	6

Table A3 Original Data – Lake County Health Department Laboratory

Client ID	Result	Result Qualifier	Unit of Measure	Parameter Name	RDL
FCLC5-N. END LAKE LOUISE	32		mg/L	Calcium	0.2
FCLC5-N. END LAKE LOUISE	3.6		mg/L	Potassium	0.5
FCLC5-N. END LAKE LOUISE	23		mg/L	Magnesium	0.1
FCLC5-N. END LAKE LOUISE	95		mg/L	Sodium	1.5
FCLC5-N. END LAKE LOUISE	0.42		mg/L	Aluminum	0.01
FCLC5-N. END LAKE LOUISE	0.012		mg/L	Zinc	0.006
FCLC5-N. END LAKE LOUISE	<0.0020	U	mg/L	Phenolics	0.005
FCLC5-N. END LAKE LOUISE	20.12		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75
FCLC6-N. LAKE LOUISE OUTFLOW	70		mg/L	Calcium	0.2
FCLC6-N. LAKE LOUISE OUTFLOW	5.8		mg/L	Potassium	0.5
FCLC6-N. LAKE LOUISE OUTFLOW	36		mg/L	Magnesium	0.1
FCLC6-N. LAKE LOUISE OUTFLOW	130		mg/L	Sodium	1.5
FCLC6-N. LAKE LOUISE OUTFLOW	0.15		mg/L	Aluminum	0.01
FCLC6-N. LAKE LOUISE OUTFLOW	0.006		mg/L	Zinc	0.006
FCLC6-N. LAKE LOUISE OUTFLOW	<0.0020	U	mg/L	Phenolics	0.005
FCLC6-N. LAKE LOUISE OUTFLOW	53.83		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75
FCLC7-LAKE ZURICH	31		mg/L	Calcium	0.2
FCLC7-LAKE ZURICH	3.7		mg/L	Potassium	0.5
FCLC7-LAKE ZURICH	17		mg/L	Magnesium	0.1
FCLC7-LAKE ZURICH	110		mg/L	Sodium	1.5
FCLC7-LAKE ZURICH	0.024		mg/L	Aluminum	0.01
FCLC7-LAKE ZURICH	0.0031	J	mg/L	Zinc	0.006
FCLC7-LAKE ZURICH	<0.0020	U	mg/L	Phenolics	0.005
FCLC7-LAKE ZURICH	15.98		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75
FCLC8-ECHO LAKE	31		mg/L	Calcium	0.2
FCLC8-ECHO LAKE	2.7		mg/L	Potassium	0.5
FCLC8-ECHO LAKE	26		mg/L	Magnesium	0.1
FCLC8-ECHO LAKE	130		mg/L	Sodium	1.5
FCLC8-ECHO LAKE	0.089		mg/L	Aluminum	0.01
FCLC8-ECHO LAKE	0.0017	J	mg/L	Zinc	0.006
FCLC8-ECHO LAKE	<0.0020	U	mg/L	Phenolics	0.005
FCLC8-ECHO LAKE	30.76		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75
FCLC9-HONEY LAKE	49		mg/L	Calcium	0.2
FCLC9-HONEY LAKE	4.8		mg/L	Potassium	0.5
FCLC9-HONEY LAKE	27		mg/L	Magnesium	0.1
FCLC9-HONEY LAKE	130		mg/L	Sodium	1.5
FCLC9-HONEY LAKE	0.0042	J	mg/L	Aluminum	0.01
FCLC9-HONEY LAKE	0.0027	J	mg/L	Zinc	0.006
FCLC9-HONEY LAKE	<0.0020	U	mg/L	Phenolics	0.005

Table A3 Original Data – Lake County Health Department Laboratory (Continued)

Client ID	Result	Result Qualifier	Unit of Measure	Parameter Name	RDL
FCLC9-HO	19.22		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75
FCLC10-GF	45		mg/L	Calcium	0.2
FCLC10-GF	6.5		mg/L	Potassium	0.5
FCLC10-GF	28		mg/L	Magnesium	0.1
FCLC10-GF	110		mg/L	Sodium	1.5
FCLC10-GF	0.12		mg/L	Aluminum	0.01
FCLC10-GF	0.0045	J	mg/L	Zinc	0.006
FCLC10-GF	<0.0020	U	mg/L	Phenolics	0.005
FCLC10-GF	21.56		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75
FCLC11-FL	32		mg/L	Calcium	0.2
FCLC11-FL	3.6		mg/L	Potassium	0.5
FCLC11-FL	23		mg/L	Magnesium	0.1
FCLC11-FL	95		mg/L	Sodium	1.5
FCLC11-FL	0.3		mg/L	Aluminum	0.01
FCLC11-FL	0.0047	J	mg/L	Zinc	0.006
FCLC11-FL	<0.0020	U	mg/L	Phenolics	0.005
FCLC11-FL	20.38		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75
FCLC12-FL	75		mg/L	Calcium	0.2
FCLC12-FL	6.1		mg/L	Potassium	0.5
FCLC12-FL	39		mg/L	Magnesium	0.1
FCLC12-FL	130		mg/L	Sodium	1.5
FCLC12-FL	1.5		mg/L	Aluminum	0.01
FCLC12-FL	0.023		mg/L	Zinc	0.006
FCLC12-FL	<0.0020	U	mg/L	Phenolics	0.005
FCLC12-FL	51.18		mg/L	Sulfate by EPA 300.0 Rev. 2.1	1.75

Table A3 Original Data – Lake County Health Department Laboratory (Continued)

Location	ALK	TKN	NH3-N	NO2+NO3-N	TP	SRP	TDS	CL-	TSS	TS	TVS	FL-	S04
FCLC5	140	3.11	<0.1	<0.05	0.238	0.043	NA	150	55	543	139	NA	NA
FCLC 6	138	3.08	<0.1	<0.05	0.228	0.035	478	148	48	531	123	<0.2	22.8
FCLC7	116	0.877	<0.1	<0.05	0.021	0.006	472	184	4.2	515	88	<0.2	24.4
FCLC8	129	1.17	<0.1	<0.05	0.074	0.013	606	224	11	666	142	<0.2	33.4
FCLC9	195	1.36	<0.1	<0.05	0.039	0.01	624	211	6.2	670	137	<0.2	22.6
FCLC10	194	2.24	<0.1	<0.05	0.149	0.016	576	175	22.6	558	124	<0.2	23.9
FCLC11	264	1.49	0.127	0.807	0.35	0.241	NA	218	19.2	831	165	NA	NA
FCLC12	263	2.46	0.449	0.524	0.478	0.196	770	223	111	895	158	0.373	52.5

Table A3 Original Data – Lake County Health Department Laboratory (Continued)

Location	SECCHI	COND	pH	DO	Fecal Coliform	BOD	COD	Cadmium	Copper	Iron	Lead
FCLC5	0.44	0.788	8.74	7.85	30	6.3	36.5	<0.03	<0.03	1.31	<0.07
FCLC 6	NA	0.7844	8.97	11.5	50	7.4	73.6	<0.03	<0.03	1.30	<0.07
FCLC7	4.92	0.8718	8.43	8.57	10	6.3	25.9	<0.03	<0.03	<0.07	<0.07
FCLC8	1.8	1.03	8.28	5.91	60	7.4	33.3	<0.03	<0.03	0.38	<0.07
FCLC9	2.8	1.06	8.01	5.85	30	3.7	47.0	<0.03	<0.03	<0.07	<0.07
FCLC10	0.8	0.964	8.72	10.44	430	4.7	46.9	<0.03	<0.03	0.48	<0.07
FCLC11	NA	1.283	7.98	6.34	<10	<2	28.1	<0.03	<0.03	0.43	<0.07
FCLC12	NA	1.282	7.9	5.41	1267	<2	57.2	<0.03	<0.03	1.91	<0.07

Table A3 Original Data – Lake County Health Department Laboratory (Continued)

Location	Manganese	Potassium	Zinc	Oil&Grease
FCLC5	0.22	4.25	<0.030	<3.5
FCLC 6	0.23	4.12	<0.030	<3.5
FCLC7	0.04	4.17	<0.030	<3.5
FCLC8	0.09	2.84	<0.030	<3.5
FCLC9	0.06	5.10	<0.030	<3.5
FCLC10	0.17	7.18	<0.030	<3.5
FCLC11	0.15	6.81	<0.030	<3.5
FCLC12	0.23	7.03	<0.030	<3.5

Table A4 Original Data – Integrated Lakes Management

Site ID	Temp°c	Cond (mS/cm)	DO	pH	ORP	Discharge cfs
FCNB1	18.44	1.500	6.35	7.60	-133.0	0.24
FCNB2	20.67	1.187	6.54	7.30	-127.3	0.04
FCNB4	19.95	1.335	6.93	7.60	-133.5	0.15
FCNB7	23.76	1.084	4.46	7.24	-123.6	0.51
FCLB3Q	24.23	1.354	7.68	7.96	-136.4	2.99
FCLB4Q	20.95	1.043	6.31	7.30	-119.6	0.43
FCLB5Q	26.33	1.318	9.40	8.07	-147.5	4.02
SCBH3Q	23.32	0.835	8.76	8.16	-139.2	1.52
FCBH4	22.65	1.780	3.55	7.70	-121.9	2.90
SCBH2Q	22.20	0.897	0.46	7.16	-73.1	2.17
SCBH1Q	23.01	1.324	6.14	7.79	-129.9	1.31
SCSB2	21.74	1.057	2.42	7.00	-92.5	0.01
SCSB1	23.72	1.220	7.57	7.83	-134.1	3.00
FCBH1	18.47	1.610	0.53	7.07	-73.4	0.05
FCB1	22.23	2.640	2.40	7.17	-103.3	0.02
FCB3T	20.62	2.310	8.45	7.21	-86.4	7.05
FCBH2Q	28.64	0.870	6.64	7.11	-75.4	0.18
FCB4Q	21.51	2.260	8.56	7.34	-103.9	1.76
FCB2	23.25	0.989	1.26	7.11	-87.5	0.12
FCDP5	25.16	1.176	5.70	7.80	-124.3	0.13
FCDP1	20.76	2.030	0.35	7.00	-70.2	0.00
FCDP2	19.74	1.310	1.92	7.30	-93.4	0.03

Figure A1 Sampling Location Photographs

Photo 1: FCNB1 at Clover Hill, facing upstream (8/13/15).

Photo 2: FCNB2 at Miller Road. No flow in Dog Bone Tributary.

Photos 3 & 4: FCNB2 moved to 545 Miller, Dog Bone Trib. facing upstream & downstream (Flint Creek North junction in background).

Photos 5 & 6: FCNB4 Flint Creek North at Rt. 59 facing upstream and downstream (8/13/15).

Figure A1 Sample Location Photographs (Continued)

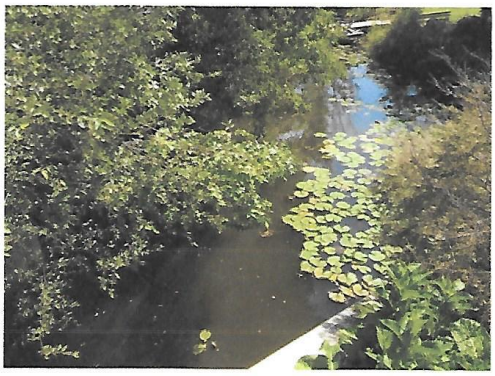


Photo 7: FCNB7 at outlet from Honey Lake at Biltmore Rd.

Photo 8: FCLB3Q Flint Creek at Woodland Drive (8/13/15).

Photos 9 & 10: FCLB4Q Flint Creek North Branch confluence above Flint Lake, facing upstream and downstream. Note Flint Lake is full of sediment and algae.

Photo 11: FCLB5Q Flint Creek at Kelsey Road bridge (8/13/14).

Photo 12: SCB3Q Spring Creek on Lincoln Ave., left of three culverts with most flow.

Figure A1 Sample Location Photographs (Continued)

Photo 13: FCBH4 Flint Creek at Merryoaks facing upstream (8/14/15).

Photo 14: SCBH2Q Spring Creek at County Line Rd. N. side of bridge (downstream).

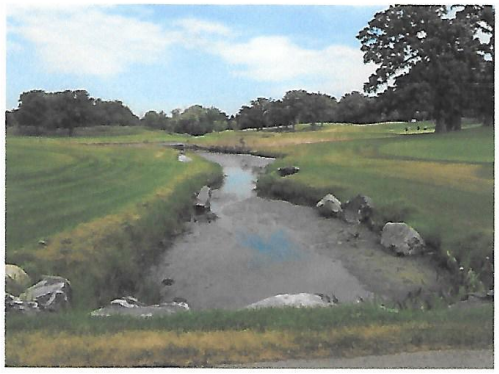
Photo 15: SCBH1Q Spring Creek on Rt. 68, north side of bridge (downstream). Mudflats present.

Photo 16: SCSB2 Branch of Spring Creek on Rt. 59. Note very Note very little flow.

Photo 17: SCSB1: Spring Creek N. of Regency Blvd., flowing well.

Photo 18: FCBH1 Flint Creek Rts. 68 & 59. Stagnant.

Figure A1 Sample Location Photographs (Continued)



Photos 19 & 20: FCB1 in Makray Golf Club, culvert under Rt. 14 facing upstream and downstream, trickle of flow (8/14/15).

Photos 21 & 22: FCB3T: Sewage treatment plant effluent discharging into Flint Creek. Samples collected from effluent.

Photo 23: FCBH1Q Flint Creek at Lake Cook Rd. Note mudflats.

Photo 24: FCB4Q Flint Creek at Hart Rd., only left downstream had flow.

Figure A1 Sample Location Photographs (Continued)

Photo 25: FCB4Q view downstream.

Photo 26: FCB2 Flint Creek branch by Lake Zurich Road facing downstream (8/17/15).

Photos 27 & 28: FCDP5 Flint Creek branch off Braemar, view downstream by house and upstream under railroad tracks.

Photo 29: FCDP1 full of duckweed & cattails, facing upstream.

Photo 30: FCDP2 Flint Creek branch off Ela Rd. facing downstream.

Table A5 Water Quality Standards

Measured Parameters	Water Quality Standards		
	MCL (mg/L)	SMCL(mg/L)	Recommended (mg/L)
pH		6.5 – 8.5 (pH Units)	
Specific Conductivity			
Dissolved Oxygen			5.0
Clarity			
Temperature			
Stream Discharge			
Oxidation Reduction Potential			
Ammonia			
Chloride		250	
Fluoride	4.0	2.0	
Total Suspended Solids			
Total Dissolved Solids		500	
E. Coli			200/100 mL
Biological Oxygen Demand			>5.0
Chemical Oxygen Demand			
Total Kjeldahl Nitrogen			
Total Nitrate/Nitrite	10		
Total Phosphorus			0.05
Dissolved Phosphorus			0.01
Cadmium	0.005		
Copper	1.3		
Lead	0.015		
Potassium			
Zinc		5.0	
Phenolics			
Oil & Grease			
Alkalinity			
Orthophosphate			0.01
Sulfate		250	
Aluminum			
Barium	2.0		
Calcium			
Iron		0.3	
Magnesium			
Manganese		0.05	
Sodium			

Standard Exceeded

Table A6 Analytical Results with Statistics - Flint Creek

Stream Branch	Sampling Location	Temp°c (°C)	Conductvity (mS/cm)	DO (mg/L)	pH (pH Units)	ORP (mV)	Discharge (cfs)
FCMB	FCBH1`	18.47	1.610	0.53	7.07	-73.4	0.05
FCMB	FCBH2Q	28.64	0.870	6.64	7.11	-75.4	0.18
FCEB	FCDP1	20.76	2.030	0.35	7.00	-70.2	0.00
FCEB	FCDP2	19.74	1.310	1.92	7.30	-93.4	0.03
FCEBNSB	FCDP5	25.16	1.176	5.7	7.8	-124.3	0.13
FCEBSSB	FCB1	22.23	2.640	2.40	7.17	-103.3	0.02
FCEBSSB	FCLC5	NA	0.788	7.85	8.74	NA	NA
FCEBSSB	FCLC6	NA	0.784	11.5	8.97	NA	NA
FCEB	FCB2	23.25	0.989	1.26	7.11	-87.5	0.12
FCEB	FCB3T	20.62	2.310	8.45	7.21	-86.4	7.05
FCEB	FCB4Q	21.51	2.260	8.56	7.34	-103.9	1.76
FCMB	FCBH4	22.65	1.780	3.55	7.70	-121.9	2.90
FCMB	FCLB3Q	24.23	1.354	7.68	7.96	-136.4	2.99
FCNB	FCLC7	NA	0.8718	8.57	8.43	NA	NA
FCNB	FCLC8	NA	1.03	5.91	8.28	NA	NA
FCNB	FCNB1	18.44	1.500	6.35	7.60	-133.0	0.24
FCNBNSB	FCNB2	20.67	1.187	6.54	7.30	-127.3	0.04
FCNB	FCNB4	19.95	1.335	6.93	7.60	-133.5	0.15
FCNBSSB	FCLC9	NA	1.06	5.85	8.01	NA	NA
FCNBSSB	FCNB7	23.76	1.084	4.46	7.24	-123.6	0.51
FCNBSSB	FCLC10	NA	0.964	10.44	8.72	NA	NA
FCNB	FCLB4Q	20.95	1.043	6.31	7.30	-119.6	0.43
FCMB	FCLC11	NA	1.283	6.34	7.98	NA	NA
FCMB	FCLC12	NA	1.282	5.41	7.9	NA	NA
FCMB	FCLB5Q	26.33	1.318	9.40	8.07	-147.5	4.02
Statistics	Number of Samples:	17	25	25	25	17	17
	95 % CI (+/-):	5.665	0.209	1.158	0.236	29.322	0.892
	Mean:	22.431	1.344	6.182	7.743	-111.700	1.286
	Standard Deviation:	11.018	0.505	2.804	0.572	57.030	1.735
	Variance:	121.386	0.256	7.864	0.328	3252.444	3.012
	Minimum:	18.440	0.784	0.350	7.000	-147.500	0.000
	First Quantile:	20.633	0.999	4.698	7.255	-131.575	0.060
	Median:	21.870	1.235	6.345	7.650	-120.750	0.210
	Third Quantile:	24.113	1.464	8.300	8.055	-88.975	2.615
	Maximum:	28.640	2.640	11.500	8.970	-70.200	7.050

Table A6 Analytical Results with Statistics - Flint Creek (Continued)

Stream Branch	Sampling Location	E Coli (100ml)	Fluoride ('mg/L)	Sulfate ('mg/L)	Chloride ('mg/L)	Ortho-P ('mg/L)	Alkalinity ('mg/L)
FCMB	FCBH1`	517.2	0.16	8.87	202	0.08	240
FCMB	FCBH2Q	648.8	0.21	5.84	136	0.26	200
FCEB	FCDP1	435.2	0.16	27.56	429	0.06	302
FCEB	FCDP2	93.4	0.17	25.69	224	0.03	278
FCEBNSB	FCDP5	307.6	0.14	22.8	261	0.01	152
FCEBSSB	FCB1	1299.7	0.09	50.4	658	0.24	286
FCEBSSB	FCLC5	NA	NA	20.12	150	NA	140
FCEBSSB	FCLC6	NA	0.02	53.83	148	NA	138
FCEB	FCB2	290.9	0.17	16.27	188	0.34	172
FCEB	FCB3T	920.8	0.76	111.97	462	2.89	310
FCEB	FCB4Q	980.4	0.76	1038.78	457	2.85	312
FCMB	FCBH4	325.5	0.43	86.3	339	0.43	290
FCMB	FCLB3Q	547.5	57.86	0.3	257	0.25	0.25
FCNB	FCLC7	NA	0.02	15.98	184	NA	116
FCNB	FCLC8	NA	0.02	30.76	224	NA	129
FCNB	FCNB1	360.9	31.35	0.16	337	0.11	0.11
FCNBNSB	FCNB2	36.4	25.8	0.19	194	0.05	0.06
FCNB	FCNB4	155.3	27.92	0.16	273	0.07	0.08
FCNBSSB	FCLC9	NA	0.02	19.22	211	NA	195
FCNBSSB	FCNB7	50.4	19.25	0.13	228	0.01	0.01
FCNBSSB	FCLC10	NA	0.02	21.56	175	NA	194
FCNB	FCLB4Q	21.64	0.18	210	0.07	0.08	178
FCMB	FCLC11	NA	NA	20.38	218	NA	264
FCMB	FCLC12	NA	0.373	51.18	223	NA	263
FCMb	FCLB5Q	488.4	50.34	0.3	245	0.2	0.2
Statistics	Number of Samples:	17	23	25	25	17	25
	95 % CI (+/-):	188.134	7.285	85.144	55.674	0.407	46.772
	Mean:	435.178	9.401	73.550	259.211	0.493	163.321
	Standard Deviation:	365.910	16.847	206.270	134.877	0.793	113.309
	Variance:	133890.232	283.835	42547.463	18191.812	0.628	12838.921
	Minimum:	21.640	0.020	0.130	0.070	0.010	0.010
	First Quantile:	108.875	0.090	3.070	185.000	0.053	29.188
	Median:	343.200	0.180	20.380	224.000	0.155	175.000
	Third Quantile:	623.475	19.250	50.790	321.000	0.320	274.500
	Maximum:	1299.700	57.860	1038.780	658.000	2.890	312.000

Table A6 Analytical Results with Statistics - Flint Creek (Continued)

Stream Branch	Sampling Location	Total-P, Dissolved ('mg/L)	BOD ('mg/L)	TSS ('mg/L)	NH_3 ('mg/L)	TDS ('mg/L)	Total-P ('mg/L)
FCMB	FCBH1`	0.05	3.97	15	600	0.22	0.16
FCMB	FCBH2Q	0.23	3.75	6	0.82	500	0.31
FCEB	FCDP1	0.07	8.83	79	0.13	1133	0.71
FCEB	FCDP2	0.05	4.07	14	0.27	767	0.11
FCEBNSB	FCDP5	0.03	5.37	12	0.06	600	0.06
FCEBSSB	FCB1	0.05	7.95	13	1433	3.52	0.33
FCEBSSB	FCLC5	0.043	6.3	55	0.1	NA	0.238
FCEBSSB	FCLC6	0.035	7.4	48	0.1	478	0.228
FCEB	FCB2	0.37	5.29	6.7	0.93	533	0.47
FCEB	FCB3T	2.98	2.11	0.7	0.03	1367	3.03
FCEB	FCB4Q	2.94	2.59	3	0.12	1367	3
FCMB	FCBH4	0.19	4.71	33	1100	0.3	0.48
FCMB	FCLB3Q	240	4.85	0.04	15	767	0.32
FCNB	FCLC7	0.006	3.7	4.2	0.1	472	0.021
FCNB	FCLC8	0.013	3.7	11	0.1	606	0.074
FCNB	FCNB1	238	2.19	0.03	4.3	867	0.14
FCNBNSB	FCNB2	236	2.83	0.1	6	667	0.1
FCNB	FCNB4	220	2.11	0.01	2.7	733	0.09
FCNBSSB	FCLC9	0.01	3.7	6.2	0.1	624	0.039
FCNBSSB	FCNB7	180	4.71	-0.03	5	633	0.02
FCNBSSB	FCLC10	0.016	4.7	22.6	0.1	576	0.149
FCNB	FCLB4Q	3.03	0.04	4	600	0.11	<2.4
FCMB	FCLC11	0.241	2	19.2	0.127	NA	0.35
FCMB	FCLC12	0.196	2	111	0.449	770	0.478
FCMB	FCLB5Q	236	4.77	0.1	14	800	0.29
Statistics	Number of Samples:	25	25	25	25	23	25
	95 % CI (+/-):	41.219	0.858	11.630	154.009	173.428	0.333
	Mean:	56.688	4.153	18.702	132.647	620.180	0.480
	Standard Deviation:	99.856	2.079	28.174	373.102	401.052	0.807
	Variance:	9971.291	4.320	793.802	139204.832	160842.481	0.652
	Minimum:	0.006	0.040	-0.030	0.030	0.110	0.020
	First Quantile:	0.037	2.290	0.250	0.100	478.000	0.090
	Median:	0.213	3.910	6.450	0.360	624.000	0.238
	Third Quantile:	135.758	5.180	21.750	5.750	770.000	0.470
	Maximum:	240.000	8.830	111.000	1433.000	1367.000	3.030

Table A6 Analytical Results with Statistics - Flint Creek (Continued)

Stream Branch	Sampling Location	Oil & Grease - T ('mg/L)	Calcium ('mg/L)	Iron ('mg/L)	Potassium ('mg/L)	Magnesium ('mg/L)	Sodium ('mg/L)
FCMB	FCBH1`	<2.6	79	1.5	2.7	36	87
FCMB	FCBH2Q	<2.4	60	1.3	2.9	29	82
FCEB	FCDP1	<8.3	100	11	4	39	300
FCEB	FCDP2	<2.5	80	1.4	7	48	140
FCEBNSB	FCDP5	<2.4	49	0.49	3.4	21	180
FCEBSSB	FCB1	<2.4	84	1.5	12	52	420
FCEBSSB	FCLC5	3.5	32	1.31	3.6	23	95
FCEBSSB	FCLC6	3.5	70	1.30	5.8	36	130
FCEB	FCB2	<2.4	52	1.4	3.3	30	120
FCEB	FCB3T	<2.4	110	0.048	17	61	300
FCEB	FCB4Q	<2.3	120	0.13	16	61	290
FCMB	FCBH4	<2.6	100	1	9.9	53	210
FCMB	FCLB3Q	<2.6	69	0.62	5.7	36	130
FCNB	FCLC7	3.5	31	0.07	3.7	17	110
FCNB	FCLC8	3.5	31	0.38	2,7	26	130
FCNB	FCNB1	<2.4	65	0.71	3.8	35	160
FCNBNSB	FCNB2	<2.5	64	0.68	20	36	83
FCNB	FCNB4	<2.5	62	0.29	6.8	34	140
FCNBSSB	FCLC9	3.5	49	0.07	4.8	27	130
FCNBSSB	FCNB7	<2.5	49	0.037	4.8	27	130
FCNBSSB	FCLC10	3.5	45	0.48	6.5	28	110
FCNB	FCLB4Q	46	0.28	5.3	29	110	0.055
FCMB	FCLC11	3.5	32	0.43	3.6	23	95
FCMB	FCLC12	3.5	75	1.91	6.1	39	130
FCMB	FCLB5Q	<2.6	67	0.49	5.8	36	130
Statistics	Number of Samples:	25	25	25	25	25	25
	95 % CI (+/-):	3.836	11.423	0.938	2.717	7.820	36.780
	Mean:	8.222	63.011	1.353	7.842	38.520	153.282
	Standard Deviation:	9.292	27.673	2.273	6.583	18.945	89.103
	Variance:	86.341	765.783	5.165	43.333	358.927	7939.424
	Minimum:	3.500	0.280	0.037	2.700	17.000	0.055
	First Quantile:	3.500	47.000	0.335	3.625	27.000	102.500
	Median:	3.500	64.000	0.680	5.750	36.000	130.000
	Third Quantile:	3.500	79.500	1.400	9.175	43.500	170.000
	Maximum:	46.000	120.000	11.000	29.000	110.000	420.000

Table A6 Analytical Results with Statistics - Flint Creek (Continued)

Stream Branch	Sampling Location	Aluminum ('mg/L)	Barium ('mg/L)	Cadmium ('mg/L)	Copper ('mg/L)	Manganese ('mg/L)	Lead ('mg/L)
FCMB	FCBH1`	0.22	0.049	0.000084	0.0026	1.3	0.00096
FCMB	FCBH2Q	0.1	0.035	0.000084	0.0018	0.26	0.00053
FCEB	FCDP1	0.19	0.073	0.00013	0.015	1.1	0.00023
FCEB	FCDP2	0.21	0.049	0.000085	0.0032	0.91	0.00033
FCEBNSB	FCDP5	0.18	0.044	0.00019	0.0035	0.074	0.00043
FCEBSSB	FCB1	0.16	0.075	0.00011	0.006	0.37	0.00066
FCEBSSB	FCLC5	0.42	NA	0.03	0.03	0.22	0.07
FCEBSSB	FCLC6	0.15	NA	0.03	0.03	0.23	0.07
FCEB	FCB2	0.02	0.045	0.000075	0.0029	0.74	<0.000084
FCEB	FCB3T	0.01	0.045	0.000069	0.012	0.0091	0.00048
FCEB	FCB4Q	0.038	0.05	0.000085	0.012	0.025	0.00063
FCMB	FCBH4	0.59	0.063	0.00014	0.01	0.16	0.0029
FCMB	FCLB3Q	0.22	0.052	<0.000053	0.0053	0.12	0.0009
FCNB	FCLC7	0.024	NA	0.03	0.03	0.04	0.07
FCNB	FCLC8	0.089	NA	0.03	0.03	0.09	0.07
FCNB	FCNB1	0.16	0.057	<0.000053	0.0043	0.091	<0.000084
FCNBNSB	FCNB2	0.095	0.11	<0.000053	0.003	0.26	0.00025
FCNB	FCNB4	0.064	0.059	<0.000053	0.0036	0.086	0.00017
FCNBSSB	FCLC9	0.0042	NA	0.03	0.03	0.06	0.07
FCNBSSB	FCNB7	0.006	0.38	<0.000053	0.0032	0.028	0.00015
FCNBSSB	FCLC10	0.12	NA	0.03	0.03	0.17	0.07
FCNB	FCLB4Q	0.06	<0.000053	0.0031	0.16	<0.000084	0.0032
FCMB	FCLC11	0.3	NA	0.03	0.03	0.15	0.07
FCMB	FCLC12	1.5	NA	0.03	0.03	0.23	0.07
FCMB	FCLB5Q	0.14	0.054	<0.000053	0.0042	0.14	0.0013
Statistics	Number of Samples:	25	17	25	25	25	25
	95 % CI (+/-):	0.125	0.040	55.67449963	0.013	0.118	0.014
	Mean:	0.203	0.079	259.21125	0.020	0.241	0.026
	Standard Deviation:	0.302	0.077	134.8770251	0.032	0.285	0.033
	Variance:	0.091	0.006	18191.81191	0.001	0.081	0.001
	Minimum:	0.004	0.035	0.07	0.002	0.009	0.000
	First Quantile:	0.049	0.045	185	0.004	0.074	0.000
	Median:	0.140	0.054	224	0.011	0.146	0.001
	Third Quantile:	0.215	0.073	321	0.030	0.260	0.070
	Maximum:	1.500	0.380	658	0.160	1.100	0.070

Table A6 Analytical Results with Statistics - Flint Creek (Continued)

Stream Branch	Sampling Location	Zinc ('mg/L)	Nitrate/Nitrite-N ('mg/L)	Phenolics ('mg/L)	TKN ('mg/L)	COD ('mg/L)
FCMB	FCBH1`	0.0099	0.035	<0.0020	1.2	35
FCMB	FCBH2Q	0.0061	0.026	<0.0020	2.5	46
FCEB	FCDP1	0.0079	<0.0025	0.0063	2.8	100
FCEB	FCDP2	0.021	0.15	0.0031	1.5	48
FCEBNSB	FCDP5	0.0079	0.018	0.0025	1.4	34
FCEBSSB	FCB1	0.0092	0.11	0.0043	4.9	46
FCEBSSB	FCLC5	0.012	0.05	<0.0020	3.11	36.5
FCEBSSB	FCLC6	0.006	0.05	<0.0020	3.08	73.6
FCEB	FCB2	0.0041	0.0035	0.0047	2.3	46
FCEB	FCB3T	0.046	10	<0.0020	0.83	<3.2
FCEB	FCB4Q	0.044	8.5	<0.0020	0.98	19
FCMB	FCBH4	0.025	2.8	0.0035	1.4	28
FCMB	FCLB3Q	0.0073	0.76	<0.0020	1.1	24
FCNB	FCLC7	0.0031	0.05	<0.0020	0.877	25.9
FCNB	FCLC8	0.0017	0.05	<0.0020	1.17	33.3
FCNB	FCNB1	0.0042	0.39	<0.0020	1.2	36
FCNBNSB	FCNB2	0.0036	0.13	<0.0020	1.1	23
FCNB	FCNB4	0.0029	0.1	<0.0020	0.94	26
FCNBSSB	FCLC9	0.0027	0.05	<0.0020	1.36	47.0
FCNBSSB	FCNB7	0.0021	<0.0025	<0.0020	1.3	31
FCNBSSB	FCLC10	0.0045	0.05	<0.0020	2.24	46.9
FCNB	FCLB4Q	0.14	<0.0020	1.4	31	NA
FCMB	FCLC11	0.0047	0.807	<0.0020	1.49	28.1
FCMB	FCLC12	0.023	0.524	<0.0020	2.46	57.2
FCMB	FCLB5Q	0.0055	0.58	<0.0020	1.4	31
Statistics	Number of Samples:	25	25	25	25	24
	95 % CI (+/-):	0.012	1.074	0.115	2.492	8.895
	Mean:	0.016	1.200	0.203	3.018	40.295
	Standard Deviation:	0.028	2.602	0.280	6.038	21.065
	Variance:	0.001	6.770	0.078	36.453	443.734
	Minimum:	0.002	0.004	0.003	0.830	19.000
	First Quantile:	0.004	0.050	0.003	1.118	27.500
	Median:	0.006	0.110	0.004	1.400	35.000
	Third Quantile:	0.017	0.670	0.006	2.490	46.925
	Maximum:	0.140	10.000	1.400	31.000	100.000

Table A7 Analytical Results with Statistics - Spring Creek

Stream Branch	Sampling Location	Temp°c (°C)	Conductvity (mS/cm)	DO (mg/L)	pH (pH Units)	ORP (mV)	Discharge (cfs)
SCMB	**SCSB1**	23.72	1.220	7.57	7.83	-134.1	3.00
SCNB	**SCSB2**	21.74	1.057	2.42	7.00	-92.5	0.01
SCMB	**SCBH1Q**	23.01	1.324	6.14	7.79	-129.9	1.31
SCMB	**SCBH2Q**	22.20	0.897	0.46	7.16	-73.1	2.17
SCMB	**SCBH3Q**	23.32	0.835	8.76	8.16	-139.2	1.52
Statistics	**Number of Samples:**	5	5	5	5	5	5
	95 % CI (+/-):	1.010	0.258	4.358	0.607	36.342	1.375
	Mean:	22.798	1.067	5.070	7.588	-113.760	1.602
	Standard Deviation:	0.813	0.208	3.510	0.489	29.269	1.107
	Variance:	0.661	0.043	12.321	0.239	856.658	1.226
	Minimum:	21.740	0.835	0.460	7.000	-139.200	0.010
	First Quantile:	21.970	0.866	1.440	7.080	-136.650	0.660
	Median:	23.010	1.057	6.140	7.790	-129.900	1.520
	Third Quantile:	23.520	1.272	8.165	7.995	-82.800	2.585
	Maximum:	23.720	1.324	8.760	8.160	-73.100	3.000

Table A7 Analytical Results with Statistics - Spring Creek (Continued)

Stream Branch	Sampling Location	E Coli (100ml)	Fluoride ('mg/L)	Sulfate ('mg/L)	Chloride ('mg/L)	Ortho-P ('mg/L)	Alkalinity ('mg/L)
SCMB	**SCSB1**	28.1	0.25	99.66	220	0.04	180
SCNB	**SCSB2**	72.7	0.21	17.04	156	0.04	262
SCMB	**SCBH1Q**	139.1	0.19	60.49	258	0.01	202
SCMB	**SCBH2Q**	11	0.15	35.47	106	0.01	236
SCMB	**SCBH3Q**	156.5	37.61	0.17	73.4	0.03	0.04
Statistics	**Number of Samples:**	5	5	5	5	5	5
	95 % CI (+/-):	80.570	20.773	48.410	95.373	0.019	128.213
	Mean:	81.480	7.682	42.566	162.680	0.026	176.008
	Standard Deviation:	64.888	16.730	38.988	76.811	0.015	103.259
	Variance:	4210.502	279.903	1520.086	5899.912	0.000	10662.480
	Minimum:	11.000	0.150	0.170	73.400	0.010	0.040
	First Quantile:	19.550	0.170	8.605	89.700	0.010	90.020
	Median:	72.700	0.210	35.470	156.000	0.030	202.000
	Third Quantile:	147.800	18.930	80.075	239.000	0.040	249.000
	Maximum:	156.500	37.610	99.660	258.000	0.040	262.000

Table A7 Analytical Results with Statistics - Spring Creek (Continued)

Stream Branch	Sampling Location	Total-P, Dissolved ('mg/L)	BOD ('mg/L)	TSS ('mg/L)	NH_3 ('mg/L)	TDS ('mg/L)	Total-P ('mg/L)
SCMB	SCSB1	0.03	8.31	66	733	0.01	0.11
SCNB	SCSB2	0.02	2.81	4.3	0.29	600	0.09
SCMB	SCBH1Q	0.02	4.03	12	0.02	767	0.05
SCMB	SCBH2Q	0.04	3.67	1	-0.03	533	0.05
SCMB	SCBH3Q	282	2.11	-0.03	2.3	533	0.04
Statistics	Number of Samples:	5	5	5	5	5	5
	95 % CI (+/-):	156.576	3.010	34.748	406.670	358.021	0.038
	Mean:	56.422	4.186	16.654	147.116	486.602	0.068
	Standard Deviation:	126.102	2.424	27.985	327.521	288.340	0.030
	Variance:	15901.698	5.875	783.178	107269.697	83139.867	0.001
	Minimum:	0.020	2.110	-0.030	>0.05	0.010	0.040
	First Quantile:	0.020	2.460	0.485	>0.05	266.505	0.045
	Median:	0.030	3.670	4.300	0.290	533.000	0.050
	Third Quantile:	141.020	6.170	39.000	367.650	683.500	0.100
	Maximum:	282.000	8.310	66.000	733.000	767.000	0.110

Table A7 Analytical Results with Statistics - Spring Creek (Continued)

Stream Branch	Sampling Location	Oil & Grease - T ('mg/L)	Calcium ('mg/L)	Iron ('mg/L)	Potassium ('mg/L)	Magnesium ('mg/L)	Sodium ('mg/L)
SCMB	**SCSB1**	<2.8	78	1.4	5.9	34	140
SCNB	**SCSB2**	<2.5	79	1	3.1	35	98
SCMB	**SCBH1Q**	<2.4	75	0.33	4.4	34	150
SCMB	**SCBH2Q**	<2.6	75	0.072	2.3	37	67
SCMB	**SCBH3Q**	<2.5	76	0.25	2.5	41	41
Statistics	**Number of Samples:**	5	5	5	5	5	5
	95 % CI (+/-):	NA	2.256	0.701	1.870	3.662	57.810
	Mean:	NA	76.600	0.610	3.640	36.200	99.200
	Standard Deviation:	NA	1.817	0.564	1.506	2.950	46.559
	Variance:	NA	3.300	0.318	2.268	8.700	2167.700
	Minimum:	NA	75.000	0.072	2.300	34.000	41.000
	First Quantile:	NA	75.000	0.161	2.400	34.000	54.000
	Median:	NA	76.000	0.330	3.100	35.000	98.000
	Third Quantile:	NA	78.500	1.200	5.150	39.000	145.000
	Maximum:	NA	79.000	1.400	5.900	41.000	150.000

Table A7 Analytical Results with Statistics - Spring Creek (Continued)

Stream Branch	Sampling Location	Aluminum ('mg/L)	Barium ('mg/L)	Cadmium ('mg/L)	Copper ('mg/L)	Manganese ('mg/L)	Lead ('mg/L)
SCMB	SCSB1	1	0.077	0.000068	0.0043	0.1	0.0015
SCNB	SCSB2	0.034	0.058	<0.000053	0.0017	0.78	0.00013
SCMB	SCBH1Q	0.18	0.072	0.000054	0.0029	0.085	0.00041
SCMB	SCBH2Q	0.077	0.056	<0.000053	0.0012	0.23	0.00016
SCMB	SCBH3Q	0.033	0.067	<0.000053	0.0015	0.017	0.00013
Statistics	Number of Samples:	5	5	5	5	5	5
	95 % CI (+/-):	0.516	0.011	NA	0.002	0.385	0.001
	Mean:	0.265	0.066	NA	0.002	0.242	0.000
	Standard Deviation:	0.415	0.009	NA	0.001	0.310	0.001
	Variance:	0.172	0.000	NA	0.000	0.096	0.000
	Minimum:	0.033	0.056	NA	0.001	0.017	0.000
	First Quantile:	0.034	0.057	NA	0.001	0.051	0.000
	Median:	0.077	0.067	NA	0.002	0.100	0.000
	Third Quantile:	0.590	0.075	NA	0.004	0.505	0.001
	Maximum:	1.000	0.077	NA	0.004	0.780	0.002

Table A7 Analytical Results with Statistics - Spring Creek (Continued)

Stream Branch	Sampling Location	Zinc ('mg/L)	Nitrate/Nitrite-N ('mg/L)	Phenolics ('mg/L)	TKN ('mg/L)	COD ('mg/L)
SCMB	**SCSB1**	0.011	0.17	0.005	1.8	3.5
SCNB	**SCSB2**	0.0044	0.016	0.005	0.78	21
SCMB	**SCBH1Q**	0.0059	0.057	0.004	1.1	31
SCMB	**SCBH2Q**	0.0062	0.071	0.0048	1.2	33
SCMB	**SCBH3Q**	0.0035	0.29	<0.0020	0.64	7.9
Statistics	**Number of Samples:**	5	5	5	5	5
	95 % CI (+/-):	0.004	0.137	0.003	0.560	16.508
	Mean:	0.006	0.121	0.005	1.104	19.280
	Standard Deviation:	0.003	0.110	0.002	0.451	13.295
	Variance:	0.000	0.012	0.000	0.203	176.767
	Minimum:	0.004	0.016	0.004	0.640	3.500
	First Quantile:	0.004	0.037	0.004	0.710	5.700
	Median:	0.006	0.071	0.005	1.100	21.000
	Third Quantile:	0.009	0.230	0.005	1.500	32.000
	Maximum:	0.011	0.290	0.005	1.800	33.000

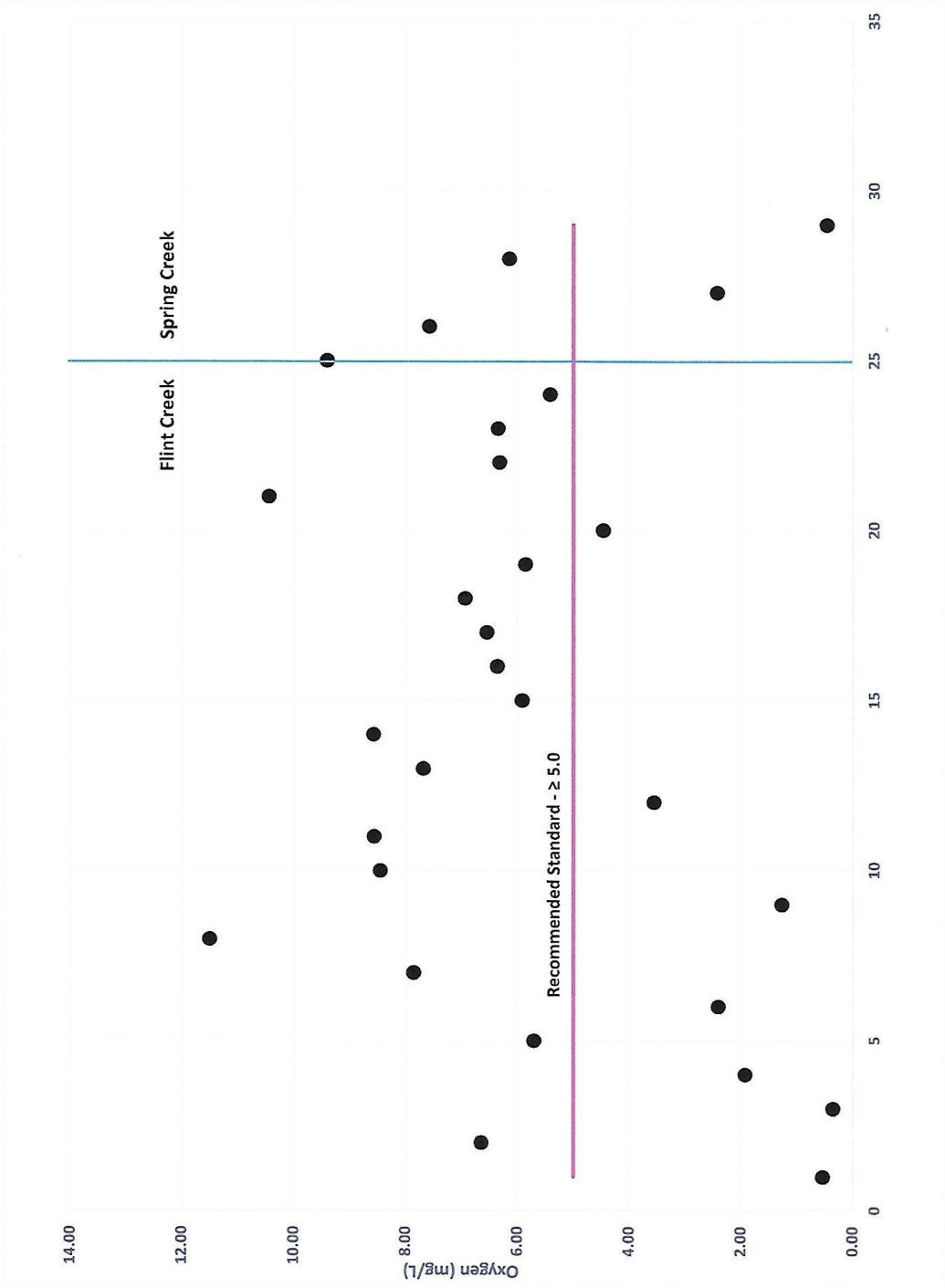


Figure A2 Oxygen Concentrations in Flint and Spring Creeks

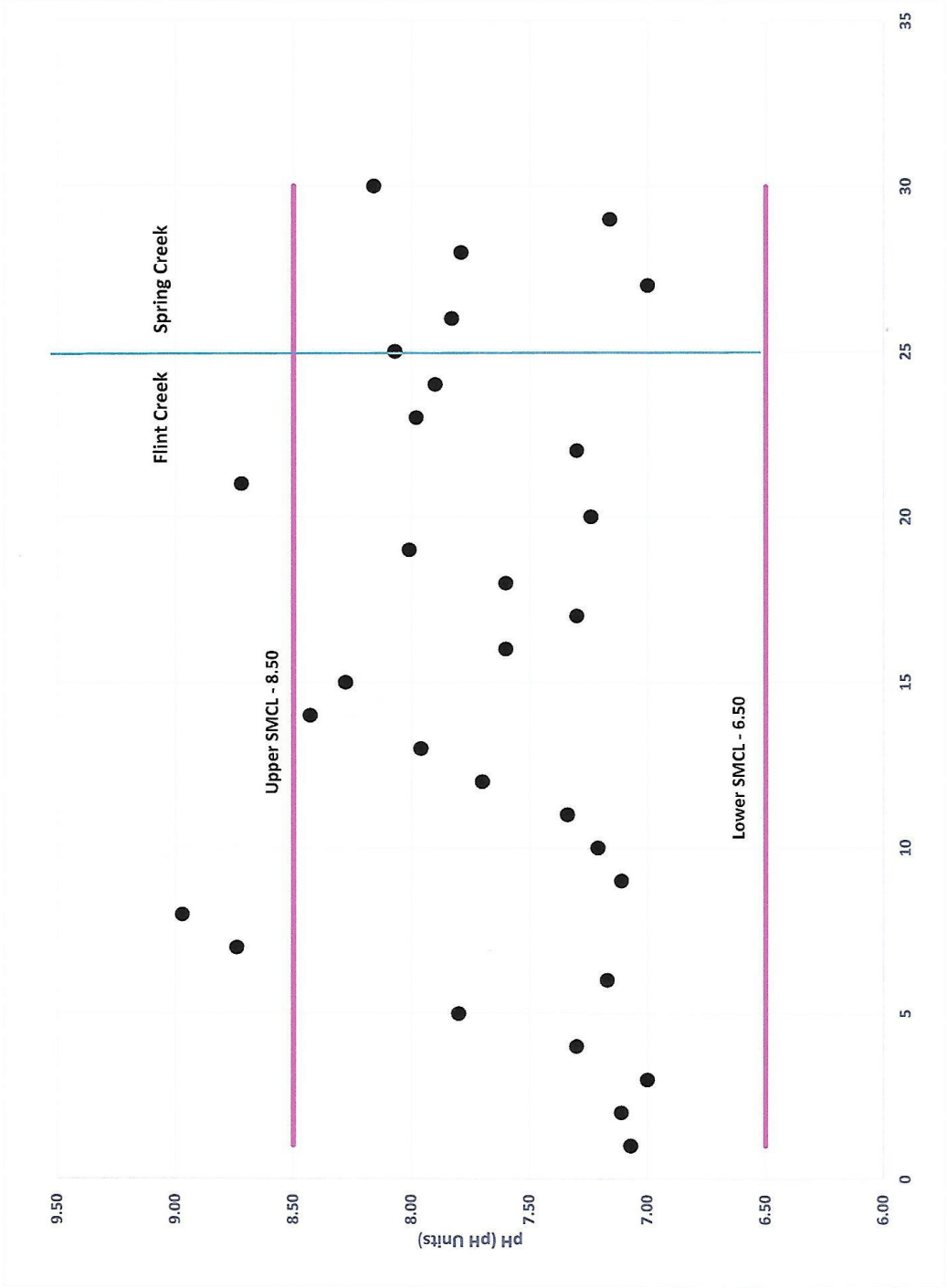


Figure A3 pH Values in Flint and Spring Creeks

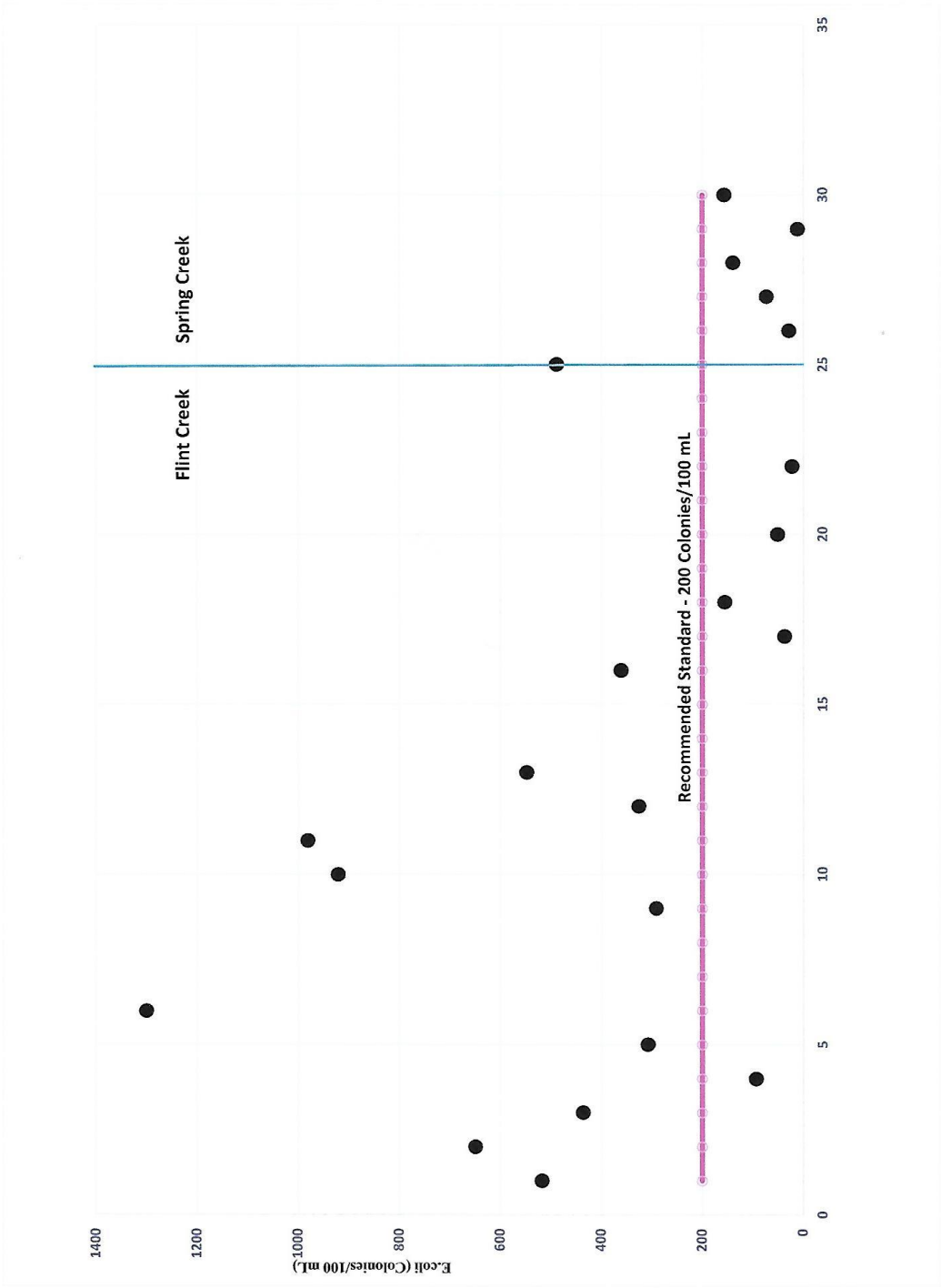


Figure A4 E. coli Concentrations in Flint and Spring Creeks

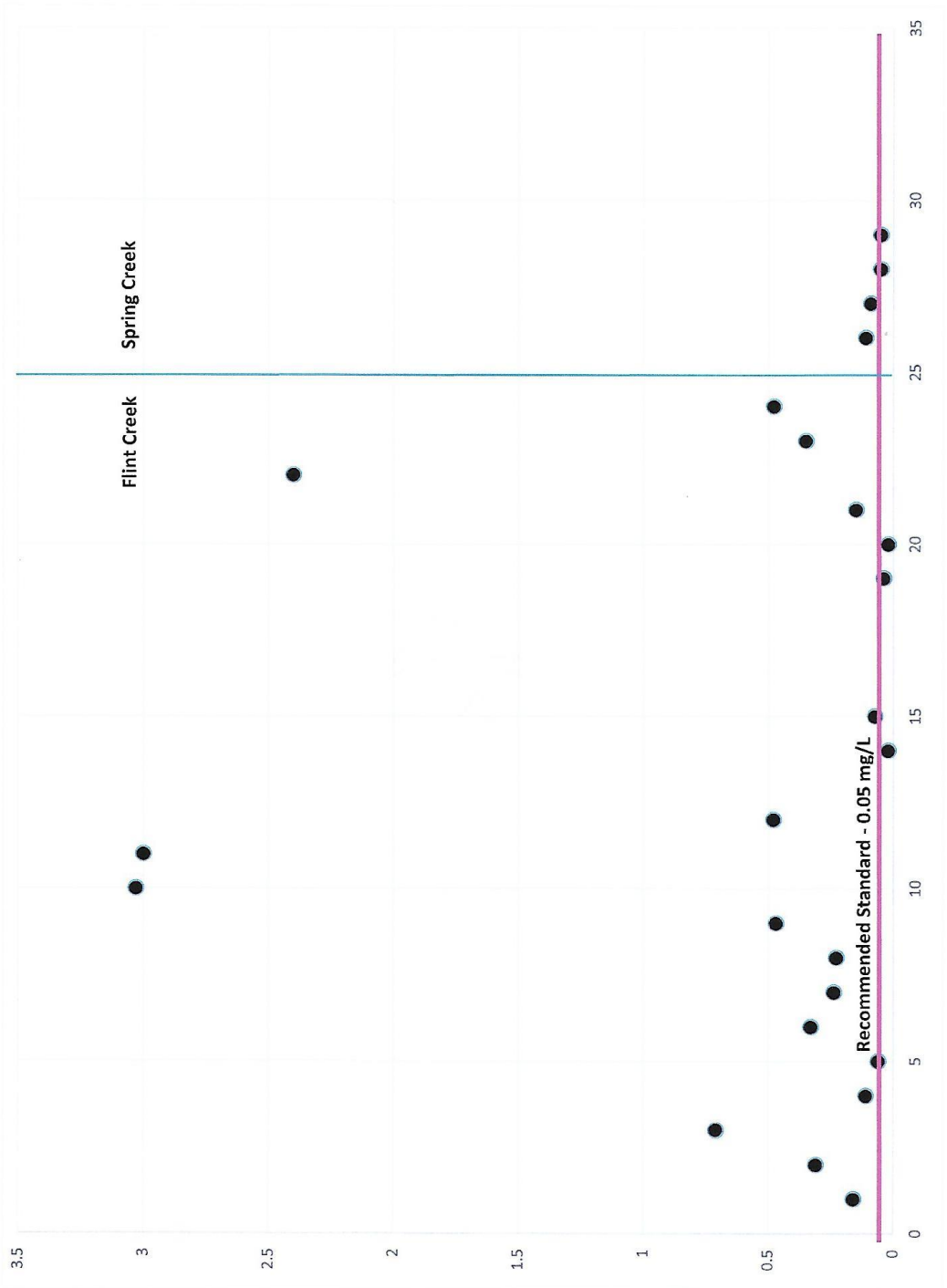


Figure A5 Total Phosphorus Concentrations in Flint and Spring Creeks

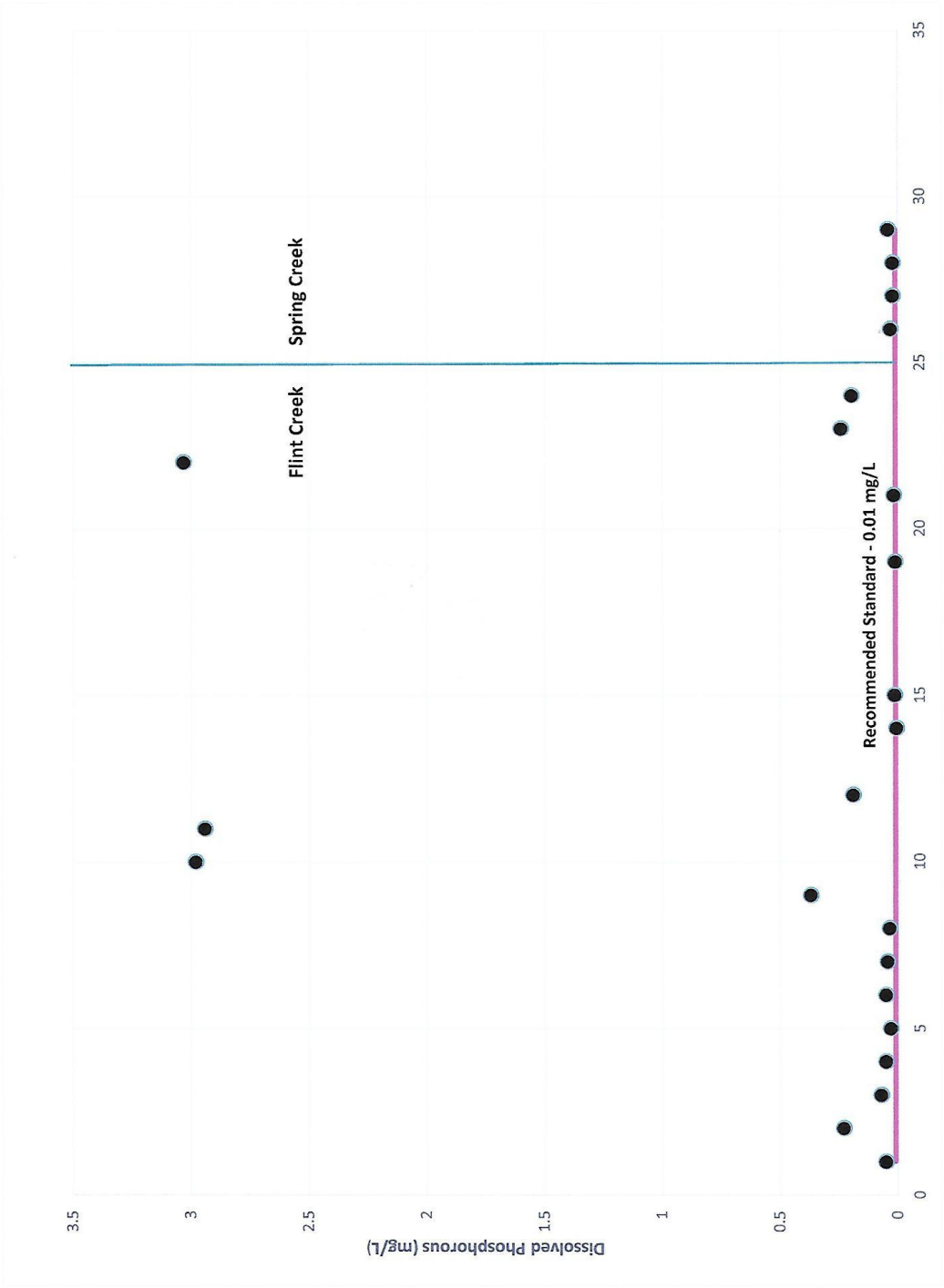


Figure A6 Dissolved Phosphorus Concentrations in Flint and Spring Creeks

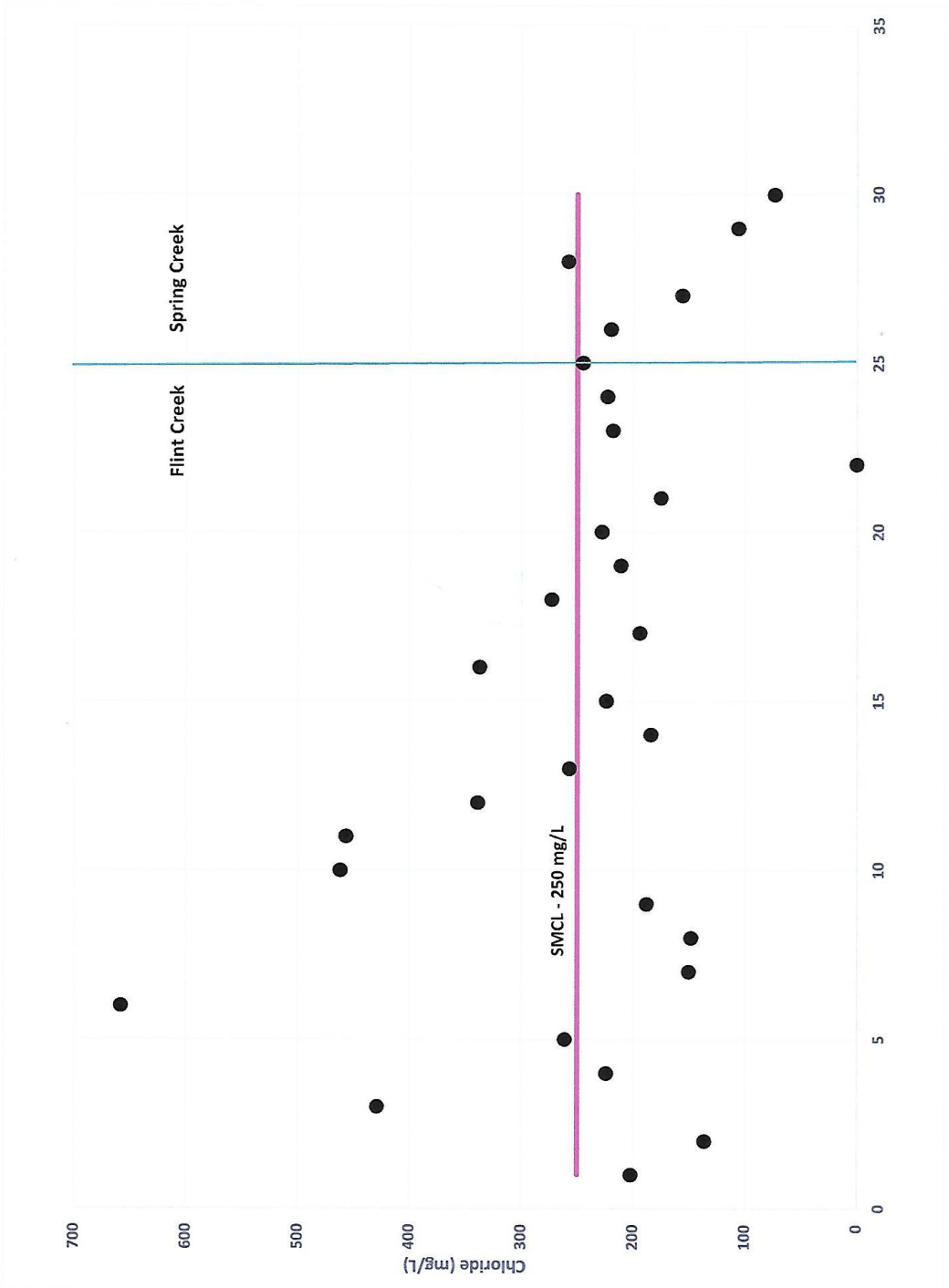


Figure A7 Chloride Concentrations in Flint and Spring Creeks

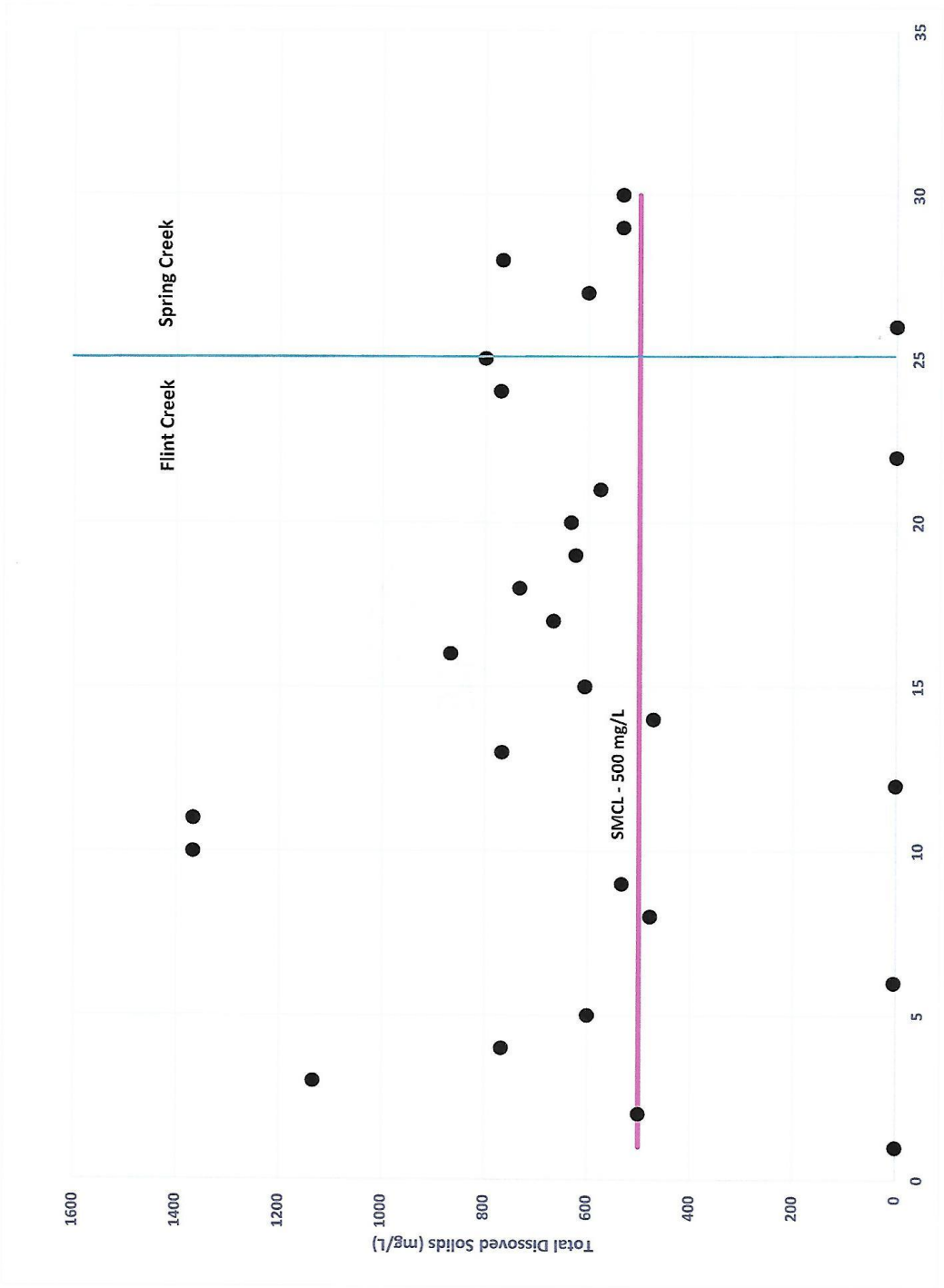


Figure A8 Total Dissolved Solids Concentrations in Flint and Spring Creeks

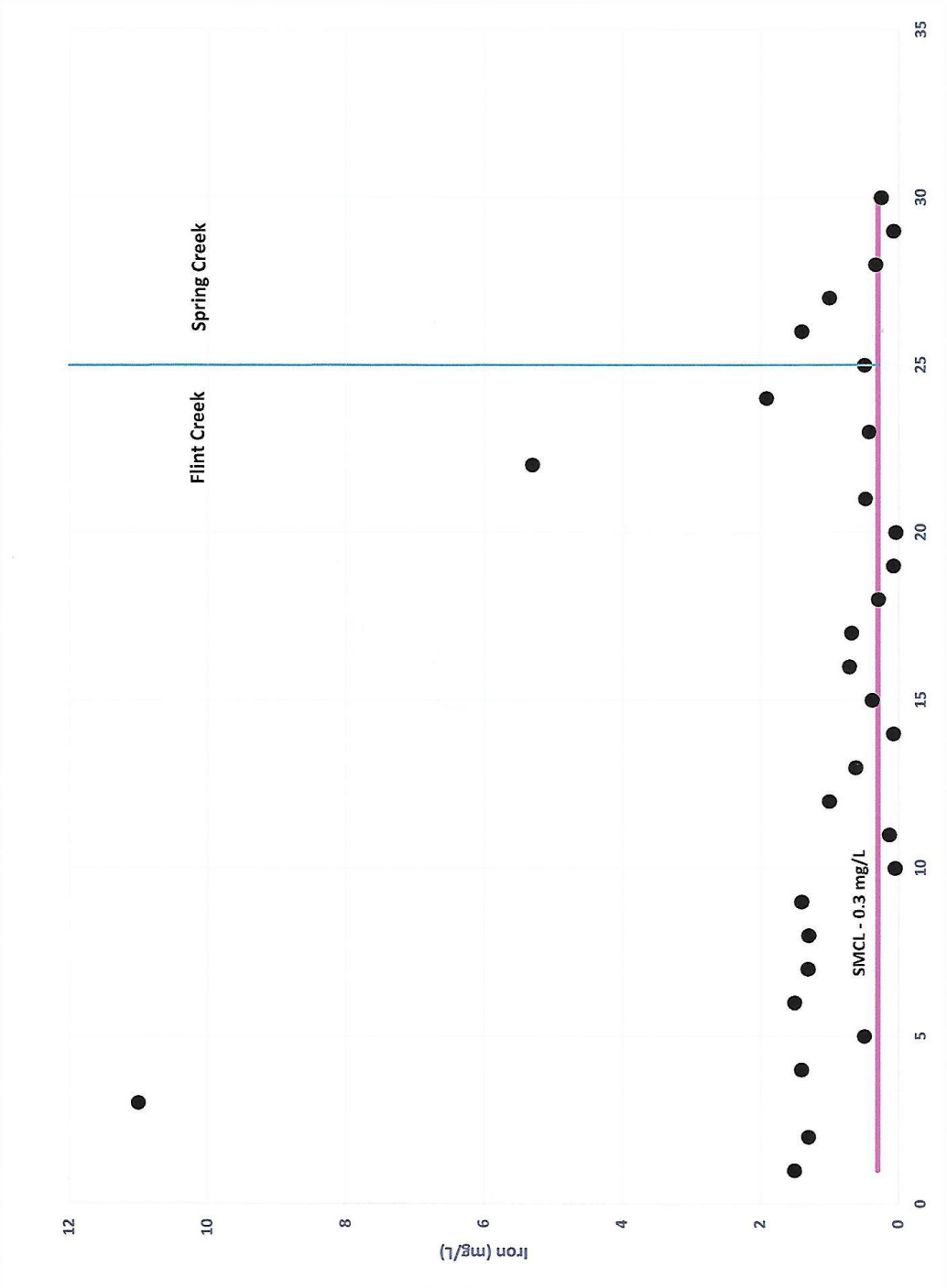


Figure A9 Iron Concentrations in Flint and Spring Creeks

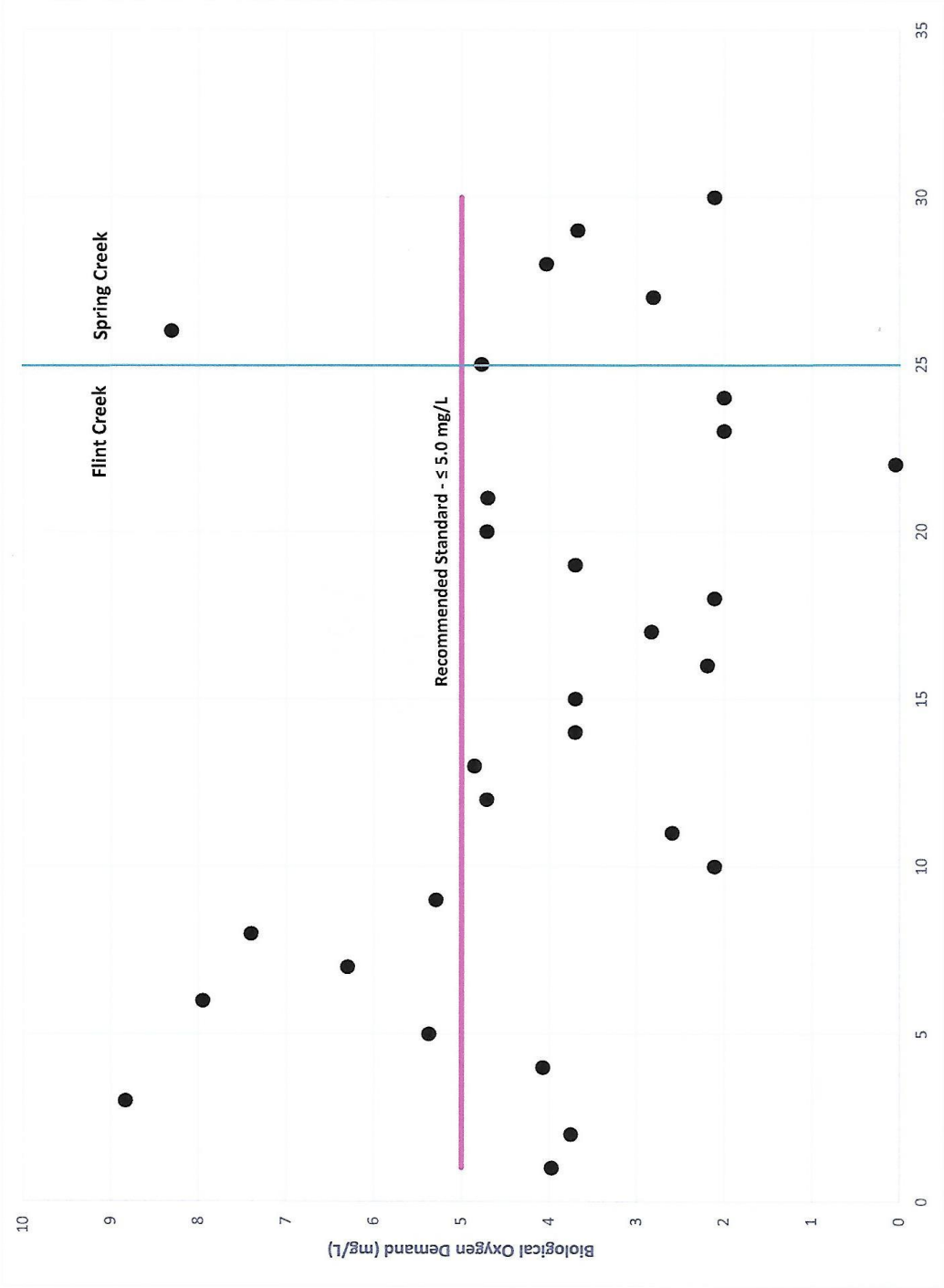


Figure A10 Biological Oxygen Demand Concentrations in Flint and Spring Creeks

Appendix B - Stiff Diagrams

STIFF DIAGRAM AND ASSOCIATED VALUES

Flint/Spring Creek Watersheds Partnership

Anions	mg/L	meq/L
Bicarbonate (HCO_3)	292.625	4.796
Chloride (Cl)	202.000	5.698
Sulfate (SO_4)	8.870	0.185
Nitrate (NO_3)	0.035	0.001
Fluoride (F)	0.160	0.008
Phosphate (PO_4)	0.080	0.003
Total Anions		10.691

Ion Activity Products	IAP	Ksp	IAP/Ksp
Halite NaCl	1.688E-05	3.730E+01	4.525E-07
$CaCl_2$	3.125E-08	1.210E+03	2.583E-11
Gypsum $CaSO_4$	7.112E-08	2.625E-05	2.709E-03
Calcite $CaCO_3$	5.264E-06	3.300E-09	1.595E+03
Magnesite $MgCO_3$	3.985E-06	2.595E-05	1.536E-01
$Mg(OH)_2$	1.280E-17	1.200E-11	1.067E-06
Goethite $Fe(OH)_3$	2.740E-26	1.000E-38	2.740E+12

Cations	mg/L	meq/L
Sodium (Na)	87.000	3.785
Calcium (Ca)	79.000	3.942
Magnesium (Mg)	36.000	2.962
Iron (Fe)	1.500	0.054
Potassium (K)	2.700	0.069
Aluminum (Al)	0.220	0.024
Barium (Ba)	0.049	0.001
Manganese (Mn)	1.300	0.047
Total Cations		10.884

Ion Difference (meq/L)=	0.194
Cation/Anion Balance (%)	0.897
Ionic Strength(I)=	0.014

pH=	7.07
pOH=	6.93
TDS(mg/L)=	600
SC(umhos/cm)=	1610.00
TDS/SC=	0.37

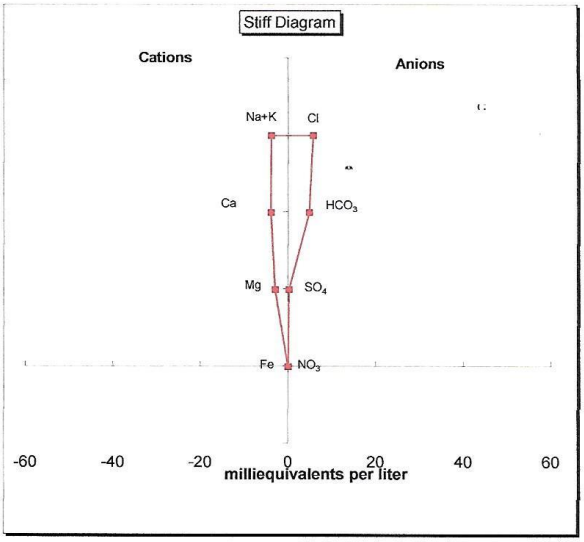


FIGURE B1

STIFF DIAGRAM AND ASSOCIATED VALUES FCBH1

Flint/Spring Creek Watersheds Partnership

Figure B1 Stiff Diagram – FCBH1

STIFF DIAGRAM AND ASSOCIATED VALUES

Flint/Spring Creek Watersheds Partnership

Anions	mg/L	meq/L
Bicarbonate (HCO_3)	292.625	4.796
Chloride (Cl)	202.000	5.698
Sulfate (SO_4)	8.870	0.185
Nitrate (NO_3)	0.035	0.001
Fluoride (F)	0.160	0.008
Phosphate (PO_4)	0.080	0.003
Total Anions		10.691

Ion Activity Products	IAP	Ksp	IAP/Ksp
Halite NaCl	1.688E-05	3.730E+01	4.525E-07
$CaCl_2$	3.125E-08	1.210E+03	2.583E-11
Gypsum $CaSO_4$	7.112E-08	2.625E-05	2.709E-03
Calcite $CaCO_3$	5.264E-06	3.300E-09	1.595E+03
Magnesite $MgCO_3$	3.985E-06	2.595E-05	1.536E-01
$Mg(OH)_2$	1.280E-17	1.200E-11	1.067E-06
Goethite $Fe(OH)_3$	2.740E-26	1.000E-38	2.740E+12

Cations	mg/L	meq/L
Sodium (Na)	87.000	3.785
Calcium (Ca)	79.000	3.942
Magnesium (Mg)	36.000	2.962
Iron (Fe)	1.500	0.054
Potassium (K)	2.700	0.069
Aluminum (Al)	0.220	0.024
Barium (Ba)	0.049	0.001
Manganese (Mn)	1.300	0.047
Total Cations		10.884

Ion Difference (meq/L)=	0.194
Cation/Anion Balance (%)	0.897
Ionic Strength(I)=	0.014

pH=	7.07
pOH=	6.93
TDS(mg/L)=	600
SC(umhos/cm)=	1610.00
TDS/SC=	0.37

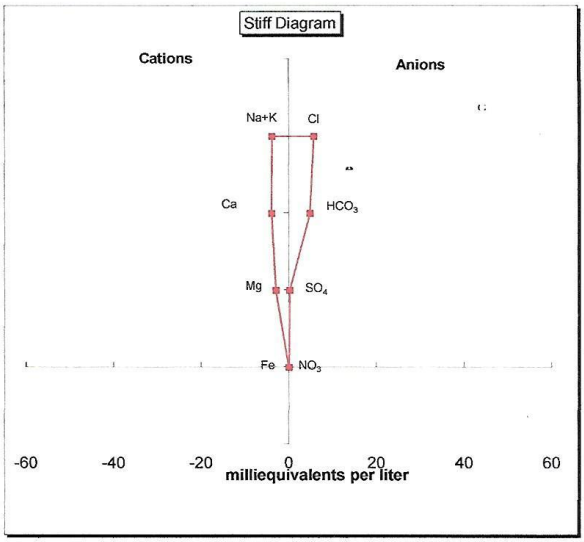


FIGURE B2

STIFF DIAGRAM AND ASSOCIATED VALUES FCBH2Q

Flint/Spring Creek Watersheds Partnership

Figure B2 Stiff Diagram – FCBH2Q

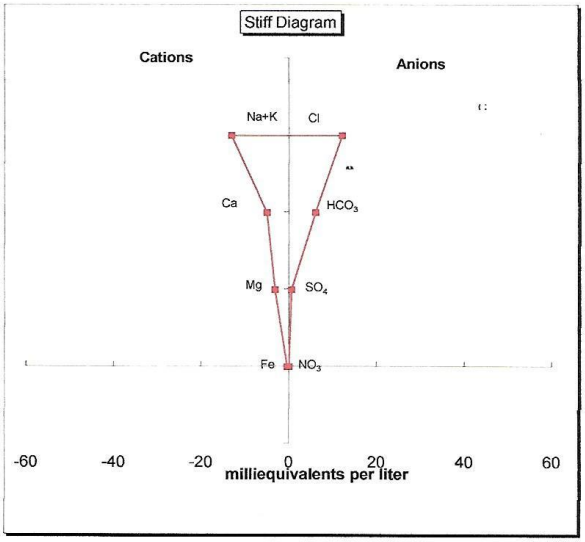
STIFF DIAGRAM AND ASSOCIATED VALUES

Flint/Spring Creek Watersheds Partnership

Anions	mg/L	meq/L
Bicarbonate (HCO_3)	368.220	6.035
Chloride (Cl)	429.000	12.102
Sulfate (SO_4)	27.560	0.574
Nitrate (NO_3)	0.003	0.000
Fluoride (F)	0.160	0.008
Phosphate (PO_4)	0.060	0.002
Total Anions		18.721

Ion Activity Products	IAP	Ksp	IAP/Ksp
Halite NaCl	1.159E-04	3.730E+01	3.107E-06
$CaCl_2$	1.486E-07	1.210E+03	1.228E-10
Gypsum $CaSO_4$	2.212E-07	2.625E-05	8.427E-03
Calcite $CaCO_3$	7.247E-06	3.300E-09	2.196E+03
Magnesite $MgCO_3$	4.715E-06	2.595E-05	1.817E-01
$Mg(OH)_2$	8.973E-18	1.200E-11	7.477E-07
Goethite $Fe(OH)_3$	1.111E-25	1.000E-38	1.111E+13

Cations	mg/L	meq/L
Sodium (Na)	300.000	13.050
Calcium (Ca)	100.000	4.990
Magnesium (Mg)	39.000	3.209
Iron (Fe)	11.000	0.394
Potassium (K)	4.000	0.102
Aluminum (Al)	0.190	0.021
Barium (Ba)	0.073	0.001
Manganese (Mn)	1.100	0.040
Total Cations		21.808



Ion Difference (meq/L)=	3.086
Cation/Anion Balance (%)	7.615
Ionic Strength(I)=	0.025

pH=	7.00
pOH=	7.00
TDS(mg/L)=	1133
SC(umhos/cm)=	2030.00
TDS/SC=	0.56

FIGURE B3

STIFF DIAGRAM AND ASSOCIATED VALUES
FCDP1

Flint/Spring Creek Watersheds Partnership

Figure B3 Stiff Diagram – FCDP1

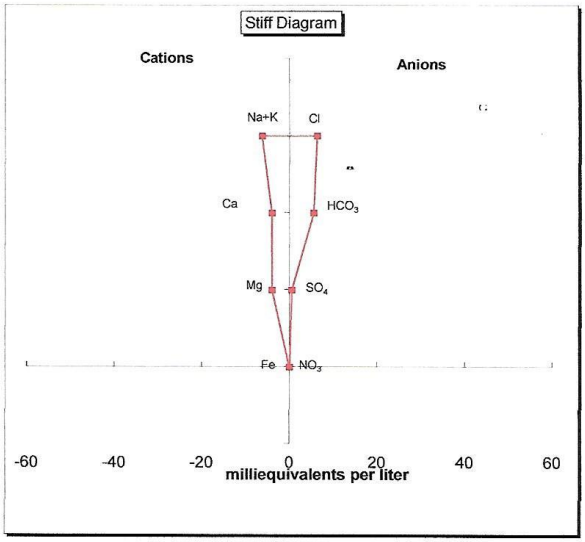
STIFF DIAGRAM AND ASSOCIATED VALUES

Flint/Spring Creek Watersheds Partnership

Anions	mg/L	meq/L
Bicarbonate (HCO_3)	338.957	5.556
Chloride (Cl)	224.000	6.319
Sulfate (SO_4)	25.690	0.535
Nitrate (NO_3)	0.150	0.002
Fluoride (F)	0.170	0.009
Phosphate (PO_4)	0.030	0.001
Total Anions		12.422

Ion Activity Products	IAP	Ksp	IAP/Ksp
Halite NaCl	2.944E-05	3.730E+01	7.894E-07
$CaCl_2$	3.648E-08	1.210E+03	3.015E-11
Gypsum $CaSO_4$	1.920E-07	2.625E-05	7.314E-03
Calcite $CaCO_3$	5.864E-06	3.300E-09	1.777E+03
Magnesite $MgCO_3$	5.854E-06	2.595E-05	2.255E-01
$Mg(OH)_2$	4.731E-17	1.200E-11	3.942E-06
Goethite $Fe(OH)_3$	1.205E-25	1.000E-38	1.205E+13

Cations	mg/L	meq/L
Sodium (Na)	140.000	6.090
Calcium (Ca)	80.000	3.992
Magnesium (Mg)	48.000	3.950
Iron (Fe)	1.400	0.050
Potassium (K)	7.000	0.179
Aluminum (Al)	0.210	0.023
Barium (Ba)	0.049	0.001
Manganese (Mn)	0.910	0.033
Total Cations		14.318



Ion Difference (meq/L)=	1.897
Cation/Anion Balance (%)	7.093
Ionic Strength(I)=	0.018

pH=	7.30
pOH=	6.70
TDS(mg/L)=	767
SC(umhos/cm)=	1310.00
TDS/SC=	0.59

FIGURE B4

STIFF DIAGRAM AND ASSOCIATED VALUES FCDP2

Flint/Spring Creek Watersheds Partnership

Figure B4 Stiff Diagram – FCDP2

STIFF DIAGRAM AND ASSOCIATED VALUES

Flint/Spring Creek Watersheds Partnership

Anions	mg/L	meq/L
Bicarbonate (HCO_3)	185.329	3.038
Chloride (Cl)	261.000	7.363
Sulfate (SO_4)	22.800	0.475
Nitrate (NO_3)	0.018	0.000
Fluoride (F)	0.140	0.007
Phosphate (PO_4)	0.010	0.000
Total Anions		10.883

Ion Activity Products	IAP	Ksp	IAP/Ksp
Halite NaCl	4.530E-05	3.730E+01	1.215E-06
$CaCl_2$	3.274E-08	1.210E+03	2.706E-11
Gypsum $CaSO_4$	1.151E-07	2.625E-05	4.385E-03
Calcite $CaCO_3$	2.087E-06	3.300E-09	6.326E+02
Magnesite $MgCO_3$	1.486E-06	2.595E-05	5.725E-02
$Mg(OH)_2$	2.171E-16	1.200E-11	1.809E-05
Goethite $Fe(OH)_3$	1.398E-24	1.000E-38	1.398E+14

Cations	mg/L	meq/L
Sodium (Na)	180.000	7.830
Calcium (Ca)	49.000	2.445
Magnesium (Mg)	21.000	1.728
Iron (Fe)	0.490	0.018
Potassium (K)	3.400	0.087
Aluminum (Al)	0.180	0.020
Barium (Ba)	0.044	0.001
Manganese (Mn)	0.074	0.003
Total Cations		12.131

Ion Difference (meq/L)=	1.248
Cation/Anion Balance (%)	5.423
Ionic Strength(I)=	0.014

pH=	7.80
pOH=	6.20
TDS(mg/L)=	600
SC(umhos/cm)=	1176.00
TDS/SC=	0.51

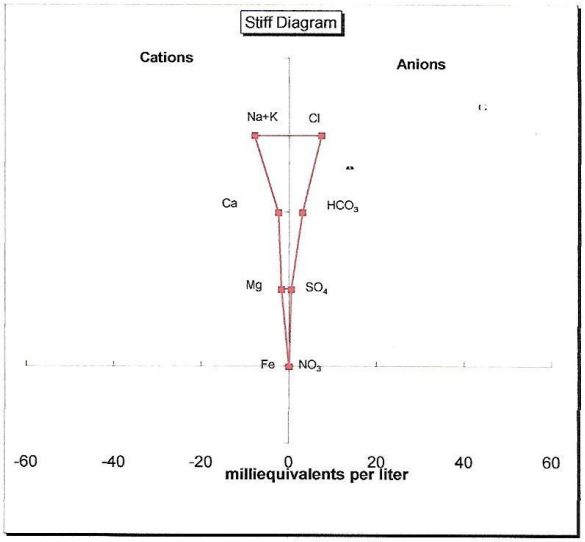


FIGURE B5

STIFF DIAGRAM AND ASSOCIATED VALUES FCDP5

Flint/Spring Creek Watersheds Partnership

Figure B5 Stiff Diagram – FCDP5

STIFF DIAGRAM AND ASSOCIATED VALUES

Flint/Spring Creek Watersheds Partnership

Anions	mg/L	meq/L
Bicarbonate (HCO_3)	348.711	5.715
Chloride (Cl)	658.000	18.562
Sulfate (SO_4)	50.400	1.049
Nitrate (NO_3)	0.110	0.002
Fluoride (F)	0.090	0.005
Phosphate (PO_4)	0.240	0.008
Total Anions		25.341

Ion Activity Products	IAP	Ksp	IAP/Ksp
Halite NaCl	2.415E-04	3.730E+01	6.476E-06
$CaCl_2$	2.700E-07	1.210E+03	2.231E-10
Gypsum $CaSO_4$	3.055E-07	2.625E-05	1.164E-02
Calcite $CaCO_3$	5.396E-06	3.300E-09	1.635E+03
Magnesite $MgCO_3$	5.585E-06	2.595E-05	2.152E-01
$Mg(OH)_2$	2.487E-17	1.200E-11	2.073E-06
Goethite $Fe(OH)_3$	4.669E-26	1.000E-38	4.669E+12

Cations	mg/L	meq/L
Sodium (Na)	420.000	18.270
Calcium (Ca)	84.000	4.192
Magnesium (Mg)	52.000	4.279
Iron (Fe)	1.500	0.054
Potassium (K)	12.000	0.307
Aluminum (Al)	0.160	0.018
Barium (Ba)	0.075	0.001
Manganese (Mn)	0.370	0.013
Total Cations		27.134

Ion Difference (meq/L)=	1.793
Cation/Anion Balance (%)	3.416
Ionic Strength(I)=	0.031

pH=	7.17
pOH=	6.83
TDS(mg/L)=	1433
SC(umhos/cm)=	2640.00
TDS/SC=	0.54

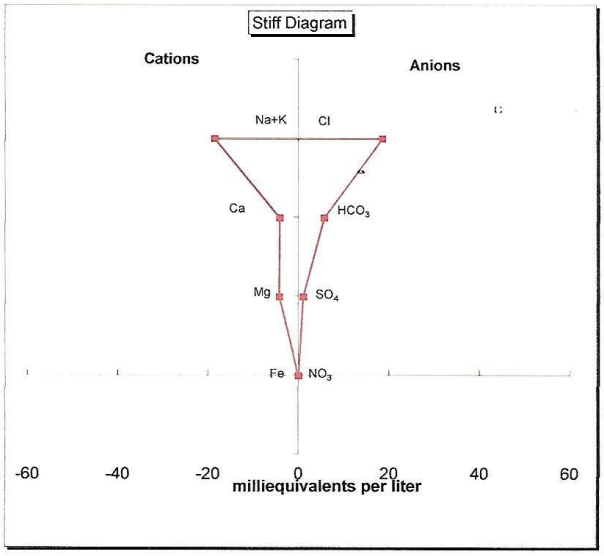


FIGURE B6

STIFF DIAGRAM AND ASSOCIATED VALUES
FCB1

Flint/Spring Creek Watersheds Partnership

Figure B6 Stiff Diagram – FCB1

STIFF DIAGRAM AND ASSOCIATED VALUES

Flint/Spring Creek Watersheds Partnership

Anions	mg/L	meq/L
Bicarbonate (HCO_3)	170.698	2.798
Chloride (Cl)	150.000	4.232
Sulfate (SO_4)	20.120	0.419
Nitrate (NO_3)	0.050	0.001
Fluoride (F)	0.001	0.000
Phosphate (PO_4)	0.493	0.016
Total Anions		7.465

Ion Activity Products	IAP	Ksp	IAP/Ksp
Halite NaCl	1.448E-05	3.730E+01	3.883E-07
$CaCl_2$	8.214E-09	1.210E+03	6.789E-12
Gypsum $CaSO_4$	8.067E-08	2.625E-05	3.073E-03
Calcite $CaCO_3$	1.418E-06	3.300E-09	4.297E+02
Magnesite $MgCO_3$	1.688E-07	2.595E-05	6.504E-03
$Mg(OH)_2$	1.985E-15	1.200E-11	1.654E-04
Goethite $Fe(OH)_3$	2.710E-21	1.000E-38	2.710E+17

Cations	mg/L	meq/L
Sodium (Na)	95.000	4.133
Calcium (Ca)	32.000	1.597
Magnesium (Mg)	2.300	0.189
Iron (Fe)	1.310	0.047
Potassium (K)	1.600	0.041
Aluminum (Al)	0.420	0.047
Barium (Ba)	0.079	0.001
Manganese (Mn)	0.220	0.008
Total Cations		6.062

Ion Difference (meq/L)=	1.402
Cation/Anion Balance (%)	10.367
Ionic Strength(I)=	0.008

pH=	8.74
pOH=	5.26
TDS(mg/L)=	164
SC(umhos/cm)=	788.00
TDS/SC=	0.21

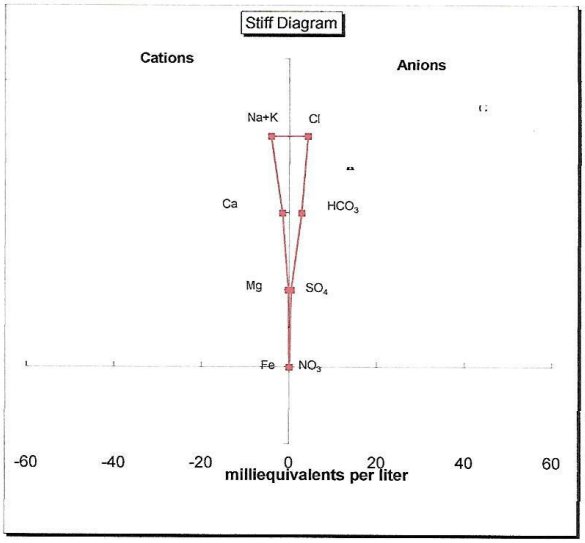


FIGURE B7

STIFF DIAGRAM AND ASSOCIATED VALUES
FCLC5

Flint/Spring Creek Watersheds Partnership

Figure B7 Stiff Diagram – FCLC5

STIFF DIAGRAM AND ASSOCIATED VALUES

Flint/Spring Creek Watersheds Partnership

Anions	mg/L	meq/L
Bicarbonate (HCO_3)	168.259	2.758
Chloride (Cl)	148.000	4.175
Sulfate (SO_4)	53.830	1.121
Nitrate (NO_3)	0.050	0.001
Fluoride (F)	0.001	0.000
Phosphate (PO_4)	0.439	0.014
Total Anions		8.068

Ion Activity Products	IAP	Ksp	IAP/Ksp
Halite NaCl	1.852E-05	3.730E+01	4.965E-07
$CaCl_2$	1.496E-08	1.210E+03	1.236E-11
Gypsum $CaSO_4$	3.857E-07	2.625E-05	1.469E-02
Calcite $CaCO_3$	2.696E-06	3.300E-09	8.170E+02
Magnesite $MgCO_3$	2.303E-06	2.595E-05	8.874E-02
$Mg(OH)_2$	8.124E-14	1.200E-11	6.770E-03
Goethite $Fe(OH)_3$	1.198E-20	1.000E-38	1.198E+18

Cations	mg/L	meq/L
Sodium (Na)	130.000	5.655
Calcium (Ca)	70.000	3.493
Magnesium (Mg)	36.000	2.962
Iron (Fe)	1.300	0.047
Potassium (K)	5.800	0.148
Aluminum (Al)	0.493	0.055
Barium (Ba)	0.079	0.001
Manganese (Mn)	0.230	0.008
Total Cations		12.370

Ion Difference (meq/L)=	4.301
Cation/Anion Balance (%)	21.046
Ionic Strength(I)=	0.014

pH=	8.97
pOH=	5.03
TDS(mg/L)=	164
SC(umhos/cm)=	784.00
TDS/SC=	0.21

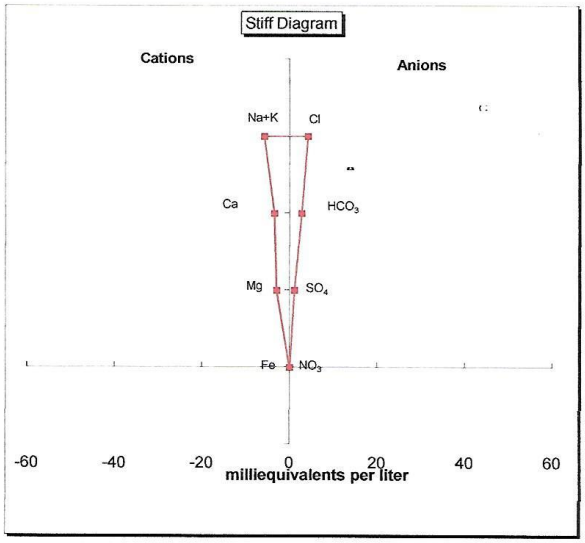


FIGURE B8

STIFF DIAGRAM AND ASSOCIATED VALUES FCLC6

Flint/Spring Creek Watersheds Partnership

Figure B8 Stiff Diagram – FCLC6

STIFF DIAGRAM AND ASSOCIATED VALUES

Flint/Spring Creek Watersheds Partnership

Anions	mg/L	meq/L
Bicarbonate (HCO_3)	209.715	3.437
Chloride (Cl)	188.000	5.303
Sulfate (SO_4)	16.227	0.338
Nitrate (NO_3)	0.004	0.000
Fluoride (F)	0.170	0.009
Phosphate (PO_4)	0.340	0.011
Total Anions		9.098

Ion Activity Products	IAP	Ksp	IAP/Ksp
Halite NaCl	2.198E-05	3.730E+01	5.894E-07
$CaCl_2$	1.857E-08	1.210E+03	1.535E-11
Gypsum $CaSO_4$	9.037E-08	2.625E-05	3.442E-03
Calcite $CaCO_3$	2.567E-06	3.300E-09	7.781E+02
Magnesite $MgCO_3$	2.459E-06	2.595E-05	9.474E-02
$Mg(OH)_2$	1.317E-17	1.200E-11	1.097E-06
Goethite $Fe(OH)_3$	3.458E-26	1.000E-38	3.458E+12

Cations	mg/L	meq/L
Sodium (Na)	120.000	5.220
Calcium (Ca)	52.000	2.595
Magnesium (Mg)	30.000	2.469
Iron (Fe)	1.400	0.050
Potassium (K)	3.300	0.084
Aluminum (Al)	0.020	0.002
Barium (Ba)	0.045	0.001
Manganese (Mn)	0.740	0.027
Total Cations		10.448

Ion Difference (meq/L)=	1.350
Cation/Anion Balance (%)	6.905
Ionic Strength(I)=	0.013

pH=	7.11
pOH=	6.89
TDS(mg/L)=	533
SC(umhos/cm)=	989.00
TDS/SC=	0.54

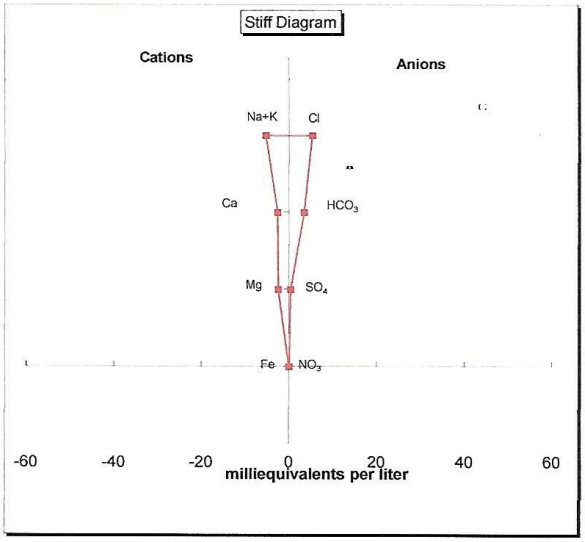


FIGURE B9

STIFF DIAGRAM AND ASSOCIATED VALUES

FCB2

Flint/Spring Creek Watersheds Partnership

Figure B9 Stiff Diagram – FCB2

STIFF DIAGRAM AND ASSOCIATED VALUES

Flint/Spring Creek Watersheds Partnership

Anions	mg/L	meq/L
Bicarbonate (HCO_3)	377.974	6.195
Chloride (Cl)	462.000	13.033
Sulfate (SO_4)	111.970	2.331
Nitrate (NO_3)	10.000	0.161
Fluoride (F)	0.760	0.040
Phosphate (PO_4)	2.890	0.091
Total Anions		21.852

Ion Activity Products	IAP	Ksp	IAP/Ksp
Halite NaCl	1.220E-04	3.730E+01	3.272E-06
$CaCl_2$	1.780E-07	1.210E+03	1.471E-10
Gypsum $CaSO_4$	9.126E-07	2.625E-05	3.476E-02
Calcite $CaCO_3$	7.786E-06	3.300E-09	2.360E+03
Magnesite $MgCO_3$	7.215E-06	2.595E-05	2.780E-01
$Mg(OH)_2$	3.553E-17	1.200E-11	2.961E-06
Goethite $Fe(OH)_3$	1.994E-27	1.000E-38	1.994E+11

Cations	mg/L	meq/L
Sodium (Na)	300.000	13.050
Calcium (Ca)	110.000	5.489
Magnesium (Mg)	61.000	5.020
Iron (Fe)	0.048	0.002
Potassium (K)	17.000	0.435
Aluminum (Al)	0.010	0.001
Barium (Ba)	0.045	0.001
Manganese (Mn)	0.009	0.000
Total Cations		23.997

Ion Difference (meq/L)=	2.146
Cation/Anion Balance (%)	4.680
Ionic Strength(I)=	0.029

pH=	7.21
pOH=	6.79
TDS(mg/L)=	3
SC(umhos/cm)=	2310.00
TDS/SC=	0.00

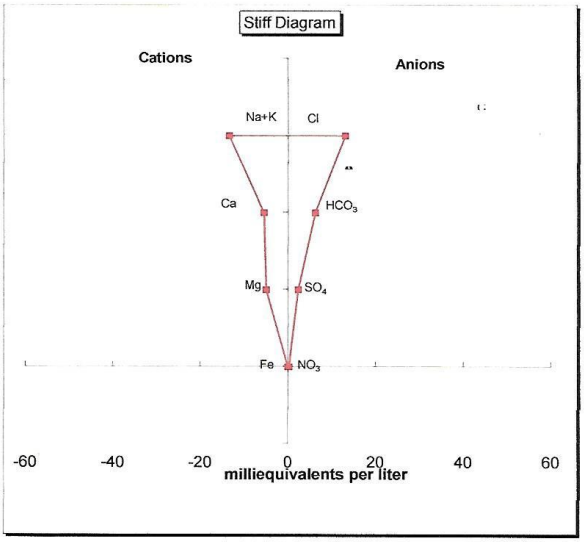


FIGURE B10

STIFF DIAGRAM AND ASSOCIATED VALUES FCB3T

Flint/Spring Creek Watersheds Partnership

Figure B10 Stiff Diagram – FCB3T

STIFF DIAGRAM AND ASSOCIATED VALUES

Flint/Spring Creek Watersheds Partnership

Anions	mg/L	meq/L
Bicarbonate (HCO_3)	380.412	6.235
Chloride (Cl)	457.000	12.892
Sulfate (SO_4)	75.000	1.562
Nitrate (NO_3)	8.500	0.137
Fluoride (F)	0.760	0.040
Phosphate (PO_4)	2.850	0.090
Total Anions		20.956

Ion Activity Products	IAP	Ksp	IAP/Ksp
Halite NaCl	1.170E-04	3.730E+01	3.137E-06
$CaCl_2$	1.914E-07	1.210E+03	1.582E-10
Gypsum $CaSO_4$	6.731E-07	2.625E-05	2.564E-02
Calcite $CaCO_3$	8.598E-06	3.300E-09	2.606E+03
Magnesite $MgCO_3$	7.302E-06	2.595E-05	2.814E-01
$Mg(OH)_2$	5.402E-17	1.200E-11	4.502E-06
Goethite $Fe(OH)_3$	1.010E-26	1.000E-38	1.010E+12

Cations	mg/L	meq/L
Sodium (Na)	290.000	12.615
Calcium (Ca)	120.000	5.988
Magnesium (Mg)	61.000	5.020
Iron (Fe)	0.130	0.005
Potassium (K)	16.000	0.409
Aluminum (Al)	0.038	0.004
Barium (Ba)	0.050	0.001
Manganese (Mn)	0.025	0.001
Total Cations		24.042

Ion Difference (meq/L)=	3.087
Cation/Anion Balance (%)	6.860
Ionic Strength(I)=	0.029

pH=	7.30
pOH=	6.70
TDS(mg/L)=	1367
SC(umhos/cm)=	1043.00
TDS/SC=	1.31

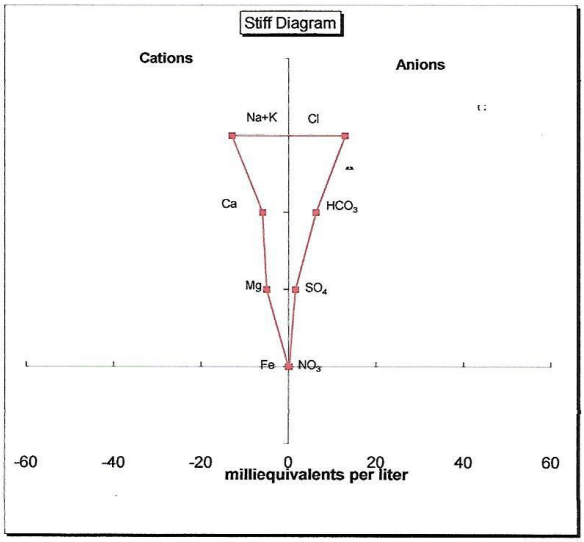


FIGURE B11

STIFF DIAGRAM AND ASSOCIATED VALUES FCB4Q

Flint/Spring Creek Watersheds Partnership

Figure B11 Stiff Diagram – FCB4Q

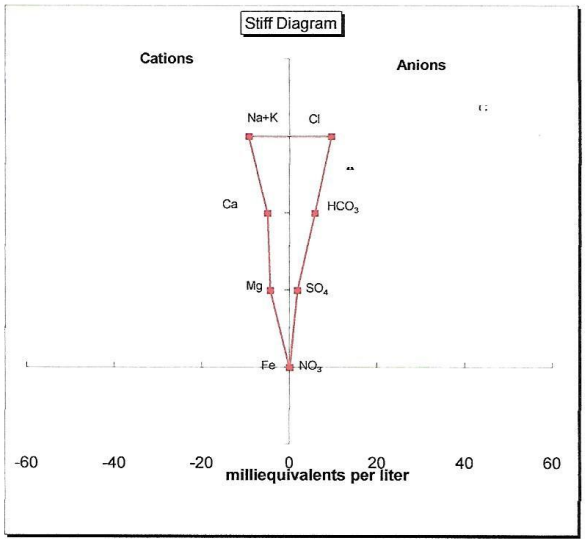
STIFF DIAGRAM AND ASSOCIATED VALUES

Flint/Spring Creek Watersheds Partnership

Anions	mg/L	meq/L
Bicarbonate (HCO_3)	353.588	5.795
Chloride (Cl)	339.000	9.563
Sulfate (SO_4)	86.300	1.797
Nitrate (NO_3)	2.800	0.045
Fluoride (F)	0.430	0.023
Phosphate (PO_4)	0.420	0.013
Total Anions		17.236

Ion Activity Products	IAP	Ksp	IAP/Ksp
Halite NaCl	6.450E-05	3.730E+01	1.729E-06
$CaCl_2$	9.441E-08	1.210E+03	7.803E-11
Gypsum $CaSO_4$	7.085E-07	2.625E-05	2.699E-02
Calcite $CaCO_3$	7.057E-06	3.300E-09	2.139E+03
Magnesite $MgCO_3$	6.237E-06	2.595E-05	2.403E-01
$Mg(OH)_2$	3.098E-16	1.200E-11	2.582E-05
Goethite $Fe(OH)_3$	1.286E-24	1.000E-38	1.286E+14

Cations	mg/L	meq/L
Sodium (Na)	210.000	9.135
Calcium (Ca)	100.000	4.990
Magnesium (Mg)	53.000	4.361
Iron (Fe)	1.000	0.036
Potassium (K)	9.900	0.253
Aluminum (Al)	0.590	0.066
Barium (Ba)	0.063	0.001
Manganese (Mn)	0.160	0.006
Total Cations		18.848



Ion Difference (meq/L)=	1.611
Cation/Anion Balance (%)	4.466
Ionic Strength(I)=	0.024

pH=	7.70
pOH=	6.30
TDS(mg/L)=	1100
SC(umhos/cm)=	1780.00
TDS/SC=	0.62

FIGURE B12

STIFF DIAGRAM AND ASSOCIATED VALUES FCBH4

Flint/Spring Creek Watersheds Partnership

Figure B12 Stiff Diagram – FCBH4

STIFF DIAGRAM AND ASSOCIATED VALUES

Flint/Spring Creek Watersheds Partnership

Anions	mg/L	meq/L
Bicarbonate (HCO_3)	292.625	4.796
Chloride (Cl)	257.000	7.250
Sulfate (SO_4)	57.860	1.205
Nitrate (NO_3)	0.760	0.012
Fluoride (F)	0.300	0.016
Phosphate (PO_4)	0.250	0.008
Total Anions		13.287

Ion Activity Products	IAP	Ksp	IAP/Ksp
Halite NaCl	3.132E-05	3.730E+01	8.396E-07
$CaCl_2$	4.123E-08	1.210E+03	3.407E-11
Gypsum $CaSO_4$	3.707E-07	2.625E-05	1.412E-02
Calcite $CaCO_3$	4.350E-06	3.300E-09	1.318E+03
Magnesite $MgCO_3$	3.776E-06	2.595E-05	1.455E-01
$Mg(OH)_2$	7.395E-16	1.200E-11	6.163E-05
Goethite $Fe(OH)_3$	5.088E-24	1.000E-38	5.088E+14

Cations	mg/L	meq/L
Sodium (Na)	130.000	5.655
Calcium (Ca)	69.000	3.443
Magnesium (Mg)	36.000	2.962
Iron (Fe)	0.620	0.022
Potassium (K)	5.700	0.146
Aluminum (Al)	0.220	0.024
Barium (Ba)	0.052	0.001
Manganese (Mn)	36.000	1.310
Total Cations		13.564

Ion Difference (meq/L)=	0.277
Cation/Anion Balance (%)	1.033
Ionic Strength(I)=	0.018

pH=	7.96
pOH=	6.04
TDS(mg/L)=	767
SC(umhos/cm)=	1354.00
TDS/SC=	0.57

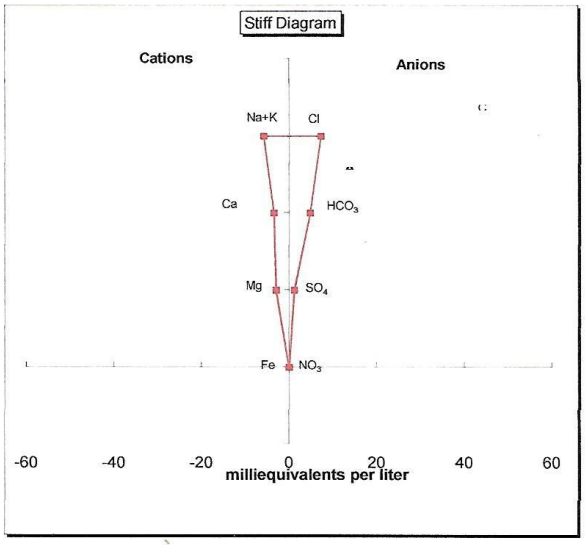


FIGURE B13

STIFF DIAGRAM AND ASSOCIATED VALUES FCLB3Q

Flint/Spring Creek Watersheds Partnership

Figure B13 Stiff Diagram – FCLB3Q

STIFF DIAGRAM AND ASSOCIATED VALUES

Flint/Spring Creek Watersheds Partnership

Anions	mg/L	meq/L
Bicarbonate (HCO_3)	141.435	2.318
Chloride (Cl)	184.000	5.191
Sulfate (SO_4)	15.980	0.333
Nitrate (NO_3)	0.050	0.001
Fluoride (F)	0.001	0.000
Phosphate (PO_4)	0.492	0.016
Total Anions		7.858

Ion Activity Products	IAP	Ksp	IAP/Ksp
Halite NaCl	2.024E-05	3.730E+01	5.426E-07
$CaCl_2$	1.142E-08	1.210E+03	9.439E-12
Gypsum $CaSO_4$	5.838E-08	2.625E-05	2.224E-03
Calcite $CaCO_3$	1.096E-06	3.300E-09	3.320E+02
Magnesite $MgCO_3$	9.959E-07	2.595E-05	3.837E-02
$Mg(OH)_2$	3.415E-15	1.200E-11	2.846E-04
Goethite $Fe(OH)_3$	1.652E-23	1.000E-38	1.652E+15

Cations	mg/L	meq/L
Sodium (Na)	110.000	4.785
Calcium (Ca)	31.000	1.547
Magnesium (Mg)	17.000	1.399
Iron (Fe)	0.070	0.003
Potassium (K)	3.700	0.095
Aluminum (Al)	0.493	0.055
Barium (Ba)	0.079	0.001
Manganese (Mn)	0.040	0.001
Total Cations		7.885

Ion Difference (meq/L)=	0.028
Cation/Anion Balance (%)	0.175
Ionic Strength(I)=	0.010

pH=	8.43
pOH=	5.57
TDS(mg/L)=	164
SC(umhos/cm)=	872.00
TDS/SC=	0.19

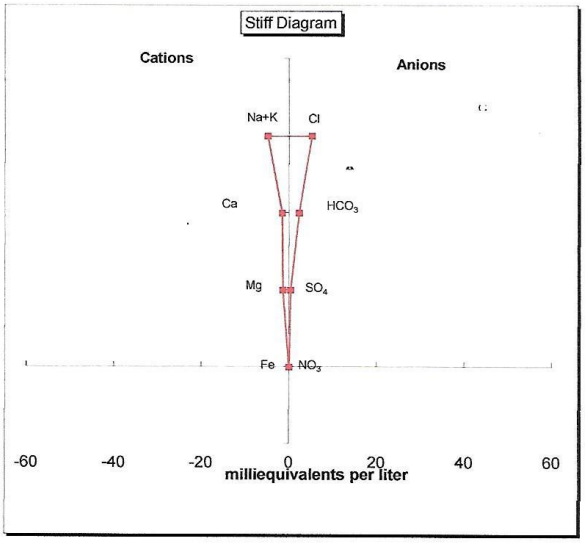


FIGURE B14

STIFF DIAGRAM AND ASSOCIATED VALUES FCLC7

Flint/Spring Creek Watersheds Partnership

Figure B14 Stiff Diagram – FCLC7

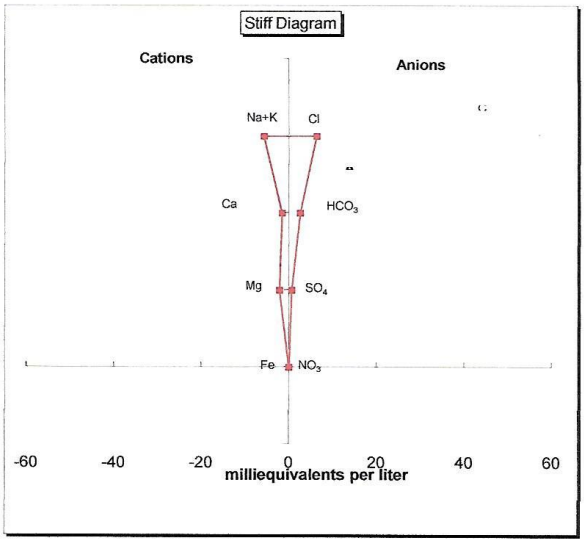
STIFF DIAGRAM AND ASSOCIATED VALUES

Flint/Spring Creek Watersheds Partnership

Anions	mg/L	meq/L
Bicarbonate (HCO_3)	157.286	2.578
Chloride (Cl)	224.000	6.319
Sulfate (SO_4)	30.760	0.640
Nitrate (NO_3)	0.050	0.001
Fluoride (F)	0.020	0.001
Phosphate (PO_4)	0.493	0.016
Total Anions		9.555

Ion Activity Products	IAP	Ksp	IAP/Ksp
Halite NaCl	2.857E-05	3.730E+01	7.660E-07
$CaCl_2$	1.603E-08	1.210E+03	1.325E-11
Gypsum $CaSO_4$	1.048E-07	2.625E-05	3.990E-03
Calcite $CaCO_3$	1.166E-06	3.300E-09	3.534E+02
Magnesite $MgCO_3$	1.623E-06	2.595E-05	6.254E-02
$Mg(OH)_2$	2.530E-15	1.200E-11	2.108E-04
Goethite $Fe(OH)_3$	3.078E-23	1.000E-38	3.078E+15

Cations	mg/L	meq/L
Sodium (Na)	130.000	5.655
Calcium (Ca)	31.000	1.547
Magnesium (Mg)	26.000	2.140
Iron (Fe)	0.380	0.014
Potassium (K)	2.700	0.069
Aluminum (Al)	0.089	0.010
Barium (Ba)	0.079	0.001
Manganese (Mn)	0.090	0.003
Total Cations		9.438



Ion Difference (meq/L)=	0.116
Cation/Anion Balance (%)	0.613
Ionic Strength(I)=	0.012

pH=	8.28
pOH=	5.72
TDS(mg/L)=	164
SC(umhos/cm)=	1030.00
TDS/SC=	0.16

FIGURE B15

STIFF DIAGRAM AND ASSOCIATED VALUES FCLC8

Flint/Spring Creek Watersheds Partnership

Figure B15 Stiff Diagram – FCLC8

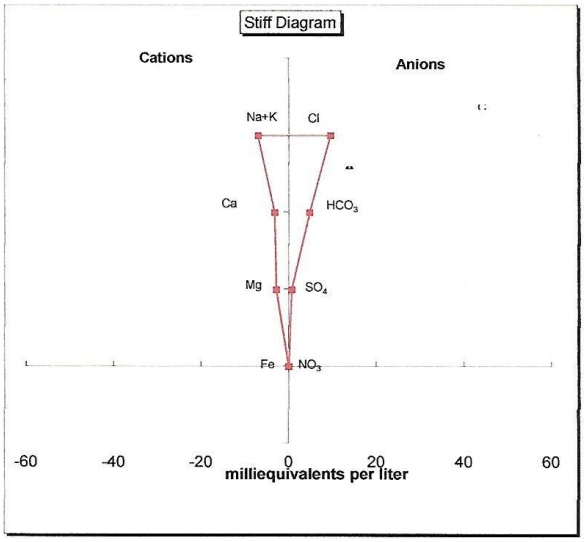
STIFF DIAGRAM AND ASSOCIATED VALUES

Flint/Spring Creek Watersheds Partnership

Anions	mg/L	meq/L
Bicarbonate (HCO_3)	290.186	4.756
Chloride (Cl)	337.000	9.507
Sulfate (SO_4)	31.350	0.653
Nitrate (NO_3)	0.390	0.006
Fluoride (F)	0.160	0.008
Phosphate (PO_4)	0.110	0.003
Total Anions		14.934

Ion Activity Products	IAP	Ksp	IAP/Ksp
Halite NaCl	5.068E-05	3.730E+01	1.359E-06
$CaCl_2$	6.730E-08	1.210E+03	5.562E-11
Gypsum $CaSO_4$	1.911E-07	2.625E-05	7.281E-03
Calcite $CaCO_3$	4.089E-06	3.300E-09	1.239E+03
Magnesite $MgCO_3$	3.663E-06	2.595E-05	1.411E-01
$Mg(OH)_2$	1.376E-16	1.200E-11	1.147E-05
Goethite $Fe(OH)_3$	4.867E-25	1.000E-38	4.867E+13

Cations	mg/L	meq/L
Sodium (Na)	160.000	6.960
Calcium (Ca)	65.000	3.244
Magnesium (Mg)	35.000	2.880
Iron (Fe)	0.710	0.025
Potassium (K)	3.800	0.097
Aluminum (Al)	0.160	0.018
Barium (Ba)	0.057	0.001
Manganese (Mn)	0.091	0.003
Total Cations		13.228



Ion Difference (meq/L)=	1.706
Cation/Anion Balance (%)	6.056
Ionic Strength(I)=	0.018

pH=	7.60
pOH=	6.40
TDS(mg/L)=	867
SC(umhos/cm)=	1500.00
TDS/SC=	0.58

FIGURE B16

STIFF DIAGRAM AND ASSOCIATED VALUES
FCNB1

Flint/Spring Creek Watersheds Partnership

Figure B16 Stiff Diagram – FCNB1

STIFF DIAGRAM AND ASSOCIATED VALUES

Flint/Spring Creek Watersheds Partnership

Anions	mg/L	meq/L
Bicarbonate (HCO_3)	287.748	4.716
Chloride (Cl)	194.000	5.473
Sulfate (SO_4)	25.800	0.537
Nitrate (NO_3)	0.130	0.002
Fluoride (F)	0.190	0.010
Phosphate (PO_4)	0.050	0.002
Total Anions		10.740

Ion Activity Products	IAP	Ksp	IAP/Ksp
Halite NaCl	1.552E-05	3.730E+01	4.161E-07
$CaCl_2$	2.360E-08	1.210E+03	1.951E-11
Gypsum $CaSO_4$	1.699E-07	2.625E-05	6.473E-03
Calcite $CaCO_3$	4.230E-06	3.300E-09	1.282E+03
Magnesite $MgCO_3$	3.952E-06	2.595E-05	1.523E-01
$Mg(OH)_2$	3.718E-17	1.200E-11	3.098E-06
Goethite $Fe(OH)_3$	6.126E-26	1.000E-38	6.126E+12

Cations	mg/L	meq/L
Sodium (Na)	83.000	3.611
Calcium (Ca)	64.000	3.194
Magnesium (Mg)	36.000	2.962
Iron (Fe)	0.680	0.024
Potassium (K)	20.000	0.512
Aluminum (Al)	0.095	0.011
Barium (Ba)	0.110	0.002
Manganese (Mn)	0.260	0.009
Total Cations		10.324

Ion Difference (meq/L)=	0.416
Cation/Anion Balance (%)	1.973
Ionic Strength(I)=	0.014

pH=	7.30
pOH=	6.70
TDS(mg/L)=	667
SC(umhos/cm)=	1187.00
TDS/SC=	0.56

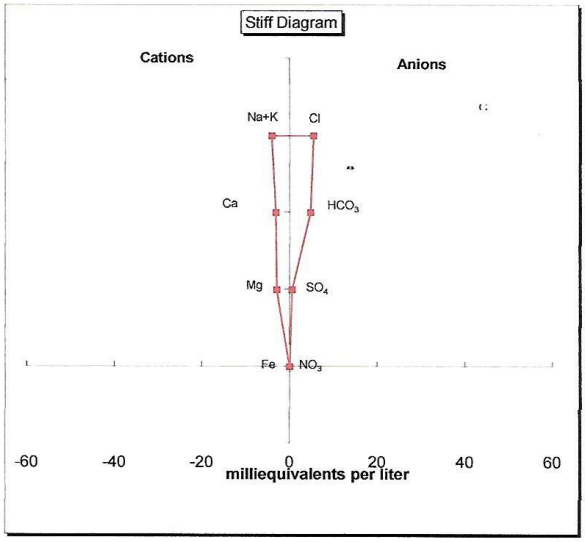


FIGURE B17

STIFF DIAGRAM AND ASSOCIATED VALUES FCNB2

Flint/Spring Creek Watersheds Partnership

Figure B17 Stiff Diagram – FCNB2

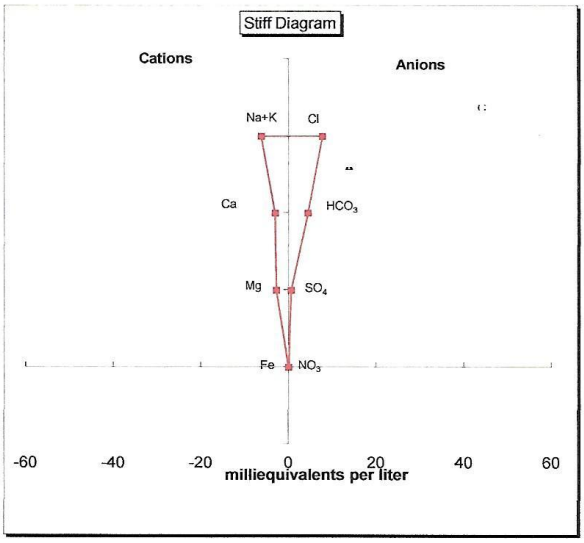
STIFF DIAGRAM AND ASSOCIATED VALUES

Flint/Spring Creek Watersheds Partnership

Anions	mg/L	meq/L
Bicarbonate (HCO_3)	268.240	4.396
Chloride (Cl)	273.000	7.701
Sulfate (SO_4)	27.920	0.581
Nitrate (NO_3)	0.100	0.002
Fluoride (F)	0.160	0.008
Phosphate (PO_4)	0.070	0.002
Total Anions		12.691

Ion Activity Products	IAP	Ksp	IAP/Ksp
Halite NaCl	3.637E-05	3.730E+01	9.751E-07
$CaCl_2$	4.363E-08	1.210E+03	3.606E-11
Gypsum $CaSO_4$	1.699E-07	2.625E-05	6.470E-03
Calcite $CaCO_3$	3.708E-06	3.300E-09	1.124E+03
Magnesite $MgCO_3$	3.380E-06	2.595E-05	1.302E-01
$Mg(OH)_2$	1.366E-16	1.200E-11	1.139E-05
Goethite $Fe(OH)_3$	2.030E-25	1.000E-38	2.030E+13

Cations	mg/L	meq/L
Sodium (Na)	140.000	6.090
Calcium (Ca)	62.000	3.094
Magnesium (Mg)	34.000	2.798
Iron (Fe)	0.290	0.010
Potassium (K)	6.800	0.174
Aluminum (Al)	0.064	0.007
Barium (Ba)	0.059	0.001
Manganese (Mn)	0.086	0.003
Total Cations		12.177



Ion Difference (meq/L)=	0.514
Cation/Anion Balance (%)	2.068
Ionic Strength(I)=	0.016

pH=	7.60
pOH=	6.40
TDS(mg/L)=	733
SC(umhos/cm)=	1335.00
TDS/SC=	0.55

FIGURE B18

STIFF DIAGRAM AND ASSOCIATED VALUES
FCNB4

Flint/Spring Creek Watersheds Partnership

Figure B18 Stiff Diagram – FCNB4

STIFF DIAGRAM AND ASSOCIATED VALUES

Flint/Spring Creek Watersheds Partnership

Anions	mg/L	meq/L
Bicarbonate (HCO_3)	237.758	3.897
Chloride (Cl)	211.000	5.952
Sulfate (SO_4)	19.220	0.400
Nitrate (NO_3)	0.050	0.001
Fluoride (F)	0.020	0.001
Phosphate (PO_4)	0.493	0.016
Total Anions		10.267

Ion Activity Products	IAP	Ksp	IAP/Ksp
Halite NaCl	2.665E-05	3.730E+01	7.144E-07
$CaCl_2$	2.185E-08	1.210E+03	1.806E-11
Gypsum $CaSO_4$	9.972E-08	2.625E-05	3.799E-03
Calcite $CaCO_3$	2.723E-06	3.300E-09	8.254E+02
Magnesite $MgCO_3$	2.491E-06	2.595E-05	9.600E-02
$Mg(OH)_2$	7.440E-16	1.200E-11	6.200E-05
Goethite $Fe(OH)_3$	8.628E-25	1.000E-38	8.628E+13

Cations	mg/L	meq/L
Sodium (Na)	130.000	5.655
Calcium (Ca)	49.000	2.445
Magnesium (Mg)	27.000	2.222
Iron (Fe)	0.070	0.003
Potassium (K)	4.800	0.123
Aluminum (Al)	0.004	0.000
Barium (Ba)	0.079	0.001
Manganese (Mn)	0.060	0.002
Total Cations		10.451

Ion Difference (meq/L)=	0.184
Cation/Anion Balance (%)	0.889
Ionic Strength(I)=	0.013

pH=	8.01
pOH=	5.99
TDS(mg/L)=	164
SC(umhos/cm)=	1060.00
TDS/SC=	0.15

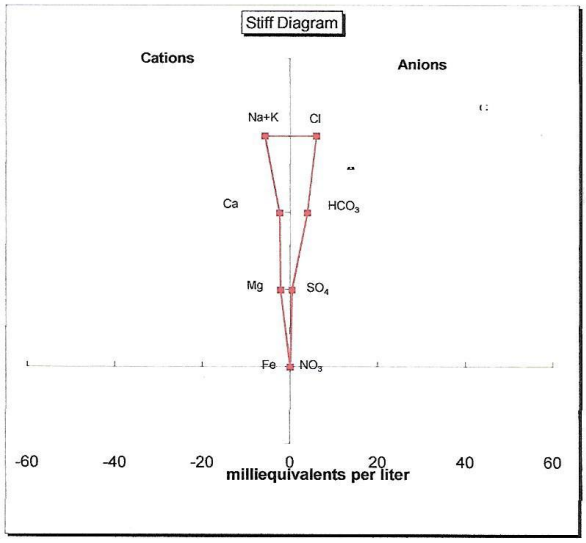


FIGURE B19

STIFF DIAGRAM AND ASSOCIATED VALUES FCLC9

Flint/Spring Creek Watersheds Partnership

Figure B19 Stiff Diagram – FCLC9

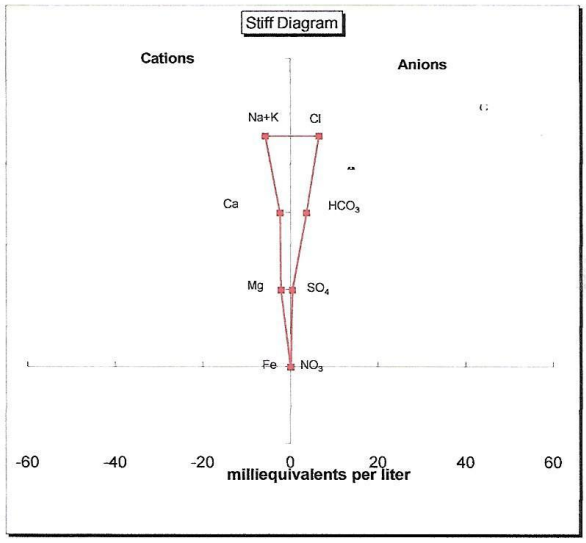
STIFF DIAGRAM AND ASSOCIATED VALUES

Flint/Spring Creek Watersheds Partnership

Anions	mg/L	meq/L
Bicarbonate (HCO_3)	219.469	3.597
Chloride (Cl)	228.000	6.432
Sulfate (SO_4)	19.250	0.401
Nitrate (NO_3)	0.003	0.000
Fluoride (F)	0.130	0.007
Phosphate (PO_4)	0.010	0.000
Total Anions		10.437

Ion Activity Products	IAP	Ksp	IAP/Ksp
Halite NaCl	2.878E-05	3.730E+01	7.715E-07
$CaCl_2$	2.547E-08	1.210E+03	2.105E-11
Gypsum $CaSO_4$	9.963E-08	2.625E-05	3.795E-03
Calcite $CaCO_3$	2.510E-06	3.300E-09	7.607E+02
Magnesite $MgCO_3$	2.296E-06	2.595E-05	8.848E-02
$Mg(OH)_2$	2.142E-17	1.200E-11	1.785E-06
Goethite $Fe(OH)_3$	2.229E-27	1.000E-38	2.229E+11

Cations	mg/L	meq/L
Sodium (Na)	130.000	5.655
Calcium (Ca)	49.000	2.445
Magnesium (Mg)	27.000	2.222
Iron (Fe)	0.037	0.001
Potassium (K)	4.800	0.123
Aluminum (Al)	0.086	0.010
Barium (Ba)	0.380	0.006
Manganese (Mn)	0.028	0.001
Total Cations		10.462



Ion Difference (meq/L)=	0.025
Cation/Anion Balance (%)	0.121
Ionic Strength(I)=	0.013

pH=	7.24
pOH=	6.76
TDS(mg/L)=	633
SC(umhos/cm)=	1084.00
TDS/SC=	0.58

FIGURE B20

STIFF DIAGRAM AND ASSOCIATED VALUES FCNB7

Flint/Spring Creek Watersheds Partnership

Figure B20 Stiff Diagram – FCNB7

STIFF DIAGRAM AND ASSOCIATED VALUES

Flint/Spring Creek Watersheds Partnership

Anions	mg/L	meq/L
Bicarbonate (HCO_3)	237.758	3.897
Chloride (Cl)	211.000	5.952
Sulfate (SO_4)	19.220	0.400
Nitrate (NO_3)	0.050	0.001
Fluoride (F)	0.020	0.001
Phosphate (PO_4)	0.493	0.016
Total Anions		10.267

Ion Activity Products	IAP	Ksp	IAP/Ksp
Halite NaCl	2.665E-05	3.730E+01	7.144E-07
$CaCl_2$	2.185E-08	1.210E+03	1.806E-11
Gypsum $CaSO_4$	9.972E-08	2.625E-05	3.799E-03
Calcite $CaCO_3$	2.723E-06	3.300E-09	8.254E+02
Magnesite $MgCO_3$	2.491E-06	2.595E-05	9.600E-02
$Mg(OH)_2$	7.440E-16	1.200E-11	6.200E-05
Goethite $Fe(OH)_3$	8.628E-25	1.000E-38	8.628E+13

Cations	mg/L	meq/L
Sodium (Na)	130.000	5.655
Calcium (Ca)	49.000	2.445
Magnesium (Mg)	27.000	2.222
Iron (Fe)	0.070	0.003
Potassium (K)	4.800	0.123
Aluminum (Al)	0.004	0.000
Barium (Ba)	0.079	0.001
Manganese (Mn)	0.060	0.002
Total Cations		10.451

Ion Difference (meq/L)=	0.184
Cation/Anion Balance (%)	0.889
Ionic Strength(I)=	0.013

pH=	8.01
pOH=	5.99
TDS(mg/L)=	164
SC(umhos/cm)=	1060.00
TDS/SC=	0.15

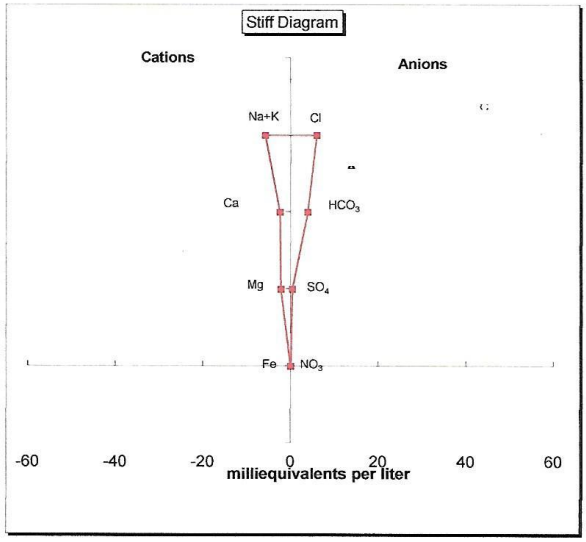


FIGURE B21

STIFF DIAGRAM AND ASSOCIATED VALUES
FCLC10

Flint/Spring Creek Watersheds Partnership

Figure B21 Stiff Diagram – FCLC10

STIFF DIAGRAM AND ASSOCIATED VALUES

Flint/Spring Creek Watersheds Partnership

Anions	mg/L	meq/L
Bicarbonate (HCO_3)	217.030	3.557
Chloride (Cl)	210.000	5.924
Sulfate (SO_4)	21.640	0.451
Nitrate (NO_3)	0.140	0.002
Fluoride (F)	0.180	0.009
Phosphate (PO_4)	0.070	0.002
Total Anions		9.946

Ion Activity Products	IAP	Ksp	IAP/Ksp
Halite NaCl	2.254E-05	3.730E+01	6.043E-07
$CaCl_2$	2.058E-08	1.210E+03	1.701E-11
Gypsum $CaSO_4$	1.071E-07	2.625E-05	4.080E-03
Calcite $CaCO_3$	2.357E-06	3.300E-09	7.144E+02
Magnesite $MgCO_3$	2.467E-06	2.595E-05	9.505E-02
$Mg(OH)_2$	3.060E-17	1.200E-11	2.550E-06
Goethite $Fe(OH)_3$	2.576E-26	1.000E-38	2.576E+12

Cations	mg/L	meq/L
Sodium (Na)	110.000	4.785
Calcium (Ca)	46.000	2.295
Magnesium (Mg)	29.000	2.386
Iron (Fe)	0.280	0.010
Potassium (K)	5.300	0.136
Aluminum (Al)	0.056	0.006
Barium (Ba)	0.060	0.001
Manganese (Mn)	0.160	0.006
Total Cations		9.625

Ion Difference (meq/L)=	0.320
Cation/Anion Balance (%)	1.637
Ionic Strength(I)=	0.012

pH=	7.30
pOH=	6.70
TDS(mg/L)=	600
SC(umhos/cm)=	1043.00
TDS/SC=	0.58

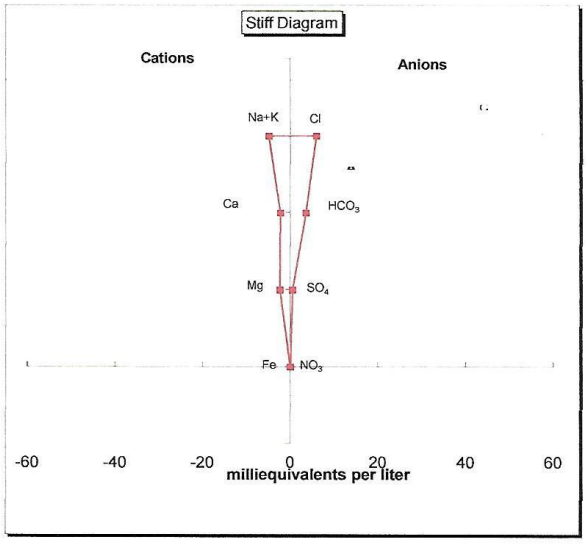


FIGURE B22

STIFF DIAGRAM AND ASSOCIATED VALUES
FCLB4Q

Flint/Spring Creek Watersheds Partnership

Figure B22 Stiff Diagram – FCLB4Q

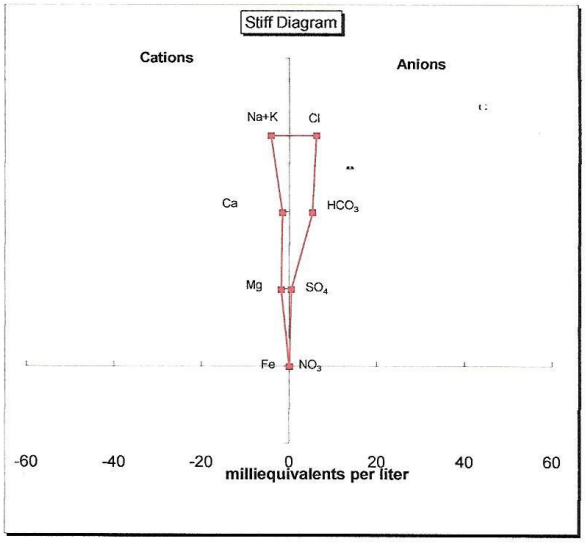
STIFF DIAGRAM AND ASSOCIATED VALUES

Flint/Spring Creek Watersheds Partnership

Anions	mg/L	meq/L
Bicarbonate (HCO_3)	321.887	5.276
Chloride (Cl)	218.000	6.150
Sulfate (SO_4)	20.380	0.424
Nitrate (NO_3)	0.807	0.013
Fluoride (F)	0.020	0.001
Phosphate (PO_4)	0.493	0.016
Total Anions		11.879

Ion Activity Products	IAP	Ksp	IAP/Ksp
Halite NaCl	2.030E-05	3.730E+01	5.441E-07
$CaCl_2$	1.562E-08	1.210E+03	1.291E-11
Gypsum $CaSO_4$	7.132E-08	2.625E-05	2.717E-03
Calcite $CaCO_3$	2.457E-06	3.300E-09	7.445E+02
Magnesite $MgCO_3$	2.930E-06	2.595E-05	1.129E-01
$Mg(OH)_2$	5.607E-16	1.200E-11	4.673E-05
Goethite $Fe(OH)_3$	4.374E-24	1.000E-38	4.374E+14

Cations	mg/L	meq/L
Sodium (Na)	95.000	4.133
Calcium (Ca)	32.000	1.597
Magnesium (Mg)	23.000	1.893
Iron (Fe)	0.430	0.015
Potassium (K)	3.600	0.092
Aluminum (Al)	0.300	0.033
Barium (Ba)	0.079	0.001
Manganese (Mn)	0.150	0.005
Total Cations		7.769



Ion Difference (meq/L)=	4.110
Cation/Anion Balance (%)	20.917
Ionic Strength(I)=	0.012

pH=	7.98
pOH=	6.02
TDS(mg/L)=	164
SC(umhos/cm)=	1283.00
TDS/SC=	0.13

FIGURE B23

STIFF DIAGRAM AND ASSOCIATED VALUES
FCLC11

Flint/Spring Creek Watersheds Partnership

Figure B23 Stiff Diagram – FCLC11

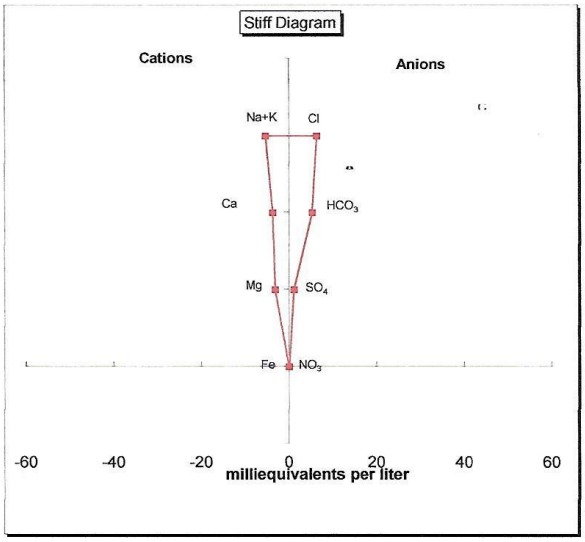
STIFF DIAGRAM AND ASSOCIATED VALUES

Flint/Spring Creek Watersheds Partnership

Anions	mg/L	meq/L
Bicarbonate (HCO_3)	320.668	5.256
Chloride (Cl)	223.000	6.291
Sulfate (SO_4)	51.180	1.066
Nitrate (NO_3)	0.524	0.008
Fluoride (F)	0.373	0.020
Phosphate (PO_4)	0.493	0.016
Total Anions		12.656

Ion Activity Products	IAP	Ksp	IAP/Ksp
Halite NaCl	2.526E-05	3.730E+01	6.773E-07
$CaCl_2$	3.443E-08	1.210E+03	2.845E-11
Gypsum $CaSO_4$	3.659E-07	2.625E-05	1.394E-02
Calcite $CaCO_3$	5.266E-06	3.300E-09	1.596E+03
Magnesite $MgCO_3$	4.554E-06	2.595E-05	1.755E-01
$Mg(OH)_2$	6.154E-16	1.200E-11	5.128E-05
Goethite $Fe(OH)_3$	1.048E-23	1.000E-38	1.048E+15

Cations	mg/L	meq/L
Sodium (Na)	120.000	5.220
Calcium (Ca)	75.000	3.743
Magnesium (Mg)	39.000	3.209
Iron (Fe)	1.910	0.068
Potassium (K)	6.100	0.156
Aluminum (Al)	1.500	0.167
Barium (Ba)	0.079	0.001
Manganese (Mn)	0.230	0.008
Total Cations		12.573



Ion Difference (meq/L)=	0.083
Cation/Anion Balance (%)	0.330
Ionic Strength(I)=	0.017

pH=	7.90
pOH=	6.10
TDS(mg/L)=	164
SC(umhos/cm)=	1282.00
TDS/SC=	0.13

FIGURE B24

STIFF DIAGRAM AND ASSOCIATED VALUES
FCLC12

Flint/Spring Creek Watersheds Partnership

Figure B24 Stiff Diagram – FCLC12

STIFF DIAGRAM AND ASSOCIATED VALUES

Flint/Spring Creek Watersheds Partnership

Anions	mg/L	meq/L
Bicarbonate (HCO_3)	287.748	4.716
Chloride (Cl)	245.000	6.911
Sulfate (SO_4)	50.340	1.048
Nitrate (NO_3)	0.580	0.009
Fluoride (F)	0.300	0.016
Phosphate (PO_4)	0.200	0.006
Total Anions		12.707

Ion Activity Products	IAP	Ksp	IAP/Ksp
Halite NaCl	3.021E-05	3.730E+01	8.100E-07
$CaCl_2$	3.764E-08	1.210E+03	3.110E-11
Gypsum $CaSO_4$	3.272E-07	2.625E-05	1.246E-02
Calcite $CaCO_3$	4.268E-06	3.300E-09	1.293E+03
Magnesite $MgCO_3$	3.813E-06	2.595E-05	1.469E-01
$Mg(OH)_2$	1.254E-15	1.200E-11	1.045E-04
Goethite $Fe(OH)_3$	8.775E-24	1.000E-38	8.775E+14

Cations	mg/L	meq/L
Sodium (Na)	130.000	5.655
Calcium (Ca)	67.000	3.343
Magnesium (Mg)	36.000	2.962
Iron (Fe)	0.490	0.018
Potassium (K)	5.800	0.148
Aluminum (Al)	0.140	0.016
Barium (Ba)	0.054	0.001
Manganese (Mn)	0.140	0.005
Total Cations		12.148

Ion Difference (meq/L)=	0.559
Cation/Anion Balance (%)	2.249
Ionic Strength(I)=	0.016

pH=	8.07
pOH=	5.93
TDS(mg/L)=	800
SC(umhos/cm)=	1318.00
TDS/SC=	0.61

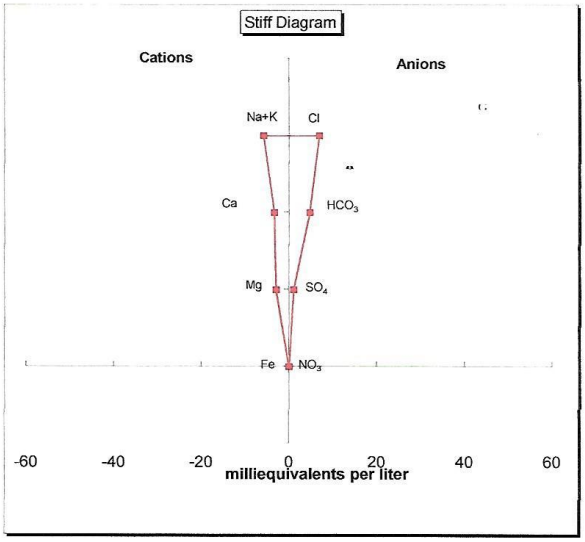


FIGURE B25

STIFF DIAGRAM AND ASSOCIATED VALUES
FCLB5Q

Flint/Spring Creek Watersheds Partnership

Figure B25 Stiff Diagram – FCLB5Q

STIFF DIAGRAM AND ASSOCIATED VALUES

Flint/Spring Creek Watersheds Partnership

Anions	mg/L	meq/L
Bicarbonate (HCO_3)	219.469	3.597
Chloride (Cl)	220.000	6.206
Sulfate (SO_4)	99.660	2.075
Nitrate (NO_3)	0.170	0.003
Fluoride (F)	0.250	0.013
Phosphate (PO_4)	0.040	0.001
Total Anions		11.895

Ion Activity Products	IAP	Ksp	IAP/Ksp
Halite NaCl	2.904E-05	3.730E+01	7.786E-07
$CaCl_2$	3.474E-08	1.210E+03	2.871E-11
Gypsum $CaSO_4$	7.378E-07	2.625E-05	2.810E-02
Calcite $CaCO_3$	3.739E-06	3.300E-09	1.133E+03
Magnesite $MgCO_3$	2.710E-06	2.595E-05	1.044E-01
$Mg(OH)_2$	3.878E-16	1.200E-11	3.232E-05
Goethite $Fe(OH)_3$	4.727E-24	1.000E-38	4.727E+14

Cations	mg/L	meq/L
Sodium (Na)	140.000	6.090
Calcium (Ca)	78.000	3.892
Magnesium (Mg)	34.000	2.798
Iron (Fe)	1.400	0.050
Potassium (K)	5.900	0.151
Aluminum (Al)	1.000	0.111
Barium (Ba)	0.017	0.000
Manganese (Mn)	0.100	0.004
Total Cations		13.096

Ion Difference (meq/L)=	1.201
Cation/Anion Balance (%)	4.805
Ionic Strength(I)=	0.017

pH=	7.83
pOH=	6.17
TDS(mg/L)=	733
SC(umhos/cm)=	1220.00
TDS/SC=	0.60

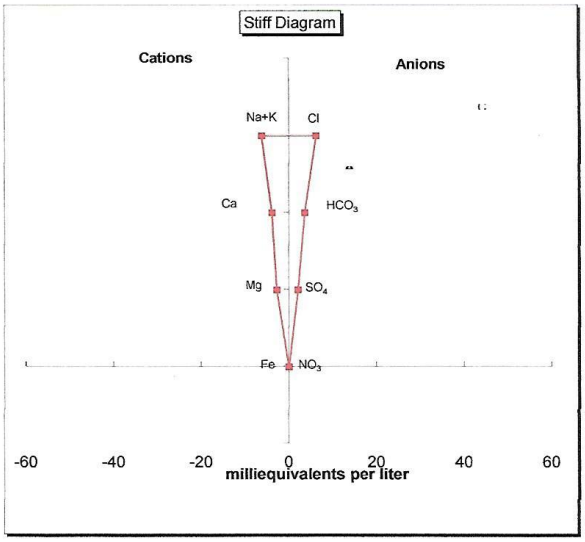


FIGURE B26

STIFF DIAGRAM AND ASSOCIATED VALUES
SCSB1

Flint/Spring Creek Watersheds Partnership

Figure B26 Stiff Diagram – SCSB1

STIFF DIAGRAM AND ASSOCIATED VALUES

Flint/Spring Creek Watersheds Partnership

Anions	mg/L	meq/L
Bicarbonate (HCO_3)	319.449	5.236
Chloride (Cl)	156.000	4.401
Sulfate (SO_4)	17.040	0.355
Nitrate (NO_3)	0.016	0.000
Fluoride (F)	0.210	0.011
Phosphate (PO_4)	0.040	0.001
Total Anions		10.004

Ion Activity Products	IAP	Ksp	IAP/Ksp
Halite NaCl	1.470E-05	3.730E+01	3.941E-07
$CaCl_2$	1.870E-08	1.210E+03	1.546E-11
Gypsum $CaSO_4$	1.372E-07	2.625E-05	5.228E-03
Calcite $CaCO_3$	5.762E-06	3.300E-09	1.746E+03
Magnesite $MgCO_3$	4.241E-06	2.595E-05	1.634E-01
$Mg(OH)_2$	9.036E-18	1.200E-11	7.530E-07
Goethite $Fe(OH)_3$	1.129E-26	1.000E-38	1.129E+12

Cations	mg/L	meq/L
Sodium (Na)	98.000	4.263
Calcium (Ca)	79.000	3.942
Magnesium (Mg)	35.000	2.880
Iron (Fe)	1.000	0.036
Potassium (K)	3.400	0.087
Aluminum (Al)	0.034	0.004
Barium (Ba)	0.058	0.001
Manganese (Mn)	0.780	0.028
Total Cations		11.241

Ion Difference (meq/L)=	1.237
Cation/Anion Balance (%)	5.823
Ionic Strength(I)=	0.014

pH=	7.00
pOH=	7.00
TDS(mg/L)=	600
SC(umhos/cm)=	1057.00
TDS/SC=	0.57

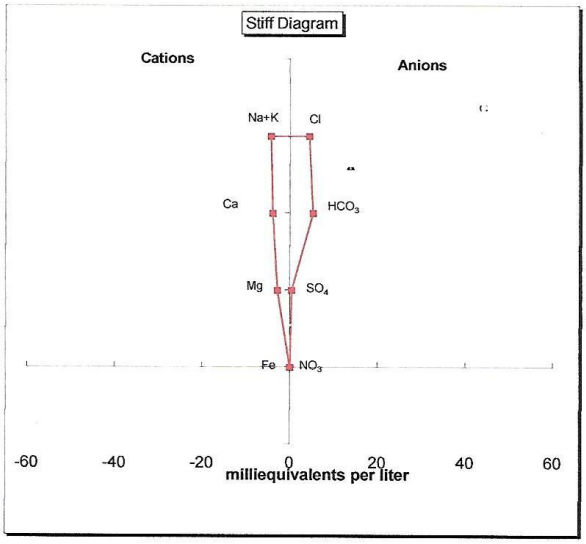


FIGURE B27

STIFF DIAGRAM AND ASSOCIATED VALUES
SCSB2

Flint/Spring Creek Watersheds Partnership

Figure B27 Stiff Diagram – SCSB2

F

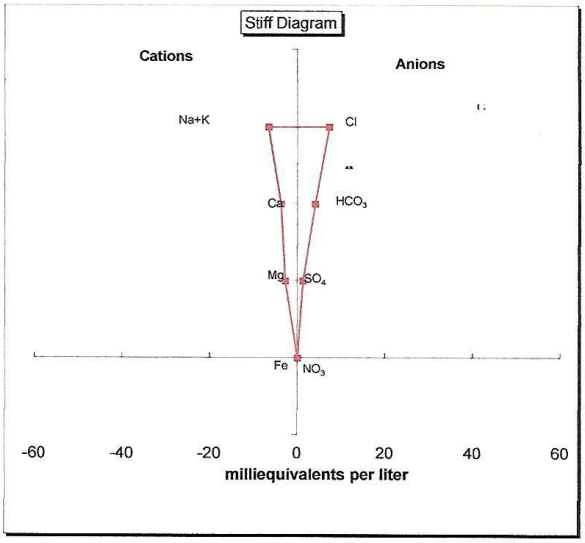
STIFF DIAGRAM AND ASSOCIATED VALUES

Flint/Spring Creek Watersheds Partnership

Anions	mg/L	meq/L
Bicarbonate (HCO_3)	246.293	4.037
Chloride (Cl)	258.000	7.278
Sulfate (SO_4)	60.490	1.259
Nitrate (NO_3)	0.057	0.001
Phosphate (PO_4)	0.010	0.000
Total Anions		12.576

Ion Activity Products	IAP	Ksp	IAP/Ksp
Halite NaCl	3.654E-05	3.730E+01	9.796E-07
$CaCl_2$	4.610E-08	1.210E+03	3.810E-11
Gypsum $CaSO_4$	4.326E-07	2.625E-05	1.648E-02
Calcite $CaCO_3$	4.046E-06	3.300E-09	1.226E+03
Magnesite $MgCO_3$	3.050E-06	2.595E-05	1.175E-01
$Mg(OH)_2$	3.233E-16	1.200E-11	2.694E-05
Goethite $Fe(OH)_3$	8.471E-25	1.000E-38	8.471E+13

Cations	mg/L	meq/L
Sodium (Na)	150.000	6.525
Calcium (Ca)	75.000	3.743
Magnesium (Mg)	34.000	2.798
Iron (Fe)	0.330	0.012
Potassium (K)	4.400	0.113
Aluminum (Al)	0.180	0.020
Barium (Ba)	0.072	0.001
Manganese (Mn)	0.005	0.000
Total Cations		13.211



Ion Difference (meq/L)=	0.625
RPD(%)=	2.424
Ionic Strength(I)=	0.017

pH=	7.79
pOH=	6.21
TDS(mg/L)=	767
SC(umhos/cm)=	897.00
TDS/SC=	0.86

FIGURE B28

STIFF DIAGRAM AND ASSOCIATED VALUES
SCBH1Q

Flint/Spring Creek Watersheds Partnership

Figure B28 Stiff Diagram – SCBH1Q

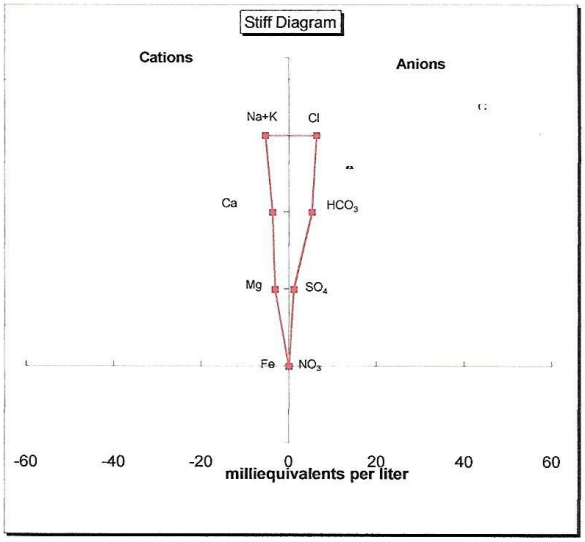
STIFF DIAGRAM AND ASSOCIATED VALUES

Flint/Spring Creek Watersheds Partnership

Anions	mg/L	meq/L
Bicarbonate (HCO_3)	320.668	5.256
Chloride (Cl)	223.000	6.291
Sulfate (SO_4)	51.180	1.066
Nitrate (NO_3)	0.524	0.008
Fluoride (F)	0.373	0.020
Phosphate (PO_4)	0.493	0.016
Total Anions		12.656

Ion Activity Products	IAP	Ksp	IAP/Ksp
Halite NaCl	2.526E-05	3.730E+01	6.773E-07
$CaCl_2$	3.443E-08	1.210E+03	2.845E-11
Gypsum $CaSO_4$	3.659E-07	2.625E-05	1.394E-02
Calcite $CaCO_3$	5.266E-06	3.300E-09	1.596E+03
Magnesite $MgCO_3$	4.554E-06	2.595E-05	1.755E-01
$Mg(OH)_2$	6.154E-16	1.200E-11	5.128E-05
Goethite $Fe(OH)_3$	1.048E-23	1.000E-38	1.048E+15

Cations	mg/L	meq/L
Sodium (Na)	120.000	5.220
Calcium (Ca)	75.000	3.743
Magnesium (Mg)	39.000	3.209
Iron (Fe)	1.910	0.068
Potassium (K)	6.100	0.156
Aluminum (Al)	1.500	0.167
Barium (Ba)	0.079	0.001
Manganese (Mn)	0.230	0.008
Total Cations		12.573



Ion Difference (meq/L)=	0.083
Cation/Anion Balance (%)	0.330
Ionic Strength(I)=	0.017

pH=	7.90
pOH=	6.10
TDS(mg/L)=	164
SC(umhos/cm)=	1282.00
TDS/SC=	0.13

FIGURE B29

STIFF DIAGRAM AND ASSOCIATED VALUES
SCBH2Q

Flint/Spring Creek Watersheds Partnership

Figure B29 Stiff Diagram – SCBH2Q

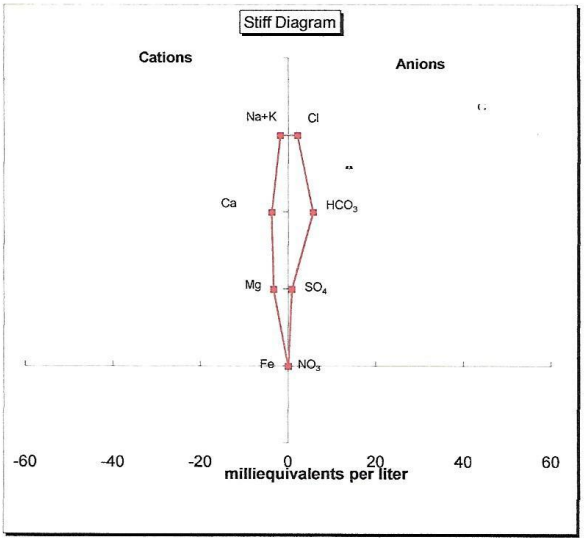
STIFF DIAGRAM AND ASSOCIATED VALUES

Flint/Spring Creek Watersheds Partnership

Anions	mg/L	meq/L
Bicarbonate (HCO_3)	343.834	5.635
Chloride (Cl)	73.400	2.071
Sulfate (SO_4)	37.610	0.783
Nitrate (NO_3)	0.290	0.005
Fluoride (F)	0.170	0.009
Phosphate (PO_4)	0.030	0.001
Total Anions		8.504

Ion Activity Products	IAP	Ksp	IAP/Ksp
Halite NaCl	2.927E-06	3.730E+01	7.848E-08
$CaCl_2$	4.117E-09	1.210E+03	3.402E-12
Gypsum $CaSO_4$	3.041E-07	2.625E-05	1.158E-02
Calcite $CaCO_3$	6.127E-06	3.300E-09	1.857E+03
Magnesite $MgCO_3$	5.487E-06	2.595E-05	2.114E-01
$Mg(OH)_2$	2.260E-15	1.200E-11	1.883E-04
Goethite $Fe(OH)_3$	8.706E-24	1.000E-38	8.706E+14

Cations	mg/L	meq/L
Sodium (Na)	41.000	1.784
Calcium (Ca)	76.000	3.792
Magnesium (Mg)	41.000	3.374
Iron (Fe)	0.250	0.009
Potassium (K)	2.500	0.064
Aluminum (Al)	0.033	0.004
Barium (Ba)	0.067	0.001
Manganese (Mn)	0.017	0.001
Total Cations		9.028



Ion Difference (meq/L)=	0.524
Cation/Anion Balance (%)	2.991
Ionic Strength(I)=	0.013

pH=	8.16
pOH=	5.84
TDS(mg/L)=	533
SC(umhos/cm)=	835.00
TDS/SC=	0.64

FIGURE B30

STIFF DIAGRAM AND ASSOCIATED VALUES
SCBH3Q

Flint/Spring Creek Watersheds Partnership

Figure B30 Stiff Diagram – SCBH3Q

Appendix C - Storm Event

Table C1 Storm Event Chemistry Data

	E. coli (Colonies/ 100 mL)	TDS (mg/L)	TSS (mg/L)	TDP (mg/L)	TP (mg/L)	BOD (mg/L)	O&G (mg/L)	NO3/NO2 (mg/L)	TKN (mg/L)	COD (mg/L)
FCBH2Q	770	400	15	0.078	0.115	9.4	<2.3	0.14	0.94	12
FCB4Q	NA	767	36	0.074	0.907	8.5	<2.5	4.9	1.3	29
FCLB3Q	440	867	17	0.355	0.436	5.97	<2.6	2.7	0.9	23
FCLB4Q	110	600	9.4	0.024	0.043	6.4	<2.4	0.088	0.89	27
FCLB5Q	1200	733	28	0.0182	0.256	7	<2.5	1.5	1.3	29
SCBH1Q	260	700	8	0.02	0.035	6	<2.5	0.049	0.28	20
SCBH2Q	20	600	3.6	0.029	0.05	6.3	<2.6	<0.0025	0.58	28
SCBH3Q	390	567	3.8	0.024	0.034	4.9	<2.3	0.25	<0.26	18

Table C2 Storm Event Field Measurements

	Temperature (°C)	Conductivity (umhos/cm)	Dissolved Oxygen (mg/L)	pH (pH Units)	Discharge (cfs)
FCBH2Q	12.78	0.687	6.12	7.41	0.56
FCB4Q	14.07	1.304	7.08	7.50	8.57
FCLB3Q	11.19	1.421	6.90	7.17	3.68
FCLB4Q	11.26	1.036	6.01	7.23	3.15
FCLB5Q	11.06	1.251	7.71	7.69	4.51
SCBH1Q	11.41	1.232	6.97	7.73	3.24
SCBH2Q	11.23	0.931	5.01	7.66	4.23
SCBH3Q	11.24	0.889	8.65	7.93	3.50

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Table C3 Summary of Storm Event Comparison Results

Measured Parameter	Figure	Points Above, Below or Equal to Equality Line		
		Above	Below	Equal
pH	C1	3	5	0
Specific Conductivity	C2	3	4	1
Dissolved Oxygen	C3	2	6	0
Temperature	C4	0	8	0
Stream Discharge	C5	8	0	0
Total Suspended Solids	C6	6	1	0
Total Dissolved Solids	C7	4	4	0
E Coli	C8	7	1	0
Biological Oxygen Demand	C9	8	0	0
Chemical Oxygen Demand	C10	2	5	0
Total Kjeldahl Nitrogen	C11	1	7	0
Nitrate/Nitrite	C12	4	4	0
Total Phosphorus	C13	1	5	2
Total Dissolved Phosphorus	C14	0	5	3
All Data	C15	49	55	6
		44.5%	50.0%	5.5%

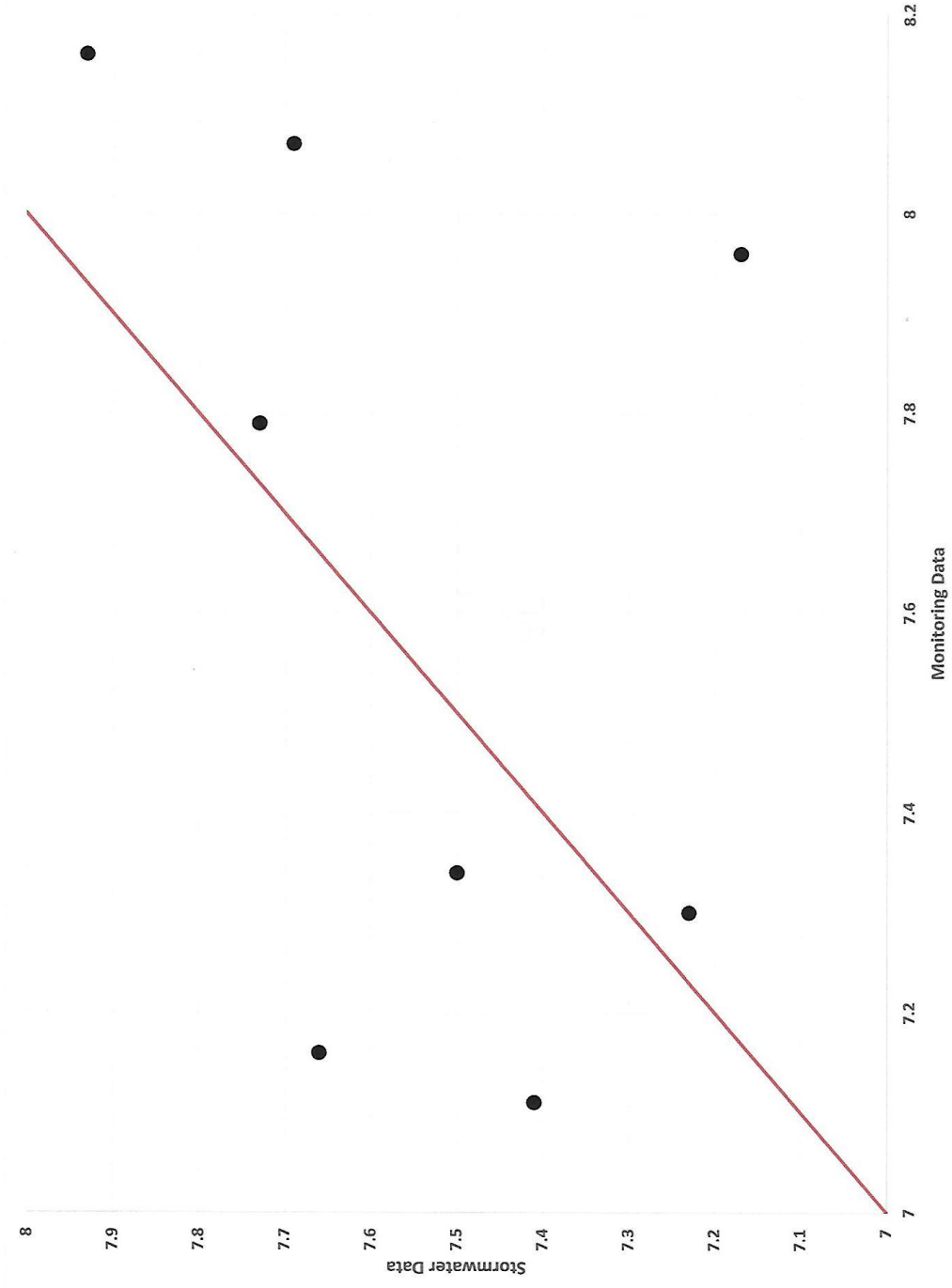


Figure C1 Stormwater Data as a Function of Monitoring Data – pH (pH Units)

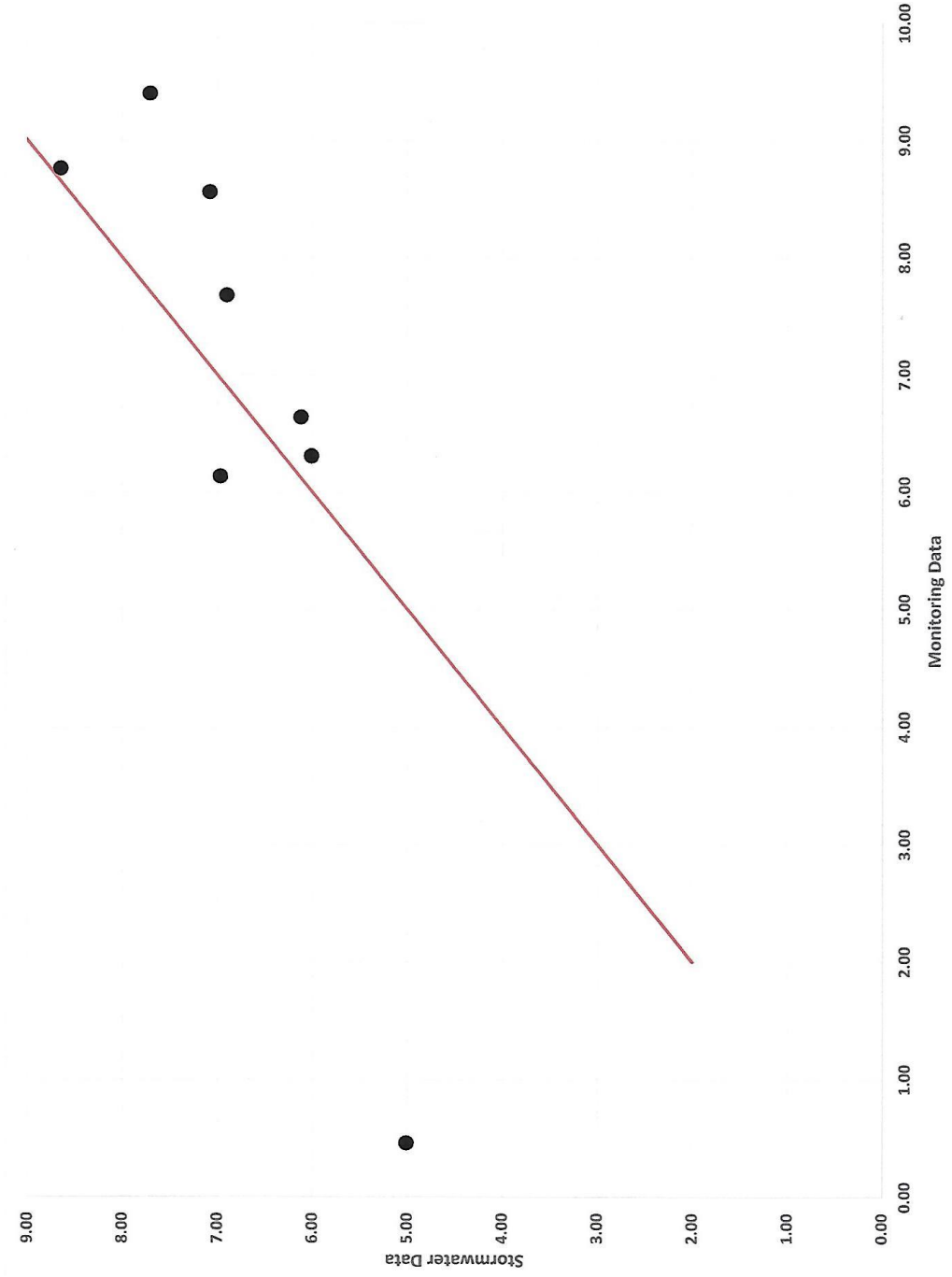


Figure C2 Stormwater Data as a Function of Monitoring Data – Dissolved Oxygen (mg/L)

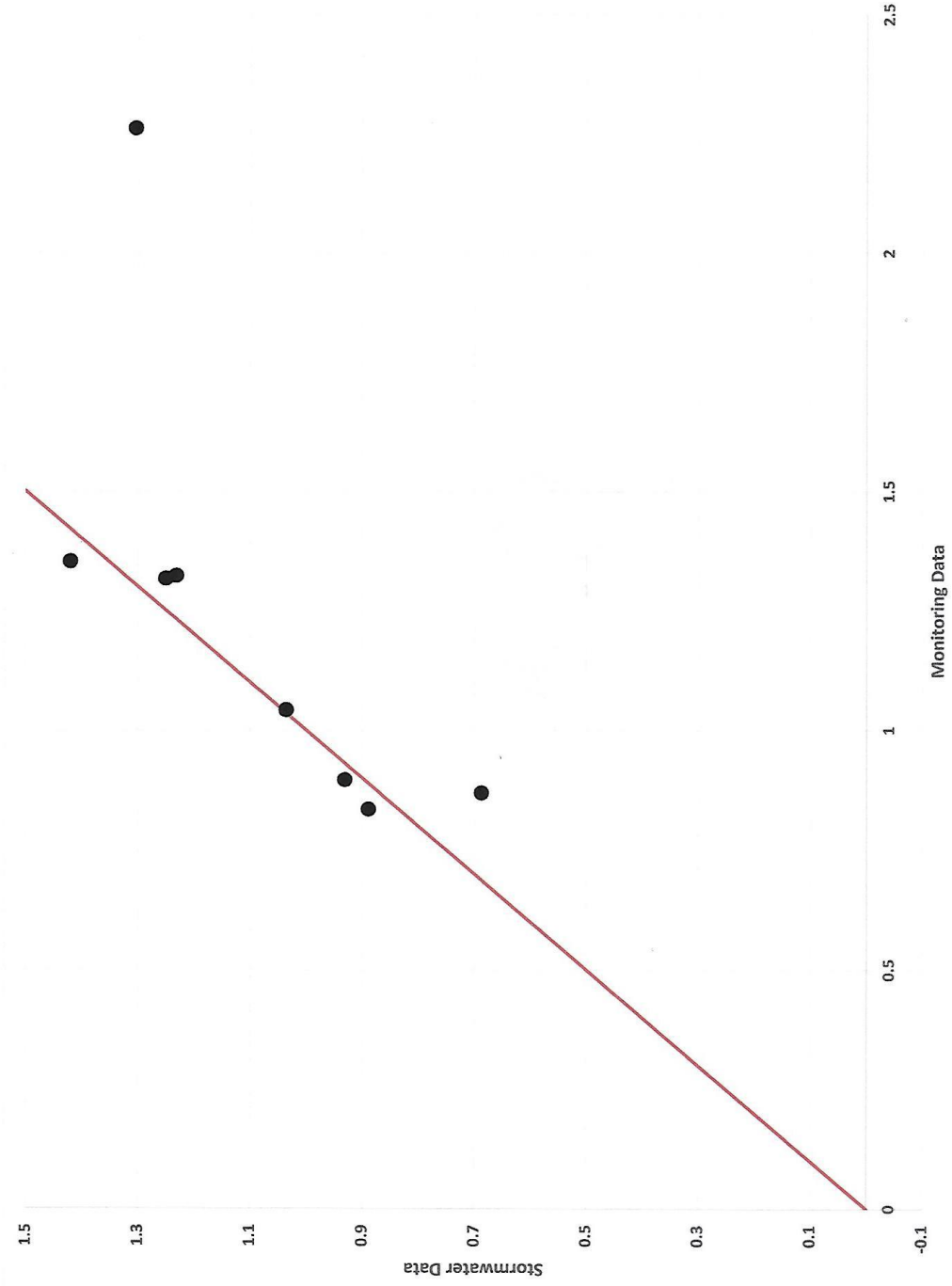


Figure C3 Stormwater Data as a Function of Monitoring Data – Specific Conductivity (µmhos/cm)

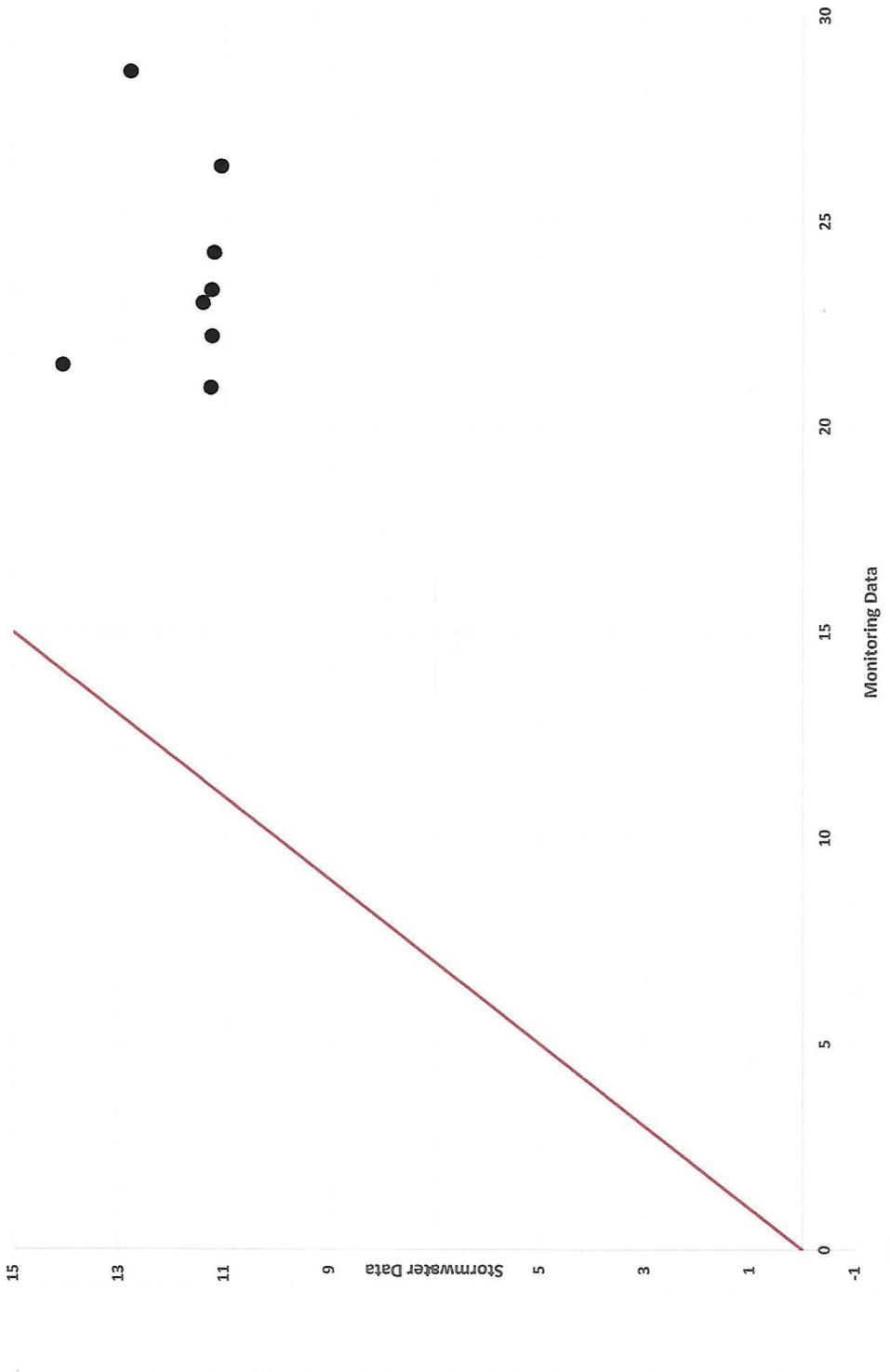


Figure C4 Stormwater Data as a Function of Monitoring Data – Temperature (C°)

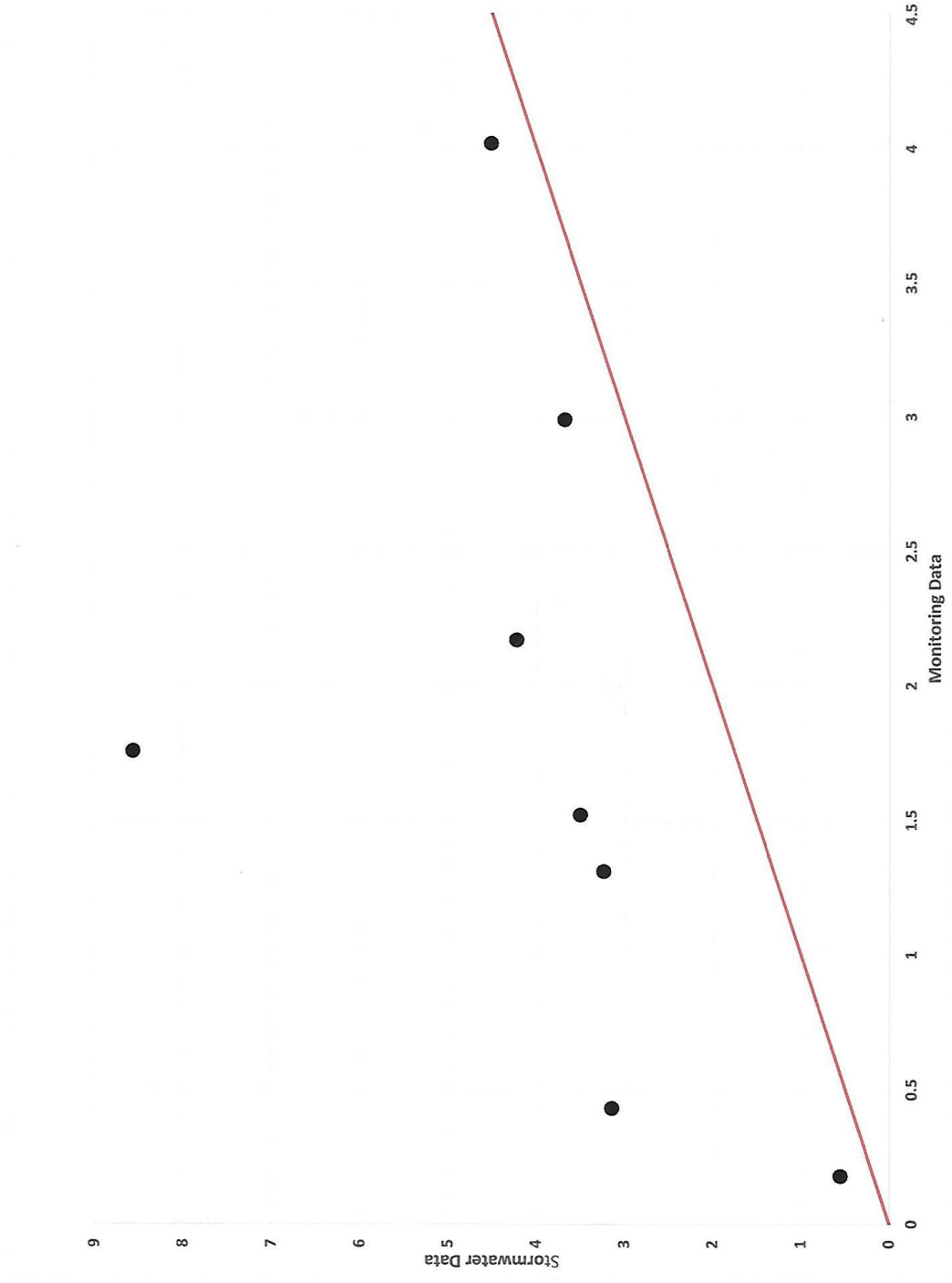


Figure C5 Stormwater Data as a Function of Monitoring Data – Discharge (cfs)

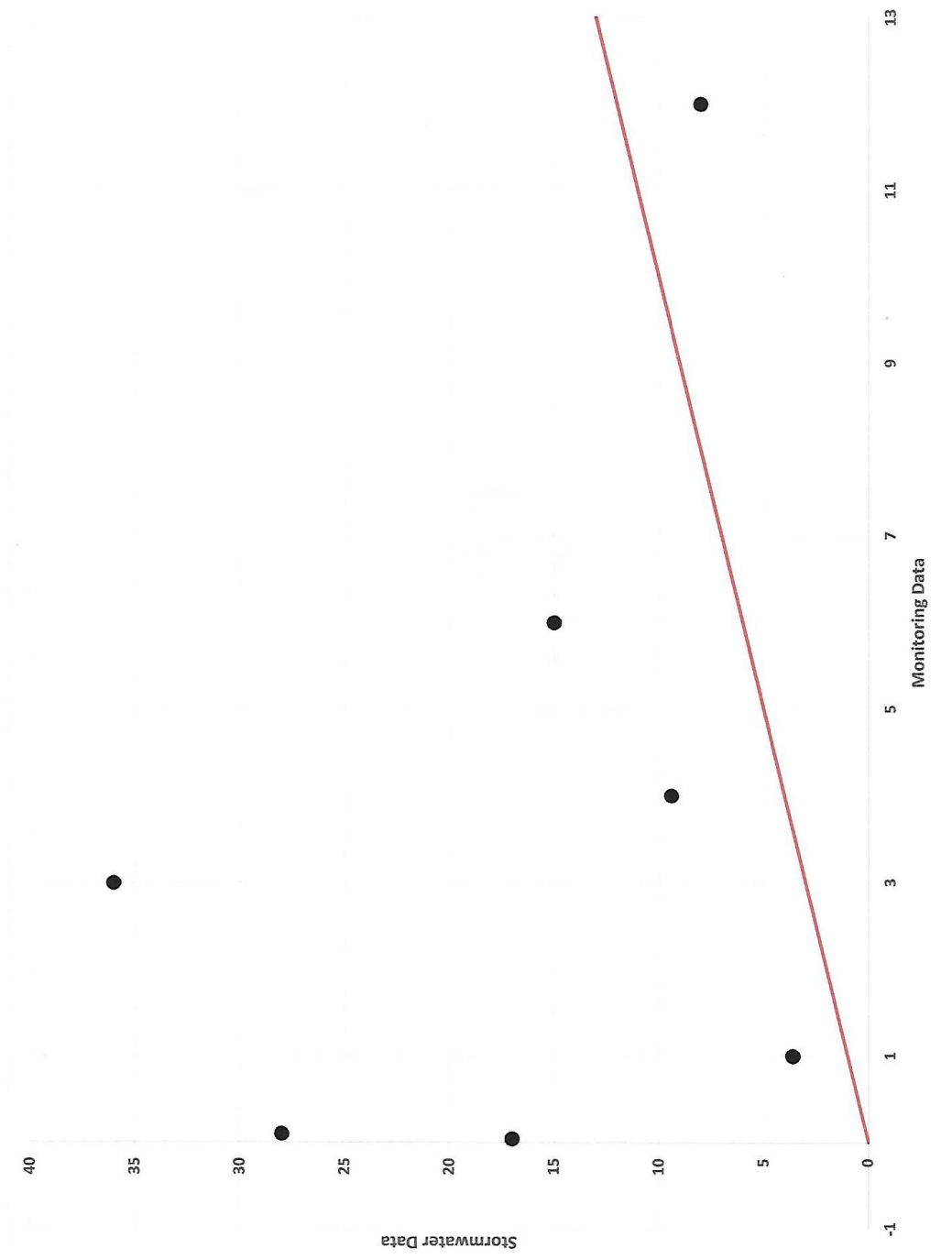


Figure C6 Stormwater Data as a Function of Monitoring Data – Total Suspended Solids (mg/L)

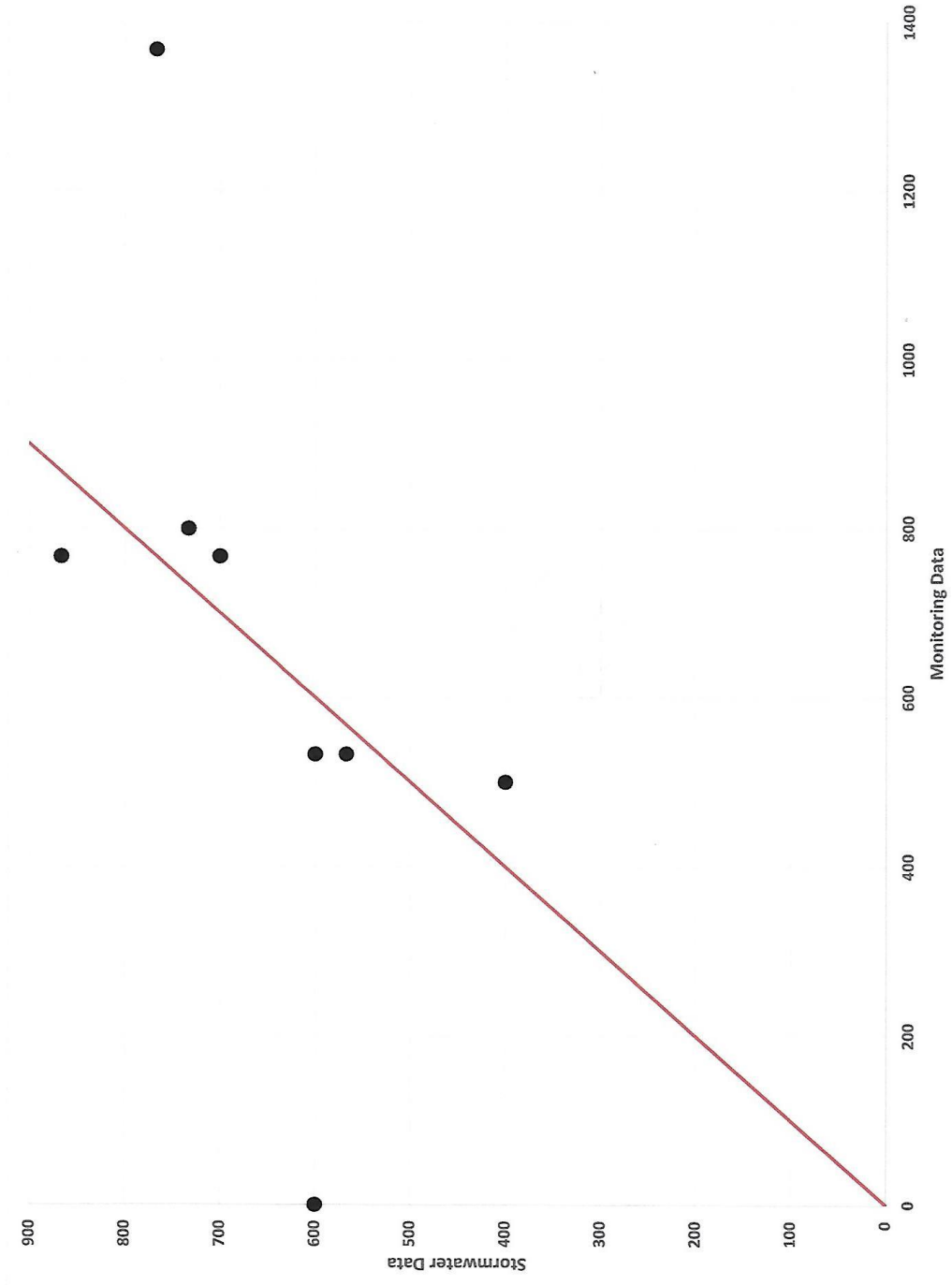


Figure C7 Stormwater Data as a Function of Monitoring Data – Total Dissolved Solids (mg/L)

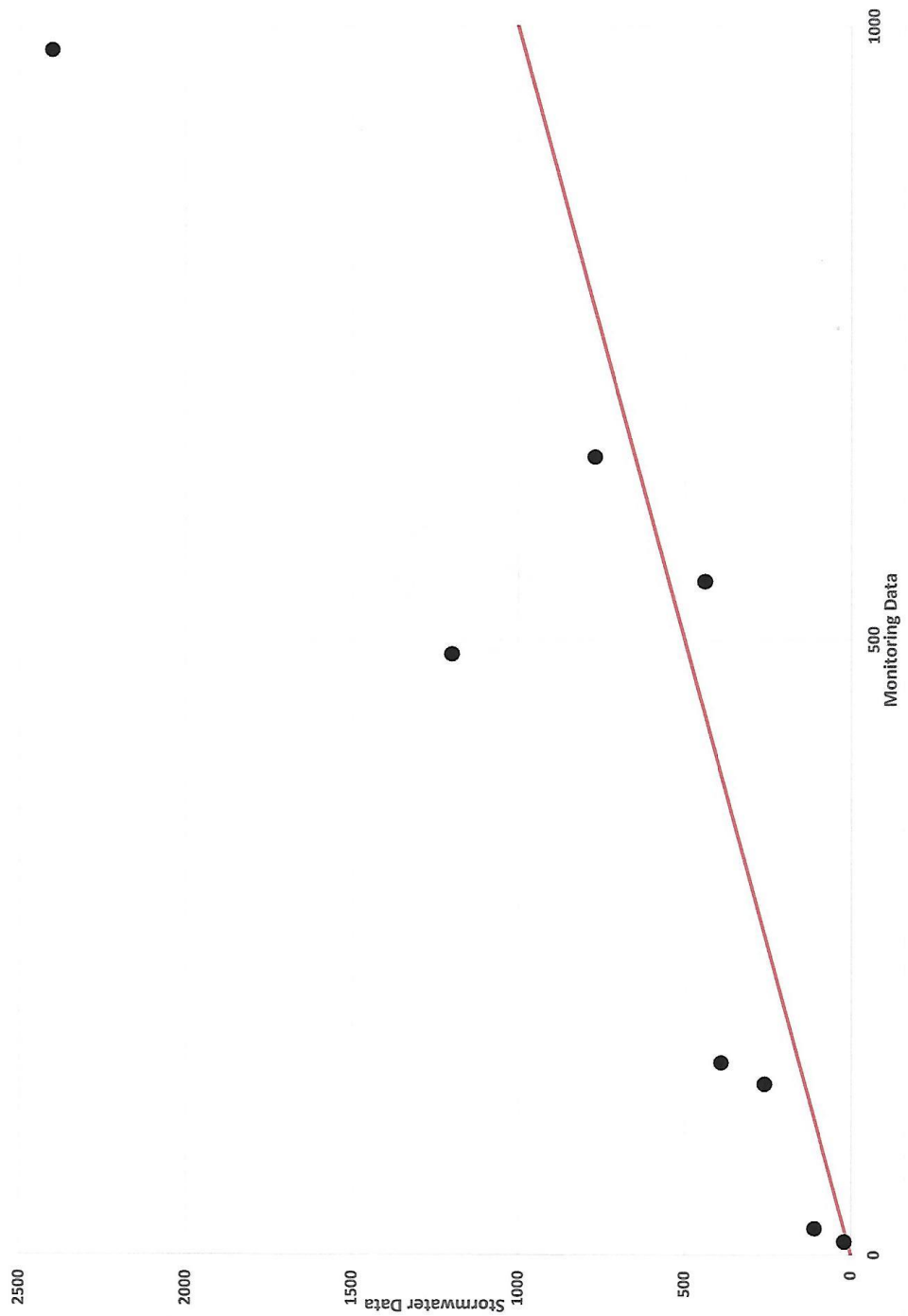


Figure C8 Stormwater Data as a Function of Monitoring Data – E. coli (Colonies/100mL)

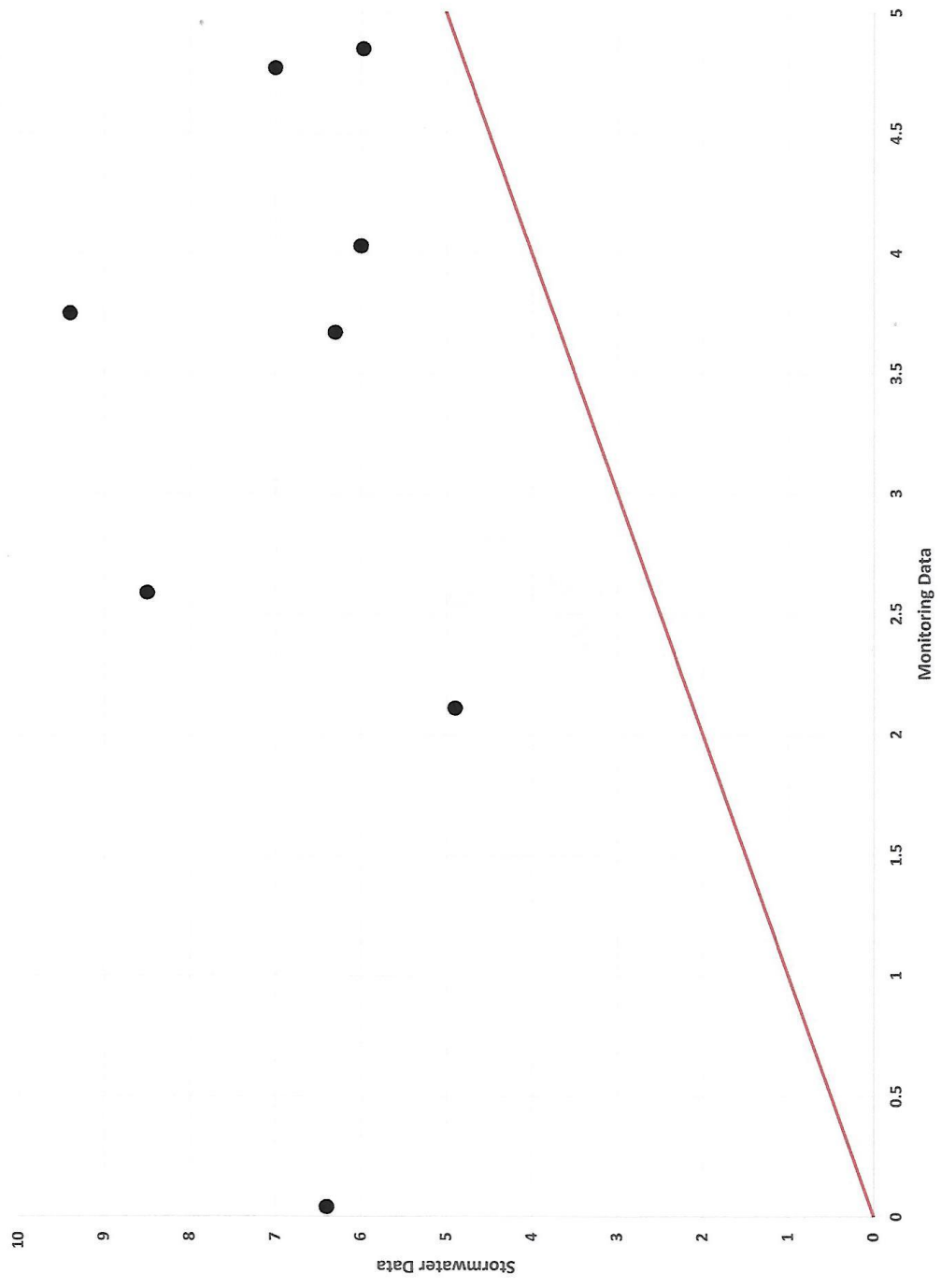


Figure C9 Stormwater Data as a Function of Monitoring Data – Biological Oxygen Demand (mg/L)

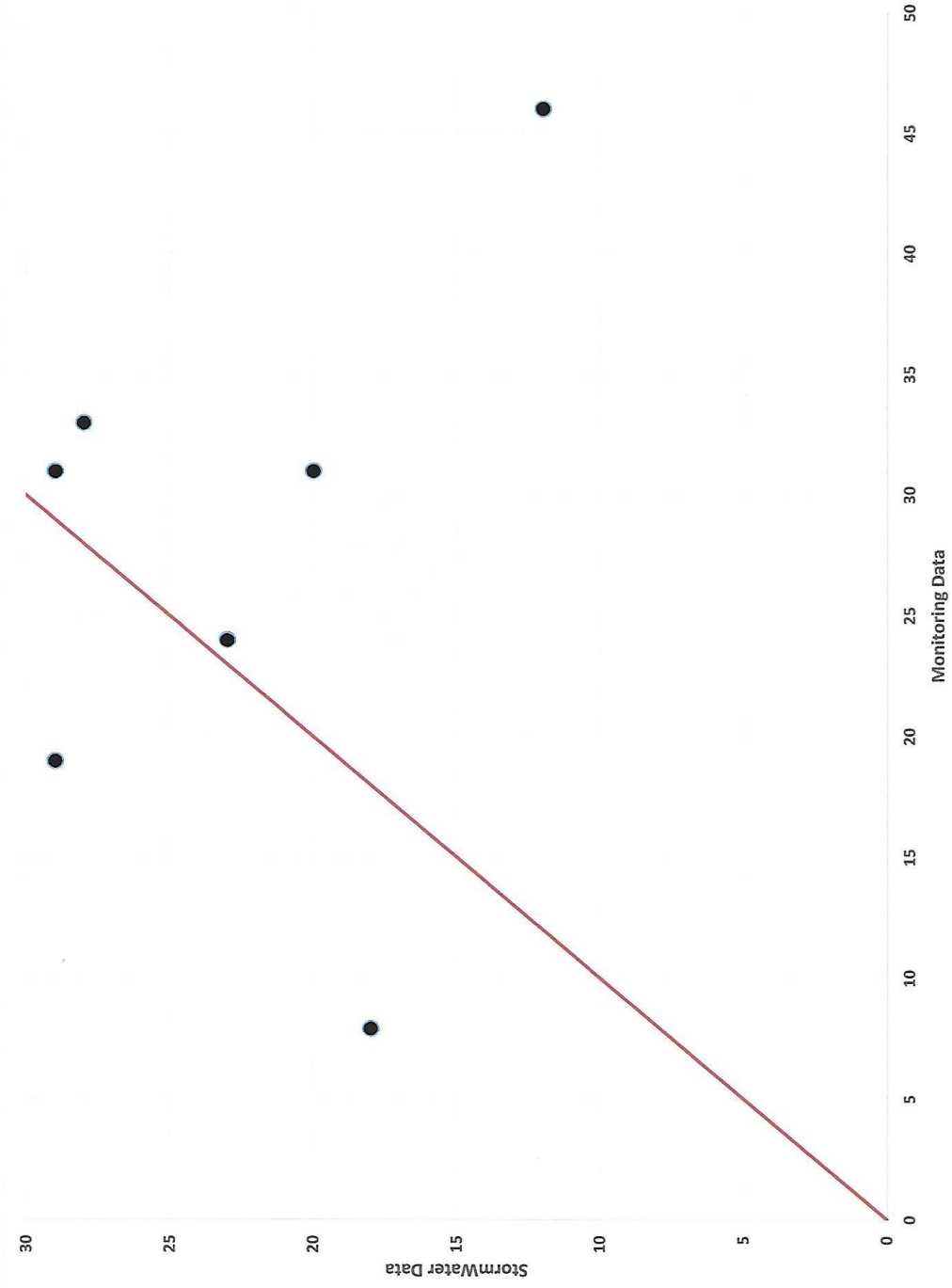


Figure C10 Stormwater Data as a Function of Monitoring Data – Chemical Oxygen Demand (mg/L)

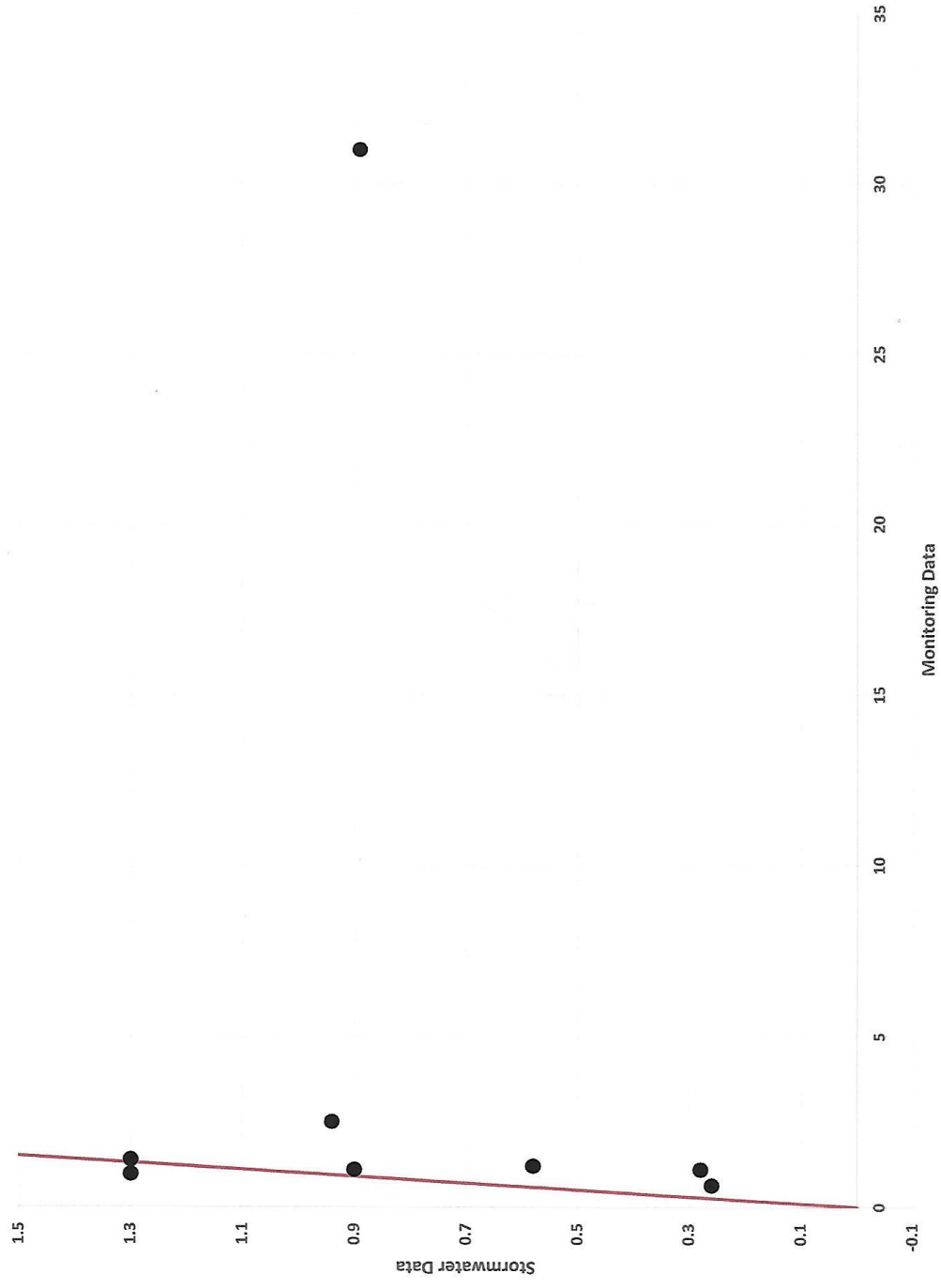


Figure C11 Stormwater Data as a Function of Monitoring Data – Total Kjeldahl Nitrogen (mg/L)

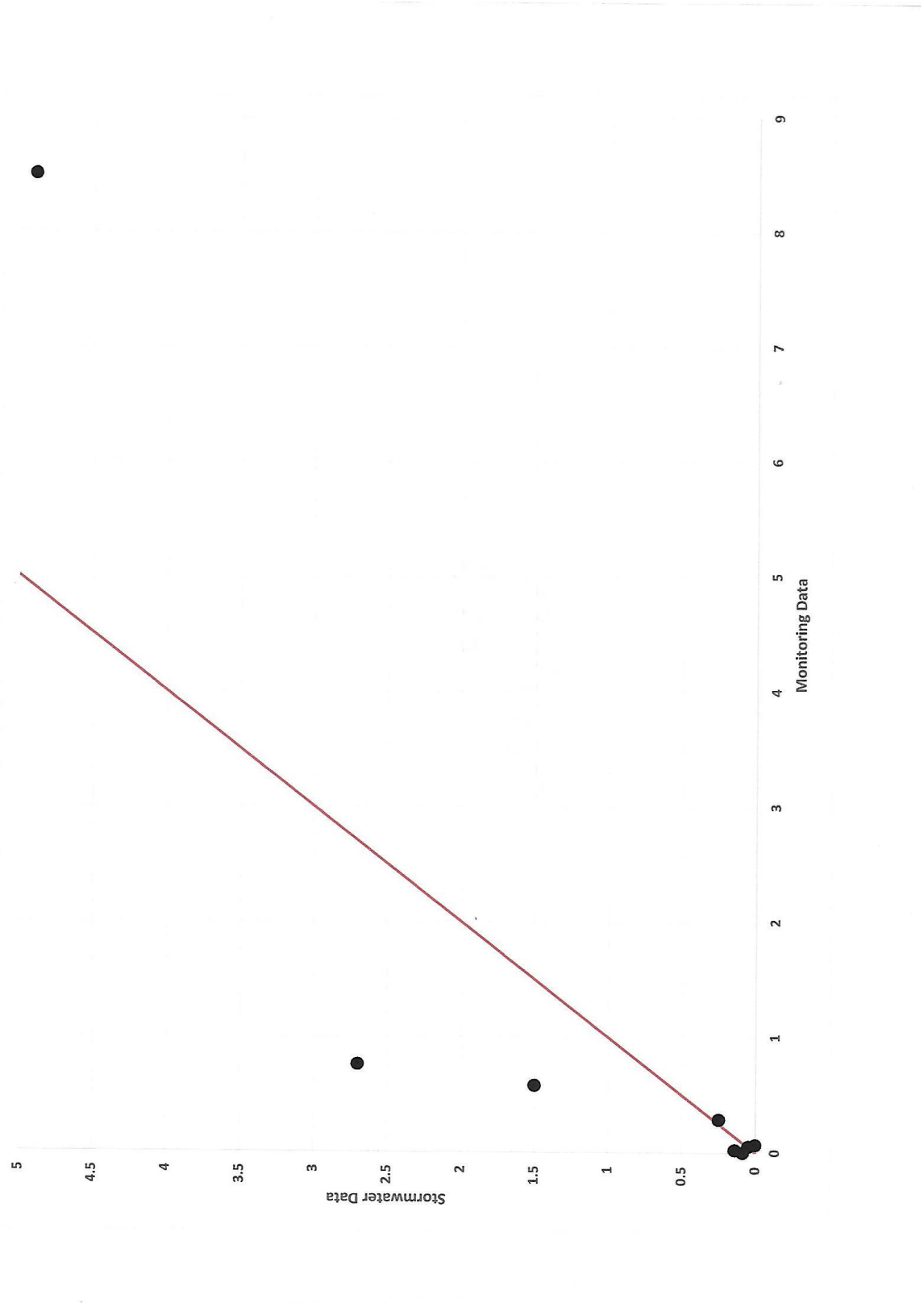


Figure C12 Stormwater Data as a Function of Monitoring Data – Nitrate/Nitrite (mg/L)

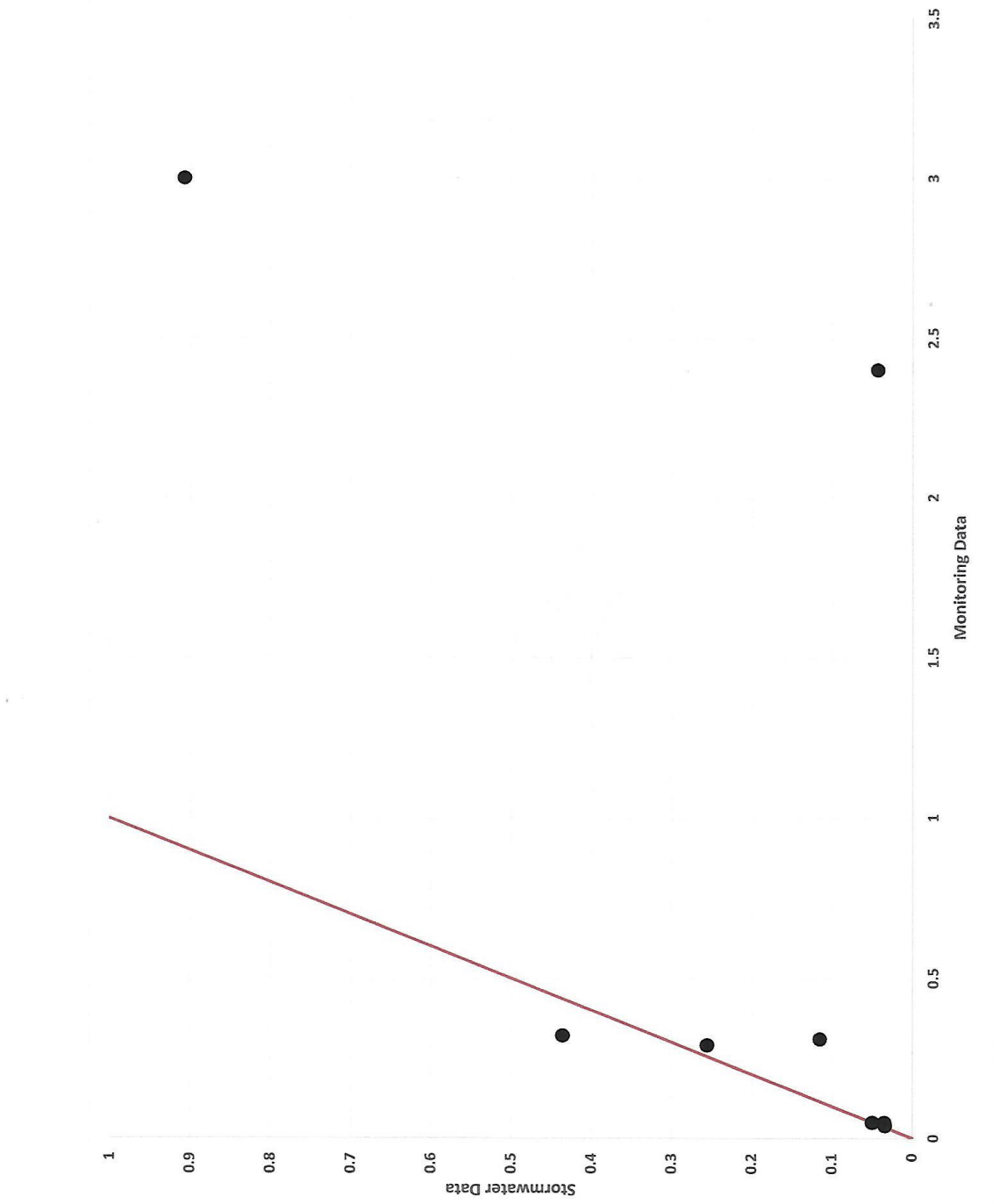


Figure C13 Stormwater Data as a Function of Monitoring Data – Total Phosphorus (mg/L)

Figure C14 Stormwater Data as a Function of Monitoring Data – Total Dissolved Phosphorus (mg/L)

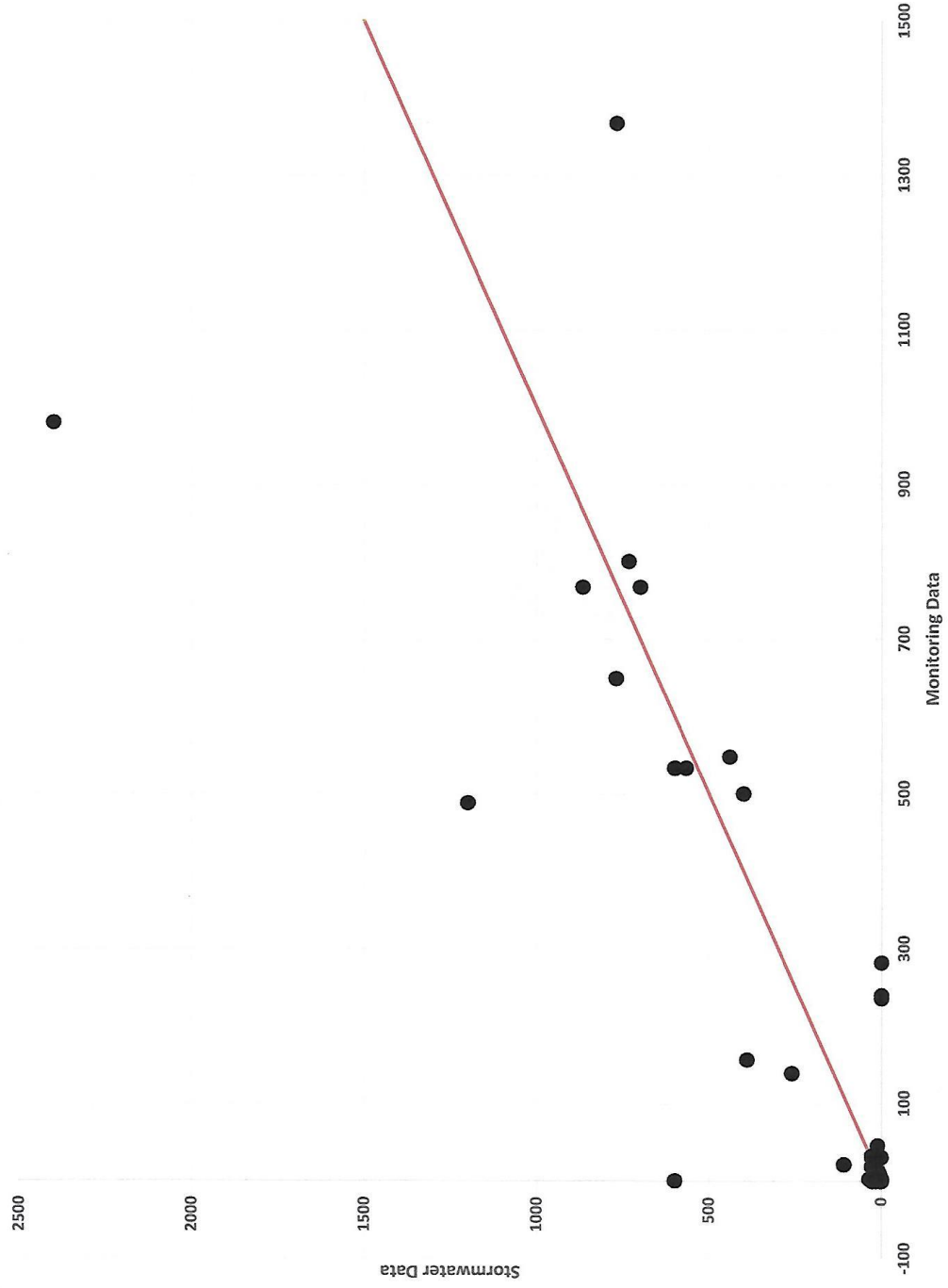


Figure C15 Stormwater Data as a Function of Monitoring Data – All Data

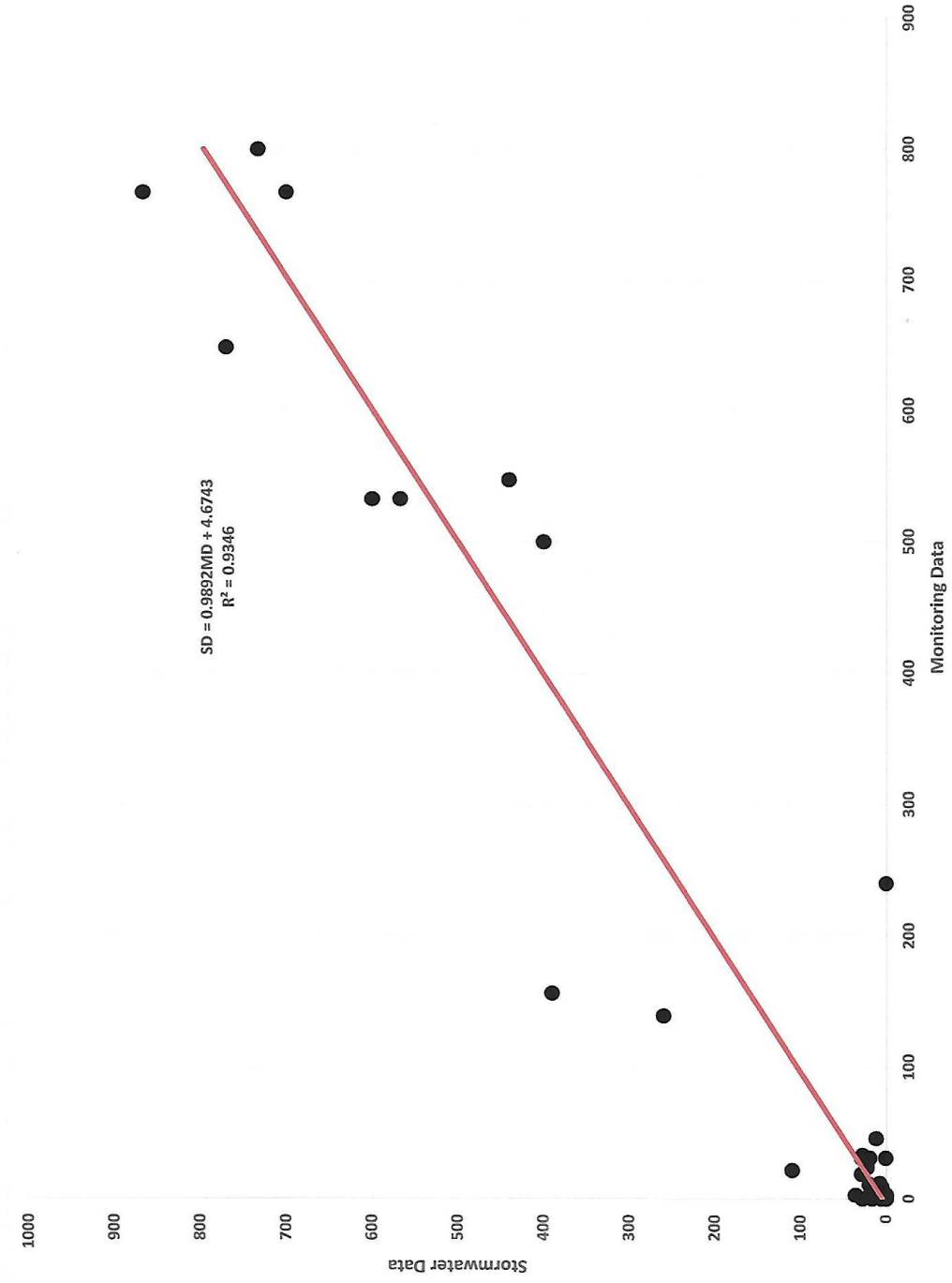


Figure C16 Stormwater Data as a Function of Monitoring Data – Model

Appendix I: Pollutant Loading for New Projects

URBAN RUNOFF BMP POLLUTANT LOAD REDUCTION WORKSHEET

Please fill in the gray areas below.

Notes:
The methodology and efficiency values used in this worksheet were developed by the Illinois Environmental Protection Agency.

Please Select a Best Management Practice:

(•) Vegetated Filter Strips	( ) Sand Filters	( ) Sand Filter/Infiltration Basin
( ) Grass Swales	( ) WQ Inlets	( ) WQ Inlet w/ Sand Filter
( ) Infiltration Device	( ) Weekly Street Sweeping	( ) Oil/Grit Separator
( ) Extended Wet Detention	( ) Infiltration Basin	( ) Wet Pond
( ) Wetland Detention	( ) Infiltration Trench	
( ) Dry Detention	( ) Porous Pavement	
( ) Settling Basin	( ) Concrete Grid Pavement	

Please enter landuse of contributing/drainage area in acres:

	Sewered	Unsewered
Commercial	0	0
Industrial	0	0
Institutional	0	0
Transportation	0	0
Multi-Family	0	0
Residential	0	0
Agriculture	0	0
Vacant	0	0
Open Space	0	180

Note: Sewered and Unsewered refer to storm sewers.

Estimated Load and Load Reductions

	Load before BMP (lbs/yr)		Load after BMP (lbs/yr)		Load Reduction (lbs/yr)
BOD	72		36		36
COD	2,700		1,620		1,080
TSS	3,600		972		2,628
LEAD	1		1		0
COPPER	0		U		U
ZINC	5		2		3
TDS	43,380		U		U
TN	36		22		14
TKN	79		U		U
DP	5		U		U
TP	23		13		11
CADMIUM	0		U		U

U = Removal Efficiency for the particular BMP and constituent unavailable.

URBAN RUNOFF BMP POLLUTANT LOAD REDUCTION WORKSHEET

Please fill in the gray areas below.

Notes:
The methodology and efficiency values used in this worksheet were developed by the Illinois Environmental Protection Agency.

Please Select a Best Management Practice:

○ Vegetated Filter Strips	○ Sand Filters	○ Sand Filter/Infiltration Basin
○ Grass Swales	○ WQ Inlets	○ WQ Inlet w/ Sand Filter
○ Infiltration Device	○ Weekly Street Sweeping	○ Oil/Grit Separator
◉ Extended Wet Detention	○ Infiltration Basin	○ Wet Pond
○ Wetland Detention	○ Infiltration Trench	
○ Dry Detention	○ Porous Pavement	
○ Settling Basin	○ Concrete Grid Pavement	

Please enter landuse of contributing/drainage area in acres:

	Sewered	Unsewered
Commercial	0	0
Industrial	0	0
Institutional	0	0
Transportation	0	0
Multi-Family	0	0
Residential	0	19
Agriculture	0	0
Vacant	0	0
Open Space	0	0

Note: Sewered and Unsewered refer to storm sewers.

Estimated Load and Load Reductions

	Load before BMP (lbs/yr)		Load after BMP (lbs/yr)		Load Reduction (lbs/yr)
BOD	209		59		150
COD	1,349		U		U
TSS	2,926		410		2,516
LEAD	2		1		1
COPPER	0		U		U
ZINC	9		7		2
TDS	4,142		U		U
TN	59		27		32
TKN	30		U		U
DP	2		U		U
TP	8		2		5
CADMIUM	0		U		U

U = Removal Efficiency for the particular BMP and constituent unavailable.

URBAN RUNOFF BMP POLLUTANT LOAD REDUCTION WORKSHEET

Please fill in the gray areas below.

Notes:
The methodology and efficiency values used in this worksheet were developed by the Illinois Environmental Protection Agency.

Please Select a Best Management Practice:

○ Vegetated Filter Strips	○ Sand Filters	○ Sand Filter/Infiltration Basin
○ Grass Swales	○ WQ Inlets	○ WQ Inlet w/ Sand Filter
○ Infiltration Device	○ Weekly Street Sweeping	○ Oil/Grit Separator
◉ Extended Wet Detention	○ Infiltration Basin	○ Wet Pond
○ Wetland Detention	○ Infiltration Trench	
○ Dry Detention	○ Porous Pavement	
○ Settling Basin	○ Concrete Grid Pavement	

Please enter landuse of contributing/drainage area in acres:

	Sewered	Unsewered
Commercial	8	0
Industrial	0	0
Institutional	0	0
Transportation	0	0
Multi-Family	25	0
Residential	0	0
Agriculture	0	0
Vacant	0	0
Open Space	0	0

Note: Sewered and Unsewered refer to storm sewers.

Estimated Load and Load Reductions

	Load before BMP (lbs/yr)		Load after BMP (lbs/yr)		Load Reduction (lbs/yr)
BOD	1,980		554		1,426
COD	12,712		U		U
TSS	42,440		5,942		36,498
LEAD	17		10		7
COPPER	4		U		U
ZINC	27		22		5
TDS	38,215		U		U
TN	443		199		244
TKN	215		U		U
DP	21		U		U
TP	45		14		31
CADMIUM	0		U		U

U = Removal Efficiency for the particular BMP and constituent unavailable.

Bank Stabilization

If estimating for just one bank, put "0" in areas for Bank #2.

Please select a soil textural class:

○ Sands, loamy sands	○ Silty clay loam, silty clay
○ Sandy loam	○ Clay loam
○ Fine sandy loam	○ Clay
◉ Loams, sandy clay loams, sandy clay	○ Organic
○ Silt loam	

Please fill in the gray areas below:

Parameter	Bank #1	Bank #2	Example	
Length (ft)	5000	5000	**500**	
Height (ft)	1.5	1.5	**15**	
Lateral Recession Rate (ft/yr)*	0.2	0.2	**0.5**	
Soil Weight (tons/ft^3)	0.045	0.045	**0.04**	
Soil P Conc (lb/lb soil)** DEFAULT	0.0005	0.0005	**0.0005**	**
Soil N Conc (lb/lb soil)** DEFAULT	0.001	0.001	**0.001**	**

** If not using the default values, users must provide input (in red) for Total P and Total N soil concentrations

*Lateral Recession Rate (LRR) is the rate at which bank deterioration has taken place and is measured in feet per year. This rate may not be easily determined by direct measurement. Therefore best professional judgement may be required to estimate the LRR. Please refer to the narrative descriptions in Table 1.

Estimated Load Reductions

	BMP Efficiency* Bank #1	BMP Efficiency* Bank #2	Bank #1	Bank #2	Example
Sediment Load Reduction (ton/year)	0.95	0.95	64.1	64.1	**143**
Phosphorus Load Reduction (lb/year)			54.5	54.5	**143**
Nitrogen Load Reduction (lb/yr)			109.0	109.0	**285**

Bank Stabilization

If estimating for just one bank, put "0" in areas for Bank #2.

Please select a soil textural class:

○ Sands, loamy sands	○ Silty clay loam, silty clay
○ Sandy loam	○ Clay loam
○ Fine sandy loam	○ Clay
◉ Loams, sandy clay loams, sandy clay	○ Organic
○ Silt loam	

Please fill in the gray areas below:

Parameter	Bank #1	Bank #2	Example	
Length (ft)	4400	4400	**500**	
Height (ft)	2.5	2.5	**15**	
Lateral Recession Rate (ft/yr)*	0.4	0.4	**0.5**	
Soil Weight (tons/ft^3)	0.045	0.045	**0.04**	
Soil P Conc (lb/lb soil)** DEFAULT	0.0005	0.0005	**0.0005**	**
Soil N Conc (lb/lb soil)** DEFAULT	0.001	0.001	**0.001**	**

** If not using the default values, users must provide input (in red) for Total P and Total N soil concentrations

*Lateral Recession Rate (LRR) is the rate at which bank deterioration has taken place and is measured in feet per year. This rate may not be easily determined by direct measurement. Therefore best professional judgement may be required to estimate the LRR. Please refer to the narrative descriptions in Table 1.

Estimated Load Reductions

	BMP Efficiency* Bank #1	BMP Efficiency* Bank #2	Bank #1	Bank #2	Example
Sediment Load Reduction (ton/year)	0.95	0.95	188.1	188.1	**143**
Phosphorus Load Reduction (lb/year)			159.9	159.9	**143**
Nitrogen Load Reduction (lb/yr)			319.8	319.8	**285**

Bank Stabilization

If estimating for just one bank, put "0" in areas for Bank #2.

Please select a soil textural class:

○ Sands, loamy sands	○ Silty clay loam, silty clay
○ Sandy loam	○ Clay loam
○ Fine sandy loam	○ Clay
◉ Loams, sandy clay loams, sandy clay	○ Organic
○ Silt loam	

Please fill in the gray areas below:

Parameter	Bank #1	Bank #2	Example	
Length (ft)	2700	2700	**500**	
Height (ft)	3.5	3.5	**15**	
Lateral Recession Rate (ft/yr)*	0.2	0.2	**0.5**	
Soil Weight (tons/ft^3)	0.045	0.045	**0.04**	
Soil P Conc (lb/lb soil)** DEFAULT	0.0005	0.0005	**0.0005**	**
Soil N Conc (lb/lb soil)** DEFAULT	0.001	0.001	**0.001**	**

** If not using the default values, users must provide input (in red) for Total P and Total N soil concentrations

*Lateral Recession Rate (LRR) is the rate at which bank deterioration has taken place and is measured in feet per year. This rate may not be easily determined by direct measurement. Therefore best professional judgement may be required to estimate the LRR. Please refer to the narrative descriptions in Table 1.

Estimated Load Reductions

	BMP Efficiency* Bank #1	BMP Efficiency* Bank #2	Bank #1	Bank #2	Example
Sediment Load Reduction (ton/year)	0.95	0.95	80.8	80.8	**143**
Phosphorus Load Reduction (lb/year)			68.7	68.7	**143**
Nitrogen Load Reduction (lb/yr)			137.4	137.4	**285**

Bank Stabilization

If estimating for just one bank, put "0" in areas for Bank #2.

Please select a soil textural class:

○ Sands, loamy sands	○ Silty clay loam, silty clay
○ Sandy loam	○ Clay loam
○ Fine sandy loam	○ Clay
◉ Loams, sandy clay loams, sandy clay	○ Organic
○ Silt loam	

Please fill in the gray areas below:

Parameter	Bank #1	Bank #2	Example	
Length (ft)	4300	4300	**500**	
Height (ft)	3.5	3.5	**15**	
Lateral Recession Rate (ft/yr)*	0.2	0.2	**0.5**	
Soil Weight (tons/ft^3)	0.045	0.045	**0.04**	
Soil P Conc (lb/lb soil)** DEFAULT	0.0005	0.0005	**0.0005**	**
Soil N Conc (lb/lb soil)** DEFAULT	0.001	0.001	**0.001**	**

** If not using the default values, users must provide input (in red) for Total P and Total N soil concentrations

*Lateral Recession Rate (LRR) is the rate at which bank deterioration has taken place and is measured in feet per year. This rate may not be easily determined by direct measurement. Therefore best professional judgement may be required to estimate the LRR. Please refer to the narrative descriptions in Table 1.

Estimated Load Reductions

	BMP Efficiency* Bank #1	BMP Efficiency* Bank #2	Bank #1	Bank #2	Example
Sediment Load Reduction (ton/year)	0.95	0.95	128.7	128.7	**143**
Phosphorus Load Reduction (lb/year)			109.4	109.4	**143**
Nitrogen Load Reduction (lb/yr)			218.8	218.8	**285**

Feedlot Pollution Reduction

Please fill in the gray areas below.

Notes:
An animal lot refers to an open lot or combination of open lots intended for confined feeding, breeding, raising or holding animals. It is specifically designed as a confinement area in which manure accumulates or where the concentration of animals is such that vegetation cannot be maintained. The purpose of these calculations is to represent Biological Oxygen Demand (BOD), phosphorus (P), and nitrogen reductions after an animal waste system is installed. This method has two assumptions: 1) the feedlot is adjacent to a receiving hydrological system without any buffering areas; and 2) installing the animal waste system will prevent any further pollutants from the lot from reaching the hydrologic system. Feedlots that cannot show impact to the hydrologic system being protected should not be evaluated with this computation.

The fundamental methodology of this worksheet is based on "Pollutants Controlled Calculation and Documentation for Section 319 Watersheds Training Manual" (Michigan DEQ, June 1999). However, the Michigan DEQ methodology was modified to calculate annual load through inclusion of climatological data. In addition, biological oxygen demand, phosphorus, and nitrogen constants used in this worksheet were derived from U.S. EPA's STEPL model, developed by Tetra Tech, Inc. in order to enhance consistency between methods.

STEP 1 — **3.6** **Contributing Area (acres): the area contributing polluted water to the discharge point(s).**

STEP 2 **Percent Paved: Percent of the contributing area that is paved**

- (•) 0-24%
- ( ) 25-49%
- ( ) 50-74%
- ( ) 75-100%

STEP 3

Please select your State	Please select your County.	Nearest Weather Station
Illinois	Lake	IL CHICAGO MIDWAY A AP 3

Note: Precipitation data for Alaska and Hawaii were unavailable for this version of the workbook.

STEP 4

Animal Numbers	Animal Type	esign Weight*
0	Slaughter Steer	1,000
0	Young Beef	500
0	Dairy Cow	1,400
0	Young Dairy Stoc	500
0	Swine	200
0	Feeder Pig	50
0	Sheep	100
0	Turkey	10
0	Chicken	4
0	Duck	4
12	Horse	1,000

*Design weight in pounds. Interpolation of values should be based on the maximu weight animals would be expected to reac

STEP 5 **Select a Best Management Practice**

- ( ) No BMP
- ( ) Diversion
- ( ) Filter Strip
- ( ) Runoff Mgmt System
- ( ) Terrace
- (•) Waste Mgmt System
- ( ) Waste Storage Facility
- ( ) Solids Separation Basin
- ( ) Solids Separation Basin w/ Infilt Bed

END **Estimated Load and Load Reductions**

Pollutants	Load before	Load Reductio	Load after
Biochemical Oxygen Demand load (lbs/yr)	409	NA	NA
Phosphorus load (lbs/yr)	24	22	2
Nitrogen load (lbs/yr)	245	196	49

NA indicates no BMP efficiency data available.

URBAN RUNOFF BMP POLLUTANT LOAD REDUCTION WORKSHEET

Please fill in the gray areas below.

Notes:
The methodology and efficiency values used in this worksheet were developed by the Illinois Environmental Protection Agency.

Please Select a Best Management Practice:

○ Vegetated Filter Strips	○ Sand Filters	○ Sand Filter/Infiltration Basin
◉ Grass Swales	○ WQ Inlets	○ WQ Inlet w/ Sand Filter
○ Infiltration Device	○ Weekly Street Sweeping	○ Oil/Grit Separator
○ Extended Wet Detention	○ Infiltration Basin	○ Wet Pond
○ Wetland Detention	○ Infiltration Trench	
○ Dry Detention	○ Porous Pavement	
○ Settling Basin	○ Concrete Grid Pavement	

Please enter landuse of contributing/drainage area in acres:

	Sewered	Unsewered
Commercial	0	0
Industrial	0	0
Institutional	0	0
Transportation	0	0
Multi-Family	0	0
Residential	0	43
Agriculture	0	0
Vacant	0	0
Open Space	0	0

Note: Sewered and Unsewered refer to storm sewers.

Estimated Load and Load Reductions

	Load before BMP (lbs/yr)		Load after BMP (lbs/yr)		Load Reduction (lbs/yr)
BOD	473		331		142
COD	3,053		2,290		763
TSS	6,622		2,318		4,304
LEAD	5		2		4
COPPER	1		1		1
ZINC	19		8		12
TDS	9,374		U		U
TN	133		120		13
TKN	69		U		U
DP	6		U		U
TP	17		13		4
CADMIUM	0		0		0

U = Removal Efficiency for the particular BMP and constituent unavailable.

URBAN RUNOFF BMP POLLUTANT LOAD REDUCTION WORKSHEET

Please fill in the gray areas below.

Notes:
The methodology and efficiency values used in this worksheet were developed by the Illinois Environmental Protection Agency.

Please Select a Best Management Practice:

(•) Vegetated Filter Strips	( ) Sand Filters	( ) Sand Filter/Infiltration Basin
( ) Grass Swales	( ) WQ Inlets	( ) WQ Inlet w/ Sand Filter
( ) Infiltration Device	( ) Weekly Street Sweeping	( ) Oil/Grit Separator
( ) Extended Wet Detention	( ) Infiltration Basin	( ) Wet Pond
( ) Wetland Detention	( ) Infiltration Trench	
( ) Dry Detention	( ) Porous Pavement	
( ) Settling Basin	( ) Concrete Grid Pavement	

Please enter landuse of contributing/drainage area in acres:

	Sewered	Unsewered
Commercial	0	31
Industrial	0	0
Institutional	0	0
Transportation	0	0
Multi-Family	0	0
Residential	0	31
Agriculture	0	0
Vacant	0	0
Open Space	0	32

Note: Sewered and Unsewered refer to storm sewers.

Estimated Load and Load Reductions

	Load before BMP (lbs/yr)		Load after BMP (lbs/yr)		Load Reduction (lbs/yr)
BOD	2,679		1,326		1,353
COD	18,801		11,281		7,520
TSS	37,654		10,167		27,487
LEAD	32		17		14
COPPER	6		U		U
ZINC	58		23		35
TDS	91,970		U		U
TN	661		396		264
TKN	253		U		U
DP	24		U		U
TP	54		29		24
CADMIUM	0		U		U

U = Removal Efficiency for the particular BMP and constituent unavailable.

URBAN RUNOFF BMP POLLUTANT LOAD REDUCTION WORKSHEET

Please fill in the gray areas below.

Notes:
The methodology and efficiency values used in this worksheet were developed by the Illinois Environmental Protection Agency.

Please Select a Best Management Practice:

○ Vegetated Filter Strips	○ Sand Filters	○ Sand Filter/Infiltration Basin
◉ Grass Swales	○ WQ Inlets	○ WQ Inlet w/ Sand Filter
○ Infiltration Device	○ Weekly Street Sweeping	○ Oil/Grit Separator
○ Extended Wet Detention	○ Infiltration Basin	○ Wet Pond
○ Wetland Detention	○ Infiltration Trench	
○ Dry Detention	○ Porous Pavement	
○ Settling Basin	○ Concrete Grid Pavement	

Please enter landuse of contributing/drainage area in acres:

	Sewered	Unsewered
Commercial	0	0
Industrial	0	0
Institutional	0	0
Transportation	0	0
Multi-Family	0	0
Residential	0	21
Agriculture	0	0
Vacant	0	0
Open Space	0	0

Note: Sewered and Unsewered refer to storm sewers.

Estimated Load and Load Reductions

	Load before BMP (lbs/yr)		Load after BMP (lbs/yr)		Load Reduction (lbs/yr)
BOD	231		162		69
COD	1,491		1,118		373
TSS	3,234		1,132		2,102
LEAD	2		1		2
COPPER	1		0		0
ZINC	9		4		6
TDS	4,578		U		U
TN	65		59		7
TKN	34		U		U
DP	3		U		U
TP	8		6		2
CADMIUM	0		0		0

U = Removal Efficiency for the particular BMP and constituent unavailable.

URBAN RUNOFF BMP POLLUTANT LOAD REDUCTION WORKSHEET

Please fill in the gray areas below.

Notes:
The methodology and efficiency values used in this worksheet were developed by the Illinois Environmental Protection Agency.

Please Select a Best Management Practice:

○ Vegetated Filter Strips	○ Sand Filters	○ Sand Filter/Infiltration Basin
○ Grass Swales	○ WQ Inlets	○ WQ Inlet w/ Sand Filter
○ Infiltration Device	○ Weekly Street Sweeping	○ Oil/Grit Separator
◉ Extended Wet Detention	○ Infiltration Basin	○ Wet Pond
○ Wetland Detention	○ Infiltration Trench	
○ Dry Detention	○ Porous Pavement	
○ Settling Basin	○ Concrete Grid Pavement	

Please enter landuse of contributing/drainage area in acres:

	Sewered	Unsewered
Commercial	0	0
Industrial	0	0
Institutional	0	0
Transportation	0	0
Multi-Family	0	0
Residential	0	80
Agriculture	0	0
Vacant	0	0
Open Space	0	0

Note: Sewered and Unsewered refer to storm sewers.

Estimated Load and Load Reductions

	Load before BMP (lbs/yr)		Load after BMP (lbs/yr)		Load Reduction (lbs/yr)
BOD	880		246		634
COD	5,680		U		U
TSS	12,320		1,725		10,595
LEAD	9		6		4
COPPER	2		U		U
ZINC	36		29		7
TDS	17,440		U		U
TN	248		112		136
TKN	128		U		U
DP	10		U		U
TP	32		10		22
CADMIUM	0		U		U

U = Removal Efficiency for the particular BMP and constituent unavailable.

URBAN RUNOFF BMP POLLUTANT LOAD REDUCTION WORKSHEET

Please fill in the gray areas below.

Notes:
The methodology and efficiency values used in this worksheet were developed by the Illinois Environmental Protection Agency.

Please Select a Best Management Practice:

○ Vegetated Filter Strips	○ Sand Filters	○ Sand Filter/Infiltration Basin
○ Grass Swales	○ WQ Inlets	○ WQ Inlet w/ Sand Filter
○ Infiltration Device	○ Weekly Street Sweeping	○ Oil/Grit Separator
○ Extended Wet Detention	○ Infiltration Basin	○ Wet Pond
◉ Wetland Detention	○ Infiltration Trench	
○ Dry Detention	○ Porous Pavement	
○ Settling Basin	○ Concrete Grid Pavement	

Please enter landuse of contributing/drainage area in acres:

	Sewered	Unsewered
Commercial	0	0
Industrial	0	0
Institutional	0	0
Transportation	0	0
Multi-Family	0	0
Residential	33	0
Agriculture	0	0
Vacant	0	0
Open Space	0	0

Note: Sewered and Unsewered refer to storm sewers.

Estimated Load and Load Reductions

	Load before BMP (lbs/yr)		Load after BMP (lbs/yr)		Load Reduction (lbs/yr)
BOD	726		269		457
COD	4,620		2,310		2,310
TSS	10,197		2,294		7,903
LEAD	8		3		5
COPPER	2		U		U
ZINC	30		19		10
TDS	14,388		U		U
TN	198		158		40
TKN	106		U		U
DP	9		U		U
TP	27		15		12
CADMIUM	0		U		U

U = Removal Efficiency for the particular BMP and constituent unavailable.

URBAN RUNOFF BMP POLLUTANT LOAD REDUCTION WORKSHEET

Please fill in the gray areas below.

Notes:
The methodology and efficiency values used in this worksheet were developed by the Illinois Environmental Protection Agency.

Please Select a Best Management Practice:

○ Vegetated Filter Strips	○ Sand Filters	○ Sand Filter/Infiltration Basin
○ Grass Swales	○ WQ Inlets	○ WQ Inlet w/ Sand Filter
○ Infiltration Device	○ Weekly Street Sweeping	○ Oil/Grit Separator
◉ Extended Wet Detention	○ Infiltration Basin	○ Wet Pond
○ Wetland Detention	○ Infiltration Trench	
○ Dry Detention	○ Porous Pavement	
○ Settling Basin	○ Concrete Grid Pavement	

Please enter landuse of contributing/drainage area in acres:

	Sewered	Unsewered
Commercial	0	0
Industrial	0	0
Institutional	0	0
Transportation	0	0
Multi-Family	0	0
Residential	30	0
Agriculture	0	0
Vacant	0	0
Open Space	0	22

Note: Sewered and Unsewered refer to storm sewers.

Estimated Load and Load Reductions

	Load before BMP (lbs/yr)		Load after BMP (lbs/yr)		Load Reduction (lbs/yr)
BOD	669		187		482
COD	4,530		U		U
TSS	9,710		1,359		8,351
LEAD	7		4		3
COPPER	1		U		U
ZINC	28		22		6
TDS	18,382		U		U
TN	184		83		101
TKN	106		U		U
DP	8		U		U
TP	27		9		19
CADMIUM	0		U		U

U = Removal Efficiency for the particular BMP and constituent unavailable.

URBAN RUNOFF BMP POLLUTANT LOAD REDUCTION WORKSHEET

Please fill in the gray areas below.

Notes:
The methodology and efficiency values used in this worksheet were developed by the Illinois Environmental Protection Agency.

Please Select a Best Management Practice:

○ Vegetated Filter Strips	○ Sand Filters	○ Sand Filter/Infiltration Basin
○ Grass Swales	○ WQ Inlets	○ WQ Inlet w/ Sand Filter
○ Infiltration Device	○ Weekly Street Sweeping	○ Oil/Grit Separator
○ Extended Wet Detention	○ Infiltration Basin	○ Wet Pond
◉ Wetland Detention	○ Infiltration Trench	
○ Dry Detention	○ Porous Pavement	
○ Settling Basin	○ Concrete Grid Pavement	

Please enter landuse of contributing/drainage area in acres:

	Sewered	Unsewered
Commercial	0	0
Industrial	0	0
Institutional	0	0
Transportation	0	0
Multi-Family	0	0
Residential	0	23
Agriculture	0	0
Vacant	0	0
Open Space	0	0

Note: Sewered and Unsewered refer to storm sewers.

Estimated Load and Load Reductions

	Load before BMP (lbs/yr)		Load after BMP (lbs/yr)		Load Reduction (lbs/yr)
BOD	253		94		159
COD	1,633		817		817
TSS	3,542		797		2,745
LEAD	3		1		2
COPPER	1		U		U
ZINC	10		7		4
TDS	5,014		U		U
TN	71		57		14
TKN	37		U		U
DP	3		U		U
TP	9		5		4
CADMIUM	0		U		U

U = Removal Efficiency for the particular BMP and constituent unavailable.

Bank Stabilization

If estimating for just one bank, put "0" in areas for Bank #2.

Please select a soil textural class:

○ Sands, loamy sands	○ Silty clay loam, silty clay
○ Sandy loam	○ Clay loam
○ Fine sandy loam	○ Clay
◉ Loams, sandy clay loams, sandy clay	○ Organic
○ Silt loam	

Please fill in the gray areas below:

Parameter	Bank #1	Bank #2	Example	
Length (ft)	4100	4100	**500**	
Height (ft)	1.5	1.5	**15**	
Lateral Recession Rate (ft/yr)*	0.2	0.2	**0.5**	
Soil Weight (tons/ft^3)	0.045	0.045	**0.04**	
Soil P Conc (lb/lb soil)** DEFAULT	0.0005	0.0005	**0.0005**	**
Soil N Conc (lb/lb soil)** DEFAULT	0.001	0.001	**0.001**	**

** If not using the default values, users must provide input (in red) for Total P and Total N soil concentrations

*Lateral Recession Rate (LRR) is the rate at which bank deterioration has taken place and is measured in feet per year. This rate may not be easily determined by direct measurement. Therefore best professional judgement may be required to estimate the LRR. Please refer to the narrative descriptions in Table 1.

Estimated Load Reductions

	BMP Efficiency* Bank #1	BMP Efficiency* Bank #2	Bank #1	Bank #2	Example
Sediment Load Reduction (ton/year)	0.95	0.95	52.6	52.6	**143**
Phosphorus Load Reduction (lb/year)			44.7	44.7	**143**
Nitrogen Load Reduction (lb/yr)			89.4	89.4	**285**

Bank Stabilization

If estimating for just one bank, put "0" in areas for Bank #2.

Please select a soil textural class:

○ Sands, loamy sands	○ Silty clay loam, silty clay
○ Sandy loam	○ Clay loam
○ Fine sandy loam	○ Clay
◉ Loams, sandy clay loams, sandy clay	○ Organic
○ Silt loam	

Please fill in the gray areas below:

Parameter	Bank #1	Bank #2	Example	
Length (ft)	2300	2300	**500**	
Height (ft)	2.5	2.5	**15**	
Lateral Recession Rate (ft/yr)*	0.2	0.2	**0.5**	
Soil Weight (tons/ft^3)	0.045	0.045	**0.04**	
Soil P Conc (lb/lb soil)** DEFAULT	0.0005	0.0005	**0.0005**	**
Soil N Conc (lb/lb soil)** DEFAULT	0.001	0.001	**0.001**	**

** If not using the default values, users must provide input (in red) for Total P and Total N soil concentrations

*Lateral Recession Rate (LRR) is the rate at which bank deterioration has taken place and is measured in feet per year. This rate may not be easily determined by direct measurement. Therefore best professional judgement may be required to estimate the LRR. Please refer to the narrative descriptions in Table 1.

Estimated Load Reductions

	BMP Efficiency* Bank #1	BMP Efficiency* Bank #2	Bank #1	Bank #2	Example
Sediment Load Reduction (ton/year)	0.95	0.95	49.2	49.2	**143**
Phosphorus Load Reduction (lb/year)			41.8	41.8	**143**
Nitrogen Load Reduction (lb/yr)			83.6	83.6	**285**

Appendix K: List of Funding Programs and Opportunities for the Flint Creek Watershed

(while some of these may not currently have the budget,
they are still monitored, should situations change.)

Restoration

1. Ducks Unlimited

   MARSH (Matching Aid to Restore State Habitats) Program

   - The goal of the MARSH Program is to restore or enhance wetland habitat for waterfowl conservation in the Midwest.
   - The program encourages partnerships with other game organizations, including Pheasants Forever and Wisconsin Wildlife Association.
   - Application deadline is not provided.
   - Requires 1:1 matching funds.
   - Contact Eric Schenck at 309-647-5651 for information in Illinois.

2. River Network

   Watershed Assistance Grants Program

   - Eligible projects include community-based partnerships that conserve or restore watersheds.
   - Deadlines are February 18 and June 15.
   - Grant amounts range from $4,000-30,000.
   - Contact River Network at 503-241-3506 or www.rivernetwork.org.

3. U.S. Army Corps of Engineers

   Continuing Authorities Program (Section 206 Water Resources Development Act)

   - Section 206 gives the Corps authority to carry out an aquatic ecosystem restoration and protection project if the project will improve the quality of the environment, is in the public interest and is cost effective.
   - Federal funds may be used for feasibility studies, planning, engineering, construction, supervision and administration.
   - Federal cost-share of up to $5 million available.
   - 35% non-federal cost-share required.
   - Contact Planning Division Chief, Chicago District Corps at 312-846-5330.

   Project Modifications for Improvement of the Environment (Section 1135)

   - Section 1135 gives the Corps authority to review water resource projects constructed by the Corps and determine the need for modifications to improve the quality of the environment. The objective is to restore ecosystem structure, function and dynamic processes to a less-degraded, more natural condition.
   - Federal funds may be used for feasibility studies, planning, engineering, construction and supervision.
   - Federal cost-share of up to $5 million available.
   - 25% non-federal cost-share required.
   - Contact Planning Division Chief, Chicago District Corps, 312-846-5330.

4. Lake County Stormwater Management Commission

Flood Damage Reduction
Water Quality Improvement, Ecosystem Restoration, Education

- Cost share minimum of 50%
- Contact Sharon Osterby 847-377-7706

5. U.S. Fish and Wildlife Service

North American Wetlands Conservation Act

- Eligible on-the-ground projects include acquisition, restoration, creation and/or enhancement of wetlands and wetland-associated uplands. Partnerships are encouraged. Conservation easements are required.
- Application deadline varies.
- Requires 1:1 non-federal match, maximum grant amount is $50,000.
- Contact Small Grants Coordinator, N. American Waterfowl & Wetlands Office, USFWS, at 703-358-1784; or email this address: R9ARW_NAWWO@MAIL.FWS.GOV.

Restoration/Water Quality

1. Illinois Environmental Protection Agency

The Priority Lake and Watershed Implementation Program (PLWIP)

- This program supports lake protection/restoration activities at "priority" lakes where causes and sources of problems are apparent, project sites are highly accessible, project size is relatively small, and local entities are in a position to quickly implement needed treatments.
- Contact www.epa.state.il.us/water/conservation-2000/plwip.html.

Streambank Cleanup and Lakeshore Enhancement (SCALE)

- Program provides up top $3,500 in funds for the implementation of a streambank or lakeshore clean up event; specifically for litter collection and disposal.
- Applicant selection based on event proximity to Illinois EPA designated priority waters, number of participants, and size of clean up area.
- Application deadline is November 30.
- Applications available at www.epa.state.il.us/water/watershed/scale.html or by calling 217-782-3362.

2. Fox River Ecosystem Partnership (FREP)

Ecosystems Program

- Provides funding, technical and field assistance for educational, research, habitat protection or habitat improvement projects in Fox River that cover at least one IEPA watershed.
- Apply through http://dnr.state.il.us/orep/c2000/ecosystem.

Restoration/Education

1. Chicago Urban Resources Partnership
   Technical Assistance and Grants Program
   - Eligible projects include those in the Chicago metro area that restore or enhance natural ecosystems through local community based partnerships, emphasis on citizen involvement and education.
   - Deadline varies.
   - Requires 1:1 matching funds or in-kind services.
   - Contact the partnership at 312-353-2473 for more information.

2. Chicago Wilderness
   - Many Print Resources

3. Illinois Department of Natural Resources
   Conservation 2000-Ecosystems Program
   - The goal of the Ecosystem Project Grants Program is to provide funding for partnership projects that maintain and enhance the ecological and economic conditions of the region. Funds for projects are awarded on a competitive basis to applicants from designated ecosystem partnership areas.
   - Eligible projects fit into one of the following categories: resource economics, habitat, outreach, research or capital.
   - In addition to project funds, the Ecosystems Program provides financial and technical support to ecosystem partners.
   - Deadline is February.
   - Apply for C2000 funds through FREP.
   - Contact IDNR at 217-782-7940 or see website at http://dnr.state.il.us/orep/c2000/ecosystem.

4. U.S. Fish and Wildlife Service
   Northeastern Illinois Wetlands Conservation Account
   - Eligible projects include restoration, enhancement, and/or replacement or wetland functions and values which have been degraded or destroyed as a result of activities conducts in violation of the Clean Water Act. Other eligible projects include those that promote understanding, appreciation, and stewardship of wetlands. Permanent land protection and federal/state mitigation plan required on all project sites. Project partnerships encouraged.
   - Past project funding has ranged from $650-200,000.
   - Application deadline is beginning of January.
   - Matching funds preferred (1:1 cash, goods or in-kind) but not required.
   - Contact USFWS at 847-381-2253 for information.

Education/Outreach

1. Illinois Department of Natural Resources

Urban and Community Forestry Grant Program

- The purpose is to create or enhance local forestry programs in communities with a local forestry ordinance.
- Deadline is May 12.
- 50% match required.
- Contact IDNR Regional Administration at 815-625-2968.

2. Illinois Environmental Protection Agency

Lake Education Assistance Program

- Eligible projects include educational programs on inland lakes and lake watersheds.
- Maximum funding of $500 is reimbursed after completion. Deadlines are September 30 and January 31.
- Contact IEPA at 217-782-3362.

4. U.S. Environmental Protection Agency

Environmental Education Grants

- Eligible projects include environmental education activities such as curricula design or dissemination, designing or demonstrating educational field methods, training educators, or fostering international cooperation.
- Varying application deadlines usually run the middle of November.
- Requires a minimum of 25% matching funds or in-kind services.
- Contact US Environmental Protection Agency (USEPA) at 312-353-5789.

Five-Star Restoration Challenge Grant Program

- Grant funding is available for community-based wetland and riparian areas restoration projects. The program combines environmental enhancement with employment opportunities for economically disadvantaged youth.
- Public and private entities may apply for grants averaging $10,000/project.
- Application deadline in February.
- Encourages community partnerships that contribute in-kind or matching funds for the grant.
- Contact John Pai, USEPA, at 202-566-1350; pai.john@epa.gov or Abigail Friedman, NACo, at 202-942-4225; afriedman@naco.org; or http://www.epa.gov/owow/wetlands/restore/5star/.

Lake Education Assistance Program (LEAP)

- The program provides funding up to $500 for school and other not-for-profit organization participation in lake/lake watershed related educational field trips and activities. It might also fund the attendance of individuals at lake/lake watershed related seminars and workshops.
- Contact www.epa.state.il.us/water/conservation-2000/leap/index.html.

Wildlife

1. Illinois Department of Natural Resources

Division of Wildlife Resources Special Funds Application (Habitat, Furbearer, and Pheasant Funds)

- Habitat improvement or land acquisition/protection projects funded by Habitat Fund, Furbearer Fund or Pheasant Fund. Projects must preserve,

protect, acquire or manage wildlife for future generations – by benefiting wildlife either directly or indirectly.
- Habitat, research, or education projects are considered.
- Cost-share not required, but preferred.
- Deadline is December 31.
- Contact Office of Resource Conservation – Special Funds 217-782-2602; e-mail specialfunds@dnrmail.state.il.us.

Illinois Migratory Waterfowl Stamp Fund
- Provides for the acquisition of public lands and/or the development of habitat to attract and support waterfowl. Eligible projects must directly or indirectly benefit waterfowl hunting in Illinois. Projects involving education or research are not eligible.
- Deadline is December 31.
- Contact specialfunds@dnrmail.state.il.us for information.

Illinois Wildlife Preservation Fund
- Eligible projects include those that deal with habitat enhancement, endangered and threatened species.
- Deadline is April 16.
- Match preferred but not required.
- Contact IDNR at 217-785-8774.

Private Land Wildlife Habitat Management Fund
- A technical assistance program for private landowners that provides plans, field equipment, plant materials, and labor to develop, implement and maintain wildlife habitat management practices that require specialized training, equipment or resources which would otherwise be unavailable to landowners.
- Eligible land is privately owned and is at least 0.25 acre in urban areas and 1 acre in rural areas.
- Contact IDNR at 217-782-6384.

Private Waters Program
- Free field inspections and technical advice on fish habitat, fish population management, water quality, vegetation control, streambank stabilization, and habitat development in impounded waters and streams.
- Contact IDNR at 217-782-6424.

Trees, Shrubs and Seedlings at No Cost Program
- The goal of the Trees, Shrubs and Seedlings at No Cost Program is to encourage private landowners to increase wildlife habitat and erosion control functions by reforesting their land.
- Provides seedlings at no cost to landowners with an IDNR approved management plan.
- Contact the District Forester or IDNR at 217-782-2361.

3. National Fish and Wildlife Foundation

Challenge Grants
- NFWF awards challenge grants for natural resource conservation projects. Priority areas are: wetland conservation, conservation education, fisheries, neotropical migratory bird conservation, conservation policy, and wildlife and habitat.

- NFWF promotes public/private sector partnerships.
- Requires minimum 1:1 non-federal match.
- Pre-proposal deadlines are July 1 and November 15.
- Contact NFWF 202-857-016, e-mail info2nfwf.org, or web http://www.nfwf.org.

Wildlife Links

- Cooperative program that funds cutting edge research, management and education projects that will help golf courses become an important part of the conservation landscape. Areas of interest include: management and design techniques for increasing biodiversity on golf courses; management guidelines for specific species; research to determine habitat characteristics that serve as corridors or barriers on golf courses; monitoring research to determine habitat characteristics that serve as corridors or barriers on golf courses, monitoring wildlife habitat conservation programs on golf courses; effects of golfer and maintenance activities on wildlife. The United States Golf Association provides $200,000 annually to fund these grants.
- Proposals should indicate that golf courses will be formal partners.
- Maximum request $25,000/year multi-year proposals accepted.
- Pre-proposal deadline is July 16.
- Contact Katie Distler NFWF202 857-0166, for more information http://www.nfwf.org.

4. U.S. Department of Agriculture (Natural Resources Conservation Service)

Wildlife Habitat Incentives Program (WHIP)

- Property owner enrolls private land to develop and improve wildlife habitat.
- Cost-share of up to 75% of the cost of installing wildlife practices.
- Technical assistance for establishing habitat development projects.
- Continuous sign-up, contact Pat Leavenworth at 608-276-8732.

5. U.S. Fish and Wildlife Service

Flexible Funds

- Provides relatively small amounts of funds from up to five separate programs to good projects on private lands to restore fish and/or protect wildlife habitat.
- A 1:1 match is preferred.
- Deadline is end of September.
- Contact Steve Kufrin at 612-713-5447.

Partners for Fish and Wildlife

- Provides financial assistance for restoration of degraded wetlands and other important fish and wildlife habitats such as grasslands, streams, and riparian habitats, and technical assistance for designing the restoration plans.
- 100% of the cost is provided for up to 10 years on private lands.
- Funded projects are often partnered with the Wetland Reserve Program (NRCS).
- Contact Jim Ruwaldt at 608-221-1206 or james_ruwaldt@fws.gov.

Private Stewardship Grants Program (PSGP)

- Provides financial assistance for the implementation of conservation activities on private lands that benefit federally listed, proposed, or candidate species, or other at-risk species.
- A 10% match contribution is required.
- Education and outreach, research, planning, and land acquisition activities do not qualify for the PSGP.
- Applicants must submit a proposal describing project and how it will benefit the target species. Proposals for the FY 2006 funding period are being accepted between November 22 and January 23, 2005.
- Contact Peter Fasbender at 612-713-5343 at the Region 3 - Great Lakes - Big Rivers office in Fort Snelling, Minnesota or for more information go to: http://www.fws.gov/endangered/ grants/private_stewardship/ index.html.

Waterfowl Production Areas

- Provides 100% of the fair market value for acquisition of 100-acre or larger existing or restorable wetlands open to hunting, fishing, and trapping. This program does not guarantee receipt of local permits required to restore wetlands.
- Contact Steve Lenz at 920-387-0336.

Flood Control/Management

1. Illinois Department of Natural Resources

Office of Water Resources Small Projects Fund

- Provides assistance to rural and smaller urban communities to reduce stormwater related damages by alleviating local significant drainage and flood problems.
- The Office of Water Resources Division of Planning does initial surveys and makes recommendations for flood control or acquisition projects for local flood problem areas. If a project is warranted, the Division coordinates planning and funding and provides project design.
- Can contribute up to $75,000 financial assistance on small projects.
- Contact IDNR Office of Water Resources (IDNR-OWR) at 217-782-4637.

2. Illinois Emergency Management/Federal Emergency Management Agency

Hazard Mitigation Grant program

- Provides funds for long-term hazard mitigation measures after a major disaster declaration. It has traditionally funded acquisition or elevation of flood damaged buildings.
- Covers 75% of total project costs.
- Contact is the Illinois Emergency Management Agency (IEMA) at 217-782-8719.

Flood Mitigation Assistance Program

- Provides grants to communities for projects that reduce the risk of flood damage to structures that have flood insurance. Communities must be enrolled and in good standing with the National Flood Insurance Program (NFIP).
- Provides funding for mitigation planning and mitigation projects implemented pursuant to a plan. Eligible projects include relocation or

acquisition of structures and underlying real property subject to flood damage for open space uses.
- Provides up to 75% of project costs, 25% match required.
- Contact is the Illinois Emergency Management Agency (IEMA) at 217-782-8719.

3. U.S. Army Corps of Engineers

Small Flood Control Projects (Section 205)

- Section 205 gives the Corps authority to develop and construct small flood control projects.
- Federal funds may be used for feasibility studies, planning, engineering, construction, supervision and administration.
- Federal cost-share of up to $5 million available.
- 50% non-federal cost-share required for feasibility study. 35% non-federal cost-share required for project costs.
- Contact Planning Division Chief, Chicago District Corps at 312-846-5330.

4. Lake County Stormwater Management Commission (LCSMC)

Watershed Management Board funded projects

- Requires 50% cost-share from applicant.
- Deadline for 2003 was October 10; may vary year to year.
- Awards watershed management board members with shared funds for projects that provide a multi-jurisdictional watershed benefit, such as flood reduction, improved water quality, provide natural resource protection, recreation, or public education.
- Contact LCSMC at 847-918-5260.

<u>Open Space Preservation/Management/Acquisition</u>

1. Illinois Department of Natural Resources

Forestry Development Act Program

- Administers the Forestry Development Cost-Share Program, which provides funding for land owners that manage forests for environmental, social and economic benefits and/or for timber production.
- Forests must be at least 100 feet wide. Landowners must own at least 5 acres of contiguous land in the state.
- Application includes a Forest Management Plan prepared by person(s) other than the applicant, submitted to and approved by the District Forester.
- 75% cost-share provided for tree planting, site preparation, vegetation control, fire breaks, fencing and thinning and pruning.
- Can be combined with federal FDA programs.
- Contact IDNR at 217-782-7481 or the county District Forester.

Open Space Lands Acquisition and Development Program (OSLAD)

- Eligible projects include money for acquisition and development of public parks and open space.
- Deadline is July 1.
- Funding up to 50% of project costs; $750,000 maximum for acquisition projects; $400,000 maximum for development/renovation projects.

- Contact IDNR at 217-782-7481.

Land and Water Conservation Fund (LWCF)

- A state-financed grant program that provides funding assistance to local government agencies for acquisition and/or development of land for public parks and open space.
- A similar program to OSLAD.
- Contact www.dnr.state.il.us/ocd/newoslad1.htm.

Open Land Trust Fund Grant (OLT)

- Grants are available to local governments to acquire land from willing sellers for open space and resource based outdoor recreation.
- Contact IDNR at 217-782-7481 or www.dnr.state.il.us/ocd/newolt2.htm.

Illinois Nature Preserves Commission Programs (INPC)

- The mission of the INPC is to assist private and public landowners in protecting high quality natural areas and habitats of endangered and threatened species in perpetuity, through voluntary dedication or registration of such lands into the Illinois Nature Preserves System. The Commission promotes the preservation of these significant lands and provides leadership in their stewardship, management and protection.
- Contact http://dnr.state.il.us/INPC/programs/programstest.htm.

2. The Conservation Fund

Eastman Kodak American Greenways Awards Program

- Provides small grants for greenway and trail projects that can be used for all appropriate expenses needed to complete a greenway project (planning, technical, legal and other costs).
- Grants range from $500-2,500.
- Deadline is in June.
- Contact Denise Swol, American Greenways Coordinator, at 703-525-6300 or dswo@conservationfund.org.

3. U.S. Department of Agriculture (Natural Resource Conservation Service)

Conservation Reserve Program (CRP)

- Pays farmers not to farm their highly erodible land for a period of 15 or 30 years (or permanently) and provides up to 90% cost-sharing.
- Contact local NRCS office, or Pat Leavenworth or Alison Jones Pena at 608-276-8732 (Madison, WI).

Illinois Conservation Reserve Enhancement Program (CREP)

- The CREP program provides incentive payments and technical assistance to farm owners who plant grasses and trees, restore wetlands to reduce top soil loss, improve water quality, and enhance wildlife habitat in the Illinois River basin.
- Contact 217-785-8774.

Environmental Quality Incentives Program (EQIP)

- Promotes conservation practices and environmental quality on agricultural land by providing financial and technical help to assist farmers with installation or implementation of structural and management practices.
- Provides up to 75% cost share for certain conservation practices up to 450,000 for a maximum term of ten years.

- Contact Anthony Esser, National EQIP Program Manager, at 202-720-1840.

Wetland Reserve Program (WRP)

- Property owner enrolls agricultural land with restorable wetlands, land adjacent to wetlands, wetlands restored under state or federal programs, Conservation Reserve Land or riparian areas into the program.
- 100% cost-share is provided for permanent easements. USDA will cost-share 75% of the average cost of establishing essential restoration practices within the easement for 30-year easements and restoration agreements.
- Continuous sign-up, contact NRCS at 815-338-0049.

4. U.S. Environmental Protection Agency

Community Based Environmental Protection

- Projects include those that use community-based approaches for environmental protection for energy, land use, brownfields, open space and wetlands.
- Projects have a 20% match requirement.
- Contact USEPA Hotline at 1-800-621-8431 or directly visit the internet site at http://www.epa.gov/ecocommunity/.

Wetlands Program Development Grant

- The purpose of the Wetlands Program Development Grant is to assist state, tribal and local government agencies in their wetlands protection, management and restoration efforts. Grant funds can be used to develop new wetland programs or refine existing programs.
- Requires a public participation work plan.
- Requires minimum 25% match from non-federal sources.
- Contact EPA Wetlands Protection Hotline at 800-832-7282, or http://www.epa.gov/owow/wetlands/grantguidelines/.

5. U.S. Forest Service

Urban and Community Forestry

- Provides technical assistance to state forestry agencies, local and tribal governments and the private sector improve natural resource management of trees, forested lands, and open spaces in urban areas and community settings. No funds are provided.
- Contact Richard Rideout at 608-267-0843 (WDNR) or Lisa Burban (Forest Service) at 651-649-5245.

Recreation

1. Illinois Department of Natural Resources

Illinois Bicycle Path Grant Program

- Provides financial assistance to eligible government agencies for the acquisition, construction and rehabilitation of public non-motorized bicycle paths.
- Deadline is March 1.
- 50% match required.
- Contact IDNR at 217-782-7481.

Illinois Trails Grant Program

- Provides funding to acquire, develop, and maintain trails for public recreational uses.
- Deadlines are March 1 and May 1.
- 50% match required.
- Contact IDNR at 217-782-7481.

Recreation Trails Program

- Provides financial assistance to federal, state and local government agencies and not-for-profit organizations for the acquisition, development, rehabilitation, and maintenance of public motorized and non-motorized recreational trails.
- Minimum 20% non-federal match.
- Deadline is March 1.
- Contact IDNR at 217-782-7481.

Snowmobile Grants

- Financial assistance for the acquisition and development or rehabilitation of public snowmobile areas, trails, and facilities.
- Contact www.dnr.state.il.us/ocd/newsnow2.htm.

Off Highway Vehicle Recreation Trails

- Grants are available to provide financial aid to develop parks and trails that are open and accessible to the public.
- Contact IDNR at 217-782-7481 or www.dnr.state.il.us/ocd/newohv2.htm.

2. National Park Service

Rivers and Trails Program

- Provides technical assistance to help local communities achieve conservation objectives. It provides no direct funding.
- Contact Mark Weaver at 414-297-3617.

3. Illinois Department of Transportation

TEA-21 Enhancement Program

- Eligible projects include those that support alternative modes of transportation (including trails) and that preserve visual and cultural resources, landscaping beautification.
- Call for deadlines.
- Local 20% match required, 50% match for land acquisition.
- Contact IDOT at 1-800-493-3434.
- Not accepting applications until reauthorization legislation is passed.

Water Quality

1. Illinois Department of Natural Resources

Private Waters Program

- Free field inspections and technical advice on fish habitat, fish population management, water quality, vegetation control, streambank stabilization, and habitat development in impounded waters and streams.
- Contact IDNR at 217-782-6424.

2. Illinois Environmental Protection Agency

Illinois Clean Lakes Program (ICLP)

- Financial assistance available for lakes over 6 acres with public access.
- Application deadline is August 31 (pre-approval) and October 31 (final approval).
- Requires 40% match for phase I, 50% local match for phase II.
- Contact IEPA at 217-782-3362.

Lake Education Assistance Program (LEAP)

- Eligible projects include educational programs on inland lakes and lake watersheds.
- Maximum funding of $500 is reimbursed after completion. Deadlines are September 30 and January 31.
- Contact IEPA at 217-782-3362.

Non-point Source Management Program (Section 319 Grants)

- Eligible projects include controlling or eliminating non-point pollution sources.
- Application deadline is August 1.
- Requires 40% non-federal matching funds or in-kind services.
- There is no limit on available funds.
- Will provide up to 60% reimbursement of project cost.
- Contact Illinois Environmental Protection Agency (IEPA) AT 217-782-3362, or www.epa.state.il.us/water/financial-assistance/non-point.html.

Water Revolving Fund: Wastewater and Drinking Water

- Two programs that provide low interest loans to units of local government for the construction of wastewater or community water supply facilities.
- Deadline is March 31.
- Contact http://www.epa.state.il.us/water/financial-assistance/index.html for detailed contact information.

3. U.S. Environmental Protection Agency

Water Quality Cooperative Agreement

- Supports the planning, implementation, and demonstration of innovative approaches to reducing/eliminating water pollution and improving water quality.
- No financial match is require, however applicants are encouraged to provided a 5% match.
- Funds awarded to project range from $30,000 to $400,000.
- Contact 312-886-0261

Lake County Stormwater Management Commission (SMC) - Congressional Appropriations

- Over $673,000 is available for the development and/or installation of best management practices and other water quality improvement projects in Lake County.
- The USEPA will cost share up to 55% of the total project cost; a minimum 45% non-federal match is required.
- Direct questions to Scott Paszkiewicz at SMC at 847-918-5275.
- Application deadline is October 31.

Technical Assistance

1. CMAP
    - Provides technical assistance for lake monitoring and protection, watershed protection, stream stabilization, stormwater management planning, hydrologic modeling, and greenway planning.
    - Prepares Geographic Information System (GIS) mapping and analysis.
    - Offers GIS training.
    - Develops model ordinances and manuals of best practice: stream and wetland protection, soil erosion and sediment control, stormwater drainage and detention.
    - Contact www.cmap.illinois.gov

2. Illinois Clean Energy Community Foundation
    - The Foundation provides financial support and other assistance for programs and projects throughout Illinois that benefit the public by preserving and enhancing natural areas and wildlife habitats in Illinois communities.
    - Contact www.illinoiscleanenergy.org.

3. Illinois State Geological Service (ISGS)
    - Created in 1905, the ISGS provides scientific information to government, business, and the public. Research and service programs encompass geologic mapping, water and mineral resources, environmental and engineering geology, geochemistry, and education. Geological mapping and other forms of technical assistance and advice are available from ISGS on topics such as: preliminary environmental assessments of chosen sites; locating and protecting groundwater resources; locating and conserving mineral and energy resources, including limestone, sand and gravel, oil and gas or coal; avoiding geological hazards such as landslides or abandoned underground mines; protecting existing wetlands and developing new ones, and understanding the relationships between geology and natural and man-made habitats. Depending on the level of assistance needed, cost reimbursement may be required.
    - Contact www.isgs.uiuc.edu/isgsroot/isgshome.html.

4. Illinois Natural Resources Geospatial Data Clearinghouse
    - Available data include U.S. Geological Survey digital orthophoto quarter-quadrangle maps covering the entire state; digital raster graphic files of U.S. Geological Survey 7.5-minute topographic maps of the entire state; Year 2000 orthophotography maps of the Des Plaines River Watershed; digital components of selected Illinois Geologic Quadrangle maps; statewide coverages of many geological, topographic and political maps. Many coverages are available for download at no cost; some must be purchased.
    - Contact www.isgs.uiuc.edu/nsdihome/ISGSindex.html.

5. Lake and Cook County Soil and Water Conservation District Technical Assistance

- Provides site-specific natural resource information for parcels undergoing annexation, subdivision, zoning change, variance, conditional use, or special use permit (NRI reports) and technical site assessments and recommendations for natural resource management.
- Prepares Geographic Information System (GIS) mapping and provide aerial photographs.
- Conducts soil borings to determine the suitability of septic systems, practicality of basements, etc.
- Contact http://www.lakeswcd.org/.

Other

1. Donnelly Foundation for Chicago Region Land Conservation Grants
   - Instructions at: http://gddf.org/land-conservation/chicago/guidelines

2. Grand Victoria Foundation for Vital Lands Illinois
   - Instructions at: http://www.grandvictoriafdn.org/grant-programs/guidelines

3. Coca-Cola Foundation for water: access to clean water, water conservation and recycling
   - Instructions at: http://www.coca-colacompany.com/stories/community-requests-guidelines-application

4. The Joyce Foundation – Environment and Environmental Education
   - Instructions at: http://www.joycefdn.org/apply/what-we-fund

5. Barrington Community Foundation
   - Information at: https://www.barringtonareacommunityfoundation.org/index.php/2015-07-15-18-46-53/grant-information/application-workshop

Conservation Incentive Programs

PROGRAM*	GOVERNMENT CONTACT**	ELIGIBILITY	TERM	PURPOSE						
				Cost-Share	Habitat	Forestry	Wetland, Water Res.	Soil Cons.	Land Purchase	Stream Banks
Conservation Practices Cost-Share (C2000)***	Your local SWCD, or IDOA, 217/782-6297 www.agr.state.il.us/Environment/conserv/	Individual, Corporation, Gov't	10 years	<60%				X		
Conservation Reserve Program (CRP)	NRCS, www.nrcs.usda.gov/programs/crp/ FSA, State Office, 217/353-6600	Individual, Corporation	10-15 years	<50%	X	X	X	X		
Conservation Reserve Enhancement Program(CREP)	www.ilcrep.org; IDNR, 217/785-8287, www.dnr.state.il.us/orc/ conservation_programs/crep/; or, www.fsa.usda.gov/il; or, Your local SWCD	Individual, Corporation, NGO	15, 30, 50 yrs., perm.	<100%	X	X	X	X	X	X
Ecosystems Program (C2000)	IDNR, 217/782-7940 www.dnr.state.il.us/orep/c2000/ecosystem/	Ind., Corp., Gov't, NGO			X	X	X		X	
Emergency Watershed Protection (EWP)	NRCS, 217/353-6600 www.nrcs.usda.gov/programs/ewp/	Ind., Corp., Gov't		<75%			X	X	X	
Environmental Quality Incentives Program (EQIP)	NRCS, 217/353-6600 www.il.nrcs.usda.gov/programs/eqip/	Individual, Corporation, NGO	2 - 10 years	<75%	X	X	X	X		X
Forest Stewardship***	IDNR, 217/782-2361	Individual				X				
Forestry Development Act (FDA)***	IDNR, 217/782-2361 www.dnr.state.il.us/conservation/forestry/IFDA/	Individual, Gov't		<75%		X				
Illinois Clean Energy Community Foundation	312/372-5191 www.illinoiscleanenergy.org	NGO, Gov't							X	
Illinois Clean Lakes (C2000)	IEPA, 217/782-3362 www.epa.state.il.us/water/conservation-2000/	Corporation, Gov't, NGO		<60%			X			
Illinois Conservation and Climate Initiative (ICCI)***	http://www.illinoisclimate.org/ Delta Institute, 312/554-0900 Your local SWCD	Individual, Corporation	until 2010		X	X		X		
Illinois Habitat Fund	IDNR, 217/782-2602; www.dnr.state.il.us/ grants/Special_Funds/WildGrant.htm	Individual, Gov't, NGO			X					
Lake Education Assistance (LEAP)	IEPA, 217/782-3362 www.epa.state.il.us/water/conservation-2000/leap.html	Individual, Gov't, NGO					X			

NOTES:

PROGRAM*	GOVERNMENT CONTACT**	ELIGIBILITY	TERM	PURPOSE						
				Cost-Share	Habitat	Forestry	Wetland, Water Res.	Soil Cons.	Land Purchase	Stream Banks
Landowner Incentive Program (LIP)	IDNR, 217/741-6901; http://dnr.state.il.us/orc/Conservation_programs/LIP/; USFWS; Your local SWCD	Individual		<75%	X	X	X			X
Nonpoint Source Management (Section 319)	IEPA, 217/782-3362 www.epa.state.il.us/water/financial-assistance/non-point.html	Gov't, Corporation, NGO		<60%	X for H20 quality	X for H20 quality	X	X for H20 quality	X for H20 quality	X for H20 quality
Partners for Fish and Wildlife	USFWS, 309/757-5800; IDNR, 217/782-6384 http://ecos.fws.gov/partners/	Individual, Gov't, NGO	10-15 years	<60%	X		X			
Streambank Stabilization & Restoration (SSRP)	Your local SWCD, or IDOA, 800/864-7311 http://www.agr.state.il.us/Environment/conserv/	Individual, NGO	10 years	<75%			X	X		X
Sustainable Agriculture Grants (C2000)	IDOA, 800/864-7311 http://www.agr.state.il.us/Environment/conserv/	Ind., Corp. Gov't, NGO					X	X		
Trees, Shrubs, & Seedlings***	IDNR, (217) 782-2361	Individual		100%	X	X		X		
Water Well Abandonment (C2000)	Your local SWCD; IDOA, 217/782-8297 www.agr.state.il.us/Environment/LandWater/IWWAP.pdf	Individual					X			
Wetland Reserve Program (WRP)	NRCS, 217/353-6600 http://www.nrcs.usda.gov/PROGRAMS/wrp/	Individual, NGO	30 yrs, perm.	<75%, 100%	X		X		X	
Wildlife Habitat Incentive Program (WHIP)	NRCS, 217/353-6600 http://www.nrcs.usda.gov/programs/whip/	Individual, Gov't, NGO	5-10 years	<75%	X	X	X			

***PROGRAM**: Budgets for each program vary year to year.

****GOVERNMENT CONTACT**

IEPA: Illinois Evironmental Protection Agency
IDNR: Illinois Department of Natural Resources
IDOA: Illinois Department of Agriculture
FSA: Farm Service Agency
NRCS: Natural Resources Conservation Service
SWCD: Soil and Water Conservation District
USDA: United States Department of Agriculture
USFWS: United States Fish and Wildlife Service

*** Landowner must have an approved management/conservation plan.

Search other grant opportunities at http://dnr.state.il.us/orep/c2000/grants/grants_links.htm.

Last updated August 28, 2007

Conservation Incentive Programs for Illinois*

A resource guide developed for individuals implementing natural resource projects on non-state owned land.

Produced by:

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

Conservation 2000

* This may not be inclusive of all available programs.

Appendix L: Qualitative Habitat Evaluation Index

INDIANA DIVISION OF FISH AND WILDLIFE
STREAM HABITAT EVALUATION FORM

STREAM: Tippecanoe - Buffalo RIVER MILE: 42.5
NEAREST TOW: COUNTY: White
QUADRANGLE: TWP: RNG: SEC.
LATITUDE: (upstream) LONGITUD (upstream)
LATITUDE: (downstream) LONGITUD downstream
U.S.G.S. GAUGING STATION LOC: AVG. DISCHARGE (
IS REACH REPRESENTATIVE OF STR: Y IF NOT, WHY?

DESCRIPTION OF SAMPLE SITE (Access, length, direc:
Access from private park on north side, Length from Rt. 39 bridge to 2,800' upstream

COLLECTION SUMMARY

DATE: GEAR: DC electrofishing EFFORT:
CREW: Robertson, Martin, Cowin
OTHER GEAR/EFFC: WATER STAGE:
CANOPY (% OPEN): PHOTOS (Y/N): SECCHI DISK (inches:
AIR TEMP (oF) WATER TEMP (o D.O. (ppm)
CONDUCTIVITY pH: ALKALINITY (ppm)
TDS 311
STREAM MEASUREMENTS: AVG 245' AVG. DEPTH: 35.2" MAX. DEP 55"
STATION LENGTH: (1st date) 2,746' (2nd date)

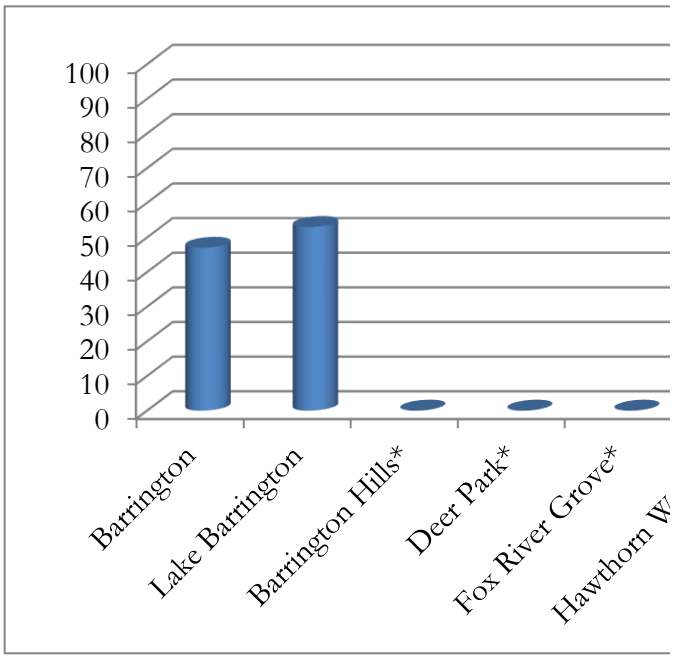
WIDTH (ft)	PTH (in)		
298'	7.5"	12"	12"
252'	53"	40'	20.5"
245'	55"	39"	16"
259'	37"	32"	33"
171'	42"	51"	48"

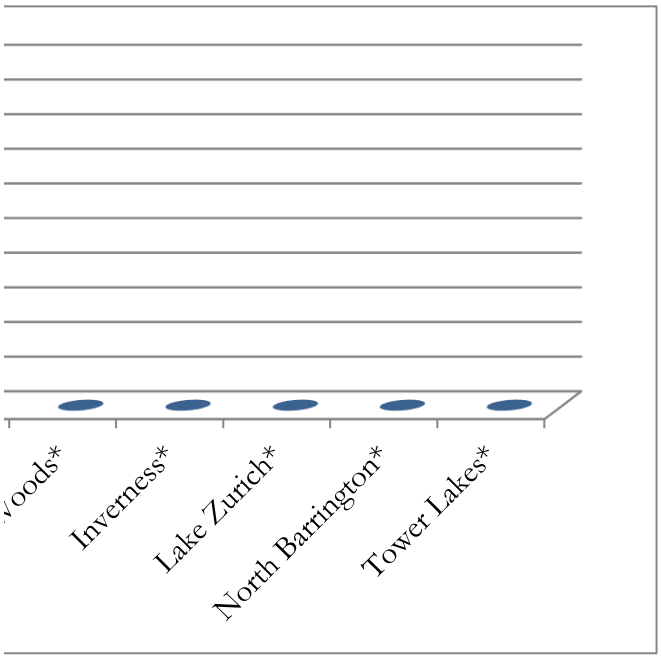
☐ SUBJECTIV RATING #
☐ AESTHETI RATING #

ADDITIONAL COMMENTS/POLLUTION:

Appendix M: Municipal Ordinance Survey

	Score
Barrington	47
Lake Barrington	53
Barrington Hills*	0
Deer Park*	0
Fox River Grove*	0
Hawthorn Woods*	0
Inverness*	0
Lake Zurich*	0
North Barrington*	0
Tower Lakes*	0




oods*
Inverness*
Lake Zurich*
North Barrington*
Tower Lakes*

Appendix N: BACOG Interim Summary Report

Barrington Area Council
Of Governments

SHALLOW AQUIFER SYSTEM WATER LEVELS MONITORING PROGRAM
INTERIM REPORT, JULY 2016

Janet L. Agnoletti, Executive Director

I. INTRODUCTION

Background / Purpose

Because the BACOG area is almost entirely reliant on the shallow aquifer system for all its water needs, there is growing concern about the sustainability of this resource. Water consumption due to growth and development has increased around and within the BACOG area and will continue. For the BACOG area, there is no alternate water supply. Lake Michigan water and river water are not available here, and even if another source of water supply were to become available, there is very little piped infrastructure to distribute such a supply. The cost to build distribution systems throughout nearly 90 square miles would be prohibitive.

Most areas have individual residential private wells or subdivision wells; over 7,800 shallow aquifer system wells provide supply for a population of approximately 35,000. A significant drop in water levels could pose a huge financial impact as private well owners might need to drill deeper or relocate wells. A threat to water levels or water quality would be a threat to public health and safety as well.

There are thousands of acres of natural areas locally, many of which are dependent on groundwater to feed them. A significant drop in water levels could also mean significant changes to those natural areas if groundwater discharge were no longer adequate to sustain rivers, streams and ponds and natural areas such as fens, woods and wetlands. If the natural areas that define the BACOG area and quality of life were to decline, property values could be negatively affected.

State studies suggest there will be a downward trend in water levels in the coming decades – by 10 to 20 feet in some BACOG communities -- so monitoring those conditions has become more critical. To address this situation, the Executive Board unanimously approved RESOLUTION #13-04 "Supporting the Establishment and Funding of a Comprehensive Groundwater Monitoring Program under the Barrington Area Council of Governments" on November 19, 2013. Establishing a baseline and then trends in water levels in the shallow aquifer system is necessary information moving forward. Water level data can provide an indication of "what we need to do" in upcoming years to protect the aquifer system that is virtually the sole water supply for the region. Under Resolution #13-04, all BACOG governments share the costs of the program due to the regional nature of this initiative and benefit to all communities.

Considerations in Monitoring

Changes in aquifer water levels reflect the dynamics between groundwater storage, recharge and discharge. If recharge exceeds discharge, the volume of water in storage will increase and water levels will rise; if discharge and extraction (pumping) exceed recharge, the volume of water in storage will decrease and water levels will fall. Water levels in wells reflect these changes, and they are the primary means of tracking changes in aquifer levels over time.

There are numerous factors that can cause water levels to rise or fall. They include: climate, regional water usage, pumping of wells in adjacent and nearby areas, varying utilization/deployment of nearby wells and their pumping rates, atmospheric pressure changes, and recharge/discharge to and from the aquifers.

Groundwater levels typically mimic seasonal changes. Higher water levels occur in late spring and summer following the snow melt and rain of the winter/spring (and the resultant recharge to the shallow aquifer system), and lower water levels occur from fall through winter following a summer of drier weather and limited precipitation, evapotranspiration, increased pumping and groundwater discharge to surface waterways. In terms of human influences, pumping from wells, especially high capacity wells, can cause water levels to decline in areas surrounding the well. This can also cause a lowering of water levels in nearby wells.

Because water levels respond daily and throughout the year to various influences, it is important to understand that a bigger picture of water levels will only emerge in a long-term analysis. Groundwater responses to climate or other influences are necessarily slow and need to be observed and evaluated on a decade (10 year) basis or longer.

When considering the long-term sustainability of groundwater, the typical range of fluctuation throughout the seasons due to climatic variables (such as precipitation, temperature, barometric pressure, and evapotranspiration) are evaluated, and then human-induced stresses such as pumping are also considered. While year-to-year changes in water levels in the short-term would likely reflect natural conditions, the BACOG monitoring program will look for long-term stability or general declines in groundwater levels that cannot be attributed to variation in the climatic variables. If water levels show a substantial decline over five to ten or more years, a likely cause might be that the rate of pumping is exceeding the rate at which that aquifer is being replenished and there is a net withdrawal from aquifer storage. This analysis would prove the trends in water levels and provide the data-based platform for taking actions that could help slow or reverse a negative trend.

Program Description

There are three components of the Comprehensive Groundwater Monitoring Program:

1. Baseline Conditions Analysis Report
2. Well Network
3. Long-term Data Analysis, Mapping, Trends and Reports

1. Baseline Conditions Analysis Report. The baseline conditions were assessed from all available information. The baseline report protocol set the data sources as follows:

- 15 Illinois State Geologic Survey (ISGS) Monitoring Wells in BACOG Area (manual measurements)

- 3 ISGS Monitoring Wells with Transducers (electronic data recorders) in BACOG Area
- Additional Monitoring Wells with Transducers in McHenry County and other Nearby Areas
- Area Stream Gages with Transducers
- 52 Municipal Pumping Wells in 13 Municipalities within and adjacent to BACOG
- Lake Level Measurements in BACOG Area

Synoptic measurements were made in summer 2014, and the primary product of the baseline conditions report was a potentiometric surface map establishing water levels in the shallow aquifer system as of that date. It also established which surface water bodies are hydraulically connected to groundwater. The report and map were completed by Kurt O. Thomsen Environmental Consulting Inc. (KOTECI) and issued in January 2015. It is available on the BACOG website at: http://www.bacog.org/images/GWL_Monitoring_Report.pdf This is the baseline information against which future measurements and water levels will be evaluated.

2. Well Network and Expansion. The well network is producing electronic measurements of groundwater levels ~~in~~ of the shallow aquifer system. BACOG worked with the United States Geological Survey (USGS) and leveraged approximately $24,000 in equipment and installation costs for three wells in the new network. BACOG executed a three-year contract with USGS where BACOG pays for operations of the three wells. Operations include collecting the data, cleaning and processing data for use, and hosting data on the USGS website for public consumption. This arrangement is anticipated to continue indefinitely, where USGS assumes responsibility for the electronic equipment including maintenance, and BACOG pays annually, on a contractual basis, for operations on the three wells.

Three equipped wells were established in the first year of the program. ISGS dedicated monitoring wells that were drilled in the BACOG area in 2005-06 were outfitted with transducers and satellite transmitters on Lake Barrington, North Barrington and Deer Park village property. Fifteen (15) other ISGS dedicated monitoring wells were developed on forest preserve property in and near BACOG. It is anticipated that more of these 15 wells can be brought into the BACOG network (by adding equipment) over time if grants are available for equipment and funding is available for annual operations.

3. Long-term Data Analysis, Trends, Mapping and Reports. This component uses the data generated from the dedicated monitoring wells and, when combined with measurements taken from all other data points (municipal wells, stream gages, etc.), can: 1) analyze trends in water-level fluctuations of the shallow aquifer system; 2) potentially identify the effect of natural phenomena and anthropogenic activities on current groundwater conditions; and 3) evaluate the interaction of groundwater with the surface water. Continued water level measurements will be used to identify detrimental changes from the baseline conditions, i.e., declining water levels. Though the program was designed to develop this reporting component annually, it was revised in 2015 to generate a comprehensive report every five years. Status reports on the program will be developed periodically in the interim by the Executive Director; status reports will not include analysis of water levels, water level mapping, or trends.

In the five-year reports, all collected data will be evaluated against the baseline maps and conditions. Changes, if any, will be identified that describe where water levels have changed, how much they have changed, and how quickly they have changed. At five years or ten years, for example, trends may emerge regarding decreases (or increases) in shallow aquifer water levels in the BACOG region.

Fact-based trend information will become the basis for planning, programs and public education to further the protection of groundwater resources.

II. FACILITIES

This section describes the points and facilities from which data is being collected for the monitoring program.

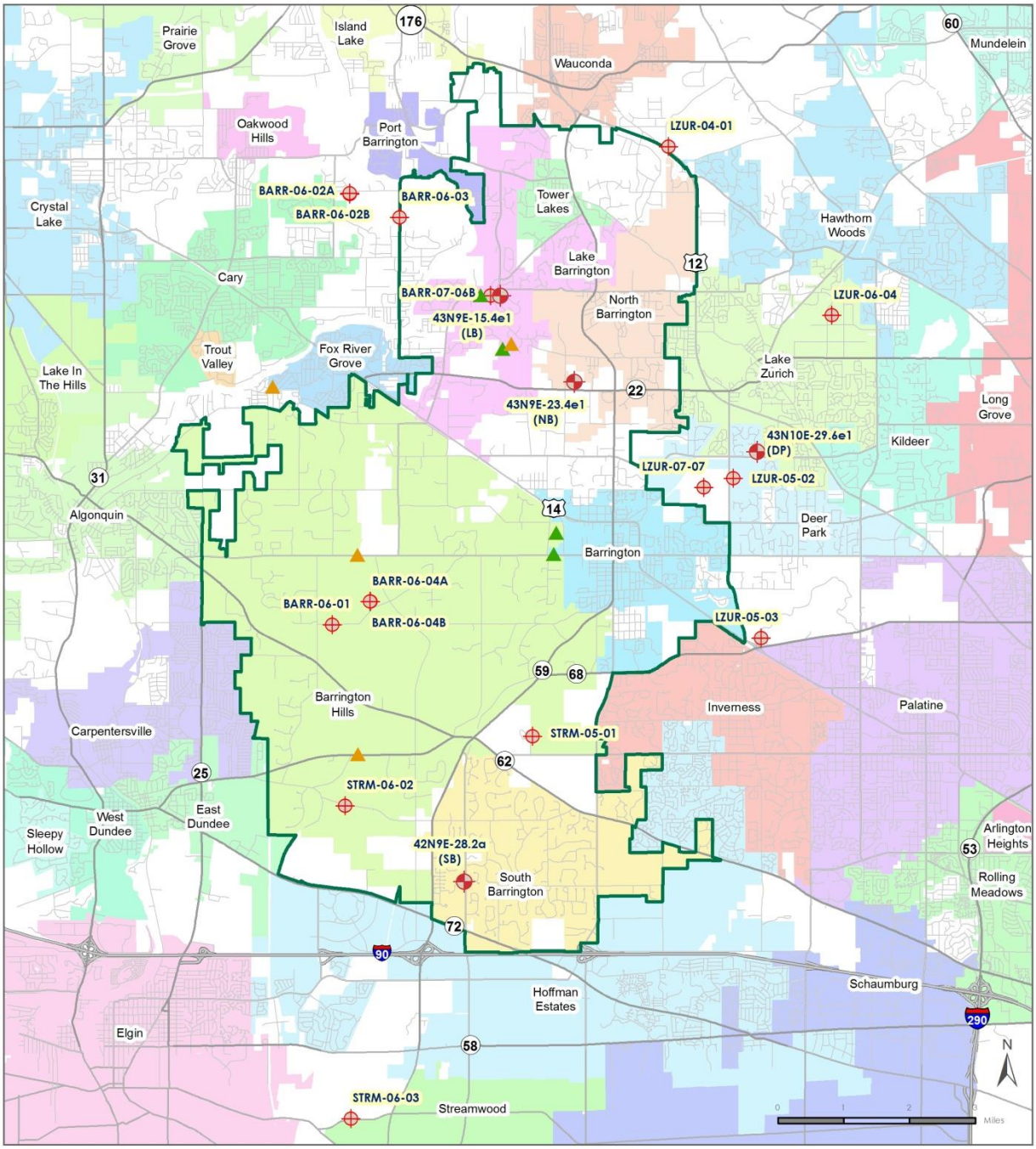
Monitoring Wells and Stream Gages

A map of the dedicated monitoring wells and stream gages, both of which take measurements of water levels, is below. Monitoring well measurements reflect groundwater levels of the shallow aquifer system. A monitoring well is drilled like a water supply well, with a borehole and casing, only it does not contain a pump or wiring for electricity; instead the well casing is left empty so that the water level can easily be measured. The map shows the 18 monitoring wells in the area that are being measured for the BACOG program. This number includes 15 monitoring wells that are not equipped with transducers and that are measured manually every year under the BACOG program. It also includes the three (3) wells that are equipped with transducers that hang in the well and satellite transmitters that take regular readings electronically.

Stream gages are located immediately adjacent to a waterway to measure the water levels in the vicinity of the stream. Stream baseflow is generally at or slightly lower than the level of the groundwater in the nearby area, as groundwater discharges into the stream. The stream gages used in the BACOG program function like shallow monitoring wells, in that a short borehole/casing is equipped with a transducer that takes water level readings in the stream on a regular basis. Data is downloaded from the transducer by cabling to a computer. The map includes locations of the four equipped stream gages in the BACOG area.

Due to the relocation of equipment from the Deer Park well to the South Barrington well at the time of this report, both locations are shown on the following map as monitoring wells funded by BACOG. In fact, only three of the four wells were equipped and monitoring water levels at any time.

Monitoring Wells and Stream Gauges



Monitoring Wells

- BACOG-Funded Monitoring Well
- Monitoring Well

Stream Gauges

- Installed and Recording
- Planned

- Interstate Highways
- State Routes
- Other Roads
- BACOG Boundary

Disclaimer of Liability:
This data has been derived partially from the Barrington Area Geographic Information System (BAGIS). This data is provided "AS-IS" without warranty of any kind, expressed or implied. BACOG and its member governments make no warranties, guarantees, or representations as to the suitability of this information for user's purposes or that the operation of the files/maps will be without defect.

Barrington Area Council Of Governments

This map was produced by BACOG on 8/11/2016
Source: BAGIS, Baseline Water-Level Conditions Report, KOT Environmental Consulting, Inc., 2014
IDOT, Cook, Kane, Lake and McHenry County

The water levels in the 15 wells without transducers have been measured by hand in the field under the BACOG program since summer 2014. Since these wells were drilled by the Illinois State Geological Survey in 2005-06, a limited number of manual measurements were taken by the ISGS in the following years; measurements in these wells were discontinued in 2012 due to discontinuation of funding for this program at ISGS. Measuring the wells involved opening the well cap, inserting a chlorinated electronic tape measure to determine the water level, and calculating the water-level elevation from the reference elevation at land surface. The first BACOG water level measurements were taken by Kurt O. Thomsen Environmental Consulting Inc. (KOTECI) for the Baseline Conditions Analysis Report, issued in January 2015. The 2015 and 2016 water level readings were taken by USGS staff as a donated services contribution to BACOG.

The three (3) wells initially equipped with transducers on Lake Barrington, North Barrington and Deer Park village property have taken water level readings multiple times a day, every day, since installation at the end of June 2014. The data is transmitted once an hour to satellites, which then send it to the USGS for processing. This data is hosted on the USGS National Water Information System site, Groundwater Conditions for Illinois, at: http://waterdata.usgs.gov/il/nwis/current/?type=gw&group_key=county_cd. There, the data generated from the three BACOG wells can be viewed, manipulated and downloaded.

Note: Since removal of the equipment on the Deer Park monitoring well on July 5th, the data collected for the previous two year period has been archived and can be viewed at: http://waterdata.usgs.gov/nwis/uv/?site_no=421036088054501&agency_cd=USGS

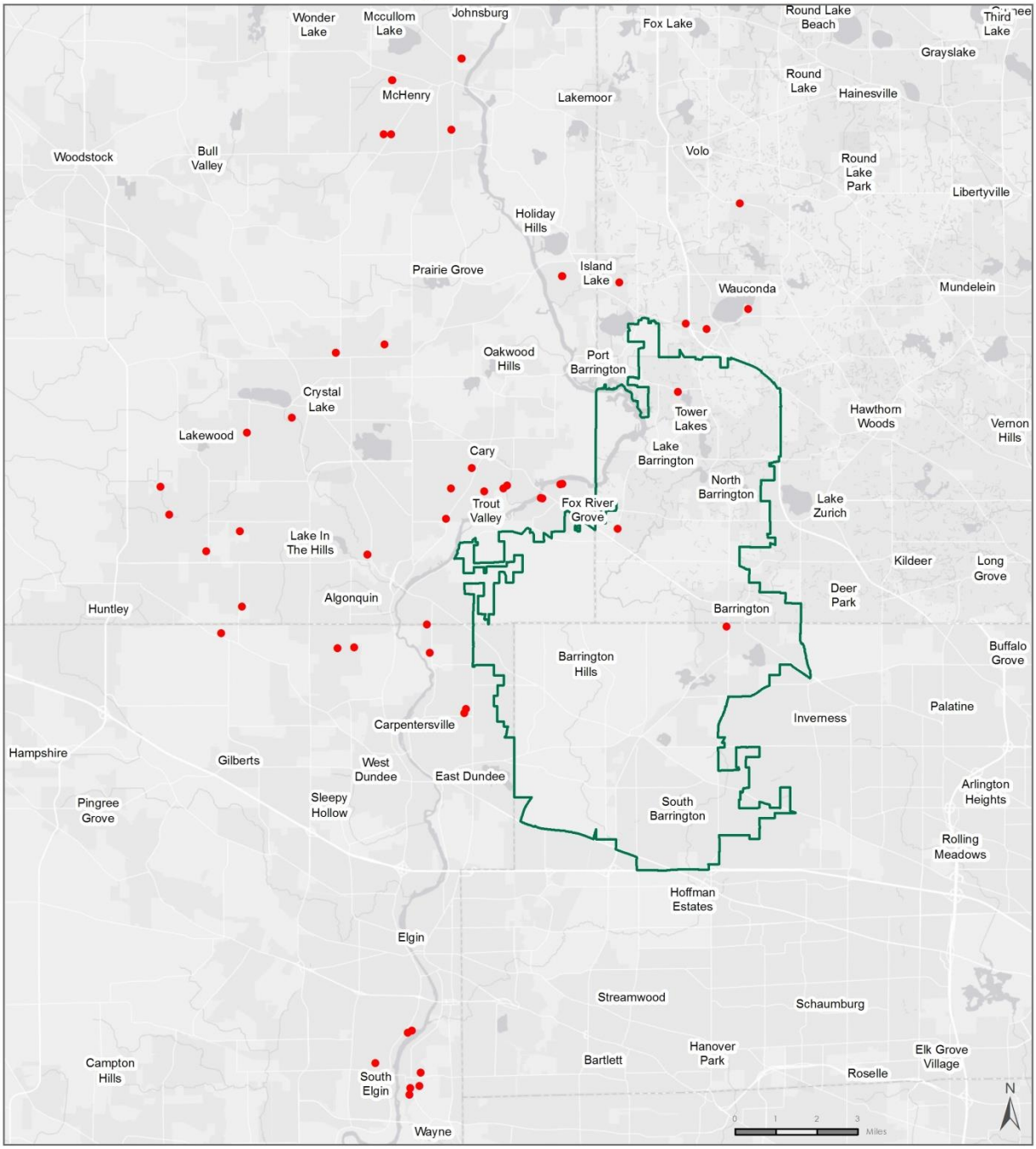
Change to BACOG Network Well Locations

The Village of South Barrington contracted for the drilling and development of a new monitoring well on village-owned property in the Conservancy in December 2015. The well was completed in June 2016. The transducer and satellite equipment in the Village of Deer Park well were moved to the South Barrington well on July 5th. This change was made due to Deer Park no longer being a member of BACOG.

Municipal Wells

Readings have been taken from municipal pumping wells in and adjacent to the BACOG area. Information including well location and elevation, pumping rate, and water levels were collected by the collaborating municipalities and sent to BACOG for the monitoring program. Wells included in the program are primarily those to the west because shallow aquifer system groundwater flows from west to east into the BACOG area. A map of the municipal pumping wells from which data is reported annually is below.

Municipal Pumping Wells



Municipal Pumping Wells
BACOG Boundary

Disclaimer of Liability:
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This map was produced by BACOG on 8/11/2016
Source: BAGIS, Baseline Water-Level Conditions Report, KOT Environmental Consulting, Inc., 2014 IDOT, Cook, Kane, Lake and McHenry County

Barrington Area Council Of Governments

III. DATA COLLECTION AND ILLUSTRATION

Following are the measurements collected from each data source. Please note this is a compilation of data, not an analysis of the data. It is intended that the five-year 2019 report will utilize this data, along with data collected from the same sources through 2019, and perform the analysis of changes in water levels and conditions.

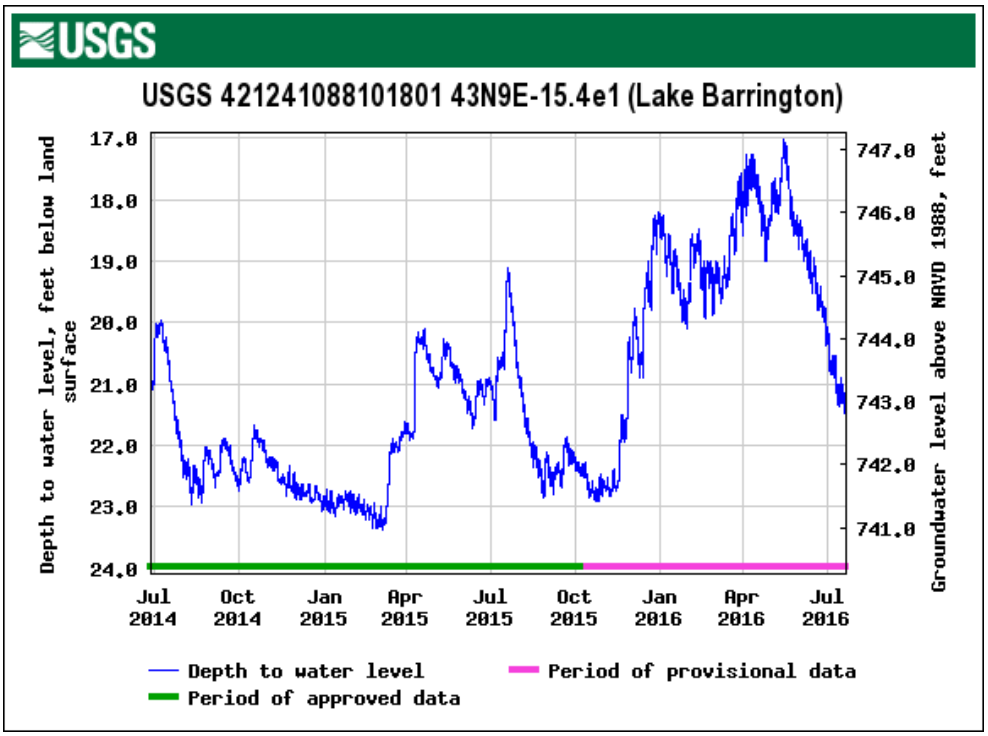
Please note the different types of data that are being collected and their uses. In the transducer-equipped stream gages and monitoring wells, the continuous data collected for surface water and groundwater will allow for several types of analyses which include, but are not limited to: estimations of recharge quantities, drawdown evaluations, barometric response function analysis, and water-budget component quantification and assessment. The measurements collected annually from the non-equipped monitoring wells and municipal pumping wells will provide a synoptic picture of groundwater levels and flow paths, as well as providing a more complete network of wells for evaluating groundwater conditions and trends. All data will ultimately be used for trend evaluation.

Equipped Dedicated Monitoring Wells

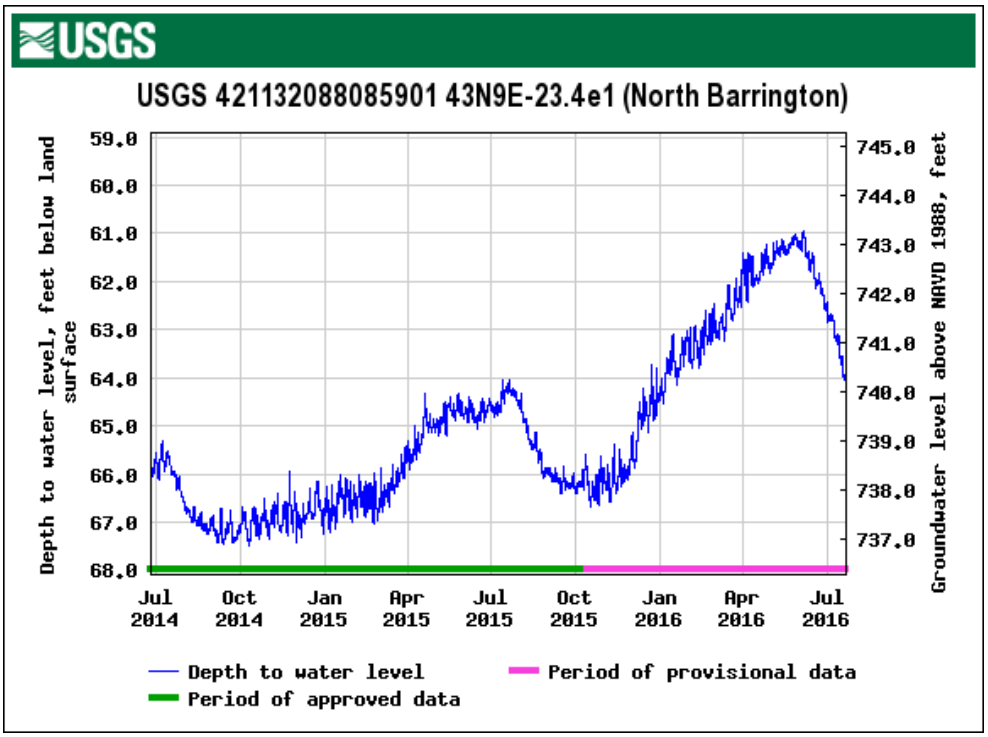
The charts below show the continuous water levels in each of the Lake Barrington, North Barrington and Deer Park equipped wells from the end of June 2014 through the first week of July 2016. The source of the graphs is USGS National Water Information – Current Conditions for Illinois Groundwater, where the BACOG monitoring well information is hosted:
http://waterdata.usgs.gov/il/nwis/current/?type=gw&group_key=county_cd

Because the South Barrington monitoring well had been collecting data only for a few weeks at the time of preparation of this report, its data is not presented here; however, the water level elevation in the South Barrington monitoring well ranged from 768.97 to 769.0 feet from July 5 to July 21, 2016.

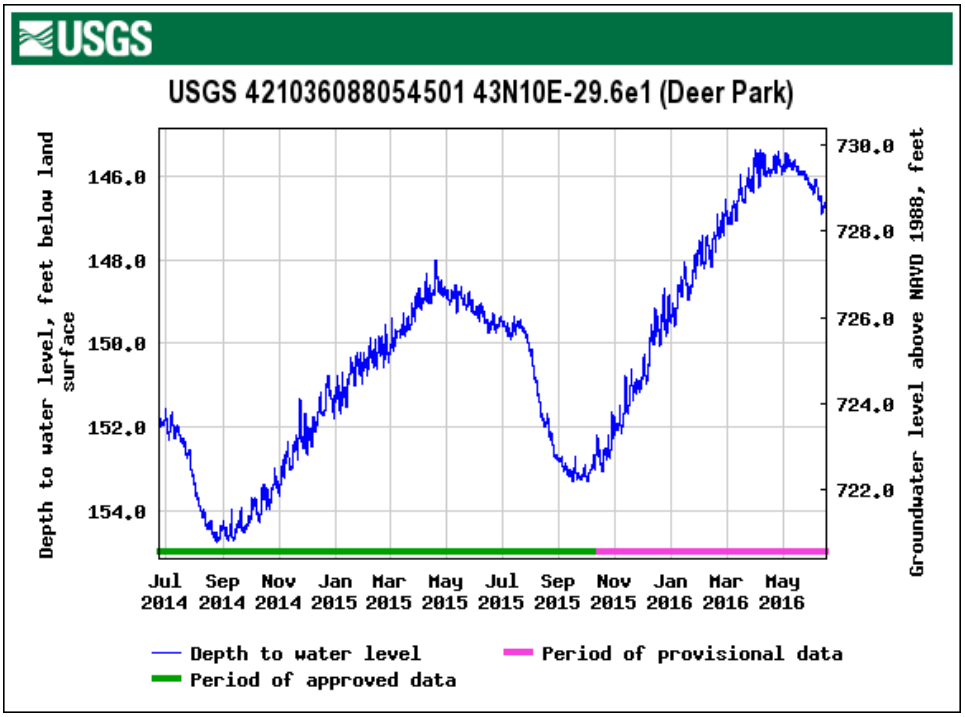
Lake Barrington Monitoring Well: 2 year period



North Barrington Monitoring Well: 2 year period

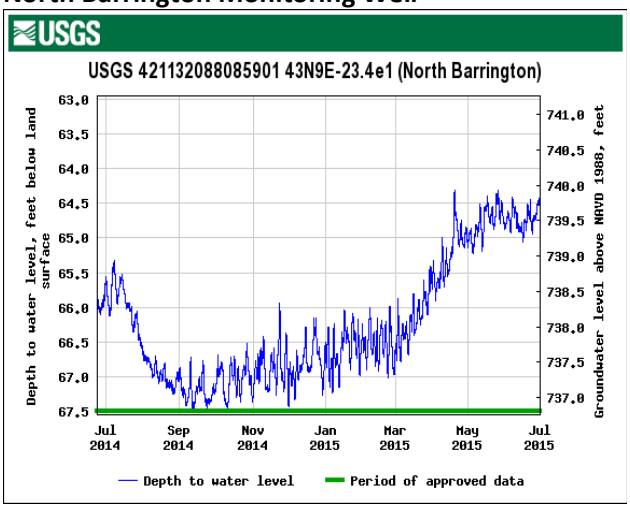


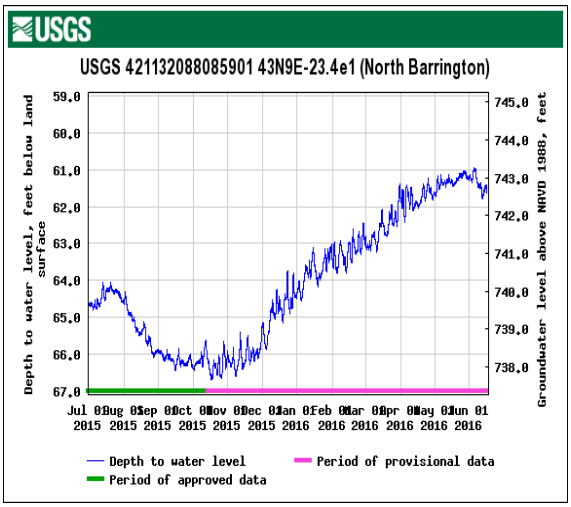
Deer Park Monitoring Well: 2 year period



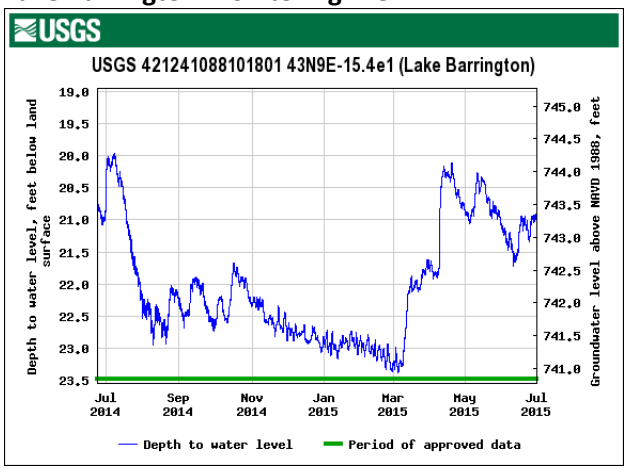
The charts that follow show continuous water levels in each of the three equipped wells for two 12-month periods, side by side, comparing the period June 2014-June 2015 to June 2015-June 2016. Please note the range of measurements on the graphs is not exactly the same for the two time periods.

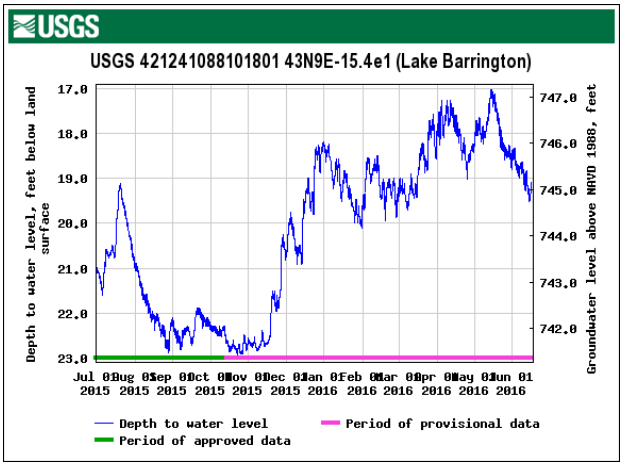
North Barrington Monitoring Well



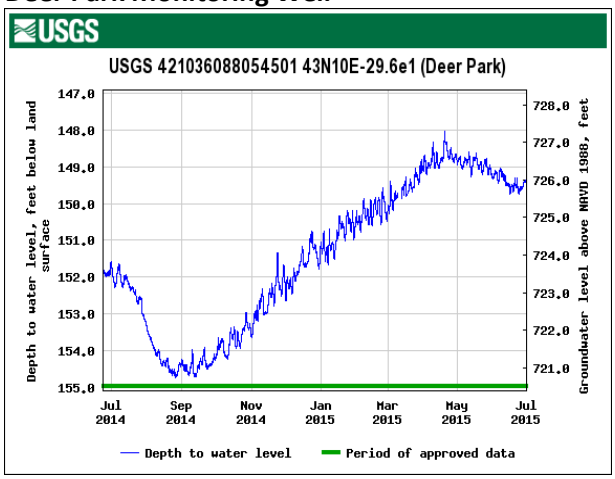


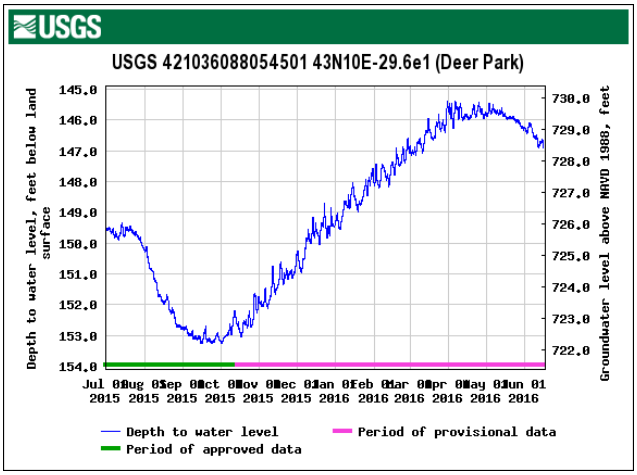
Lake Barrington Monitoring Well





Deer Park Monitoring Well





Manually-Measured Dedicated Monitoring Wells

Water levels in the 15 dedicated monitoring wells drilled by ISGS are now being measured annually at a single point-in-time. The first chart below shows measurements collected by KOTECI with BACOG staff on July 10, 2014, by USGS staff on July 28, 2015, and by USGS staff on July 7, 2016. In the second chart, data from the electronic measurements in the equipped wells has been extracted to show the water levels on the dates of measurement of the other 15 wells.

Notes:

- The column titled "Change" represents the change in water level from the baseline reading in 2014 to the most recent reading (i.e., 2016) but does not address changes in the interim years.
- Reference Point Elevations for the monitoring wells are at ground surface in the data provided by USGS, ISGS and ISWS. Water level elevations are calculated from these points.

Well (quadrangle/#)	Water Level Elevation (ft AMSL)			
	2014	2015	2016	Change
BARR-06-01	781.38	783.18	786.90	5.52
BARR-06-02A	739.65	739.05	738.69	-0.96
BARR-06-02B	752.65	751.98	752.33	-0.32
BARR-06-03	NA	775.61	NA	NA
BARR-06-04A	771.55	773.33	770.65	-0.90
BARR-06-04B	NA	768.63	NA	NA
BARR-07-06B	741.24	741.28	742.84	1.60
LZUR-04-01	744.80	745.07	748.22	3.42
LZUR-05-02	786.78	780.17	777.41	-9.37
LZUR-05-03	729.39	NA	NA	NA
LZUR-06-04	714.99	714.77	NA	NA
LZUR-07-07	724.81	726.74	730.30	5.49
STRM-05-01	748.16	749.00	747.77	-0.39
STRM-06-02	809.09	809.48	NA	NA
STRM-06-03	766.21	766.46	766.13	-0.08

Well	Water Level Elevation (ft AMSL)			
	2014	2015	2016	Change
43N9E-15.4e1 (LB)	743.98	743.96	743.5	-0.48
43N9E-23.4e1 (NB)	738.34	739.85	741.48	3.14
43N10E-29.6e1 (DP)	723.16	725.48	726.82	3.66
42N9E-28.2a (SB)	NA	NA	769	NA

Historical Manually-Measured Monitoring Well Data

Manual point-in-time measurements were taken by the Illinois State Geological Survey from the date of their construction in 2005-06 to 2012. These readings were compiled by the ISGS for the BACOG Monitoring Program and are shown below. Monitoring of these wells was discontinued as of 2012 due to funding cuts at ISGS. Please note that climatic influences such as precipitation due to seasons may affect the variability of the readings from year to year, that is, some readings were taken in the summer and some were taken in the fall.

Well	Water Level Elevation (ft AMSL)					
(quadrangle/#)	7/2/2007	10/25/2007	11/5/2008	7/14/2009	6/22/2010	6/6/2012
BARR-06-01	775.06	777.04	780.74	786.59	785.63	784.57
BARR-06-02A	737.14	739.01	739.48	739.20	739.83	NA
BARR-06-02B	752.40	752.70	752.58	754.27	753.65	751.92
BARR-06-03	738.47	739.01	739.53	741.26	740.95	NA
BARR-06-04A	766.21	768.15	771.25	775.68	774.92	NA
BARR-06-04B	765.21	766.14	767.47	768.31	768.42	767.96
BARR-07-06B	737.56	738.00	739.86	NA	NA	NA
LZUR-04-01	744.95	745.72	746.73	747.4	749.22	747.44
LZUR-05-02	847.68	843.46	837.64	829.29	819.00	800.95
LZUR-05-03	714.74	719.63	725.64	724.53	730.52	NA
LZUR-06-04	702.31	710.31	714.69	711.68	717.36	715.67
LZUR-07-07	NA	719.81	723.18	726.72	729.54	727.91
STRM-05-01	736.38	741.40	746.46	745.94	749.56	746.61
STRM-06-02	807.78	810.33	810.57	813.17	811.89	810.57
STRM-06-03	763.34	763.86	766.08	766.96	766.49	764.86

Municipal Pumping Wells

Water level measurements are being taken annually in approximately 52 wells located in 13 municipalities on a synoptic basis. BACOG developed the chart below from: 1) measurements taken July 9, 2014 and collected by KOTECI; and 2) measurements taken August 10, 2015 and July 7, 2016 collected by the BACOG Executive Director.

Notes:

- A number of variables can affect the water level in a pumping well. For example, rate of pumping, barometric pressure, and the overlapping cones of depression (drawdown of aquifer water levels due to pumping) from all the other high-capacity wells in the aquifer. This data is being collected for the 2019 comprehensive report; the reader is cautioned against trying to interpret it as stand-alone information.
- The Reference Point Elevations were self-reported by the municipalities in 2014. In 2016, BACOG staff adjusted for inconsistencies in some of this data by consulting USGS topography maps and well log information from ISGS ILWATER maps if data was available. Pumping Water Levels were calculated from these points.

Operating Municipal Well	Pumping Water Level Elevation (ft AMSL)		
	2014	2015	2016
ALGONQUIN_5	762	759	767
ALGONQUIN_7	700	699	702
ALGONQUIN_8	818	832	832
ALGONQUIN_9	837	844	850
ALGONQUIN_13	835	818	817
ALGONQUIN_15	842	NA	854
BARRINGTON_1	702	726	726
BARRINGTON_4	NA	714	716
CARPENTERSVILLE_5	767	767	762
CARPENTERSVILLE_6	752	765	752
CARY_3	781	791	778
CARY_8	713	714	715
CARY_9	700	701	693
CARY_10	787	789	789
CARY_11	804	805	804
CARY_12	811	810	809
CRYSTAL_LAKE_9	755	743	747
CRYSTAL_LAKE_10	792	794	801
CRYSTAL_LAKE_11	804	805	815
CRYSTAL_LAKE_14	795	778	783
CRYSTAL_LAKE_15	875	862	861
FOX_RIVER_GROVE_1	721	NA	724
FOX_RIVER_GROVE_2	723	723	NA
FOX_RIVER_GROVE_3	NA	NA	701
FOX_RIVER_GROVE_4	NA	675	NA
ISLAND LAKE_4-6	650	641	642
ISLAND LAKE_4-10	648	642	658
ISLAND_LAKE_5	720	716	720
LAKE BARRINGTON 1	741	725	764
LAKE BARRINGTON 2	NA	744	744
LAKE_IN_THE_HILLS_6	843	846	NA
LAKE_IN_THE_HILLS_9	767	767	767
LAKE_IN_THE_HILLS_10	855	851	855
LAKE_IN_THE_HILLS_12	809	814	816
LAKE_IN_THE_HILLS_16	822	826	824
LAKE_IN_THE_HILLS_17	727	729	729
MCHENRY_2	735	735	733
MCHENRY_3	669	668	666
MCHENRY_5	711	713	711
MCHENRY_6	704	704	700

MCHENRY_7	711	704	705
MCHENRY_8	787	719	746
MCHENRY_9	647	658	635
MCHENRY_10	611	612	609
SOUTH_ELGIN_3	677	686	686
SOUTH_ELGIN_4	735	762	764
SOUTH_ELGIN_5	698	695	699
SOUTH_ELGIN_6	687	NA	689
SOUTH_ELGIN_10	683	684	694
SOUTH_ELGIN_11	705	704	701
SOUTH_ELGIN_12	649	641	651
TOWER_LAKES_5	693	693	693
WAUCONDA_3	650	650	653
WAUCONDA_5	751	752	753
WAUCONDA_6	717	716	717
WAUCONDA_10	707	706	718

Stream Gages

Limited streamgage data is available. Streamgage measurements were not available for the 2015 Baseline Report, which was developed from data collected in 2014. With the installation of two gages in Flint Creek near Lake Barrington in November 2014 and two additional gages in Flint Creek near New Hart Road in Barrington in May 2016, more data should be available for the next report. The stream gages take continuous readings, but the measurements below were extracted for a point-in-time for 2015 and 2016.

Stream Gauge	Water Level Elevation (ft AMSL)		
	2015	2016	Change
FC_1	NA	792.33	NA
FC_2	NA	789.00	NA
FC_3	748.83	748.75	-0.08
FC_5	740.19	740.05	-0.14

Climatic Conditions

The following climatic data was compiled by BACOG in summer 2016 from the National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce, Chicago Weather Forecast Office, at: http://w2.weather.gov/climate/index.php?wfo=lot. The NOAA *Annual Climate Report* contains detailed annual weather statistics, including temperature, precipitation, degree days, wind, humidity, sunrise/sunset, and record temperature data for a year period. Precipitation data includes both calendar year and water year totals, percent of normal values, and comparisons to normal.

Precipitation, Annual – Chicago IL:

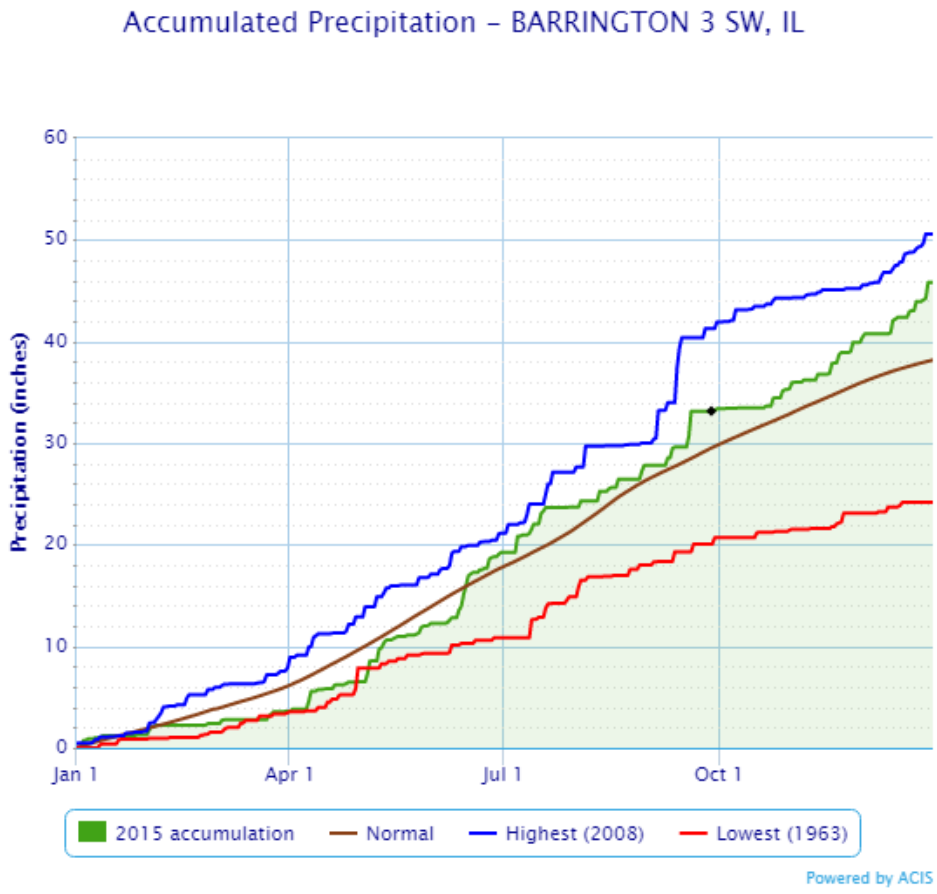
Inches, Annual	2015	2014	2013	2012	2011
	39.85	39.47	42.09	26.91	49.83
Normal*	36.89	36.89	36.89	36.89	36.89
Over/Under Normal, Inches	2.96	2.58	5.20	(9.98)	12.94
Over/Under Normal, Percent	+8%	+7%	+14%	-27%	+35%

**Normal Period: 1981 to 2010 (30-Year)*

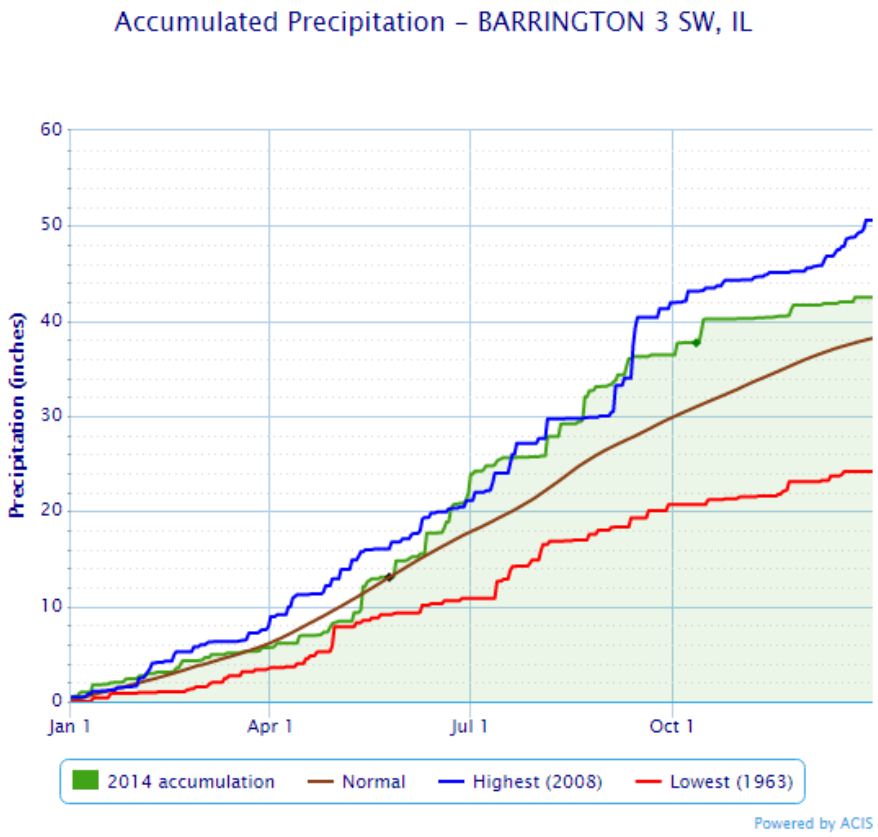
Precipitation in the Chicago metropolitan region during the years covered by the monitoring program was higher than the 30-year normal: higher by 7% in 2014, and higher by 8% in 2015 during the monitoring program.

While the preceding measurements were for the Chicago area, the following climatic information is specific to Barrington.

Precipitation, Barrington IL: January 1-December 31 2015
(from NOAA website: http://w2.weather.gov/climate/xmacis.php?wfo=lot)



Precipitation, Barrington IL: January 1-December 31 2014



Precipitation Monthly - January to December, Barrington 3 SW, IL:

2015	1.29	1.10	1.20	2.91	5.75	6.99	4.46	4.10	5.58	1.99	4.55	5.90	**TOTAL 45.82**

2014	2.39	1.91	1.35	2.63	6.51	7.11	3.82	7.41	3.28	3.82	1.43	0.83	**TOTAL 42.49**

Compilation of Data

BACOG developed a structure to store all measurements described in this Section III, using Excel spreadsheets and geodatabases. The information is maintained and backed up in the BACOG office. The data structure is designed to hold the readings collected from the start of the monitoring program in 2014 through future years. All data can be used for reporting, and it will be analyzed collectively for the 2019 comprehensive report.

IV. TRENDS OR INDICATIONS

As a courtesy to BACOG, two individuals from the ISGS and the USGS have provided comments on the data presented in this Interim Report.

Comments provided by David R. Larson, Hydrogeologist (retired), Illinois State Geological Survey; former Section Head, Geologic Mapping and Hydrogeology Center:
Because the water-level record is so short and with little stage-level data for surface water, discussion of trends would be inappropriate. A discussion of possible indicators might include the overall similarity of the North Barrington and Deep Park hydrographs between the two periods. Another feature is the hydrographs of the first period show less fluctuation of water level than the hydrographs of the second period. A third feature is the different shape of the Lake Barrington hydrographs, but this would need a word of explanation as to why they are different. The hydrographs show minor changes over time, and this may be all that is needed to be said. Adding a weather monitoring station (precipitation, temperature, etc.) within BACOG but some distance from the Barrington NOAA site would be beneficial. The data provided would enhance evaluating the trends in water-level fluctuations, for example. Cooperative programs, such as Mesonet, may help provide the resources to accomplish this, one of which involves schools.

Comments provided by Amy M. Gahala, Hydrologist, U.S. Geological Survey, DeKalb Office:
As previously noted, the required time period necessary to observe and evaluate trends in water levels is generally five years to a decade or more. For the 2019 BACOG report, the data available will include the historical ISGS measurements from 2007-12, which when evaluated together with all data collected through 2019, should provide an adequate time period to establish trends. With the exception of the LZUR-05-02 monitoring well, all the other water level data are indicating a stable trend. The Lake Zurich quadrangle well, LZUR-05-02, has shown a 70 foot decrease in water levels from 2007 to 2016. Water levels have dropped consistently on a year-to-year basis, and this is not likely to be caused by natural fluctuations.

V. PROGRAM COSTS

Component 1, the Baseline Conditions Analysis Report issued in January 2015, was entirely funded from BACOG cash reserves in 2014 in the amount of $19,565. This was a one-time expense.

Component 2, the Well Network, was funded in 2014 by: 1) a ~$24,000 grant from USGS for equipment on three wells, and 2) BACOG cash reserves in the amount of $6,150 for operations by USGS on the same three wells. In the two years since, operations have been funded by BACOG government member assessments, on a proportional basis based on the Dues Policy, in the total annual amount of $6,150. This is an on-going expense of the program; the well operational costs are likely to be raised slightly by USGS in the next 3-year contract.

Component 3, Long-term Data Analysis and Reporting, is being funded by BACOG government member assessments, on a proportional basis based on the Dues Policy. The annual amounts assessed to date are $4,242 total in 2014-15 and $4,581 total in 2015-16. The annual assessments are being collected toward the cost of the second comprehensive report of shallow aquifer system conditions, to be conducted in 2019. Over the five-year period, the assessments will increase somewhat each year for a goal amount of $25,000 to fund the 2019 report. These funds are held in a restricted account.

Component 1 and 2 together resulted in an annual assessment to members of $10,392 in 2015 (cost shared proportionately among members) to a little over $12,000 by the year 2019. There are no other costs -- other than staff time -- of the Comprehensive Groundwater Monitoring Program. This Interim Report is not a funded activity of the program.

VI. DIRECTIONS FOR THE FUTURE

No changes in program scope or directions for the upcoming 1-2 years are recommended at this time. After consultation with the Illinois State Water Survey, the date for the synoptic monitoring well and pumping well measurements likely will be moved to the month of June (from July or August) in 2017 and thereafter.

VII. ACKNOWLEDGMENTS

BACOG wishes to acknowledge collaborating agencies for their contributions to the Aquifer Water Levels Monitoring Program. Thank you to Doug Yeskis, State Director of the USGS Illinois Water Science Center, for the offer in 2013 to grant the monitoring/satellite equipment, which opened the door to launching the BACOG program. Thank you to Jon Hortness, Field Office Chief at the U.S. Geological Survey--DeKalb Office, and Supervisory Hydrologist Jon Lageman and Hydrologist Amy Gahala for guidance and technical assistance for this 2016 Interim Report. Special thanks go to the USGS DeKalb Field Office for providing staff to manually measure the 15 dedicated monitoring wells in 2015 and 2016, and to the 13 area municipalities that are collaboratively providing measurements from municipal wells: Algonquin, Barrington, Carpentersville, Cary, Crystal Lake, Fox River Grove, Island Lake, Lake Barrington, Lake in the Hills, McHenry, South Elgin, Tower Lakes, and Wauconda.

Our gratitude is also shared to staff of the Illinois State Water Survey (ISWS) and Illinois State Geological Survey (ISGS), including Scott Meyer, Steve Wilson, Walt Kelly, David Larson and Jason Thomason, for their advice, support and involvement over many years regarding the development/design of the BACOG Aquifer Water Levels Monitoring Program. Exceptional mention and appreciation goes to hydrogeologist Kurt Thomsen, KOTECI, who developed the initial protocol for this program as part of the Baseline Conditions Analysis Report and has served as professional advisor to BACOG for more than a decade. Thank you to BACOG GIS Analyst Tomasz Szczuka for his unwavering attention to accuracy in compiling the data for this report.

Report prepared by:
Janet L. Agnoletti, Executive Director
July 29, 2016

Appendix O: Action Plan Report Cards

Flint Creek Watershed Partnership Action Plan Report Card June 2012 and March 2018

Patsy Mortimer, Coordinator '12
Faye Sinnott, Coordinator '18

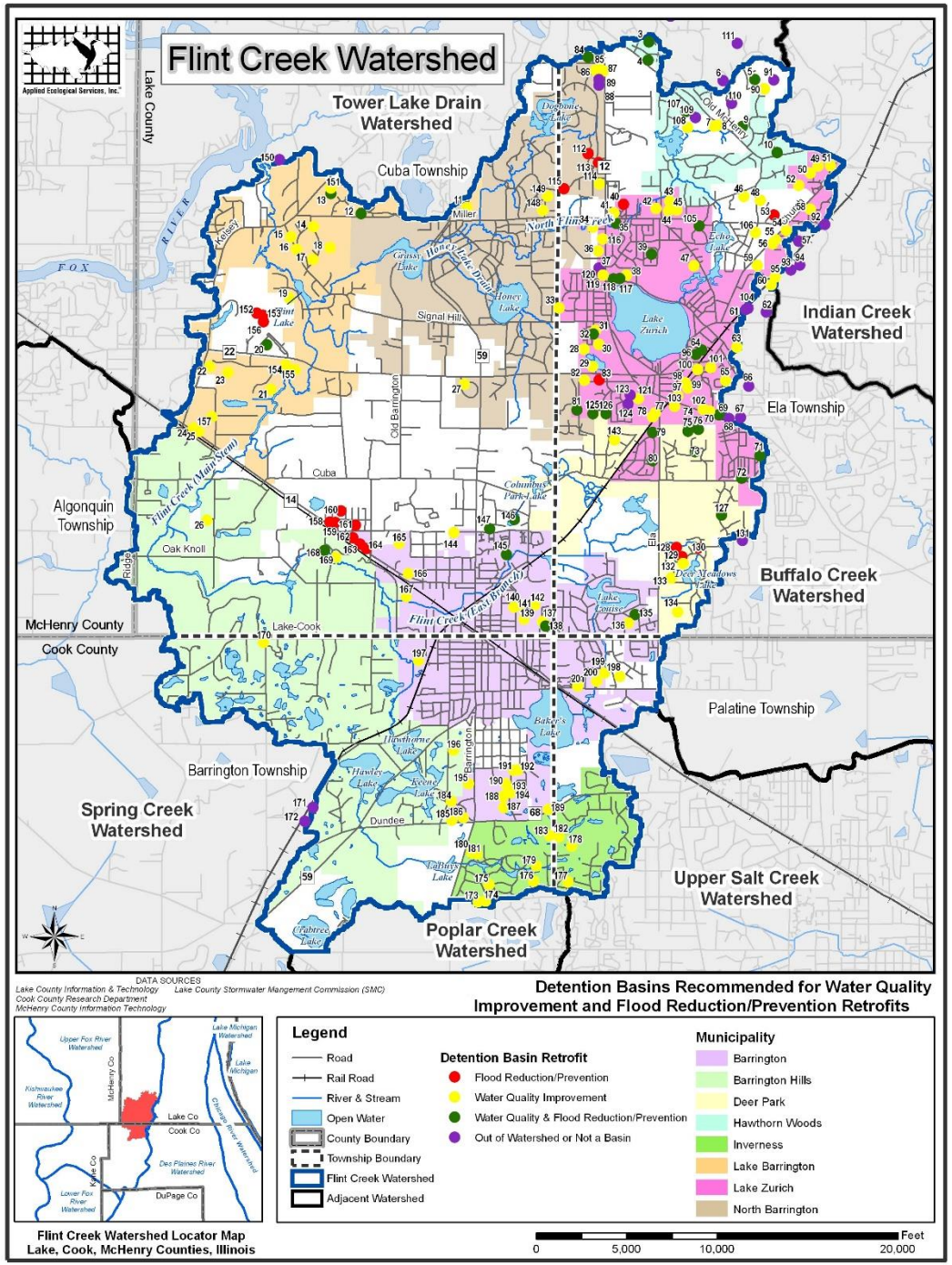
	Det basins	Floods	Lake shore	Storage	Wetland restore	Stream maint	Stream restore	Total
Cuba T	10	7	1	9	9	4	4	44
Lake Zurich	34	2	2	1		2	2	43
Barrington	19	4	1	2	2	7	7	42
Barr Hills	3	4		15	6	6	6	40
N Barrington	6	1	3	1	14	7	7	39
Ela T	7	1	1	7	6	3	3	28
L Barrington	4		1	8	4	5	5	27
Deer Park	9		1	4	2			16
Barr T		1	1	6		1	1	10
Hawthorn Woods	4				1	2	2	9
Inverness	3							3
Total	99	20	11	53	44	37	37	301

- Detention Basins

99 high & medium priority

2007: 2 retrofits completed (not identified in plan)

2018: 22 retrofits completed (additional)

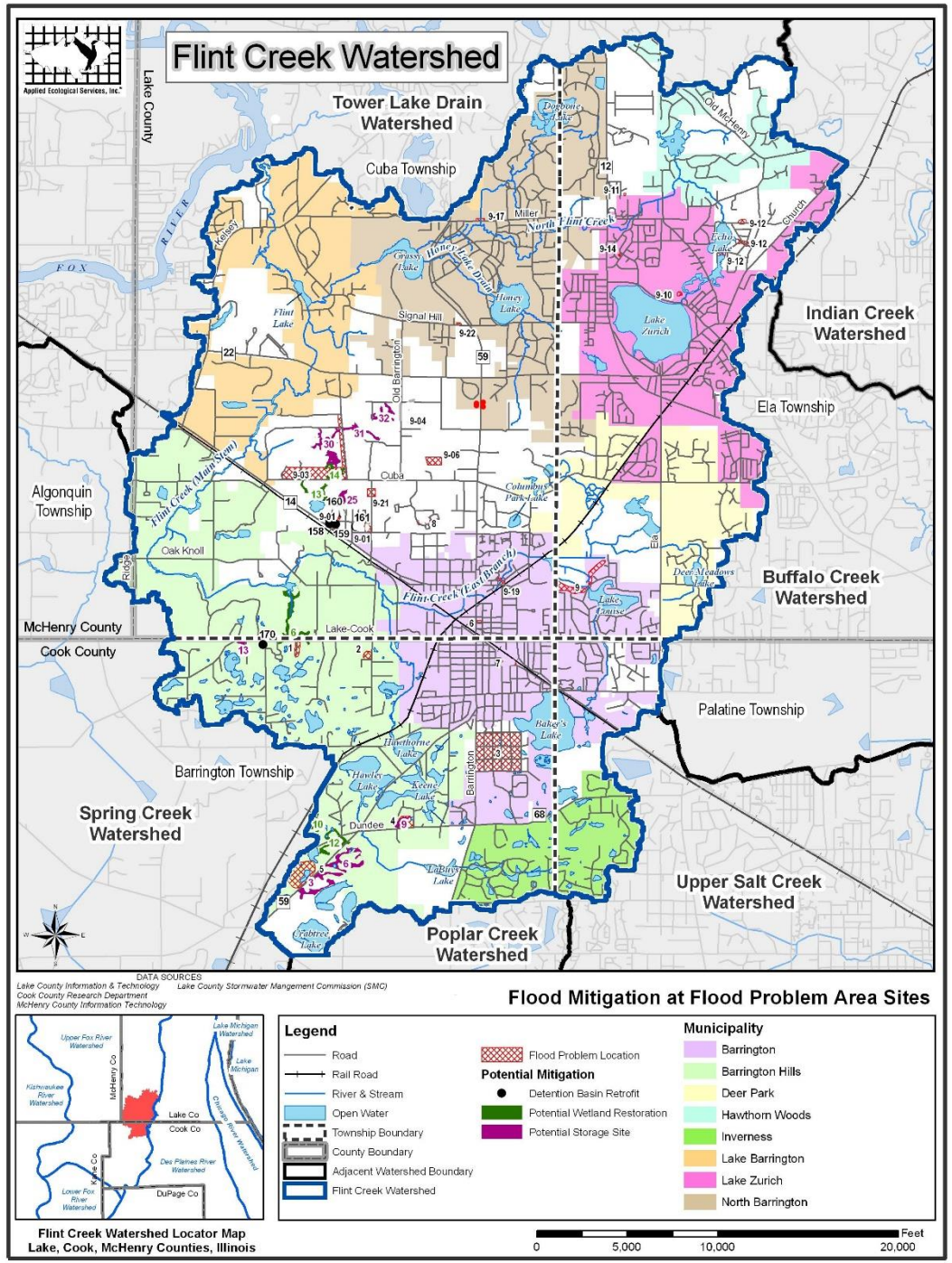


- # Flood Mitigation

Flood problem areas affecting structures: 20 areas identified

2007: Barrington Twp. fought wetland development College Streets; Barrington replaced stormsewers; N. Barrington replaced road culverts

2018: Barrington Twp. still fighting, seeking grants; Barrington continues to replace more stormsewers; Cuba Twp, Lake Zurich, N. Barrington replace culverts, etc.



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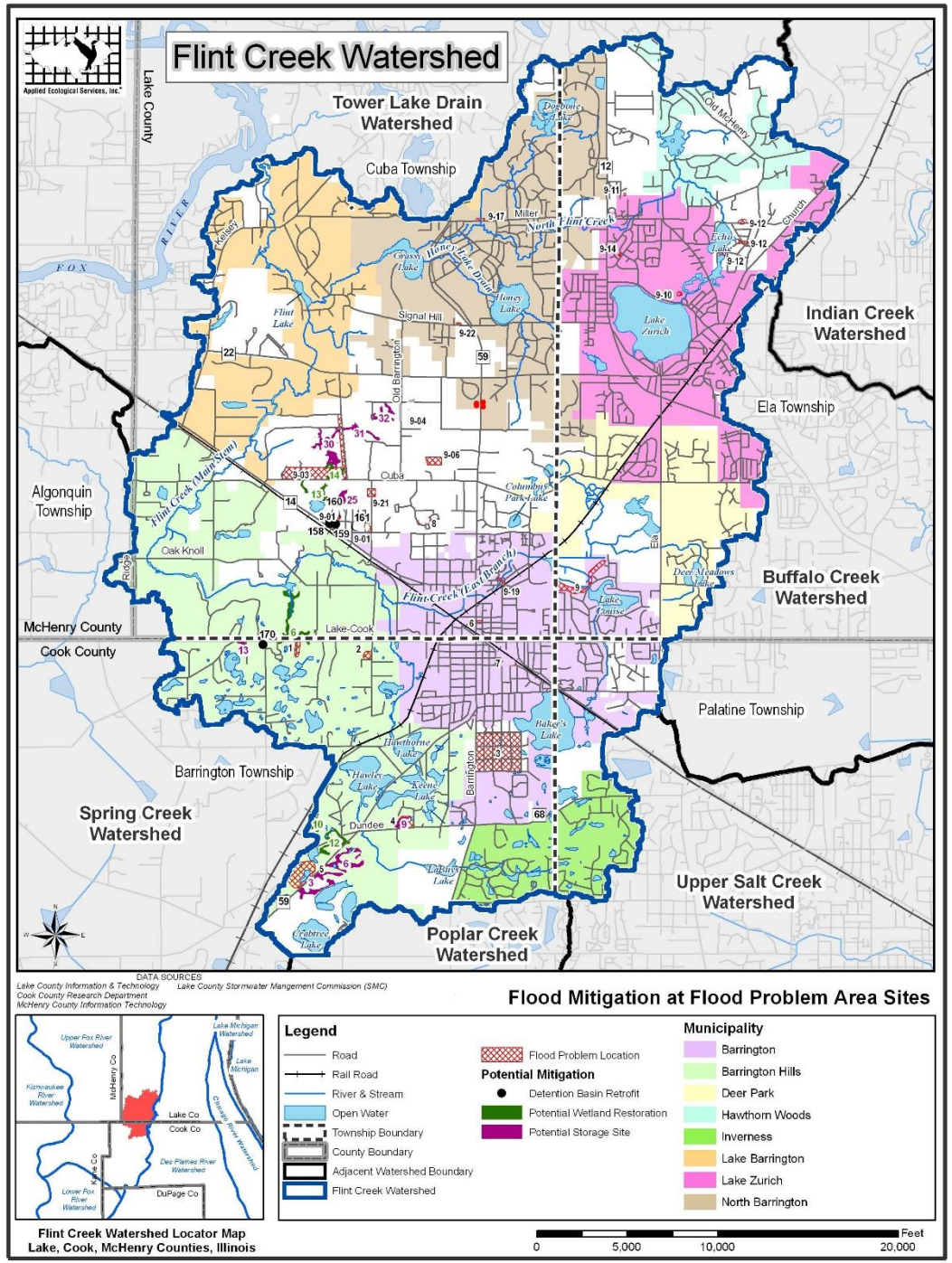
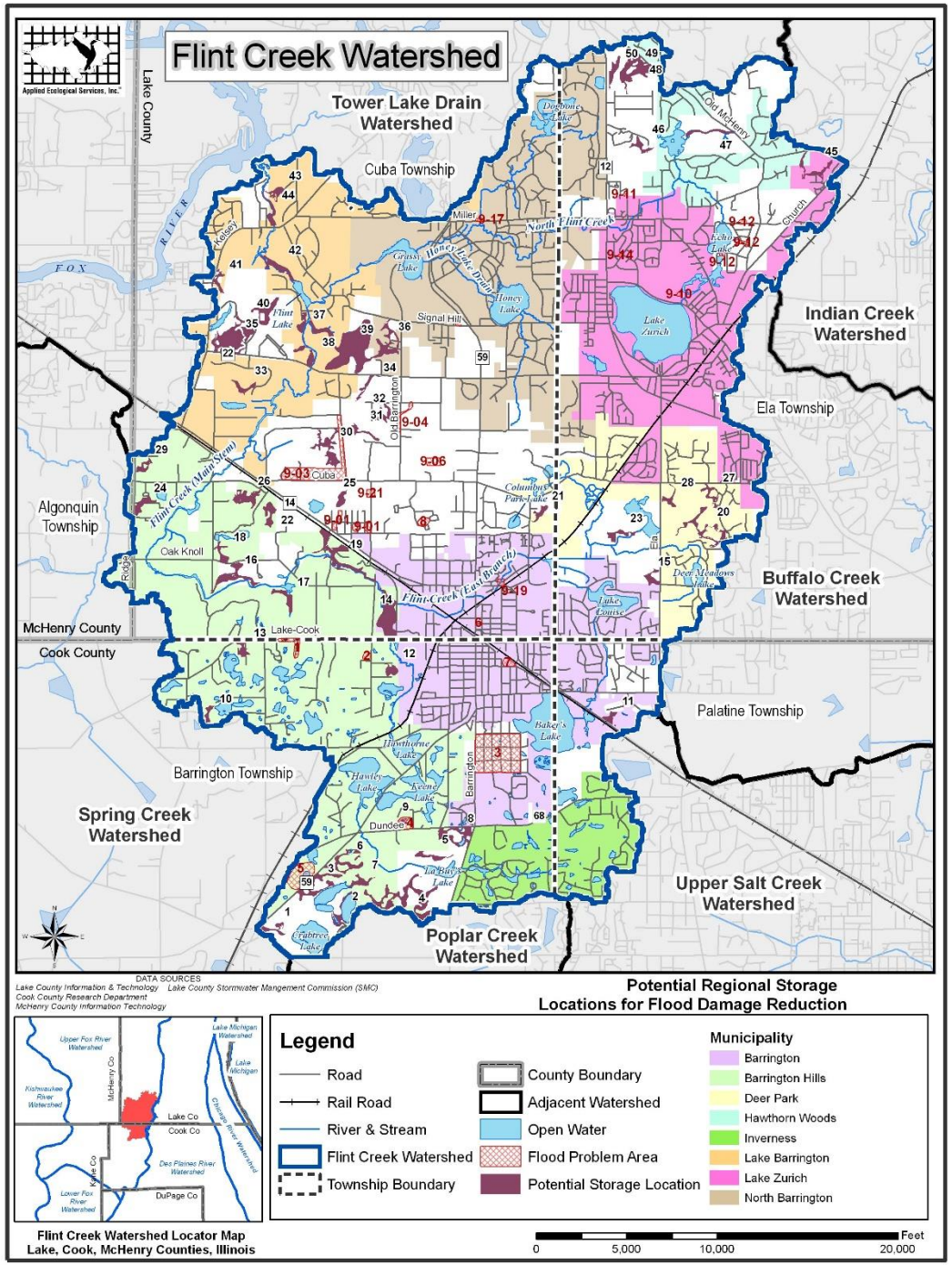


- Regional Storage

2007: Identified possible locations, many overlapped with wetland restoration options

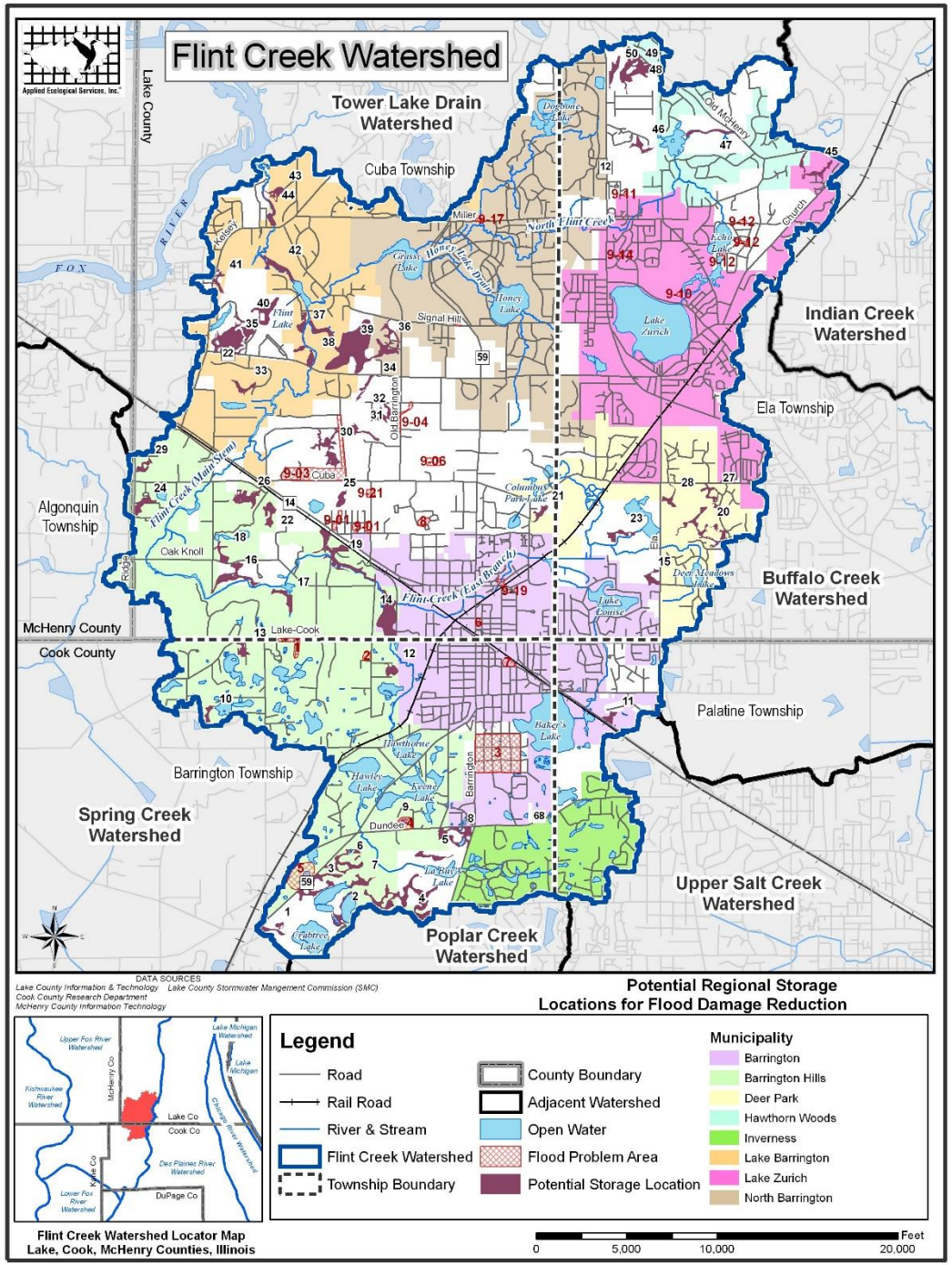
2018: Barrington – 1; Cuba Twp. – 1; Lake Barrington – 7; North Barrington - 1



- Wetland Restoration

2007: Identified possible 42 feasible locations

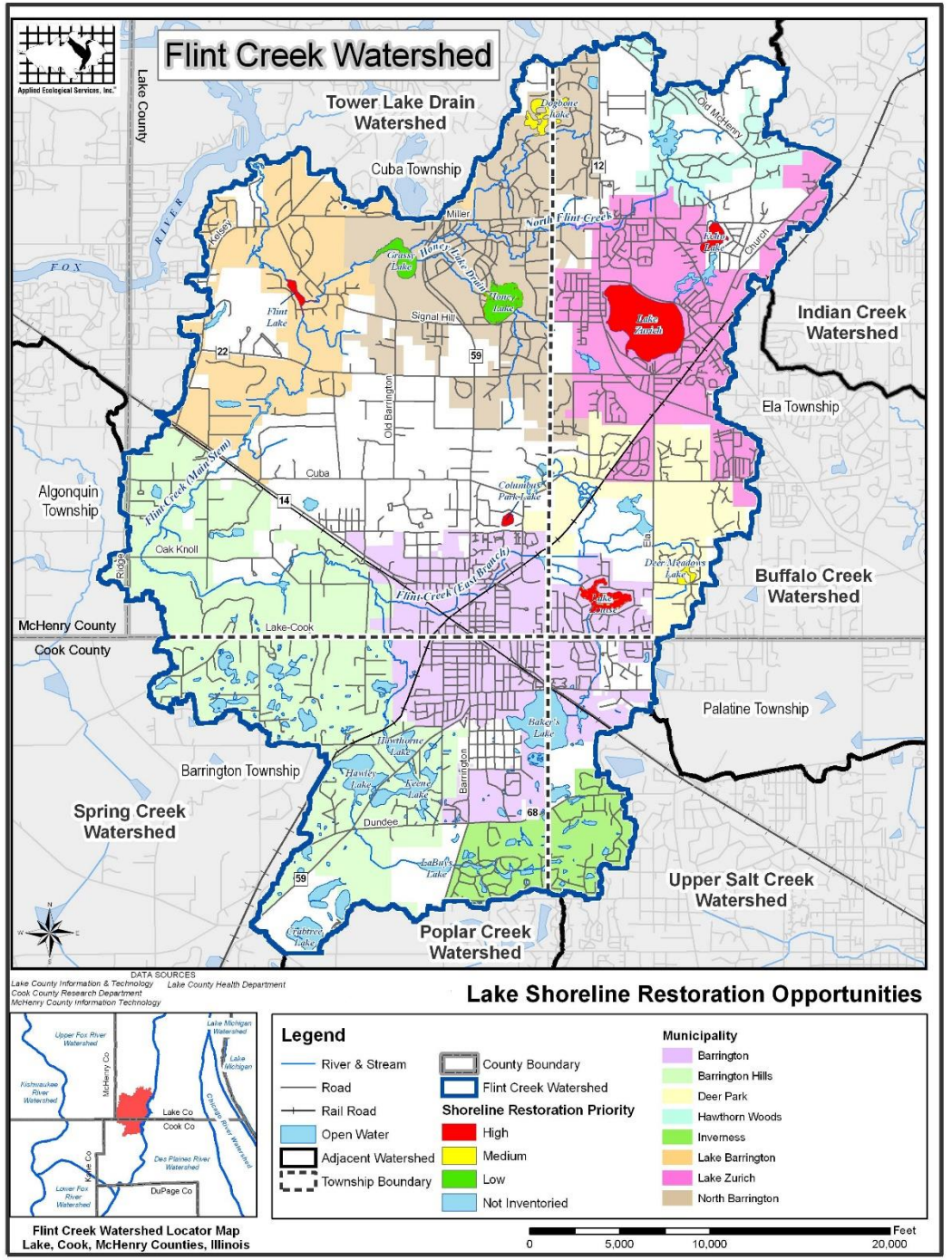
2018: Barrington – 1; Cuba Twp. – 1; Lake Barrington – 3 restorations; North Barrington - 2 restorations; BACT – 2 restorations; Citizens for Conservation – 4 restorations; Lake County Forest Preserve – 2 restorations



- Lake Shoreline Restoration

2007: Identified 10 lakes (11 governments)

2018: Lake Zurich – 2 Lake shorelines (587 linear feet and 659 linear feet plus a permit structure



- Stream Maintenance

2007: N. Flint Creek: North Barrington; E branch: Cuba Marsh

2018: Lake Zurich – stream channel maintenance and monitoring; North Barrington: implement regular clearing of debris jams in streams

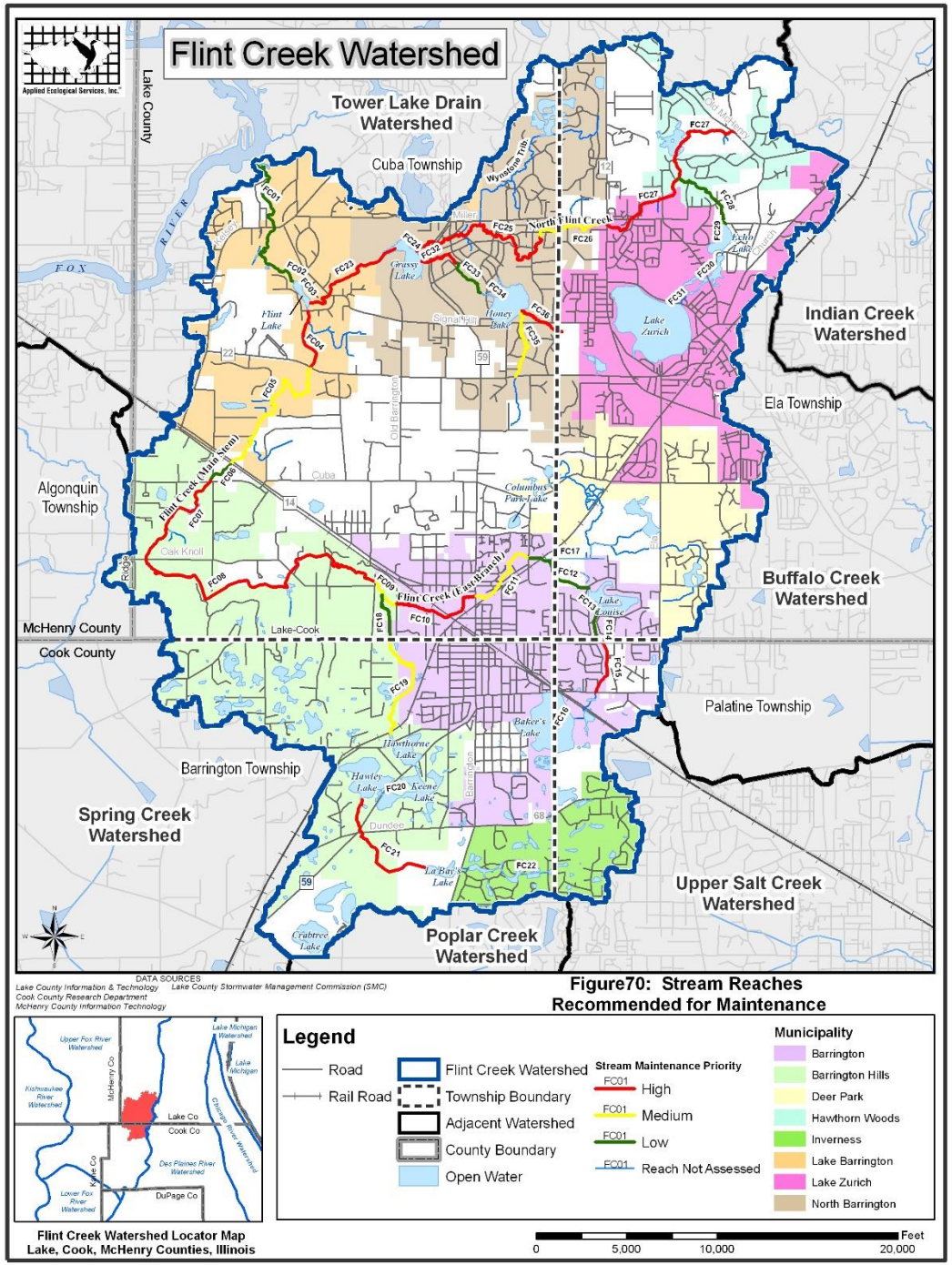
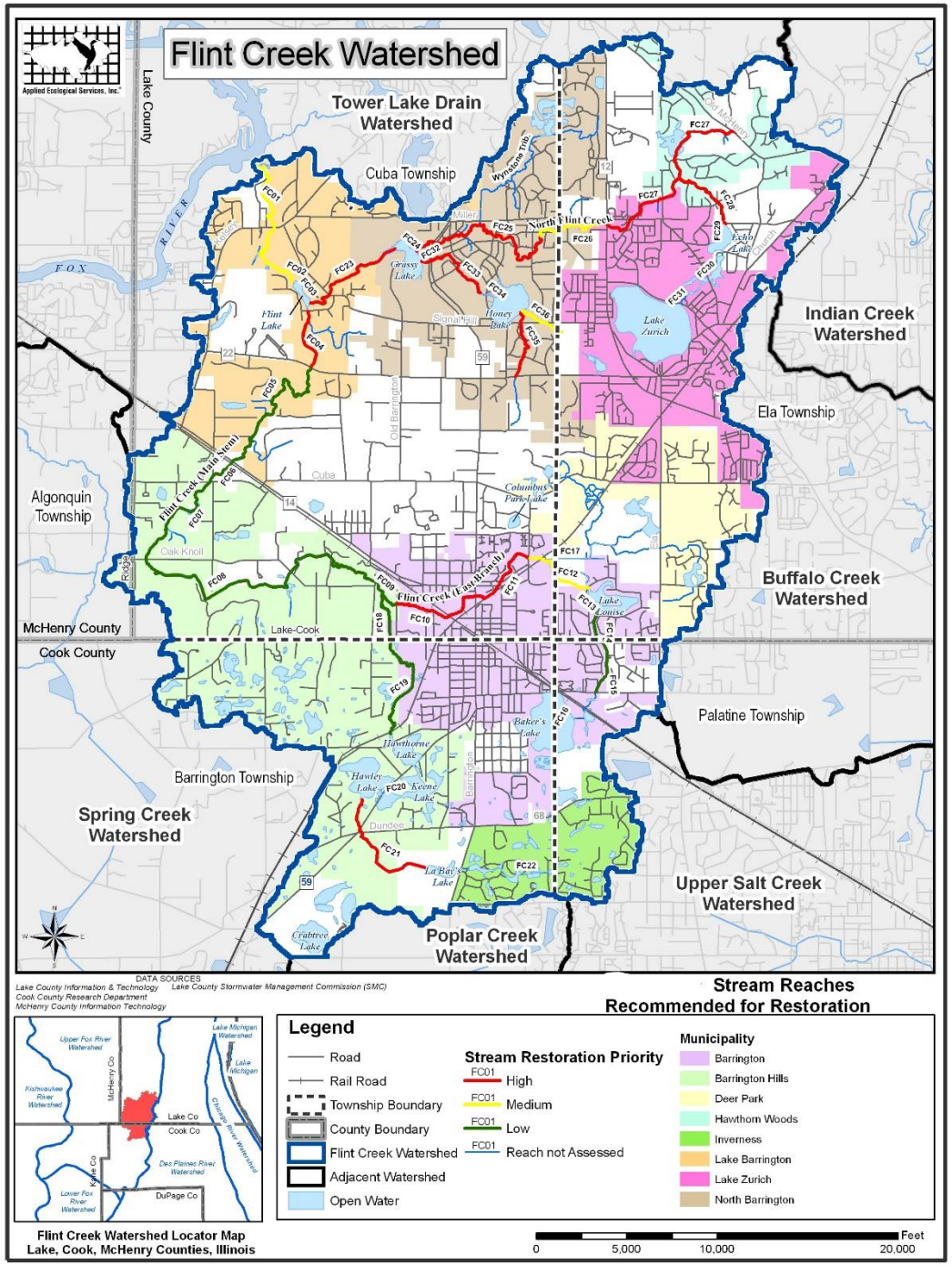


Figure70: Stream Reaches Recommended for Maintenance

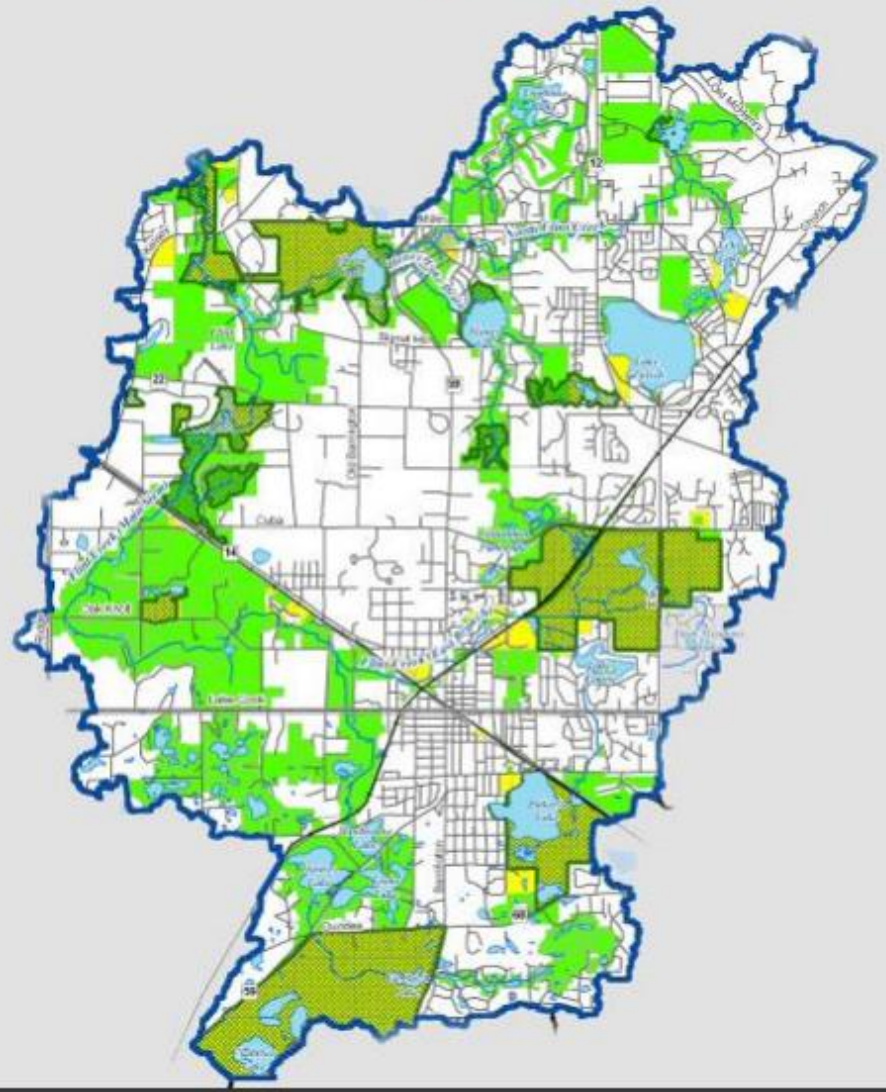
- Stream Restoration

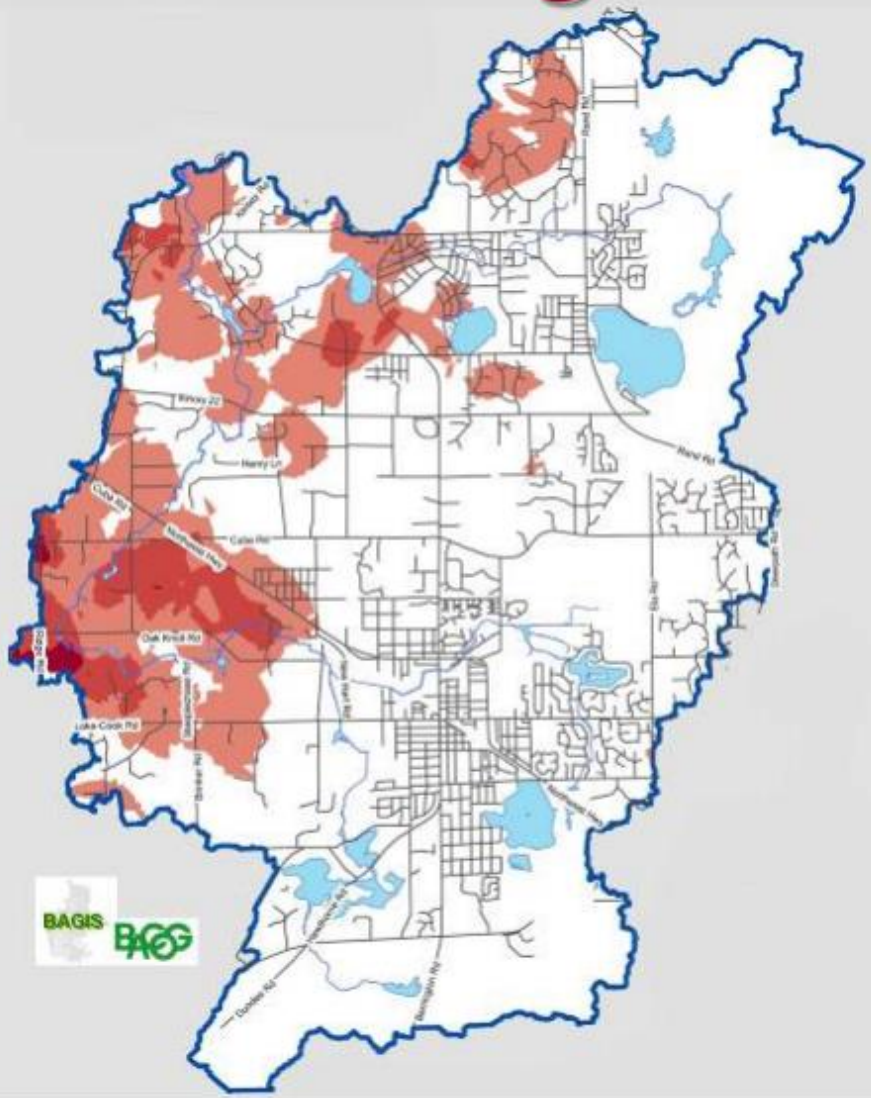
2007: 25 reaches assessed

2018: Lake Barrington – stream reach restoration with Hurd Farm; North Barrington – 1700 linear feet of stream reach restoration



Green infrastructure network protects groundwater recharge





Goal A: Protect Surface and Groundwater Resources and Enhance Overall Water Quality in the Lakes and Streams of the Watershed

2012 Report

Milestones: 1-5 Years	Grade
1. Establish and fund a water quality monitoring program. *Compile results from NB, MS4/NPDES monitoring: Barr, BH, LB, LZ*	B
2. Develop stream restoration concept plans for all high priority stream reaches identified in the Site Specific Action Plan.	F
3. Develop lake shoreline restoration concept plans for all high priority shorelines identified in the Site Specific Action Plan.	F
4. Retrofit at least 3 high priority water quality detention basin retrofits recommended in the Site Specific Action Plan. *2 not in plan: Lake Barr Village Hall, Braymore Hills of Inverness*	B
5. Develop concept plans to restore at least 2 high priority wetland restoration sites identified in the Site Specific Action Plan. *Dimucci (part of rezoning), part of Columbus Park Lake Eagle Scout project*	C
6. Identify at least 5 high or medium priority open parcels (for water quality improvement) for BMP implementation. *FCS floodplain sedges, Pederson Preserve,*	-
7. Homeowner and business associations require phosphorus-free fertilizer. *Communities passed resolutions, state banned commercial application, residents aware*	B
8. Promote alternatives to salt on roads and driveways; reduce salt usage. *BACOG education campaign*	A-

2018 Report

Milestones: 5-10 Years	Grades
1) Implement water quality monitoring program (See Section 6.4: Water Quality Monitoring Plan), *KOT Monitoring Study*	B
2) Implement at least two high priority stream (>500 linear feet) or lake shoreline (>200 linear feet) restoration projects in the watershed *See summary pages*	A
2a) Stream restoration projects achieve AHEI greater than 60, IBI greater than 30, and MBI less than 5.7 after three years.	Too soon
3) Implement at least 3 high priority water quality detention basin retrofits recommended in the Site Specific Action Plan *See summary pages*	A
4) Construct at least 2 high priority wetland restoration projects identified in years 1/5 *See summary pages*	A
5) Install BMPs in 5 high or medium priority open parcels (for water quality improvement) identified in milestones for years 1-5 above. *See summary pages*	A
6) Reduce salt concentrations used on roads to levels that are not harmful to aquatic resources *See summary pages; progress, but still much to do*	B
7) Develop concept plans to restore at least 2 high priority wetland restoration sites identified in the Site Specific Action Plan *See summary pages*	A

Goal B: Identify and Protect Important Natural Resources/Open Space in the Watershed and Provide Appropriate Passive Recreation Benefits

2012 Report

Milestones: 1-5 Years	Grade
1. 75% of sites with high quality natural areas or T&E species are protected. Note: many existing areas are already protected.	A
2. Establish program and funding for Natural Resource Inventories (NRI) for all priority unprotected green infrastructure parcels.	F
3. At least 2 buffer parcels adjacent to high quality natural areas/T&E species are protected and restored. *LB: Gibbs partially restored, Barrington Bank not restored*	B
4. At least 2 new developments on high priority open space use conservation development techniques.	NA
5. All governing bodies in the watershed incorporate the "Green Infrastructure Plan" into existing comprehensive plans.	?

2018 Report

Milestones: 5-10 Years	Grade
1) 90% of sites with high quality natural areas or T&E species are protected	A
2) Natural Resource Inventories (NRI) for all priority unprotected green infrastructure parcels are completed.	F
3) Protect 20% of the acreage of priority unprotected green infrastructure parcels identified in #2 above that has been determined to have high natural resource value based on NRIs (*CFC, FPDs, Lake Barrington, BACT*)	A
4) At least 2 buffer parcels adjacent to high quality natural areas/T&E species are protected and restored. Note: this may coincide with #3 above.	A
5) All new developments on high priority open space use conservation development techniques.	NA
6) Develop and implement conservation and management plans for all green infrastructure parcels protected and restored during plan implementation (*CFC, FPDs*)	B

Goal C: Reduce Existing Flood Damage in the Watershed and Prevent Flooding from Worsening Downstream

2012 Report

Milestones: 1-5 Years	Grade
1. Identify and protect at least 2 undeveloped (open Space) parcels in 100 year floodplain. *3: LB: Gibbs and 11-acre FCSS addition, BH: Pederson Preserve*	A+
2. Identify and develop concept and final plans to mitigate for at least 2 Flood Problem Areas by constructing storage sites, wetland restorations, or other projects recommended in the Site Specific Action Plan.	F
3. Retrofit at least 2 pre-1992 Lake County detention basins with post-1992 restrictors or other means to reduce flooding.	F
4. Implement at least 1 high priority stream (>500 linear feet) restoration project that helps reconnect the stream channel to the adjacent floodplain. Note: this milestone will likely be tied to stream restoration milestones under Goal A. *NB project underway*	C
5. All new development incorporates infiltration BMPs in design. *LB Tallgrass*	A
6. Implement a watershed-wide stream maintenance program to clear stream channels of problematic debris jams. *NB program*	D

2018 Report

Milestones: 5-10 Years	Grade
1) Identify and protect at least 2 undeveloped (open space) parcels in 100 year floodplain. *LB: CFC Gibbs, CFC – Barrington Bank donation; Savannah addition.*	A
2) Mitigate for at least 2 Flood Problem Areas by constructing storage sites, wetland restorations, or other projects designed under 1-5 year milestones. *Noted in summary*	A
3) Retrofit at least 2 pre 1992 Lake County detention basins with post 1992 restrictions or other means to reduce flooding *Noted in summary*	A
4) Implement at least one high priority stream (>500 linear feet) restoration project that helps reconnect the stream channel to the adjacent floodplain. Note: this milestone will likely be tied to stream restoration milestones under Goal A. *Noted in summary*	A
5) Retrofit at least 2 older developments with flood reduction BMPs *Noted in summary*	A
6) Identify and develop concept and final plans to mitigate for at least 2 Flood Problem Areas by constructing storage sites, wetland restorations, or other projects recommended in the Site Specific Action Plan *Noted in summary*	A

Goal D: Improve Aquatic and Terrestrial Habitat in the Watershed

2012 Report

Milestones: 1-5 Years	**Grade**
1. Restore at least 20 acres of degraded terrestrial open space to native plant communities.	?
2. Develop stream restoration concept plans for all high priority stream restoration reaches identified in the Site Specific Action Plan. Note: this milestone will likely be tied to stream restoration milestones under Goal A. *NB has plans for 1 medium priority and part of 1 high priority reaches*	F
3. Develop lake shoreline restoration concept plans for all high priority shorelines identified in the Site Specific Action Plan. Note: this milestone will likely be tied to lake shoreline milestones under Goal A.	F
4. Develop short and long term management and monitoring plan for all protected natural areas.	?
5. At least 10 watershed stakeholders (private residents, businesses, etc.) incorporate native vegetation into existing or new landscapes. *20 rain gardens, Conservation@Home, CFC's native plant sales*	A+
6. Develop concept plans to restore at least 2 high priority wetland restoration sites identified in the Site Specific Action Plan. Note: this milestone will likely be tied to wetland restoration milestones under Goal A.	C

2018 Report

Milestones: 5-10 Years	Grades
1) Restore at least 30 acres of degraded terrestrial open space to native plant communities *CFC, FPDs, BACT, Ancient Oaks*	A
2) Implement at least 2 high priority stream (> 500 linear feet) or lake shoreline (>200 linear feet) restoration projects in the watershed. Note: this milestone will likely be tied to stream and lake shoreline restoration milestones under Goal A. *Listed in Summary*	A
2a) Stream restoration projects achieve AHEI greater than 60, IBI greater than 30, and MBI less than 5.7 after three years. Note: this milestone will likely be tied to stream and lake shoreline restoration milestones under Goal A	Too soon
3) Implement short and long term management and monitoring programs for 25% protected natural areas. *CFC, BACT, FPDs*	A
4) At least 20 watershed stakeholders (private residents, businesses, etc.) incorporate native vegetation into existing or new landscapes. *Butterfly gardens and rain gardens*	A
5) Construct at least 2 high priority wetland restoration projects that incorporate high quality native plant communities. Note: this milestone will likely be tied to wetland restoration milestones under Goal A. *CFC and BACT*	A

Goal E: Increase Communication and Coordination among Municipal Decision-Makers and Other Stakeholders within the Watershed

2012 Report

Milestones: 1-5 Years	Grade
1. A watershed council is established and meets twice each year to discuss plan recommendations and track plan success.	NA
2. All municipalities and other governing bodies in watershed adopt the Flint Creek Watershed-based Plan and implement plans, codes, and projects that support watershed plan goals and objectives. *Codes: Lake County WDO*	A
3. Representatives from all municipalities and other select stakeholders attend regular meetings of the Flint Creek Watershed Partnership.	A
4. At least 3 multi-jurisdictional and/or public-private stream channel maintenance projects are implemented. *NB on private land*	D

2018 Report

Milestones: 5-10 Years	Grades
1) Watershed Council meets twice yearly to discuss plan recommendations and to track plan success *Larger group wished to continue*	A
2) Representatives from all municipalities and other select stakeholders attend regular meetings of the Flint Creek Watershed Partnership.	B
3) At least 3 multi-jurisdictional and/ or public-private stream channel maintenance projects are implemented. *NB on pvt land; BH on pvt land, BACT on D 220 land; Cuba TWP on pvt land*; more planned	A

Goal F: Foster Appreciation and Stewardship of the Watershed Through Education

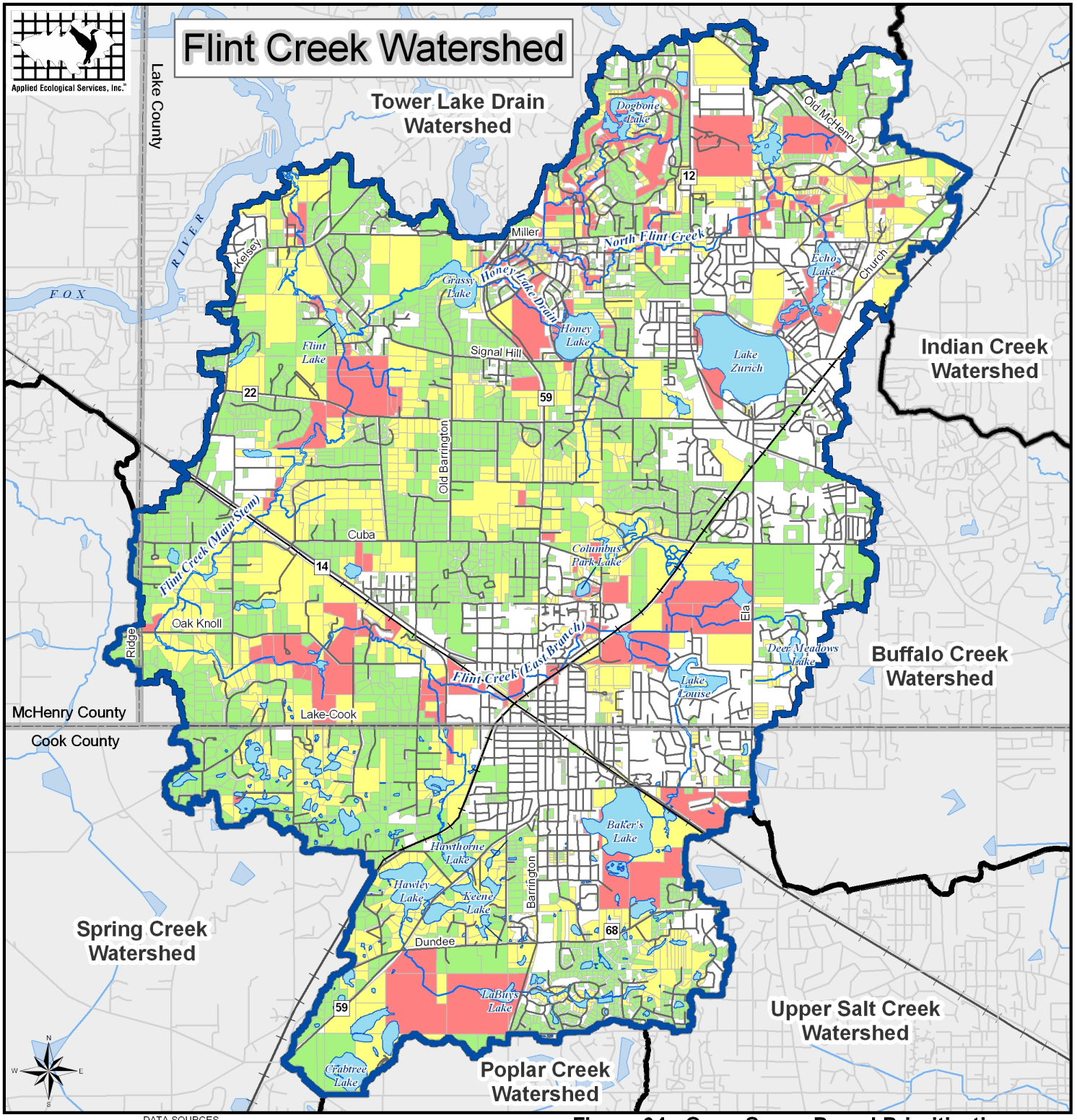
2012 Report

Milestones: 1-5 Years	Grade
1. Develop a watershed information sharing website (that includes watershed related issues, dates of important events such as seminars, workshops, monitor training etc.).	A
2. Conduct at least 2 seminars or workshops in the watershed related to benefits and goals of native plants and natural area restoration and track attendance and survey attendees at events.	A+
3. Conduct at least 2 seminars or workshops in the watershed relating to general watershed topics such as water quality, natural resource/greenway protection and enhancement, and flooding and track attendance and survey attendees at events.	A+
4. Identify at least 1 open parcel adjacent to or near each school in the watershed that would be appropriate to teach outdoor education.	A
5. Publicize all watershed improvement projects in news media, agency newsletters, website, etc.	A
6. Identify at least 1 HOA, Lake Association, or school program interested in initiating environmental monitoring programs and train at least 2 environmental monitoring volunteers.	F

2018 Report

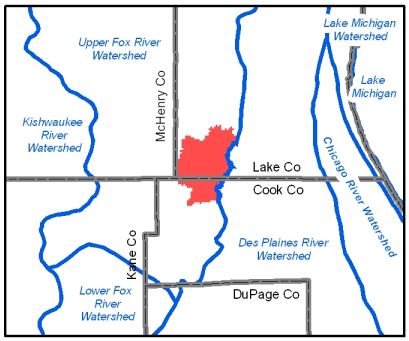
Milestones: 5-10 Years	Grades
1) Conduct at least 2 seminars or workshops in the watershed related to benefits and goals of native plants and natural area restoration and track attendance and survey attendees at events. *CFC, Ancient Oaks, BACT, FCWP programming*	A
2) Conduct at least 2 seminars or workshops in the watershed relating to general watershed topics such as water quality, natural resource/greenway protection and enhancement, and flooding and track attendance and survey attendees at events. *Speakers at mtgs*	B
3) Initiate outdoor education courses on identified open parcel adjacent to or near each school. *Not by every school but every Barringtons school has participated; Some in LZ; ? in HW*	C
4) Publicize all watershed improvement projects in news media, agency newsletters, website, etc. *Many, not all; twps. and munis publicize*	B
5) Implement at least 1 HOA, Lake Association, and/or school environmental monitoring program *BHS monitors Flint Cr.*	A

Appendix P: Maps from 2007 Referenced in Completed Projects



DATA SOURCES
Lake County Information & Technology
Cook County Research Department
McHenry County Information Technology
Barrington Area Council of Governments (BACOG)

Figure 64: Open Space Parcel Prioritization Results for Flood Prevention and Reduction



Flint Creek Watershed Locator Map
Lake, Cook, McHenry Counties, Illinois

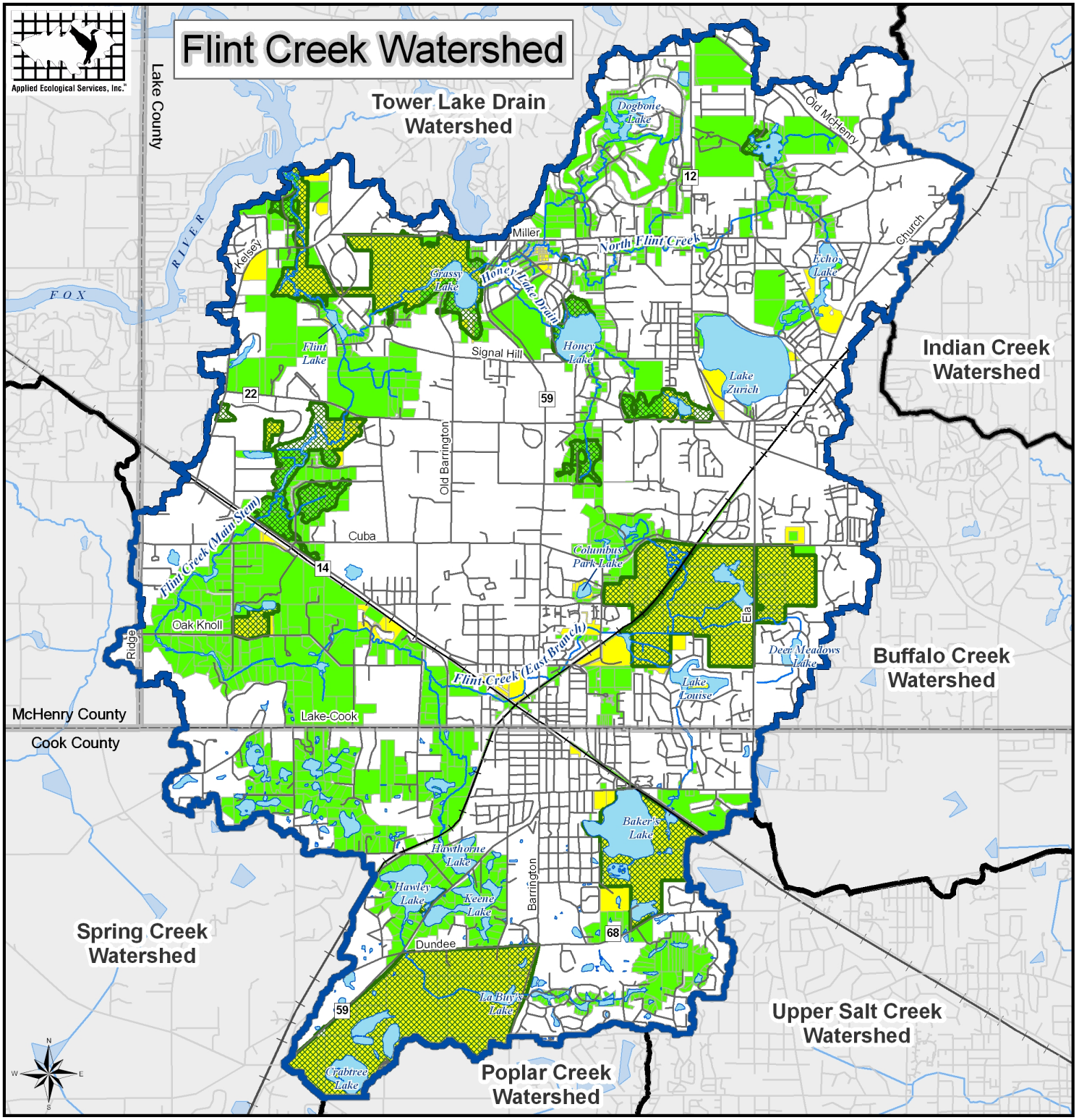
Legend

- Road
- Rail Road
- River & Stream
- County Boundary
- Adjacent Watershed
- Flint Creek Watershed
- Open Water

Prioritization Points Total (10 Criteria)

- 0 No Priority or Developed
- 1 - 3 Low
- 4 - 5 Medium
- 6 - 8 High

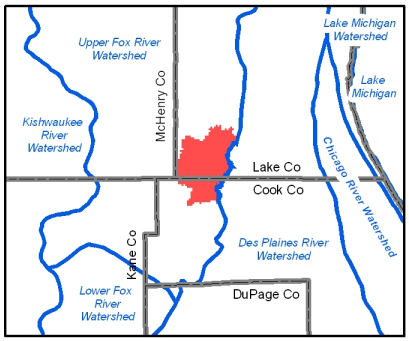
0 5,000 10,000 20,000 Feet



DATA SOURCES

Lake County Information & Technology
Cook County Research Department
McHenry County Information Technology
Illinois Department of Natural Resources
Lake County Health Department

Figure 72: Green Infrastructure Network

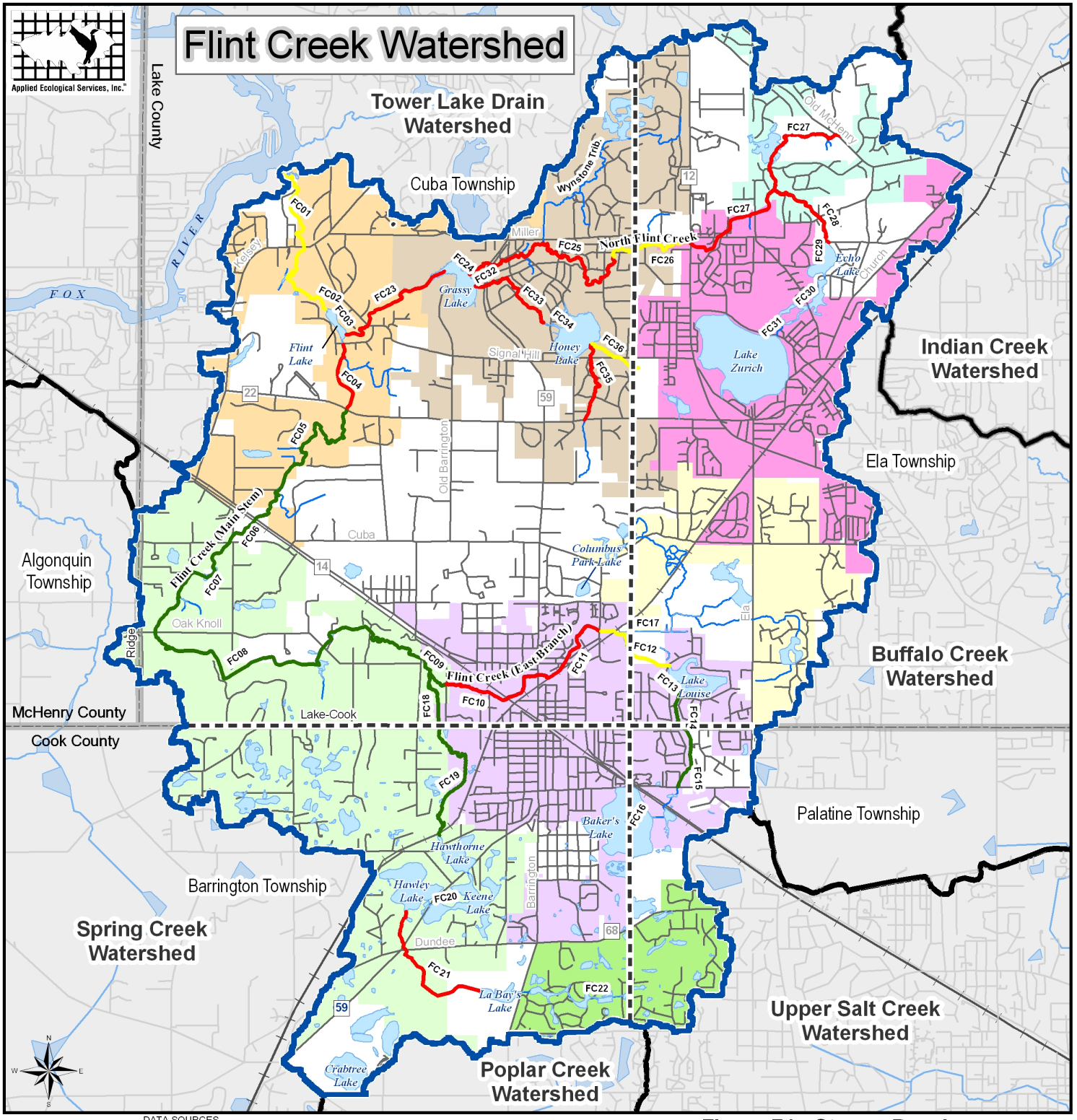


Flint Creek Watershed Locator Map
Lake, Cook, McHenry Counties, Illinois

Legend

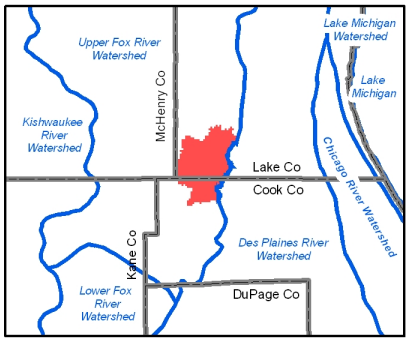
- Road
- Rail Road
- River & Stream
- Open Water
- County Boundary
- Flint Creek Watershed
- Adjacent Watershed
- Existing Ecologically Significant Area
- Protected Open Parcel
- Green Infrastructure Parcel

0 5,000 10,000 20,000 Feet



DATA SOURCES
Lake County Information & Technology
Cook County Research Department
McHenry County Information Technology
Lake County Stormwater Management Commission (SMC)

Figure 71: Stream Reaches Recommended for Restoration



Flint Creek Watershed Locator Map
Lake, Cook, McHenry Counties, Illinois

Legend

- Road
- Rail Road
- Township Boundary
- County Boundary
- Flint Creek Watershed
- Adjacent Watershed
- Open Water

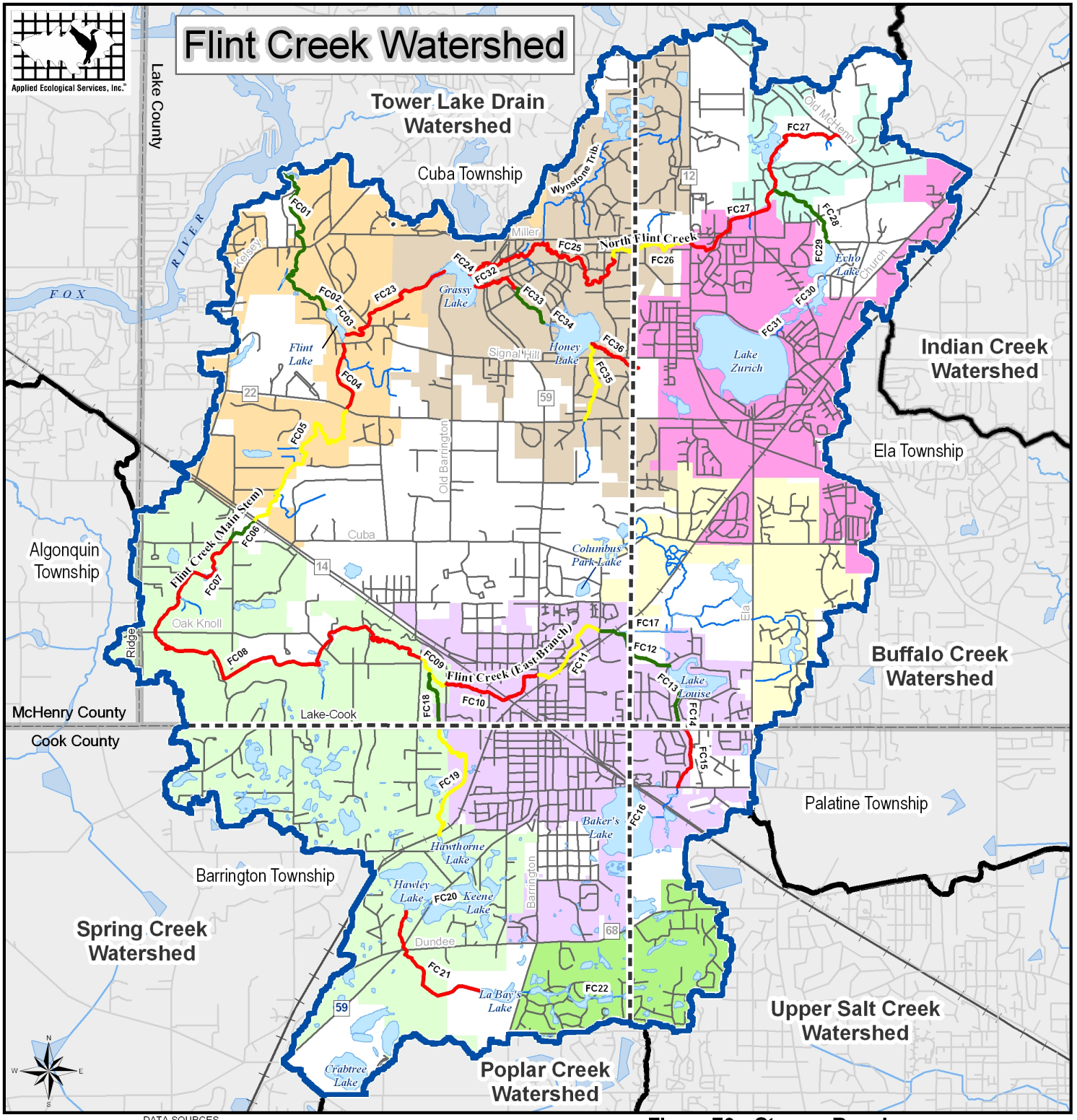
Stream Restoration Priority

- FC01 High
- FC01 Medium
- FC01 Low
- FC01 Reach not Assessed

Municipality

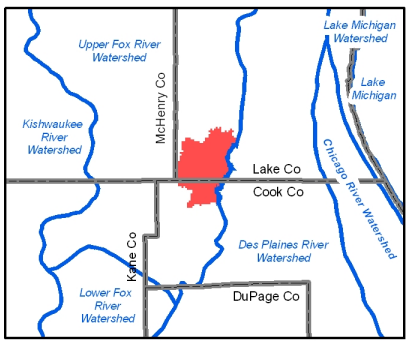
- Barrington
- Barrington Hills
- Deer Park
- Hawthorn Woods
- Inverness
- Lake Barrington
- Lake Zurich
- North Barrington

0 5,000 10,000 20,000 Feet



DATA SOURCES
Lake County Information & Technology
Cook County Research Department
McHenry County Information Technology
Lake County Stormwater Management Commission (SMC)

Figure70: Stream Reaches Recommended for Maintenance



Flint Creek Watershed Locator Map
Lake, Cook, McHenry Counties, Illinois

Legend

- Road
- Rail Road
- Flint Creek Watershed
- Township Boundary
- Adjacent Watershed
- County Boundary
- Open Water

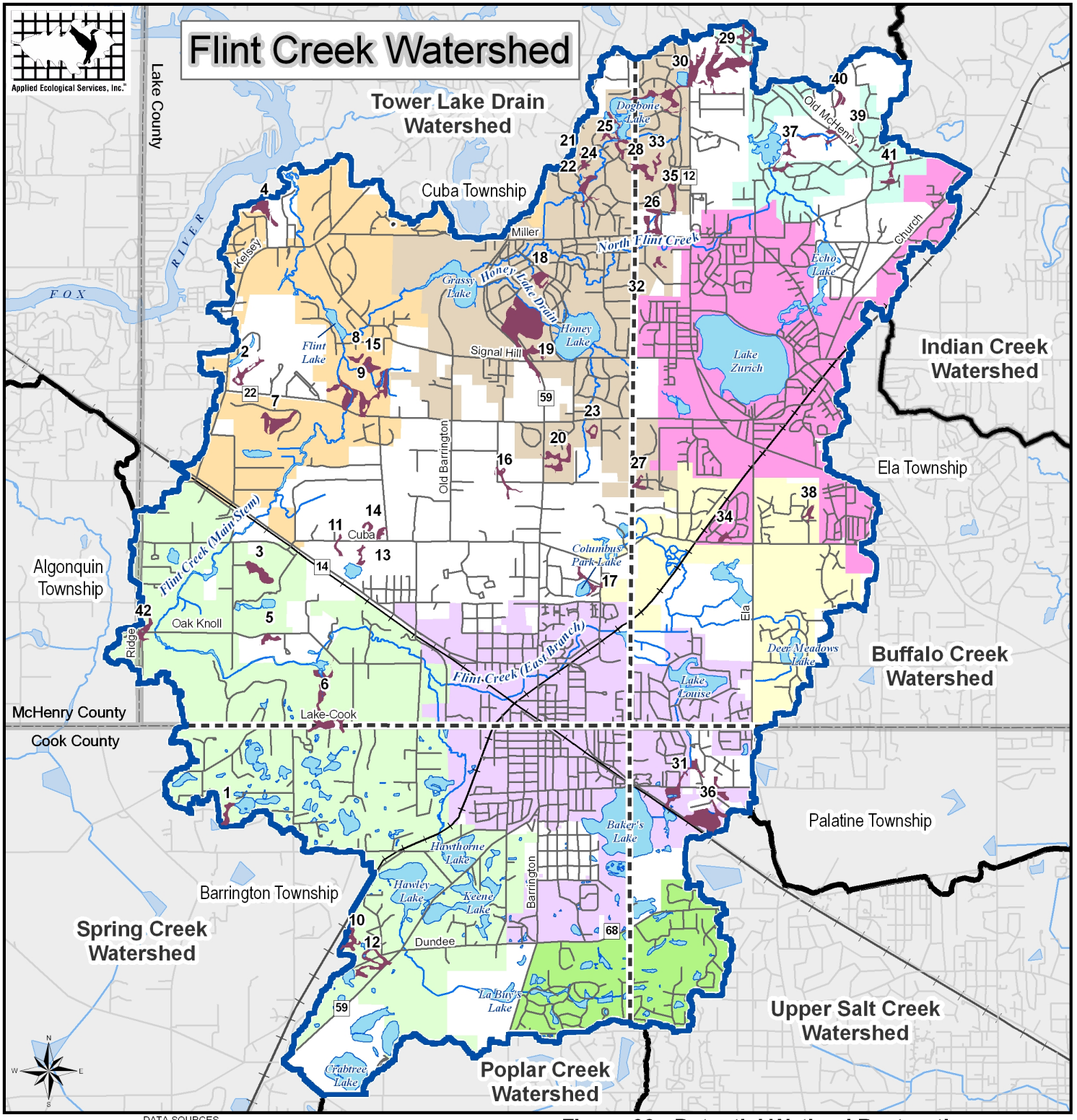
Stream Maintenance Priority

- FC01 High
- FC01 Medium
- FC01 Low
- FC01 Reach Not Assessed

Municipality

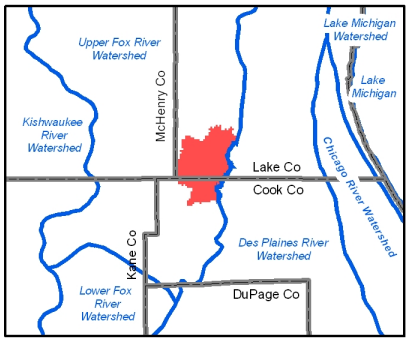
- Barrington
- Barrington Hills
- Deer Park
- Hawthorn Woods
- Inverness
- Lake Barrington
- Lake Zurich
- North Barrington

0 5,000 10,000 20,000 Feet



DATA SOURCES
Lake County Information & Technology
Cook County Research Department
McHenry County Information Technology

Figure 69: Potential Wetland Restoration Sites to Improve Water Quality



Flint Creek Watershed Locator Map
Lake, Cook, McHenry Counties, Illinois

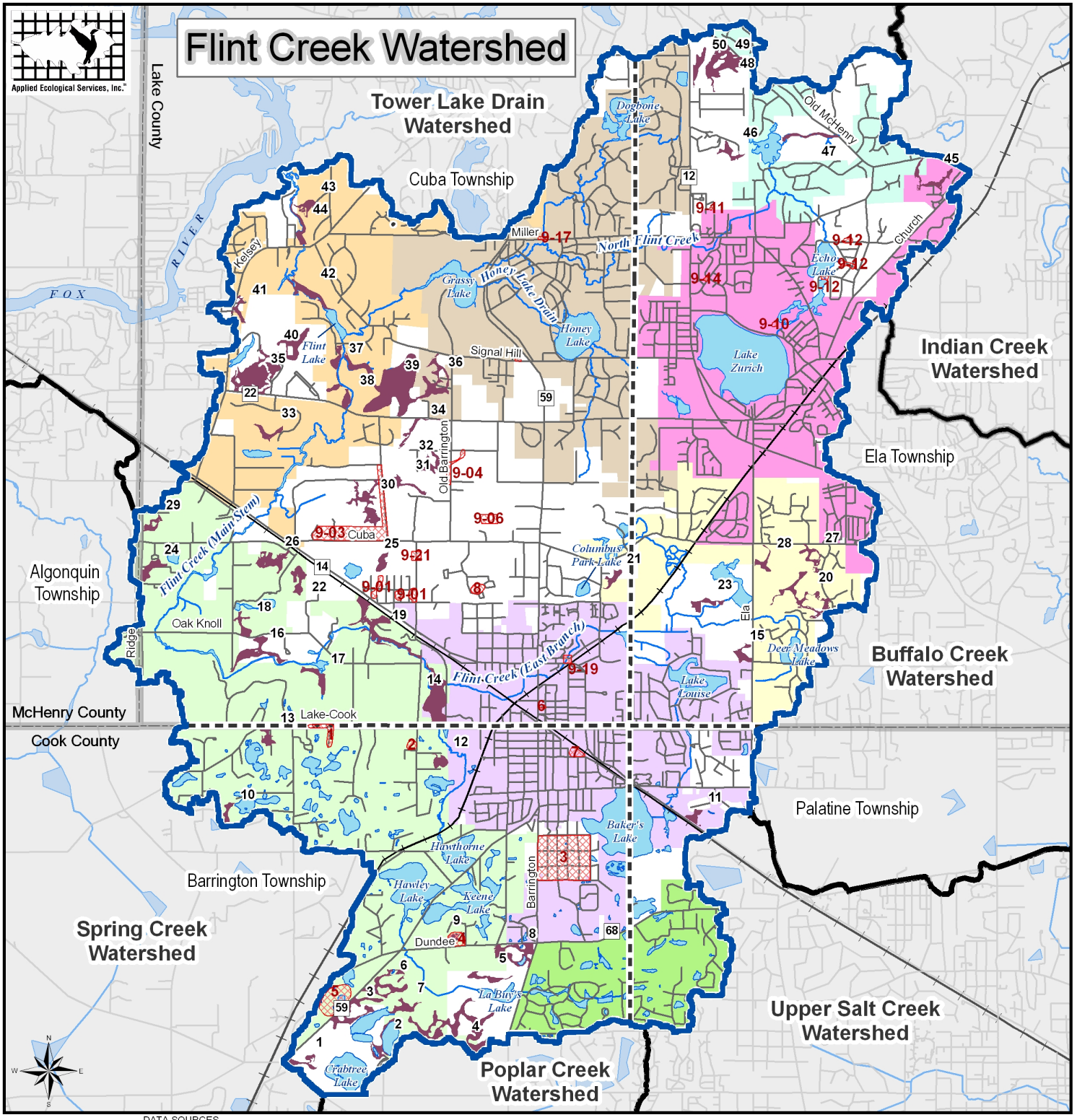
Legend

- Road
- Rail Road
- River & Stream
- Open Water
- County Boundary
- Township Boundary
- Adjacent Watershed
- Flint Creek Watershed
- Potential Wetland Restoration

Municipality

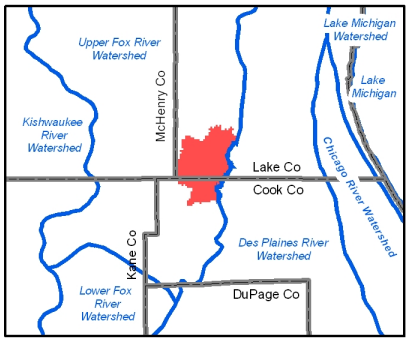
- Barrington
- Barrington Hills
- Deer Park
- Hawthorn Woods
- Inverness
- Lake Barrington
- Lake Zurich
- North Barrington

0 5,000 10,000 20,000 Feet



DATA SOURCES
Lake County Information & Technology *Lake County Stormwater Mangement Commission (SMC)*
Cook County Research Department
McHenry County Information Technology

Figure 68: Potential Regional Storage Locations for Flood Damage Reduction



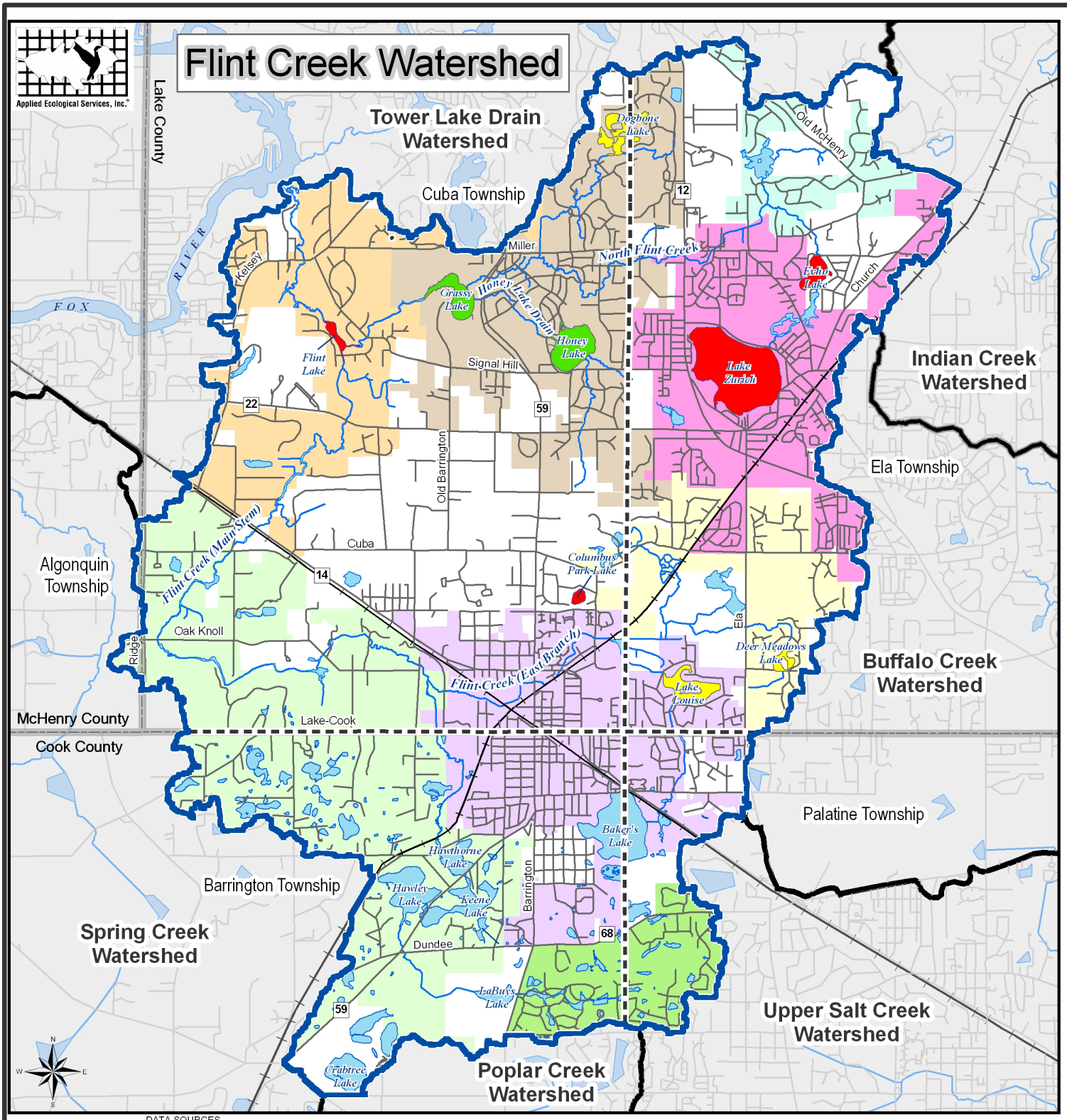
Flint Creek Watershed Locator Map
Lake, Cook, McHenry Counties, Illinois

Legend

- Road
- Rail Road
- River & Stream
- Flint Creek Watershed
- Township Boundary
- County Boundary
- Adjacent Watershed
- Open Water
- Flood Problem Area
- Potential Storage Location

Municipality
- Barrington
- Barrington Hills
- Deer Park
- Hawthorn Woods
- Inverness
- Lake Barrington
- Lake Zurich
- North Barrington

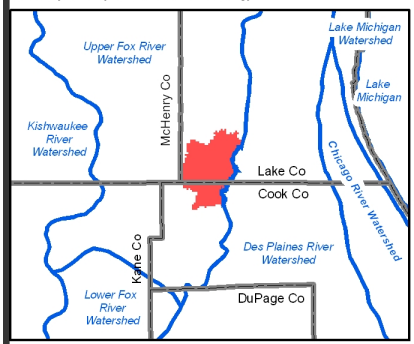
0 5,000 10,000 20,000 Feet



DATA SOURCES

Lake County Information & Technology — *Lake County Health Department*
Cook County Research Department
McHenry County Information Technology

Figure 67: Lake Shoreline Restoration Opportunities



Flint Creek Watershed Locator Map
Lake, Cook, McHenry Counties, Illinois

Legend

- River & Stream
- Road
- Rail Road
- Open Water
- Adjacent Watershed
- Township Boundary
- County Boundary
- Flint Creek Watershed

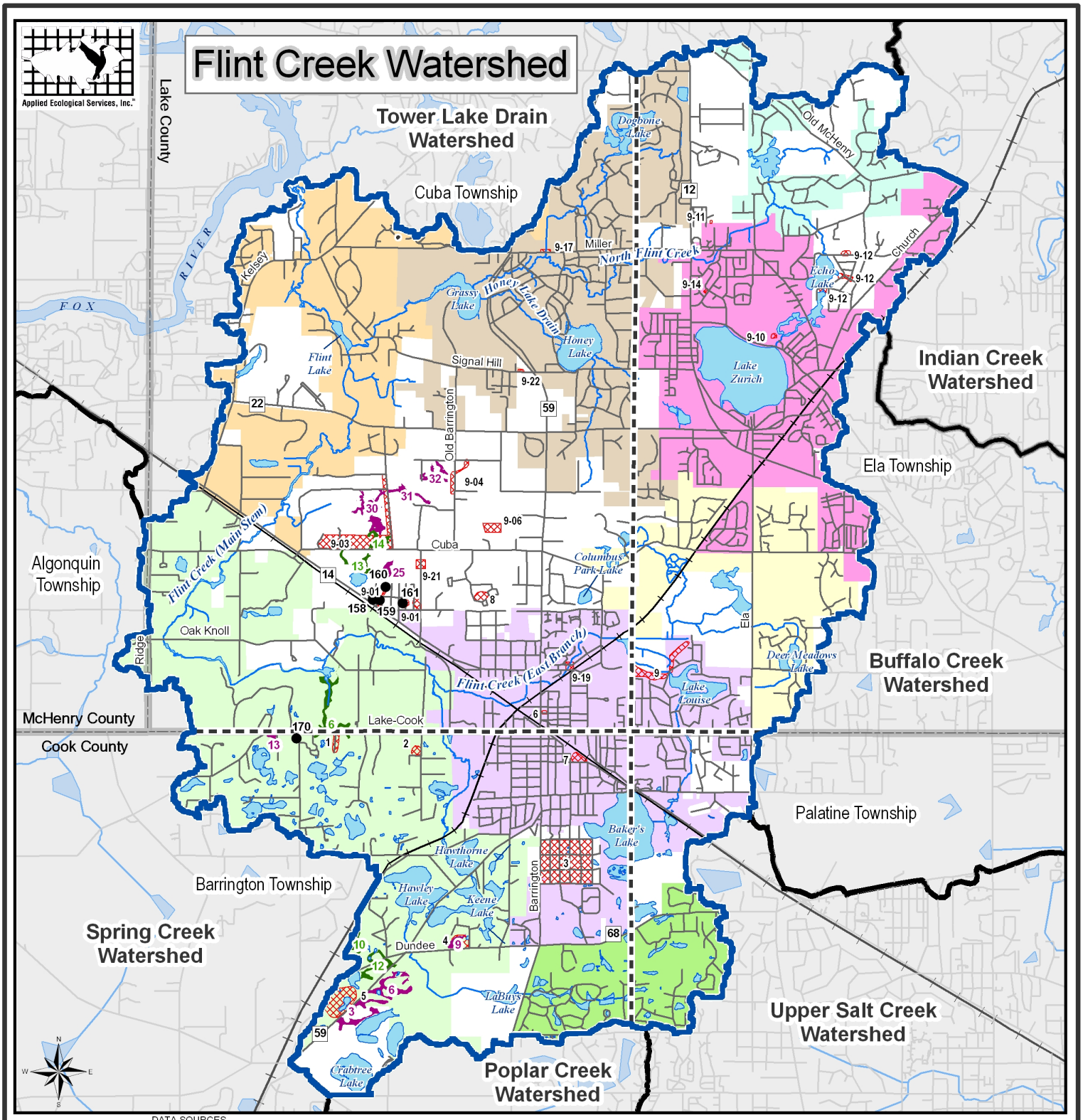
Shoreline Restoration Priority

- High
- Medium
- Low
- Not Inventoried

Municipality

- Barrington
- Barrington Hills
- Deer Park
- Hawthorn Woods
- Inverness
- Lake Barrington
- Lake Zurich
- North Barrington

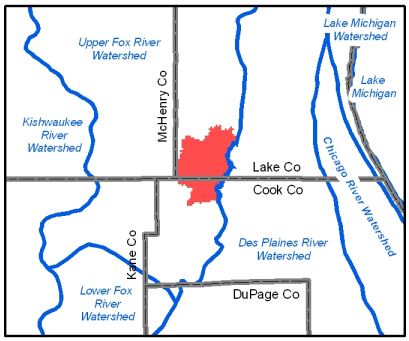
0 — 5,000 — 10,000 — 20,000 Feet



DATA SOURCES

Lake County Information & Technology
Cook County Research Department
McHenry County Information Technology
Lake County Stormwater Mangement Commission (SMC)

Figure 66: Flood Mitigation at Flood Problem Area Sites



Flint Creek Watershed Locator Map
Lake, Cook, McHenry Counties, Illinois

Legend

- Road
- Rail Road
- River & Stream
- Open Water
- Township Boundary
- County Boundary
- Adjacent Watershed Boundary
- Flint Creek Watershed
- Flood Problem Location

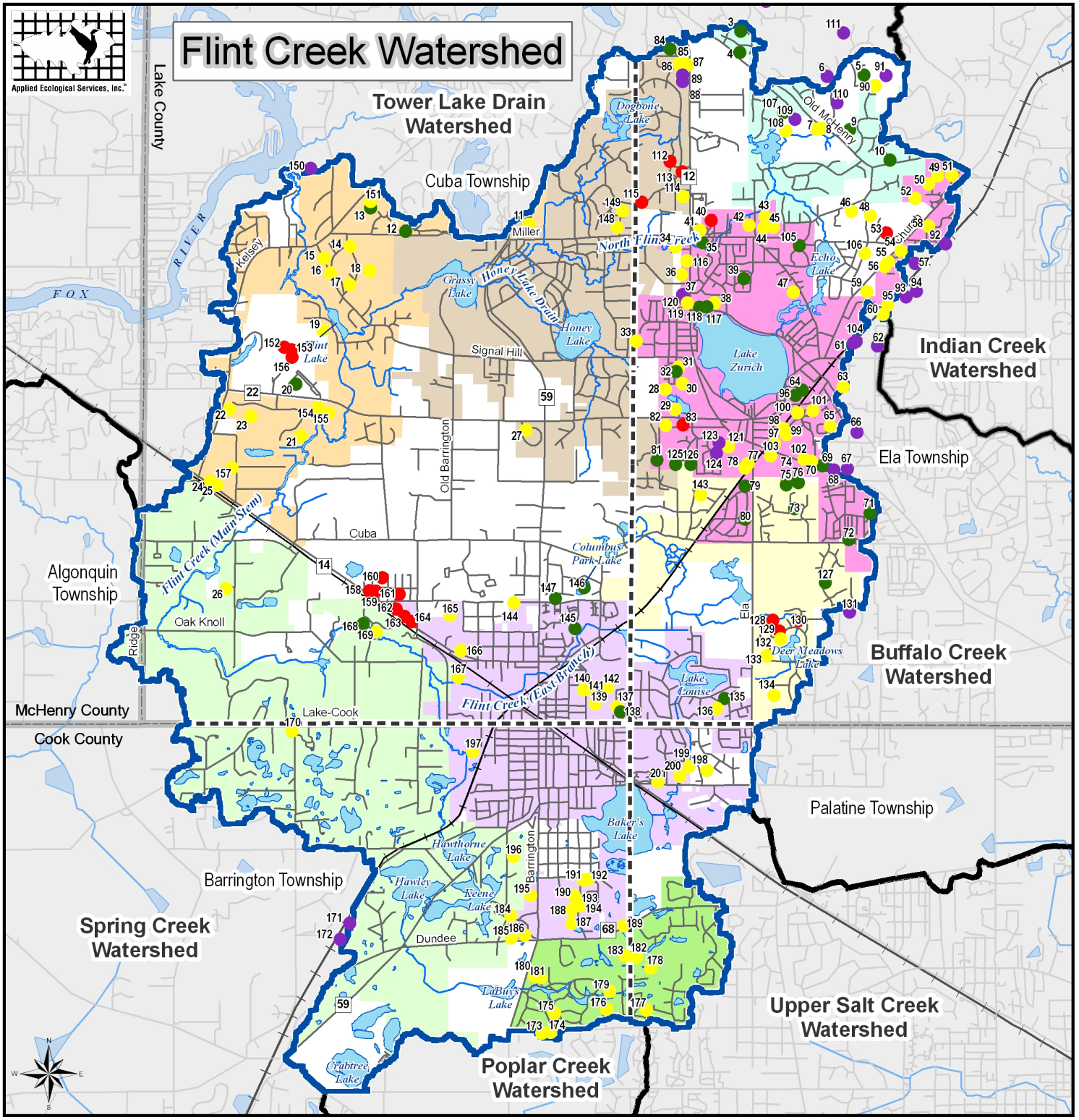
Potential Mitigation

- Detention Basin Retrofit
- Potential Wetland Restoration
- Potential Storage Site

Municipality

- Barrington
- Barrington Hills
- Deer Park
- Hawthorn Woods
- Inverness
- Lake Barrington
- Lake Zurich
- North Barrington

0 5,000 10,000 20,000 Feet



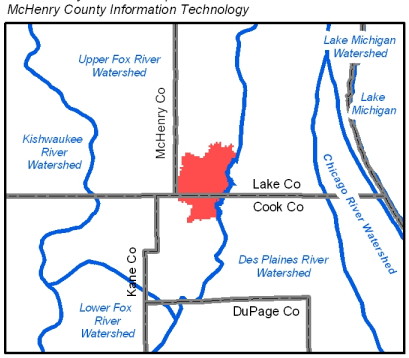
DATA SOURCES

Lake County Information & Technology — *Lake County Stormwater Mangement Commission (SMC)*

Cook County Research Department

McHenry County Information Technology

Figure 65: Detention Basins Recommended for Water Quality Improvement and Flood Reduction/Prevention Retrofits



Flint Creek Watershed Locator Map
Lake, Cook, McHenry Counties, Illinois

Legend

- Road
- Rail Road
- River & Stream
- Open Water
- County Boundary
- Township Boundary
- Flint Creek Watershed
- Adjacent Watershed

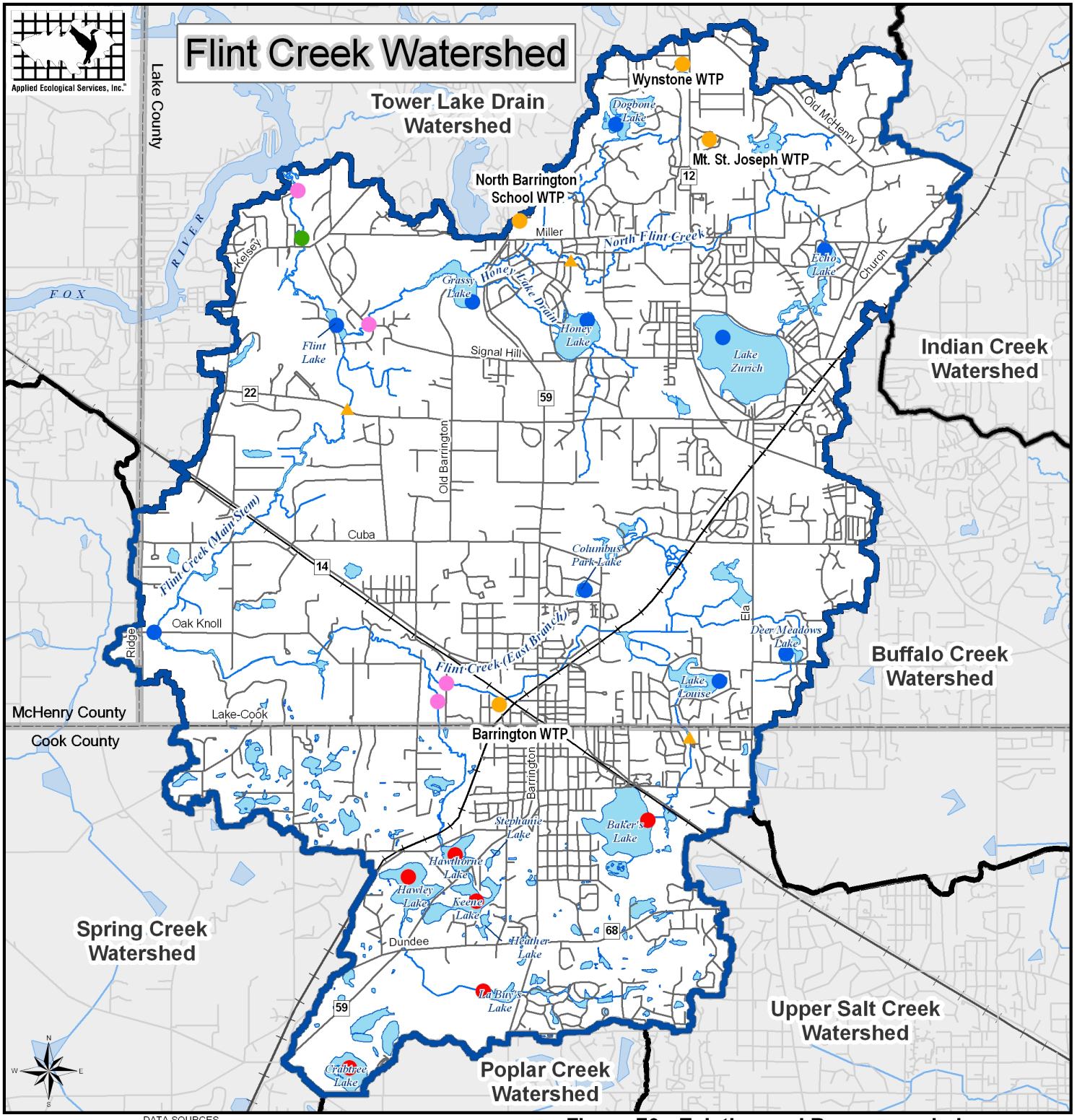
Detention Basin Retrofit

- Flood Reduction/Prevention
- Water Quality Improvement
- Water Quality & Flood Reduction/Prevention
- Out of Watershed or Not a Basin

Municipality

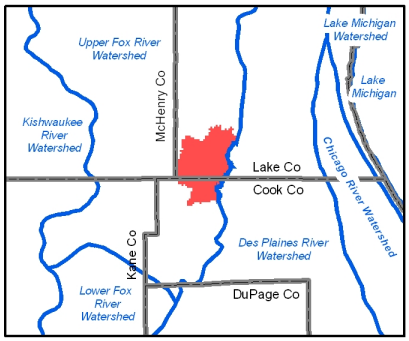
- Barrington
- Barrington Hills
- Deer Park
- Hawthorn Woods
- Inverness
- Lake Barrington
- Lake Zurich
- North Barrington

0 5,000 10,000 20,000 Feet



DATA SOURCES
Lake County Information & Technology
Cook County Research Department
McHenry County Information Technology

Figure 73: Existing and Recommended Water Quality Sampling Sites



Flint Creek Watershed Locator Map
Lake, Cook, McHenry Counties, Illinois

Legend

- Road
- Rail Road
- River & Stream
- County Boundary
- Open Water
- Adjacent Watershed
- Flint Creek Watershed

Existing Sampling Location
- NPDES Permit Site
- LCHD-LMU
- IEPA/IDNR Intensive Basin Survey
- IDNR RiverWatch

Recommended Sampling Location
- Cook County Forest Preserve/CFC
- CFC/School

0 5,000 10,000 20,000 Feet