2004 SUMMARY REPORT
of
COUNTRYSIDE GLEN LAKE

Lake County, Illinois

Prepared by the

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EXECUTIVE SUMMARY

Countryside Glen Lake is located in the Village of Hawthorn Woods at the corner of Hawley St. and Gilmer Rd. It has a surface area of 7.9 acres and estimated mean and maximum depths of 6.25 feet and 12.5 feet, respectively. However, these numbers are deceptive, as the morphometry of Countryside Glen Lake is quite unique. Approximately half of the lake is one foot deep, while the other half ranges from about four feet to 13 feet in depth. Considering the data collected on various depths throughout Countryside Glen Lake, the average depth is probably closer to four feet. Countryside Glen lake does not currently have a management group and is used by residents for fishing and aesthetics.

Water quality parameters, such as nutrients, suspended solids, oxygen, temperature and water clarity were measured and the plant community was assessed each month from May-September 2004. The deep half of Countryside Glen Lake thermally stratified June-August. The average epilimnetic total phosphorus (TP) level was equal to the Lake County median, but concentrations fluctuated throughout the summer. The average hypolimnetic TP concentration was much lower than the county median and also fluctuated throughout the summer, suggesting polymixis. Epilimnetic total suspended solids (TSS) concentrations were low and stable, but did not relate to fluctuations in TP concentrations. The main source of TP to the lake appears to be external, as TP concentrations corresponded with rainfall amounts. Secchi depths (water clarities) were moderate throughout the summer, and corresponded with increases and decreases in epilimnetic TSS concentrations. The conductivity in May was, by far, the highest of all the months, indicating that the road salt concentration in spring runoff is high. Conductivity decreased from May to June, but increased again throughout the summer, suggesting that evaporation may be affecting readings later in the summer.

A relatively good diversity of plant species are present in Countryside Glen Lake. Small pondweed, *Chara,* and curlyleaf pondweed dominated the plant community. Floatingleaf pondweed, flatstem pondweed, sago pondweed, slender naiad and white water crowsfoot were also present at moderate densities. The shallow part of the lake contained the majority of the plants during the summer and helped maintain the clarity in that part of the lake.

Slight to moderate erosion was occurring only along the manicured lawns around Countryside Glen Lake and included 73% of the entire lake shoreline. Reed Canary Grass, an invasive, exotic plant species, was also present along the shoreline. This plant outcompetes with native plants and its removal is recommended.

LAKE IDENTIFICATION AND LOCATION

Countryside Glen Lake is located in the Village of Hawthorn Woods at the corner of Hawley St. and Gilmer Rd. (T 44N, R 10E, S 28). It has a surface area of 7.9 acres, estimated mean and maximum depths of 6.25 feet and 12.5 feet, respectively, and a calculated volume of 49.3 acre-feet. However, these numbers are deceptive, as the morphometry of Countryside Glen Lake is quite unique. Approximately half of the lake is about one foot deep, while the other half ranges from about four feet to 13 feet in depth. Considering the data collected on various depths throughout Countryside Glen Lake, the average depth is probably closer to four feet. The watershed of Countryside Glen Lake encompasses approximately 133 acres, draining residential area in its immediate watershed, as well as agricultural and open land (Figure 1). The watershed to lake surface area ratio of 17:1 is moderate in size. This is positive in that it may help prevent the accumulation of solids and nutrients because lake retention time (the time it takes all the water in the lake to be replaced) is low. It takes just over 46 days for all of the water volume of Countryside Glen Lake to flush out of the lake and be replenished by new water. Water level fluctuations from May to September were low (approximately 0.10 feet). It is recommended in the future that a staff gauge be installed and readings be taken weekly or bi-weekly. This will give lake managers a much better idea of lake level fluctuations relative to rainfall events and can aid in future management decisions.

Based on the 2000 land use survey of the Countryside Glen Lake watershed residential, agricultural and open space areas dominate the watershed making up 20-40% each (Figure 2). The lake itself and associated wetlands make up the remainder of the watershed (Table 1, Appendix A). The large amount of residential area that makes up the immediate watershed can be good or bad, depending on the activities of homeowners living around the lake. If homeowners are educated about how their daily activities affect the lake and take steps to prevent additional sediment and nutrients from entering the water, there could be some improvement in water quality over time. However, if residents go about their daily activities with no regard to how it may affect the lake, water quality could be degraded over time. An easy way for lakeshore homeowners to be good stewards of the lake is to use phosphorus-free fertilizers on their lawns. Countryside Lake in Mundelein, has set a wonderful precedence for other homeowners and lake associations in the county as the first lake association to pass an ordinance banning phosphorus-containing fertilizers in the subdivision surrounding their lake. Phosphorus is not generally needed for the growth of Kentucky bluegrass once it is established. Phosphorus aids in the growth of roots. It does not make your lawn greener or fuller, and most of the soils in Lake County have an adequate amount of phosphorus to support lawns. A similar ordinance along Countryside Glen Lake would go far to protect the lake from increased algae blooms and decreased water clarity in future years.

Water exits Countryside Glen Lake via a storm pipe on the west side and flows into a wetland complex. The lake is located in the Squaw Creek sub basin, within the Fox River watershed.

Figure 1

Figure 2

BRIEF HISTORY OF COUNTRYSIDE GLEN LAKE

Countryside Glen Lake is a very new lake, constructed sometime between 1993 and 1997. Construction of homes around Countryside Glen Lake began during this time, shortly after the lake was constructed. In 1997, only two homes had been built around the lake. This past summer, construction was still ongoing within the subdivision, but 14 homes were completely built around the lake. Although there were BMP's (best management practice) in place during construction of several homes along the south end of the lake, during heavy spring rains, a large plume of clay and soil particles entered the lake from the construction sites. Although this was only observed one time during the summer and should not be an issue once the homes are completed, it is important for the BMP's to be monitored and maintained to ensure no more sediment pollution to the lake during further construction. There is no formal lake management association and the village does not actively manage the lake in any way.

LIMNOLOGICAL DATA – WATER QUALITY

Water samples collected from Countryside Glen Lake were analyzed for a variety of water quality parameters (See Appendix B for methodology). Samples were collected approximately three feet below the surface and three feet off of the bottom from the deepest location in the lake (Figure 3). The lake was thermally stratified near the deep hole in June, July and August. Thermal stratification occurs when a lake divides into an upper, warm water layer (epilimnion) and a lower, cold water layer (hypolimnion). When stratified, the epilimnetic and hypolimnetic waters do not mix, and the hypolimnion typically becomes anoxic (dissolved oxygen (DO) = <1 mg/L) by mid-summer. This phenomenon is a natural occurrence in nutrient enriched, deep lakes and is not necessarily a bad thing if enough of the lake volume remains oxygenated. DO concentrations fell below 5.0 mg/L (a level below which many warm-water fish become stressed) by a depth of seven feet in June, six feet in July and four feet in August. Because a bathymetric map (which would indicate how much of the lake volume was experiencing low DO concentrations) does not exist for Countryside Glen Lake, it is impossible to know the extent of low DO concentrations throughout the lake and how that might be affecting aquatic life in the lake. However, based on depth measurements taken throughout the lake, it appears that only a small volume of the lake near the deep hole would have been affected. The near bottom water of the hypolimnion had become anoxic in this area by June.

Phosphorus is a nutrient that can enter lakes through runoff or be released from lake sediment, and high levels of phosphorus typically cause algal blooms or produce high plant density. The 2004 average epilimnetic total phosphorus (TP) concentration in Countryside Glen Lake was 0.064 mg/L, while the average hypolimnetic phosphorus concentration was 0.078 mg/L (Table 2, Appendix A). The average epilimnetic TP

Figure 3

concentration was equal to the county median (0.063 mg/L), while the hypolimnetic TP concentration was over two times lower than the median (0.178 mg/L). The low hypolimnetic TP concentration was likely caused by relatively weak stratification that was only present during three months of the summer. During stratification, oxygen is depleted in the hypolimnion, triggering chemical reactions at the sediment surface. These reactions result in the release of phosphorus from the sediment into the water column, and are known as internal phosphorus loading. Typically, the hypolimnion is thermally isolated from the epilimnion during the entire summer and phosphorus builds up in the bottom waters, reaching the sunlit surface waters only during fall turnover. However, in Countryside Glen Lake, TP concentrations in the hypolimnion were significantly different from the epilimnion only in August, indicating that there was intermittent mixing of the water column throughout the summer. This prevented the build-up and isolation of phosphorus in the hypolimnion.

The epilimnetic TP concentration increased substantially between May and June most likely due to an increase in rainfall at the end of May (just prior to June sampling) (Figure 4). It is likely that an increased amount of soil particles and lawn fertilizer were brought into the lake with the heavy rains at the end of May and had not flushed through the lake at the time of sampling. This pulse of phosphorus to the lake triggered an algal bloom (*Lyngbia* sp.) early in July. The bloom persisted through August, but was not apparent in September.

Total suspended solids (TSS) is a measure of the amount of suspended material, such as algae or sediment, in the water column. High TSS values are typically correlated with poor water clarity and can be detrimental to many aspects of the lake ecosystem, including the plant and fish communities. A large amount of material in the water column can inhibit successful predation by sight-feeding fish, such as bass and pike, or settle out and smother fish eggs. High turbidity caused by sediment or algae can shade out native aquatic plants, resulting in their reduction or disappearance from the littoral zone. This eliminates the benefits provided by plants, such as habitat for many fish species and stabilization of the lake bottom. The average 2004 epilimnetic TSS concentration in Countryside Glen Lake (6.7 mg/L) was lower than the median value for Lake County Lakes (7.9 mg/L). Unlike TP, epilimnetic TSS concentrations remained relatively stable and even decreased at the end of the summer. The plume of sediment observed at the south part of the lake was not detected in the water samples taken at the deep hole. For reasons not entirely apparent, TSS concentrations did not increase during the algae bloom in July and August.

As a result of the relatively low TP and TSS concentrations, the average Secchi depth (water clarity) of Countryside Glen Lake was higher than the county median (3.08 feet) and Secchi depth reached a maximum of 5.12 feet in September. Secchi depth fluctuated with TSS concentrations, increasing when TSS decreased and visa versa (Figure 5). As with TSS, Secchi depth did not respond to the algae bloom in July and only somewhat responded in August.

FIGURE 4

FIGURE 5

Conductivity is the measure of different chemical ions in solution. As the concentration of these ions increases, conductivity increases. The conductivity of a lake is dependent on the lake and watershed geology, the size of the watershed flowing into the lake, the land uses within that watershed, evaporation and bacterial activity. Conductivity has been shown to be highly correlated (in urban areas) with chloride ions found in road salt mixtures. Water bodies most subject to the impacts of road salts are streams, wetlands or lakes draining major roadways and large parking lots. The average 2004 epilimnetic conductivity (0.7601 mS/cm) in Countryside Glen Lake was approximately equal to the county median (0.7652 mS/cm). However, because the highest conductivity was observed in May, after the spring thaw, is an indication that road salt in runoff makes up a major component of the dissolved ions in the lake early in the summer. The gradual increase throughout the rest of the summer, after the decrease in conductivity from May to June, indicates that other factors are contributing to the conductivity in the lake after the initial pulse of road salt in the spring.

Conductivity changes can occur seasonally and even with depth, but over the long term, increased conductivity can be an indicator of potential watershed or lake problems and an increase in pollutants entering the lake. High conductivity (which often indicates an increase in sodium or potassium chloride) can eventually change the plant and algae community, as more salt tolerant plants and algae take over. Sodium, potassium and chloride ions can bind substances in the sediment, preventing uptake by plants and reducing native plant densities. Additionally, juvenile aquatic organisms may be more susceptible to high chloride concentrations. The high conductivity levels are cause for concern, but there may not be much that can be done about it. Non-point runoff picks up road salt and enters the lake during rain events and this is very difficult, if not impossible to control.

Typically, lakes are either phosphorus (P) or nitrogen (N) limited. This means that one of these nutrients is in short supply relative to the other and any addition of phosphorus or nitrogen to the lake might result in an increase of plant or algal growth. Other resources necessary for plant and algae growth include light or carbon, but these are typically not limiting. Most lakes in Lake County are phosphorus limited, but to compare the availability of nitrogen and phosphorus, a ratio of total nitrogen to total phosphorus (TN:TP) is used. Ratios less than or equal to 10:1 indicate nitrogen is limiting. Ratios greater than or equal to 15:1 indicate that phosphorus is limiting. Ratios greater than 10:1, but less than 15:1 indicate that there are enough of both nutrients to facilitate excess algal or plant growth. Countryside Glen Lake had a 2004 average TN:TP ratio of 22:1. Typically, this means even a small increase in the phosphorus concentration could result in more planktonic algae in the future.

Phosphorus levels can also be used to indicate the trophic state (productivity level) of a lake. The Trophic State Index (TSI) uses phosphorus concentrations, chlorophyll *a* (algae biomass) levels and Secchi depth to classify and compare lake trophic states using just one value. The TSI is set up so that an increase in phosphorus concentrations are related to an increase in algal biomass and a corresponding decrease in Secchi depth. A moderate TSI value (TSI ≥40<50) indicates mesotrophic conditions, typically characterized by relatively low nutrient concentrations, low algae biomass, adequate DO concentrations and relatively good water clarity. High TSI values indicate eutrophic (TSI ≥ 50<70) to hypereutrophic (TSI ≥70) lake conditions, typically characterized by high nutrient concentrations, high algal biomass, low DO levels, a rough fish population, and low water clarity. Countryside Glen Lake had an average phosphorus TSI (TSIp) value of 64, indicating eutrophic conditions. When compared to other lakes in the county, Countryside Glen Lake ranks 73rd out of 161 lakes studied, with regard to total phosphorus concentration (Table 3, Appendix A).

Most of the water quality parameters just discussed can be used to analyze the water quality of Countryside Glen Lake based on use impairment indices established by the Illinois Environmental Protection Agency (IEPA). According to this index, Countryside Glen Lake provides *Full* support of aquatic life and swimming, and *Partial* support of recreational activities (such as boating) as a result of the high percent plant coverage in the shallow end of the lake. The lake provides *Full* overall use.

LIMNOLOGICAL DATA – AQUATIC PLANT ASSESSMENT

Aquatic plant surveys were conducted every month for the duration of the study (See Appendix B for methodology). Shoreline plants of interest were also recorded. However, no quantitative surveys were made of these shoreline plant species and these data are purely observational. Light level was measured at one-foot intervals from the water surface to the lake bottom. When light intensity falls below 1% of the level at the water surface, plants are no longer able to grow. Using this information, the lake area that has the potential to support aquatic plant growth can be determined. Depth of 1% percent light intensity was approximately eight feet from May to July and then decreased throughout the rest of the summer as water clarity decreased (Appendix C). Based on the 1% light level in August (the lowest month), Countryside Glen Lake could have supported plants to a depth of eight feet throughout the summer. However, no plants were found at a depth greater than five feet. Therefore, plants were able to and did grow in the shallow half of the lake, but did not grow in all potential areas of the deep half of the lake. The inability of aquatic plants to grow in all areas as determined by percent light level may be explained by the presence of inadequate substrate in many parts of the lake (hard, rocky bottom in some areas) or the relatively steep slope of the lake bottom in the deep half of the lake. A relatively diverse plant community exists in Countryside Glen Lake, dominated by small pondweed, curlyleaf pondweed, *Chara*, sago pondweed and slender naiad. Other common species included floatingleaf pondweed, flatstem pondweed and white water crowsfoot (Tables 4 & 5). Curlyleaf pondweed, an exotic species that usually dies back near the end of June due to high water temperatures, was present in small amounts all summer.

Of the eight plant and trees species observed along the shoreline of Countryside Glen Lake, two (Kentucky Blue Grass and Reed Canary Grass) are non-native species. The replacement of manicured lawn with buffer strips at the water-shoreline interface is recommended. Arum-leaved arrowhead is a native species found in abundance along the shoreline on the south part of the lake. This emergent plant is relatively rare in Lake County lakes and is a positive indication of quality habitat along an urban lake such as Countryside Glen.

FQI (Floristic Quality Index) is a rapid assessment tool designed to evaluate the closeness of the flora of an area to undisturbed conditions. It can be used to: 1) identify natural areas, 2) compare the quality of different sites or different locations within a single site, 3) monitor long-term floristic trends, and 4) monitor habitat restoration efforts (Nichols, 1999). Each floating or submersed aquatic plant is assigned a number between 1 and 10 (10 indicating the plant species most sensitive to disturbance). An FQI is calculated by multiplying the average of these numbers by the square root of the number of that plant species found in the lake. A high FQI number indicates there are a large number of sensitive, high quality plant species present in the lake. Non-native species were also included in the FQI calculations for Lake County lakes. The average FQI for 2000-2004 Lake County lakes is 14.3. Countryside Glen Lake has an FQI of 21.9 and ranked 24th out of 150 county lakes studied since 2000, indicating higher than average plant diversity among Lake County lakes.

Table 4. Aquatic and shoreline plants on Countryside Glen Lake, May-September 2004.

<u>*Aquatic Plants*</u>	
Small Duckweed	*Lemna minor*
Star Duckweed	*Lemna trisulca*
Slender Naiad	*Najas flexilis*
Curlyleaf Pondweed^	*Potamogeton crispus*
American Pondweed	*Potamogeton nodosus*
Floatingleaf Pondweed	*Potamogeton natans*
Sago Pondweed	*Potamogeton pectinatus*
Small Pondweed	*Potamogeton pusillus*
Flatstem Pondweed	*Potamogeton zosteriformis*
White Water Crowfoot	*Ranunculus longirostris*
Arum-Leaved Arrowhead	*Sagittaria cuneata*
Common Arrowhead	*Sagittaria latifolia*
Giant Duckweed	*Spirodella polyrhiza*
<u>*Shoreline Plants*</u>	
Spikerush	*Eleocharis* sp.
Reed Canary Grass^	*Phalaris arundinacea*
Kentucky Blue Grass^	*Poa pratensis*
Lake Sedge	
Softstem Bulrush	*Scirpus validus*
Common Cattail	*Typha latifolia*
<u>*Trees/shrubs*</u>	
Willow	*Salix* sp.

^ Exotic species

LIMNOLOGICAL DATA – SHORELINE ASSESSMENT

A shoreline assessment was conducted at Countryside Glen Lake on July 22, 2004. The shoreline was assessed for a variety of criteria (See Appendix B for methods), and based on this assessment, several important generalizations could be made. Approximately 92.5% of Countryside Glen Lake's shoreline is developed and 100% of the developed shoreline is comprised of manicured lawn. The undeveloped shoreline is comprised of wetland (Figure 6). Manicured lawn is considered undesirable because it provides a poor shoreline-water interface due to the short root structure of turf grasses. These grasses are incapable of stabilizing the shoreline and will typically lead to erosion. In fact, 79% of the manicured lawn along Countryside Glen Lake was exhibiting slight to moderate erosion (Figure 7). Woodland, wetland and buffer are the most desirable shoreline types, providing wildlife habitat and, typically, protecting the shore from excessive erosion.

Wetland shorelines should be maintained, while the addition of buffered shorelines along the current manicured lawns is highly recommended.

Although a large amount of erosion was occurring around Countryside Glen Lake, invasive plant species were only present along one portion of the shoreline (in the wetland area). Reed canary grass typically inhabits mostly wetland areas and can easily outcompete native plants. Additionally, it does not provide the quality wildlife habitat or shoreline stabilization that native plants provide. Although the exotic plant occurrence was along non-developed shoreline, steps to eliminate these plants should be carried out in order to improve the wildlife habitat and overall aesthetics of Countryside Glen Lake.

LIMNOLOGICAL DATA – WILDLIFE ASSESSMENT

Wildlife observations were made on a monthly basis during water quality and plant sampling activities (See Appendix B for methodology). Because of the abundance of residential shoreline and manicured lawns, wildlife diversity was moderate on Countryside Glen Lake (Table 6). Most of the waterfowl observed was found in the shallow area of the lake, along the wetland shoreline. If more of the shoreline were converted to buffer strips and emergent plants, the wildlife diversity and abundance on Countryside Glen Lake could improve dramatically. The maintenance of wetland, shorelines and the establishment of buffer strips is very important and it is strongly recommended to continue to provide the appropriate habitat for birds and other animals in the future.

Figure 6

Figure 7

Table 6. Wildlife species observed at Countryside Glen Lake, May-September 2004.

Birds	
Mute Swan	*Cygnus olor*
Canada Goose	*Branta canadensis*
Mallard	*Anas platyrhnchos*
American Wideon	*Anas americana*
Ring-billed Gull	*Larus delawarensis*
Great Egret	*Casmerodius albus*
Great Blue Heron	*Ardea herodias*
Killdeer	*Charadrius vociferus*
Mourning Dove	*Zenaida macroura*
Rough-wing Swallow	*Stelgidopteryx ruficollis*
Blue Jay	*Cyanocitta cristata*
Catbird	*Dumetella carolinensis*
Cedar Waxwing	*Bombycilla cedrorum*
Common Yellowthroat	*Geothlypis trichas*
Red-winged Blackbird	*Agelaius phoeniceus*
Common Grackle	*Quiscalus quiscula*
Northern Cardinal	*Cardinalis cardinalis*
American Goldfinch	*Carduelis tristis*
American Tree Sparrow	*Spizella arborea*
Amphibians	
Leopard Frog	*Rana pipiens*
Insects	
Cicadas	*Cicadidae*

EXISTING LAKE QUALITY PROBLEMS

- *Lack of a Quality Bathymetric Map*

  A bathymetric (depth contour) map is an essential tool in effective lake management, especially if the long term lake management plan includes intensive treatments, such as fish stocking, dredging, chemical application or alum application. No bathymetric map currently exists for Countryside Glen Lake, which has a very unique morphology. Morphometric data obtained in the creation of a bathymetric map is necessary for calculation of equations for correct application of many types of treatments. It is also necessary to determine the volume of water affected by low DO levels.

- *Lack of Participation in the Volunteer Lake Monitoring Program (VLMP)*

  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 lake shore residents, lake owners/managers, members of environmental groups, public water supply personnel, and citizens with interest in a particular lake. The establishment of a VLMP on Countryside Glen Lake would provide valuable historical data and enable lake managers to create baseline information and then track the improvement or decline of lake water quality over time.

- *Limited Wildlife Habitat and Shoreline Erosion*

  Almost none of Countryside Glen Lake's shoreline provides quality wildlife habitat or shoreline erosion control. While some limited buffer strips exist along the developed shore, all of the residents have manicured lawn. It is strongly recommended that all residents that do not have a buffer strip or are experiencing erosion consider planting at least a 10-20 foot wide strip of native plants along their shoreline. This could increase wildlife habitat, reduce the amount of nutrients and soil particles entering the lake, deter geese and decrease shoreline erosion. Pathways through these buffers could accommodate lake access for homeowners without reducing the integrity of the buffer. Slight to moderate erosion is occurring along 73% of the shoreline, solely along areas dominated by manicured lawn.

POTENTIAL OBJECTIVES FOR THE COUNTRYSIDE GLEN LAKE MANAGEMENT PLAN

I. Create a Bathymetric Map, Including a Morphometric Table
II. Participate in the Volunteer Lake Monitoring Program
III. Enhance Wildlife Habitat Conditions
VI. Control Shoreline Erosion

OPTIONS FOR ACHIEVING THE LAKE MANAGEMENT PLAN OBJECTIVES

Objective I: Create a Bathymetric Map, Including a Morphometric Table

A bathymetric (depth contour) map is an essential tool in effective lake management since it provides information on the morphometric features of the lake, such as depth, surface area, volume, etc. The knowledge of this morphometric information would be necessary if lake management treatments such as fish stocking, dredging, alum application or aeration were part of the overall lake management plan. Countryside Glen Lake does not currently have a bathymetric map. Maps can be created by the Lake County Health Department – Lake Management Unit or other agencies for costs that vary from $3,000-$10,000, depending on lake size.

Objective II: 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 lake shore 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 photic 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:

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Objective III: 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 (i.e., five 0.1-acre plots of different habitats may not attract as many wildlife species as one 0.5 acre plot of one habitat type).

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 shrub 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).

<u>Option 1: No Action</u>

This option means that the current land use activities will continue. No additional techniques will be implemented. Allowing a field to go fallow or not mowing a manicured lawn would be considered an action.

> ***Pros***
>
> Taking no action may maintain the current habitat conditions and wildlife species present, depending on environmental conditions and pending land use actions. If all things remain constant there will be little to no effect on lake water quality and other lake uses.
>
> ***Cons***
>
> If environmental conditions change or substantial land use actions occur (i.e., development) wildlife use of the area may change. For example, if a new housing

development with manicured lawns and roads is built next to an undeveloped property, there will probably be a change in wildlife present.

Conditions in the lake (i.e., siltation or nutrient loading) may also change the composition of aquatic plant and invertebrate communities and thus influence biodiversity. Siltation and nutrient loading will likely decrease water clarity, increase turbidity, increase algal growth (due to nutrient availability), and decrease habitat for fish and wildlife.

Costs

The financial cost of this option may be zero. However, due to continual loss of habitats many wildlife species have suffered drastic declines in recent years. The loss of habitat effects the overall health and biodiversity of the lake's ecosystems.

Option 2: Increase Habitat Cover

This option can be incorporated with Option 3 (see below). One of the best ways to increase habitat cover is to leave a minimum 25-foot buffer between the edge of the water and any mowed grass. Allow native plants to grow or plant native vegetation along shorelines, including emergent vegetation such as cattails, rushes, and bulrushes (see Table 7 & 8, Appendix A for costs and seeding rates). This will provide cover from predators and provide nesting structure for many wildlife species and their prey. It is important to control or eliminate non-native plants such as buckthorn, purple loosestrife, garlic mustard, and reed canary grass, since these species outcompete native plants and provide little value for wildlife.

Occasionally high mowing (with the mower set at its highest setting) may have to be done for specific plants, particularly if the area is newly established, since competition from weedy and exotic species is highest in the first couple years. If mowing, do not mow the buffer strip until after July 15 of each year. This will allow nesting birds to complete their breeding cycle.

Brush piles make excellent wildlife habitat. They provide cover as well as food resources for many species. Brush piles are easy to create and will last for several years. They should be place at least 10 feet away from the shoreline to prevent any debris from washing into the lake.

Trees that have fallen on the ground or into the water are beneficial by harboring food and providing cover for many wildlife species. In a lake, fallen trees provide excellent cover for fish, basking sites for turtles, and perches for herons and egrets.

Increasing habitat cover should not be limited to the terrestrial environment. Native aquatic vegetation, particularly along the shoreline, can provide cover for fish and other wildlife. Because of the turbidity in Island Lake, it would be best to start with planting of emergent species and most toward submersed species as water clarity improves.

Pros

Increased cover will lead to increased use by wildlife. Since cover is one of the most important elements required by most species, providing cover will increase the chances of wildlife using the shoreline. Once cover is established, wildlife usually have little problem finding food, since many of the same plants that provide cover also supply the food the wildlife eat, either directly (seeds, fruit, roots, or leaves) or indirectly (prey attracted to the plants).

Additional benefits of leaving a buffer include: stabilizing shorelines, reducing runoff which may lead to better water quality, and deterring nuisance Canada geese. Shorelines with erosion problems can benefit from a buffer zone because native plants have deeper root structures and hold the soil more effectively than conventional turfgrass. Buffers also absorb much of the wave energy that batters the shoreline. Water quality may be improved by the filtering of nutrients, sediment, and pollutants in run-off. This has a “domino effect” since less run-off flowing into a lake means less nutrient availability for nuisance algae, and less sediment means less turbidity, which leads to better water quality. All this is beneficial for fish and wildlife, such as sight-feeders like bass and herons, as well as people who use the lake for recreation. Finally, a buffer strip along the shoreline can serve as a deterrent to Canada geese from using a shoreline. Canada geese like flat, open areas with a wide field of vision. Ideal habitat for them are areas that have short grass up to the edge of the lake. If a buffer is allowed to grow tall, geese may choose to move elsewhere.

Cons

There are few disadvantages to this option, however, if vegetation is allowed to grow, lake access and visibility may be limited. If this occurs, a small path can be made to the shoreline or lower growing species (1.5-2.0 feet tall) can be planted. Composition and density of aquatic and shoreline vegetation are important. If vegetation consists in excess amounts or of non-native species (Eurasian water milfoil or purple loosestrife), undesirable conditions may result. A shoreline with excess exotic plant growth may result in a poor fishery (exhibited by stunted fish) and poor recreation opportunities (i.e., boating, swimming, or wildlife viewing).

Costs

The cost of this option would be minimal. The purchase of native plants can vary depending upon species and quantity. Based upon 100 feet of shoreline, a 25-foot buffer planted with a native forb and grass seed mix would cost between $165-270 (2500 sq. ft. would require 2.5, 1000 sq. ft. seed mix packages at $66-108 per package). This does not include labor that would be needed to prepare the site for planting and follow-up maintenance. This cost can be reduced or minimized if native plants are allowed to grow. However, additional time and labor may be needed to insure other exotic species, such as buckthorn, reed canary grass, and purple loosestrife, do not become established.

Option 3: Increase Natural Food Supply

This can be accomplished in conjunction with Option 2. Habitats with a diversity of native plants will provide an ample food supply for wildlife. Food comes in a variety of forms, from seeds to leaves or roots to invertebrates that live on or are attracted to the plants. Plants found in Table 7, Appendix A should be planted or allowed to grow. In addition, encourage native aquatic vegetation, such as water lily (*Nuphar* spp. and *Nymphaea tuberosa*), sago pondweed (*Stuckenia pectinatus*), largeleaf pondweed (*Potamogeton amplifolius)*, and wild celery (*Vallisneria americana*) to grow. Aquatic plants such as these are particularly important to waterfowl in the spring and fall, as they replenish energy reserves lost during migration.

Providing a natural food source in and around a lake starts with good water quality. Water quality is important to all life forms in a lake. If there is good water quality, the fishery benefits and subsequently so does the wildlife (and people) who prey on the fish. Insect populations in the area, including beneficial predatory insects, such as dragonflies, thrive in lakes with good water quality.

Dead or dying plant material can be a source of food for wildlife. A dead standing or fallen tree will harbor good populations of insects for woodpeckers, while a pile of brush may provide insects for several species of songbirds such as warblers and flycatchers.

Supplying natural foods artificially (i.e., birdfeeders, nectar feeders, corn cobs, etc.) will attract wildlife and in most cases does not harm the animals. However, “people food” such as bread should be avoided. Care should be given to maintain clean feeders and birdbaths to minimize disease outbreaks.

Pros

Providing food for wildlife will increase the likelihood they will use the area. Providing wildlife with natural food sources has many benefits. Wildlife attracted to a lake can serve the lake and its residents well, since many wildlife species (i.e., many birds, bats, and other insects) are predators of nuisance insects such as mosquitoes, biting flies, and garden and yard pests (such as certain moths and beetles). Effective natural insect control eliminates the need for chemical treatments or use of electrical “bug zappers” that have limited effect on nuisance insects.

Migrating wildlife can be attracted with a natural food supply, primarily from seeds, but also from insects, aquatic plants or small fish. In fact, most migrating birds are dependent on food sources along their migration routes to replenish lost energy reserves. This may present an opportunity to view various species that would otherwise not be seen during the summer or winter.

Cons

Feeding wildlife can have adverse consequences if populations become dependent on hand-outs or populations of wildlife exceed healthy numbers. This frequently happens when people feed waterfowl like Canada geese or mallard ducks.

Feeding these waterfowl can lead to a domestication of these animals. As a result, these birds do not migrate and can contribute to numerous problems, such as excess feces, which is both a nuisance to property owners and a significant contribution to the lake's nutrient load. Waterfowl feces are particularly high in phosphorus. Since phosphorus is generally the limiting factor for nuisance algae growth in many lakes in the Midwest, the addition of large amounts of this nutrient from waterfowl may exacerbate a lake's excessive algae problem. In addition, high populations of birds in an area can increase the risk of disease for not only the resident birds, but also wild bird populations that visit the area.

Finally, tall plants along the shoreline may limit lake access or visibility for property owners. If this occurs, a path leading to the lake could be created or shorter plants may be used in the viewing area.

Costs

The costs of this option are minimal. The purchase of native plants and food and the time and labor required to plant and maintain would be the limit of the expense.

Option 4: Increase Nest Availability

Wildlife are attracted by habitats that serve as a place to raise their young. Habitats can vary from open grasslands to closed woodlands (similar to Options 2 and 3).

Standing dead or dying trees provide excellent habitat for a variety of wildlife species. Birds such as swallows, woodpeckers, and some waterfowl need dead trees to nest in. Generally, a cavity created and used by a woodpecker (e.g., red-headed or downy woodpecker, or common flicker) in one year, will in subsequent years be used by species like tree swallows or chickadees. Over time, older cavities may be large enough for waterfowl, like wood ducks, or mammals (e.g., flying squirrels) to use. Standing dead trees are also favored habitat for nesting wading birds, such as great blue herons, night herons, and double-crested cormorants, which build stick nests on limbs. For these birds, dead trees in groups or clumps are preferred as most herons and cormorants are colonial nesters.

In addition to allowing dead and dying trees to remain, erecting bird boxes will increase nesting sites for many bird species. Box sizes should vary to accommodate various species. Swallows, bluebirds, and other cavity nesting birds can be attracted to the area using small artificial nest boxes. Larger boxes will attract species such as wood ducks, flickers, and owls. A colony of purple martins can be attracted with a purple martin house, which has multiple cavity holes, placed in an open area near water.

Bat houses are also recommended for any area close to water. Bats are voracious predators of insects and are naturally attracted to bodies of water. They can be enticed into roosting in the area by the placement of bat boxes. Boxes should be constructed of rough non-treated lumber and placed >10 feet high in a sunny location.

Pros

Providing places where wildlife can rear their young has many benefits. Watching wildlife raise their young can be an excellent educational tool for both young and old.

The presence of certain wildlife species can help in controlling nuisance insects like mosquitoes, biting flies, and garden and yard pests. This eliminates the need for chemical treatments or electric “bug zappers” for pest control.

Various wildlife species populations have dramatically declined in recent years. Since the overall health of ecosystems depend, in part, on the role of many of these species, providing sites for wildlife to raise their young will benefit not only the animals themselves, but the entire lake ecosystem.

Cons

Providing sites for wildlife to raise their young have few disadvantages. Safety precautions should be taken with leaving dead and dying trees due to the potential of falling limbs. Safety is also important when wildlife have young they are protecting. Most actions by adult animals are simply threats and are rarely carried out as attacks.

Parental wildlife may chase off other animals of its own species or even other species. This may limit the number of animals in the area for the duration of the breeding season.

Costs

The costs of leaving dead and dying trees are minimal. The costs of installing the bird and bat boxes vary. Bird boxes can range in price from $10-100.00. Purple martin houses can cost $50-150. Bat boxes range in price from $15-50.00. These prices do not include mounting poles or installation.

Objective IV: Control Shoreline Erosion

Erosion is a potentially serious problem to lake shorelines and occurs as a result of wind, wave, or ice action or from overland 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 negatively influences the lake's overall water quality by contributing nutrients, sediment, and pollutants into 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. The resulting increased amount of sediment will over time begin to fill in the lake, decreasing overall lake depth and volume and potentially impairing various recreational uses. Countryside Glen Lake has slight to moderate erosion along 28% of its shoreline, concentrated along woodland and manicured lawn. The residents around the lake should address those small areas that are eroded or could become eroded in the future.

<u>Option 1: No Action</u>

Pros

There are no short-term costs to this option. However, extended periods of erosion may result in substantially higher costs to repair the shoreline in the future.

Eroding banks on steep slopes can provide habitat for wildlife, particularly bird species (e.g. kingfishers and bank swallows) that need to burrow into exposed banks to nest. In addition, certain minerals and salts in the soils are exposed during the erosion process, which are utilized by various wildlife species.

Cons

Taking no action will most likely cause erosion to continue and subsequently may cause poor water quality due to high levels of sediment or nutrients entering a lake. This in turn may retard plant growth and provide additional nutrients for algal growth. A continual loss of shoreline is both aesthetically unpleasing and may potentially reduce property values. Since a shoreline is easier to protect than it is to rehabilitate, it is in the interest of the property owner to address the erosion issue immediately.

Costs

In the short-term, cost of this option is zero. However, long-term implications can be severe since prolonged erosion problems may be more costly to repair than if the problems were addressed earlier. As mentioned previously, long-term erosion may cause serious damage to shoreline property and in some cases lower property values.

Option 2: Create a Buffer Strip

Another effective method of controlling shoreline erosion is to create a buffer strip with existing or native vegetation. Native plants have deeper root systems than turfgrass and thus hold soil more effectively. Native plants also provide positive aesthetics and good wildlife habitat. Cost of creating a buffer strip is quite variable, depending on the current state of the vegetation and shoreline and whether vegetation is allowed to become established naturally or if the area needs to be graded and replanted. Allowing vegetation to naturally propagate the shoreline would be the most cost effective, depending on the severity of erosion and the composition of the current vegetation. Non-native plants or noxious weedy species may be present and should be controlled or eliminated.

Stabilizing the shoreline with vegetation is most effective on slopes no less than 2:1 to 3:1, horizontal to vertical, or flatter. Usually a buffer strip of at least 25 feet is recommended, however, wider strips (50 or even 100 feet) are recommended on steeper slopes or areas with severe erosion problems. Areas where erosion is severe or where slopes are greater than 3:1, additional erosion control techniques may have to be incorporated such as biologs, A-Jacks®, or rip-rap.

Buffer strips can be constructed in a variety of ways with various plant species. Generally, buffer strip vegetation consists of native terrestrial (land) species and emergent (at the land and water interface) species. Terrestrial vegetation such as native grasses and wildflowers can be used to create a buffer strip along lake shorelines. Table 7, Appendix A gives some examples, seeding rates and costs of grasses and seed mixes that can be used to create buffer strips. Native plants and seeds can be purchased at regional nurseries or from catalogs. When purchasing seed mixes, care should be taken that native plant seeds are used. Some commercial seed mixes contain non-native or weedy species or may contain annual wildflowers that will have to be reseeded every year. If purchasing plants from a nursery or if a licensed contractor is installing plants, inquire about any guarantees they may have on plant survival. Finally, new plants should be protected from herbivory (e.g., geese and muskrats) by placing a wire cage over the plants for at least one year.

Emergent vegetation, or those plants that grow in shallow water and wet areas, can be used to control erosion more naturally than seawalls or rip-rap. Native emergent vegetation can be either hand planted or allowed to become established on its own over time. Some plants, such as native cattails (*Typha* sp.), quickly spread and help stabilize shorelines, however they can be aggressive and may pose a problem later. Other species, such as those listed in Table 7, Appendix A should be considered for native plantings.

Pros

Buffer strips can be one of the least expensive means to stabilize shorelines. If no permits or heavy equipment are needed (i.e., no significant earthmoving or filling is planned), the property owner can complete the work without the need of professional contractors. Once established (typically within 3 years), a buffer strip of native vegetation will require little maintenance and may actually reduce the overall maintenance of the property, since the buffer strip will not have to be continuously mowed, watered, or fertilized. Occasional high mowing (1-2 times per year) for specific plants or physically removing other weedy species may be needed.

The buffer strip will stabilize the soil with its deep root structure and help filter run-off from lawns and agricultural fields by trapping nutrients, pollutants, and sediment that would otherwise drain into the lake. This may have a positive impact on the lake's water quality since there will be less "food" for nuisance algae. Buffer strips can filter as much as 70-95% of sediment and 25-60% of nutrients and other pollutants from runoff.

Another benefit of a buffer strip is potential flood control protection. Buffer strips may slow the velocity of flood waters, thus preventing shoreline erosion. Native plants also can withstand fluctuating water levels more effectively than commercial turfgrass. Many plants can survive after being under water for several days, even weeks, while turfgrass is intolerant of wet conditions and usually dies after several days under water. This contributes to increased maintenance costs, since the turfgrass has to be either replanted or replaced with sod. Emergent vegetation can provide additional help in preserving shorelines and improving water quality by absorbing wave energy that might otherwise batter the shoreline. Calmer wave action will result in less shoreline erosion and resuspension of bottom sediment, which may result in potential improvements in water quality.

Many fish and wildlife species prefer the native shoreline vegetation habitat. This habitat is an asset to the lake's fishery since the emergent vegetation cover may be used for spawning, foraging, and hiding. Various wildlife species are even dependent upon shoreline vegetation for their existence. Certain birds, such as marsh wrens (*Cistothorus palustris*) and endangered yellow-headed blackbirds (*Xanthocephalus xanthocephalus*) nest exclusively in emergent vegetation like cattails and bulrushes. Hosts of other wildlife like waterfowl, rails, herons, mink, and frogs to mention just a few, benefit from healthy stands of shoreline vegetation. Dragonflies, damselflies, and other beneficial invertebrates can be found thriving in vegetation along the shoreline as well.

In addition to the benefits of increased fish and wildlife use, a buffer strip planted with a variety of native plants may provide a season long show of various colors from flowers, leaves, seeds, and stems. This is not only aesthetically pleasing to people, but also benefits wildlife and the overall health of the lake's ecosystem.

Cons

There are few disadvantages to native shoreline vegetation. Certain species (i.e., cattails) can be aggressive and may need to be controlled occasionally. If stands of shoreline vegetation become dense enough, access and visibility to the lake may be compromised to some degree. However, small paths could be cleared to provide lake access or smaller plants could be planted in these areas.

Costs

If minimal amount of site preparation is needed, costs can be approximately $10 per linear foot, plus labor. Cost of installing willow posts is approximately $15-20 per linear foot. The labor that is needed can be completed by the property owner in most cases, although consultants can be used to provide technical advice where needed. This cost will be higher if the area needs to be graded. If grading is necessary, appropriate permits and surveys are needed. If filling is required, additional costs will be incurred if compensatory storage is needed. The permitting process is costly, running as high as $1,000-2,000 depending on the types of permits needed.