2004 SUMMARY REPORT
of
RIVERSHIRE POND 2

Lake County, Illinois

Prepared by the

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TABLE OF CONTENTS

APPENDIX A. DATA TABLES FOR RIVERSHIRE POND 2.

APPENDIX B. METHODS FOR FIELD DATA COLLECTION AND LABORATORY ANALYSES.

APPENDIX C. 2004 MULTIPARAMETER DATA FOR RIVERSHIRE POND 2.

APPENDIX D. GRANT OPPORTUNITIES FOR RIVERSHIRE POND 2.

EXECUTIVE SUMMARY

Rivershire Pond 2 is located in the Village of Lincolnshire. The pond was created in the early 1970's as part of the Mariott Resort golf course. Construction of homes around the pond began soon after its creation. By 1993, the pond had been expanded and homes had been built on the north side. The Rivershire Community Property Association (RCPA) was established in the late 1970's. By 1997, homes had been built along the south shore as well and the pond and the area around it appeared as it does today. Rivershire Pond 2 has a surface area of 8.3 acres and mean and maximum depths of 3.7 feet and 7.3 feet, respectively. Rivershire Pond 2 is managed by the RCPA. It is used by residents and their guests for aesthetics only.

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 average total phosphorus (TP) concentration (0.90 mg/L) was higher than the Lake County median and fluctuated throughout the summer. Total suspended solids (TSS) concentrations were also high, and were closely related to pond level each month. The main source of TP and TSS to the lake appears to be internal, and is likely a combination of resuspended sediment from common carp activities and wave action. Secchi depths (water clarity) were low throughout the summer, and corresponded somewhat with increases and decreases in TSS concentrations. The conductivity in May was the highest of all the months. Conductivity decreased dramatically from May to June due to the flooding of the Des Plaines River into Rivershire Pond 2 and the subsequent flushing of the pond. Conductivity increased gradually from June through September and coincided with decreasing lake level. This indicates that the increase throughout the summer was the result of in-lake factors and evaporation.

Very few plants were present in Rivershire Pond 2. Relatively small beds of Eurasian watermilfoil, small pondweed and spatterdock existed but were localized in the same areas of the lake all summer. A carp population is likely maintaining the high turbidity that inhibits plant growth, and results in resuspended sediment.

Slight to moderate erosion was occurring around 92% of the shoreline of Rivershire Pond 2. Most of this was along buffered, shrub and woodland shorelines. Additionally, invasive plant species including buckthorn, Queen Anne's lace, purple loosestrife and reed canary grass were present along the shoreline. These are exotic plant or shrub species that out-compete native vegetation and provide poor habitat for wildlife. A relatively high number of waterfowl and bird species were observed during the summer, due to the high amount of buffered shoreline and close proximity to the Des Plaines River.

LAKE IDENTIFICATION AND LOCATION

Rivershire Pond 2 is located in the Village of Lincolnshire, just east of IL Route 21 (Milwaukee Avenue) (T 43N, R 11E, S 23). It has a surface area of 8.3 acres, and estimated mean and maximum depths of 3.7 feet and 7.3 feet, respectively, and an estimated volume of 30.7 acre-feet. The watershed of Rivershire Pond 2 encompasses approximately 83.4 acres, draining Rivershire Pond 1 and an equal combination of residential and Mariott Hotel land around it (Figure 1). The watershed to lake surface area ratio is 10:1. With a watershed to lake ratio of this size, lake retention time (the time it takes all the water in the lake to be replaced) is relatively low. It is estimated that it takes just over ½ of a year for all of the water volume of Rivershire Pond 2 to flush out of the lake and be replenished by new water. Water level fluctuations during the summer 2004 were relatively large on Rivershire Pond 2. The Des Plaines River had flooded in late May, overtopping its banks and spilling into the pond. It is estimated that water level had increased by four feet, based on dead/drowned vegetation on the shoreline, before returning to normal water level in July.

Based on the most recent land use survey of the Rivershire Pond 2 watershed, conducted in 2000, an equal combination of residential areas and Mariott Hotel property (golf course) dominate the watershed, each making up approximately 35% of the watershed (Figure 2). Rivershire Ponds 1 and 2 make up 17% of the area, and other land uses together make up less than 15% of the watershed (Table 1, Appendix A). The large amount of residential and golf course area that make up the watershed can be good or bad, depending on the activities of homeowners that live around the lake and golf course maintenance staff. 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. One step that can be taken to reduce impacts of excess nutrients in the pond is to use phosphorus-free fertilizer. Kentucky bluegrass or turf grass may not need any additional phosphorus to grow, once they have become established. Use of phosphorus on well-established lawns maybe unnecessary and can contribute phosphorus to Rivershire Pond 2 via overland runoff. It is recommended that the Association require that homeowners use phosphorus-free fertilizers unless a soil test warrants it and approach those individuals that run the golf course about using phosphorus-free fertilizer as well.

Water enters Rivershire Pond 2 from Rivershire Pond 1 through a three foot pipe with a check valve to eliminate backflow into Rivershire Pond 1. Water exits Rivershire Pond 2 on the southeast end, through another three foot pipe, eventually entering the Des Plaines River. The lake is located in the Lower Des Plaines River sub basin, within the Des Plaines River watershed.

Figure 1

Figure 2

BRIEF HISTORY OF RIVERSHIRE POND 2

Rivershire Pond 2 was created on an old farm field in the early 1970's as part of the Mariott Resort golf course. Construction of homes around the pond began soon after its creation, and by 1993 the pond had been expanded and homes had been built on the north side (Figure 3). The Rivershire Community Property Association (RCPA) was established in the late 1970's. By 1997, homes had been built along the south shore as well, and the pond and the area around it appeared as it does today. The pond is used for aesthetics only. Rivershire Pond 1 is used for irrigation of the golf course and filamentous algae first became a problem in that pond in 2001. The homeowners around Rivershire Pond 2 contribute a unit owners' assessment to a budget each year for algaecide treatments. In 2001, a project was begun to establish buffer strips along 50% of the pond shoreline using native grasses and forbs. This was relatively successful, but observations during the summer 2004 indicated that significant maintenance is needed along these areas.

SUMMARY OF CURRENT AND HISTORICAL LAKE USES

Rivershire Pond 2 was checked approximately once per month by Integrated Lakes Management and was treated with an algaecide on June 15, 2004. The only other management conducted on the pond was the removal of fallen logs into the lake. It is recommended that fallen logs (trees) remain in the water unless the logs are impeding recreation or causing flooding to adjacent property. Fallen logs serve as high quality aquatic habitat for a variety of species, including fish and many species of wildlife. Rivershire Pond 2 is one of the few ponds left in Lake County with a significant amount of wooded shoreline, and residents should allow this shoreline and the water adjacent to it to remain as close to its natural state as possible.

LIMNOLOGICAL DATA – WATER QUALITY

Water samples collected from Rivershire Pond 2 were analyzed for a variety of water quality parameters (See Appendix B for methodology). Samples were collected approximately three feet below the surface from the deepest location in the lake (Figure 4). The surface waters of Rivershire Pond 2 were well oxygenated in May, but decreased dramatically after the pond was flooded by the Des Plaines River. At the water surface, dissolved oxygen (DO) concentrations were adequate from May-July, but decreased below a depth of three feet during June-September. DO fell to a low of 1.81 mg/L at three feet in June and remained below 5.0 mg/L (a level below which some aquatic organisms become stressed) at that same depth in July and August. DO concentrations near the pond bottom were approximately 1.0 mg/L every month except August. The probable reason for low DO in June was the severe planktonic algae bloom that was occurring as well as the addition of a significant amount of organic debris that

FIGURE 3

FIGURE 4

entered the lake during the flood. The decomposition of both the algae and organic debris can significantly reduce DO concentrations, especially overnight**.** Additionally, it appears that the pond temporarily thermally stratified in June at a depth of two feet. 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) = 0 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. However, in a small, shallow pond like Rivershire Pond 2, nearly the entire pond volume was at very low oxygen concentrations in June. Although the thermal stratification was short-lived, it likely put a large amount of stress on the fish community in the lake and encouraged the survival of common carp, which can tolerate low DO concentrations.

Phosphorus (P) is a nutrient that can enter lakes through runoff or be released from lake sediment, and high levels of P typically trigger algal blooms or produce high plant density. The average surface total phosphorus (TP) concentration in Rivershire Pond 2 was 0.090 mg/L, higher than most of the lakes in the county studied since 1999 (county median = 0.063 mg/L). TP remained relatively stable throughout the summer and correlated with TN:TP ratios (Table 2, Appendix A). Rivershire Pond 2 was nitrogen limited only during September, phosphorus limited in June and TN:TP ratios were approximately 11:1 in May, July and August. Typically, lakes are either P or nitrogen (N) limited. This means that one of these nutrients is in short supply relative to the other and that 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. When the pond was nitrogen limited, it meant that there was not enough N in the water column to sustain algal growth. If algae is not growing, it will take up and utilize neither N nor P from the water. However, P continued to be released from the sediment, resulting in a build-up of unused P in the water in September. During the months when the TN:TP ratio was 11:1, the TP concentration was nearly the same. In June, when the pond was P-limited, the TP concentration decreased and, in September, when the pond was N-limited, the TP concentration increased. Although the changes were slight, the TN:TP ratios were likely controlling the amount of phosphorus detected in the water column.

Although the Des Plaines River may have contributed very high concentrations of TP during the flooding event, it appears that algae present in the pond immediately took up the phosphorus and a significant increase was not observed in the water sample. The flooding may have also served to flush water through the system, removing some of the phosphorus and creating the P-limited environment in June. However, the flooding likely deposited flocculent, nutrient-rich sediment in the pond, which can contribute phosphorus to the water column at a later date through sediment resuspension.

Rivershire Pond 1 was treated for algae on May 12, 2004 with Cutrine®-Plus and Cidekick. Additionally, an alum treatment was carried out on the pond on June 29, 2004 to reduce algae and phosphorus in the water column. Rivershire Pond 1 flows into Rivershire Pond 2 during rain events. The alum treatment in Pond 1 did not appear to have had any effect in Pond 2, as very little rain fell in the months after the treatment and a significant amount of water did not move between the two ponds.

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 such as 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 epilimnetic TSS concentration (14.9 mg/L) in Rivershire Pond 2 was twice the county median (7.9 mg/L) and was highly correlated with pond level that was measured from May through September at a stake on the east shoreline (Figure 5). TSS was relatively high in May, decreased in June after the flood had flushed all of the water through the pond and increased again in July and August when evaporation caused water levels to decrease. With a decrease in water level, nutrients and algae are concentrated into a smaller volume of water and tend to become elevated. As a result of the flooding in late May, a planktonic algae blooms was observed in early June and continued to be present through August. The bloom was treated with a combination of Cutrine®-Plus, Cutrine®-Ultra and Cidekick on June 15, 2004. A water sample was taken on August 11, 2004 using a net tow to collect algae for identification. The sample was dominated by a green algae species (*Cartaria* spp), which gave the water a green color. Additionally, a relatively large common carp population is believed to exist in Rivershire Pond 2. These fish tend to resuspend bottom sediment through their feeding activities and are likely also a source of TSS to the pond (along with planktonic algae).

As a result of relatively high TS and TSS concentrations at the end of the summer, Secchi depth (water clarity) on Rivershire Pond 2 was lower than the county median (3.08 feet) every month during the summer of 2004, and reached a minimum of 1.80 feet in August and September (Figure 6) (Table 2, Appendix A). The combination of high TSS and low Secchi depth resulted a very low density of aquatic plants in Rivershire Pond 2. A diverse community of aquatic plants is beneficial to a lake in many ways, including stabilizing sediment to prevent resuspension, causing soil particles entering the lake through non-point runoff to settle out more quickly, competing with planktonic algae for resources, and providing habitat and a food base for a healthy fish community. Without adequate plant coverage, there were likely more sediment particles in the water column

FIGURE 5

FIGURE 6

during the summer. As a result, Secchi depth in the lake was low, and plants were unable to thrive, which then resulted in more resuspension of sediment into the water column, and the cycle continued.

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. Average 2004 conductivity in Rivershire Pond 2 (1.1984 mS/cm) was approximately 57% higher than the county median of 0.7652 mS/cm. Conductivity was highest in May, decreased dramatically from May to June, and then increased gradually from June through September. That the highest levels were observed in May, during the greatest amount of rainfall, 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 decrease in June was probably the result of all of the water flushing through the system with the flooding of the Des Plaines River. This water from the Des Plaines had likely picked up a large amount of particles that could increase conductivity levels. Once the flooding had stopped and the water settled back down to normal pond level, this high conductivity water may have remained in the pond. The gradual increase throughout the rest of the summer was likely the result of evaporation and water level decrease, which concentrated the salt ions into a smaller volume of water, causing elevated conductivity levels.

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 or an increase in pollutants entering the lake if the trend is noted over a period of years. High conductivity (which often indicate an increase in sodium or potassium chloride) can eventually change the plant community, as more salt tolerant plants take over. Sodium, potassium and chloride ions can bind substances in the sediment, preventing their uptake by plants and reducing native plant densities. Additionally, juvenile aquatic organisms may be more susceptible to high chloride concentrations. Thus the high conductivity readings are cause for concern. However, non-point runoff, such as that which picks up road salt and enters the lake during rain events, and flooding are difficult to control.

Phosphorus concentrations can also be used to indicate the trophic state (productivity level) of a lake. The Trophic State Index (TSI) uses phosphorus, chlorophyll *a* (algae biomass) 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 concentration is related to an increase in algal biomass and a corresponding decrease in Secchi depth. A moderate TSI value (TSI=40-49) 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=50-69) to hypereutrophic (TSI $\geq$70) lake conditions, typically characterized by high nutrient concentrations, high algal biomass, low DO levels, a rough fish population, and low water clarity. Rivershire Pond 2 had an average phosphorus TSI (TSIp) value of 69, indicating eutrophic conditions and degraded water quality. When compared to other lakes in the county, Rivershire Pond 2 ranks 96th 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 Rivershire Pond 2 based on use impairment indices established by the Illinois Environmental Protection Agency (IEPA). According to this index, Rivershire Pond 2 provides *Full* support of aquatic life and *Partial* support of swimming and recreation because of its low Secchi depth and moderately high levels of sediment in the water column. The lake has *Partial* 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. Eurasian watermilfoil (EWM) dominated the plant community in 2004, but was found mostly around the perimeter of the pond in limited areas. Other plant species observed (small pondweed, coontail, pickerelweed and smartweed) were extremely sparse and also found in very localized plant beds in the same place each month (Tables 4 & 5). During the study, light level was measured at one-foot intervals from the water surface to the lake bottom. When the light intensity falls below 1% of the level at the water surface, plants are no longer able to grow. Using this information, it can be determined how much of the lake has the potential to support aquatic plant growth. Although water clarity was not high, based on 1% light level, Rivershire Pond 2 could have supported plants in areas of the lake less than six feet deep (nearly 100% of the pond). 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, carp activity, high turbidity, or some other unknown factor.

Of the 38 emergent plant and trees species observed along the shoreline of Rivershire Pond 2, eight (common mullein, stinging nettle, Kentucky bluegrass, ox-eye daisy, lambs quarters, reed canary grass, purple loosestrife and buckthorn) are invasive species that out compete native vegetation, poorly stabilize shorelines, and do not provide good habitat.

FQI (Floristic Quality Index) is a rapid assessment tool designed to evaluate the closeness of the flora of an area to that of 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 plant species found in the lake. A high FQI number indicates that 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. Rivershire Pond 2 has an FQI of 11.5. However, this number can be deceiving, as it only indicates the quality of the plants found and does not take into account plant density. The plants found in Riverhsire Pond 2 were at very low densities and were present in only a handful of places in the lake. This is not reflected in the FQI number, and the plant community is below average when plant density is considered. The lake ranks 95th out of 150 lakes we have studied aquatic plants in since 2000.

Table 4. Aquatic and shoreline plants on Rivershire Pond 2, May-September 2004.

Aquatic Plants	
Coontail	*Ceratophyllum demersum*
Eurasian Water Milfoil^	*Myriophyllum spicatum*
Spatterdock	*Nuphar variegata*
Shoreline Plants	
Common Milkweed	*Asclepias syriaca*
Butterfly-weed	*Asclepias tuberosa*
New England Aster	*Aster novae-angliae*
Common Ragweed	*Ambrosia artemisiifolia*
Dog Bane	*Apocynum* sp.
Lamb's Quarters^	*Chenopodium album*
Ox-Eye Daisy^	*Chrysanthemumleucanthemum*
Sedge	*Carex* sp.
Queen Anne's Lace^	*Daucus carota*
Purple Coneflower	*Echinacea purpurea*
Unknown Spikerush	*Eleocharis sp.*
Rattlesnake Master	*Erynigium aquaticum*
Blue Flag Iris	*Iris* sp.
Purple Loosestrife^	*Lythrum salicaria*
Reed Canary Grass^	*Phalaris arundinacea*
False Dragonhead	*Physostegia virginiana*
Kentucky Blue Grass^	*Poa pratensis*
Smartweed	*Polygonum* sp.
Pickerelweed	*Pontederia cordata*
Swamp Smartweed	*Polygonum coccineum*
Mountain Mint	*Pycnanthemum* sp.
Gray-headed Coneflower	*Ratibida pinnata*
Thin-leaved Coneflower	*Rudbeckia triloba*
Green Bullrush	*Scirpus atrovirens*

^ Exotic plant species

Table 4. Aquatic and shoreline plants on Rivershire Pond 2,

May-September 2004 (cont'd).

<u>*Shoreline Plants*</u>	
Softstem Bulrush	*Scirpus validus*
Tall Goldenrod	*Solidago altissima*
Late Goldenrod	*Solidago gigantea*
Stinging Nettle^	*Urtica dioica*
<u>*Shoreline Plants*</u>	
Wild Grape	*Vitis* sp.
Blue Vervain	*Verbena hastata*
Common Mullein^	*Verbascum thapsus*
<u>*Trees/shrubs*</u>	
Box Elder	*Acer negundo*
Silver Maple	*Acer saccharinum*
Red Osier Dogwood	*Cornus sericea*
Cottonwood	*Populus deltoides*
Oak	*Quercus* sp.
Common Buckthorn^	*Rhamnus cathartica*
Willow	*Salix* sp.

^ Exotic plant species

LIMNOLOGICAL DATA – SHORELINE ASSESSMENT

A shoreline assessment was conducted at Rivershire Pond 2 in August 2004. The shoreline was assessed for a variety of criteria (See Appendix B for methods), and based on these assessments, several important generalizations could be made. Approximately 60% of Rivershire Pond 2's shoreline is developed. The majority of the developed shoreline is comprised of buffer (89%) (Figure 7). The remainder consists of rip rap (6.3%), lawn (4.1%) and seawall (0.5%). The undeveloped shoreline consists of shrub (15%), woodland (45%) and buffer (41%). Buffer, woodland and shrub are all ideal shoreline types with regard to wildlife habitat and providing shoreline stabilization. However, although the deep roots of shrubs and trees can hold soil in place and filter some nutrients, if improperly maintained, buffered shorelines, especially those with buckthorn infestations, will typically exhibit erosion. As a result of the dominance of this shoreline type around Rivershire Pond 2, 92% of the shoreline exhibited slight to moderate erosion (Figure 8). It is interesting to note that the only shoreline type that exhibited moderate erosion was manicured lawn. Manicured lawn is considered undesirable because it provides a poor shoreline-water interface due to the short root

Figure 7

Figure 8

structure of turf grasses. These grasses are incapable of stabilizing the shoreline and typically lead to erosion on most lakes. The buffered and wooded areas along Rivershire

Pond 2 are very desirable. Erosion here should be addressed and the shorelines should be improved and maintained, while the addition of manicured lawn along the shore should be discouraged.

In addition to the erosion occurring around Rivershire Pond 2, invasive plant species, including reed canary grass, purple loosestrife, ox-eye daisy, lamb's quarters and buckthorn were present along the shoreline. The areas of invasion were scattered along buffered, wooded and shurb shoreline types that had not been maintained. These plants are extremely invasive and exclude native plants from the areas they inhabit. Additionally, they do not provide the quality wildlife habitat or shoreline stabilization that native plants provide. Steps to eliminate these plants should be carried out immediately.

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 wildlife habitat in the form of woodland, shrub and buffer areas was abundant around Rivershire Pond 2 and because of its proximity to the Des Plaines River, a relatively large number of species of waterfowl, as well as a good mix of songbirds were observed (Table 6). However, it is important that the current buffer areas around the lake should be rehabilitated and maintained, and that additional buffered areas are encouraged to provide the appropriate habitat for a continued high diversity of bird species into the future.

Table 6. Wildlife species observed at Rivershire Pond 2, May-September 2004.

Birds	
Double-crested Cormorant	Phalacrocorax auritus
Canada Goose	*Branta canadensis*
Mallard	*Anas platyrhnchos*
Great Egret	*Casmerodius albus*
Great Blue Heron	*Ardea herodias*
Killdeer	*Charadrius vociferus*
Unknown Sandpiper	*Calidris* sp.
Red-tailed Hawk	*Buteo jamaicensis*
Mourning Dove	*Zenaida macroura*
Common Flicker	*Colaptes auratus*
Tree Swallow	*Iridoprocne bicolor*
Blue Jay	*Cyanocitta cristata*
Catbird	*Dumetella carolinensis*

Table 6. Wildlife species observed at Rivershire Pond 2, May-September 2004 (cont'd).

Birds

American Robin	*Turdus migratorius*
Red-winged Blackbird	*Agelaius phoeniceus*
Common Grackle	*Quiscalus quiscula*
House Sparrow	*Passer domesticus*
Northern Cardinal	*Cardinalis cardinalis*
House Finch	*Carpodacus mexicanus*
Chipping Sparrow	*Spizella passerina*
Song Sparrow	*Melospiza melodia*
Mammals	
Beaver	*Castor canadensis*
Muskrat	*Ondatra zibethicus*
Amphibians	
American Toad	*Bufo americanus*
Bull Frog	*Rana catesbeiana*
Reptiles	
Painted Turtle	*Chrysemys picta*

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 Rivershire Pond 2. 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 concentrations.

- *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 Rivershire Pond 2 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.

- *Lack of Aquatic Vegetation*

  One key to a healthy lake is a healthy plant community. Rivershire Pond 2 had very little aquatic vegetation present in much of the lake. It is not known if substantial plant beds have ever existed in Rivershire Pond 2, but high turbidity and poor sediment quality are currently preventing adequate growth of plants. A carp population is likely maintaining the high turbidity, which prevents plant growth and results in easily resuspended sediment.

- *Invasive Shoreline Plant 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. The outcome is a loss of plant and animal diversity. Reed canary grass and purple loosestrife are exotic plants found in wetland habitat. They spread very quickly and are not well utilized by wildlife. Buckthorn and stinging nettle are aggressive shrub species that grow along lake shorelines as well as most upland habitats. They shade out other plants and are quick to become established on disturbed soils. Eight exotic shoreline plants species are present along 97% of the shoreline of Rivershire Pond 2, and attempts should be made to control their spread before they become a larger problem.

- *Shoreline Erosion*

  Although Rivershire Pond 2's shoreline is dominated by buffer and woodland, slight to moderate erosion is occurring along 92% of the shoreline. This is the result of improper establishment and maintenance of the buffered areas that were part of a re-planting project several years ago. Buffers can only provide benefits such as reducing erosion, filtering incoming soil particles and providing wildlife habitat if they are properly maintained. If they are not maintained, they do not serve these purposes and can end up causing more problems by encouraging the establishment of exotic shoreline species along the eroding areas. It is recommended that the resurrection and maintenance of the current buffer strips be carried out as soon as possible and that the wooded areas along the north part of the pond be properly maintained as well.

- *Excessive Numbers of Canada Geese*

  The residents of Rivershire Pond 2 have indicated that there is a large goose population that congregates on the lake at night. They are likely contributing a large amount of feces to the lake and are also a noise nuisance. This flock was not seen during the day. Goose feces contain high amounts of the bacteria *E.coli*, which is also found with illness-causing bacteria and viruses.

POTENTIAL OBJECTIVES FOR THE RIVERSHIRE POND 2 MANAGEMENT PLAN

I. Create a Bathymetric Map, Including a Morphometric Table
II. Participate in the Volunteer Lake Monitoring Program
III. Eliminate or Control Invasive Species

IV. Control Shoreline Erosion
V. Canada Geese Management

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. Rivershire Pond 2 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:

VLMP Regional Coordinator:
Holly Hudson
Northeastern Illinois Planning Commission
222 S. Riverside Plaza, Suite 1800
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(312) 454-0400

Objective III: Eliminate or Control Invasive 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*), honeysuckle (*Lonicera* sp.) and reed canary grass (*Phalaris arundinacea*) are four examples. The outcome is a loss of plant and animal diversity. This section will address terrestrial shoreline exotic species.

Buckthorn and honeysuckle are aggressive shrub species that grow along lake shorelines as well as most upland habitats. They shade out other plants and are quick to become established on disturbed soils. Reed canary grass is an aggressive plant that 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 out-competes native vegetation that begins growth later in the year. Control of purple loosestrife, buckthorn, and reed canary grass are discussed below. However, these control measures can be similarly applied to other exotic species such as garlic mustard (*Allilaria officianalis*) or honeysuckle (*Lonicera* spp.) as well as some aggressive 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 other 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. Exotic species were found along of the shoreline of Rivershire Pond 2. Control measures should be carried out as soon as possible.

Option 1: No Action

No control will likely result in the expansion of the exotic species and the decline of native species. This option is not recommended if possible.

Pros

There are few advantages with this option. Some of the reasons exotics were brought into this country are no longer used or have limited use. However, in some cases having an exotic species growing along a shoreline may actually be preferable if the alternative plant is commercial turfgrass. Since turfgrass has shallow roots and is prone to erosion along shorelines, exotics like reed canary grass or common reed (*Phragmites australis*) will control erosion more effectively. Native plants should take precedent over exotics when possible. Tables 7 & 8, Appendix A lists several native plants that can be planted along shorelines.

Cons

Native plant and wildlife diversity will be lost as stands of exotic species expand. Exotic species are not under the same stresses (particularly diseases and predators) as native plants and thus can out-compete the natives for nutrients, space, and light. Few wildlife species use areas where exotic plants dominate. This happens because many wildlife species either have not adapted with the plants and do not view them as a food resource, the plants are not digestible to the animal, or their primary food supply (i.e., insects) are not attracted to the plants. The result is a monoculture of exotic plants with limited biodiversity.

Recreational activities, especially wildlife viewing, may be hampered by such monocultures. Access to lake shorelines may be impaired due to dense stands of non-native plants. Other recreational activities, such as swimming and boating, may not be affected.

Costs

Costs with this option are zero initially, however, when control is eventually needed, costs will be substantially more than if action was taken immediately. Additionally, the eventual loss of ecological diversity is difficult to calculate financially.

Option 2: Control by Hand

Controlling exotic plants by hand removal is most effective on small areas (< 1 acre) and if done prior to heavy infestation. Some exotics, such as purple loosestrife and reed canary grass, can be controlled to some degree by digging, cutting, or mowing if done early and often during the year. Digging may be required to ensure the entire root mass is removed. Spring or summer is the best time to cut or mow before seed heads appear, since late summer and fall is when many of the plant seeds disperse. Proper disposal of excavated plants is important since seeds may persist and germinate even after several years. Once exotic plants are removed, the disturbed ground should be planted with native vegetation and closely monitored. Many exotic species, such as purple loosestrife, buckthorn, and garlic mustard are proficient at colonizing disturbed sites. Due to the low density of exotic plants, this option is probably the most cost effective.

Pros

Removal of exotics by hand eliminates the need for chemical treatments. Costs are low if stands of plants are not too large already. Once removed, control is simple with yearly maintenance. Control or elimination of exotics preserves the ecosystem's biodiversity. This will have positive impacts on plant and wildlife presence as well as some recreational activities.

Cons

This option may be labor intensive or prohibitive if the exotic plant is already well established. Costs may be high if large numbers of people are needed to remove plants. Soil disturbance may introduce additional problems such as providing a seedbed for other non-native plants that quickly establish disturbed sites, or cause soil-laden run-off to flow into nearby lakes or streams. In addition, a well-established stand of an exotic like purple loosestrife or reed canary grass may require several years of intense removal to control or eliminate.

Costs

Cost for this option is primarily in tools, labor, and proper plant disposal.

<u>Option 3: Herbicide Treatment</u>

Chemical treatments can be effective at controlling exotic plant species. However, chemical treatment works best on individual plants or small areas already infested with the plant. In some areas where individual spot treatments are prohibitive or unpractical (i.e., large expanses of a wetland or woodland), chemical treatments may not be an option due to the fact that in order to chemically treat the area a broadcast application would be needed. Since many of the herbicides that are used are not selective, meaning they kill all plants they contact; this may be unacceptable if native plants are found in the proposed treatment area.

Herbicides are commonly used to control nuisance shoreline vegetation such as buckthorn and purple loosestrife. Herbicides are applied to green foliage or cut stems. Products are applied by either spraying or wicking (wiping) solution on plant surfaces. Spraying is used when large patches of undesirable vegetation are targeted. Herbicides are sprayed on growing foliage using a hand-held or backpack sprayer. Wicking is used when selected plants are to be removed from a group of plants. The herbicide solution is wiped on foliage, bark, or cut stems using a herbicide soaked device. Trees are normally treated by cutting a ring in the bark (called girdling). Herbicides are applied onto the ring at high concentrations. Other devices inject the herbicide through the bark. It is best to apply herbicides when plants are actively growing, such as in the late spring/early summer, but before formation of seed heads. Herbicides are often used in conjunction with other methods, such as cutting or mowing, to achieve the best results. Proper use of these products is critical to their success. Always read and follow label directions.

Pros

Herbicides provide a fast and effective way to control or eliminate nuisance vegetation. Unlike other control methods, herbicides kill the root of the plant, which prevents regrowth. If applied properly, herbicides can be selective. This allows for removal of selected plants within a mix of desirable and undesirable plants.

Cons

Since most herbicides are non-selective, they are not suitable for broadcast application. Thus, chemical treatment of large stands of exotic species may not be practical unless it is a monocrop of a specific plant species. Native species are likely to be killed inadvertently and replaced by other non-native species. Off target injury/death may result from the improper use of herbicides. If herbicides are applied in windy conditions, chemicals may drift onto desirable vegetation. Care must also be taken when wicking herbicides as not to drip on to non-targeted vegetation such as native grasses and wildflowers. Another drawback to herbicide use relates to their ecological soundness and the public perception of them. Costs may also be prohibitive if plant stands are large. Depending on the device, cost of the application equipment can be high.

Costs

Two common herbicides, triclopyr (sold as Garlon ™) and glyphosate (sold as Rodeo®, Round-up™, Eagre™, or AquaPro™), are sold in 2.5 gallon jugs, and cost approximately $200 and $350, respectively. Only Rodeo® is approved for water use. A Hydrohatchet®, a hatchet that injects herbicide through the bark, is about $300.00. Another injecting device, E-Z Ject® is $450.00. Hand-held and backpack sprayers costs from $25-$45 and $80-150, respectively. Wicking devices are $30-40. A girdling tool costs about $150.

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. Rivershire Pond 2 has slight to moderate erosion along 92% of its shoreline, concentrated along buffer and manicured lawn. The residents around the lake should address those small areas that are eroded or could become eroded in the future.

Option 1: No Action

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. Tables 7 & 8, 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.

Objective V: Canada Geese Management

Canada geese (*Branta canadensis*) 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. High nutrient levels, particularly phosphorus, 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 similar human 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 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.

The residents of Rivershire Pond 2 have indicated that there is a large goose population that congregates on the lake at night. They are likely contributing a large amount of feces to the lake and are also a noise nuisance. This flock was not seen during the day.

Option 1: No Action

Pros

This option has no costs, however, increasing numbers of geese will most likely exacerbate existing problems and probably create new ones, which in the future may cost more than if the problems are addressed immediately.

Cons

If current conditions continue and no action is taken, numbers of Canada Geese and problems associated with them will likely increase. An increase of goose feces washed into a lake will increase the lake's nutrient load and eventually may have a detrimental impact on water quality through excessive algae growth. One study (Manny et al. 1975) documented that each goose excretes 0.072 lbs of feces per day. This may not seem like a significant amount, but if 100 geese are present (many lakes in the county can experience 1,000 or more at a time) that equates to over 7 lbs of feces per day! Algae blooms may negatively impact recreational uses such as swimming, boating, and fishing. In addition, when algae dies, odor problems and depleted oxygen levels in the water occur. Increased numbers of geese may also result in overgrazed areas of grass.

Costs

There are a few short-term financial costs with this option. Costs of cleaning feces off lawns or piers are probably more psychological or physical than financial. Long-term costs may be more indirect, including increased nutrient deposition into lakes which may promote excessive algae and plants. Costs incurred may include money needed to control algae with algaecides.

Option 2: Removal

Since Canada Geese are considered migratory waterfowl, both state and federal laws restrict taking or harassing geese. Under the federal Migratory Bird Treaty Act, it is illegal to kill or capture geese outside a legal hunting season or to harass their nests without a permit. If removal of problematic geese is warranted or if nest and egg destruction is an option, permits need to be obtained from the Illinois Department of Natural Resources (217- 782-6384) and the U.S. Fish and Wildlife Service (217-241-6700).

Hunting is one of the most effective techniques used in goose management. However, since many municipalities have ordinances prohibiting the discharge of firearms, reduction of goose numbers by hunting in urban areas (i.e., lakes, ponds, and parks) may not be an option. Hunting does occur on many lakes in the county, but certain regulations apply (e.g., 100 yard minimum distance from any residential property). Contact the Illinois Department of Natural Resources for dates and regulations regarding the waterfowl hunting seasons. Also, contact local and county law enforcement agencies regarding any ordinances concerning hunting within municipal boundaries.

Egg addling, or destroying the egg by shaking, piercing, or freezing, can be used to reduce or eliminate a successful clutch. Eggs should be returned to the nest so the hen goose does not re-lay another clutch. However, if no eggs hatch, she may still lay another clutch. Leaving one or two eggs unaltered and allowing them to hatch may prevent another clutch from being laid and reduces the total year’s reproduction. Egg addling requires a state and federal permit.

The capture and relocation of geese is no longer a desirable option. First, relocated geese may return to the same location where they were captured. Second, there is a concern over potential disease transmission from relocated geese to other goose populations. Finally, since goose numbers in Illinois are already high there is no need to supplement other populations in the area.

Pros

Removing a significant portion of a problem goose population can have a positive effect on the overall health of a lake. Reduction of feces on lawns and parks is beneficial to recreation users of all types. Less feces in the water means less phosphorus available for nuisance plant and algae growth. Thus, the overall water quality of the lake may be improved by this reduction in phosphorus.

Cons
If the habitat conditions still exist, more geese will likely replace any that were removed. Thus, money and time used removing geese may not be well spent unless there is a change in habitat conditions.

Costs
A Illinois residential waterfowl hunting license (including state and federal waterfowl stamps) is $39.00 for the 2002-2003 hunting season. For depredation permits, there is a $25 fee for the federal permit. Once the federal permit is issued the state permit can be obtained at no charge.

Option 3: Dispersal/Repellent Techniques

Several techniques and products are on the market that claim to disperse or deter geese from using an area. These techniques can be divided into two categories: harassment and chemical. With both types of techniques it is important to implement any action early in the season, before geese establish territories and begin nesting. Once established, the dispersal/repellant techniques may be less effective and geese more difficult to coerce into leaving.

The goal with harassment techniques is to frighten geese from an area using sounds or objects. Various products are available that simulate natural predators (i.e., plastic hawks and owls) or otherwise make geese nervous (i.e., balloons, shiny tape, and flags). Other products emit noises, such as propane cannons, which can be set on a timer to go off at programmed intervals (e.g., every 20-30 seconds), or recorded goose distress calls which can be played back over a loudspeaker or tape player. Over time these techniques may be ineffective, since geese become acclimated to these devices. Most of these products are more effective when used in combination with other techniques.

Another technique that has become popular is using dogs or swans to harass geese. Dogs can be used primarily in the spring and fall to keep birds from using an area by herding or chasing geese away from a particular area. Any dogs used for this purpose should be well trained and under the owners control at all times. Professional trainers can be contracted to use their dogs for this purpose. Dogs should not be used during the summer when geese are unable to fly due to molting. Swans are used because they are naturally aggressive in defending their territory, including chasing other waterfowl away from their nesting area. Since wild swans cannot be used for this technique, non-native mute swans are used. However, mute swans are not as aggressive and in some case are permissive of geese. Again, using a combination of techniques would be most effective.

Chemical repellents can be used with some effectiveness. New products are continually coming out that claim to rid an area of nuisance geese. Several products (ReJeX-iT® and GooseChase™) are made from methyl-anthranilate, a natural occurring compound, and can be sprayed on areas where geese are feeding. The spray makes the grass distasteful and forces geese to move elsewhere to feed. Another product, Flight Control™, works similarly, but has the additional benefit of absorbing ultra violet light making the grass appear as if it was not a food source. The sprays need to be reapplied every 14-30 days, depending upon weather conditions and mowing frequency.

Pros
With persistence, harassment and/or use of repellants can result in reduced or minimal usage of an area by geese. Fewer geese may mean less feces and cleaner yards and parks, which may increase recreational uses along shorelines. If large numbers of geese were once present, the reduction of fecal deposits into the lake may help minimize the amount of phosphorus entering the water. Less phosphorus in the water means less “food” available for plant and algae growth, which may have a positive effect of water quality. Finally, any areas overgrazed by geese may have a chance to recover.

Cons
The effectiveness of harassment techniques is reduced over time since geese will adapt to the devices. However, their effectiveness can be extended if the devices are moved to different locations periodically, or used in conjunction with other techniques.

Use of dogs can be time consuming, since the dog must be trained and taken care of. Dogs must also be used frequently in the beginning of the season to be effective at deterring geese. This requires time of the dog owner as well. Dogs (frequently herding dogs, like border collies) that are effective at harassing or herding geese are typically may not be the best pets for the average homeowner. They are bred as working dogs and consequently have high levels of energy that requires the owner’s attention.

Repelling or chasing away geese from an area only solves the goose problem for that area and most likely moves the geese (and the problem) to another area. As long as there is suitable habitat nearby, the geese will not wander very far.

Costs
Costs for the propane cannons are approximately $660 ($360 for the cannon, $300 for a timer), not including the propane tank. The cost of ReJeX-iT® is $80/gallon, GooseChase™ is $95/gallon, and Flight Control™ costs $200/gallon. One gallon covers one acre of turf using ReJeX-iT® and, GooseChase™, and two acres using Flight Control™. Rental costs for a pair of wing-clipped swans is approximately $2,500 per pair for a season (March-October). Rental costs for using dogs varies greatly depending on the size of the water body, but can range from $500-$6,000 per month.

Option 4: Exclusion
Erecting a barrier to exclude geese is another option. In addition to a traditional wood or wire fence, an effective exclusion control is to suspend netting over the area where geese are unwanted. Geese are reluctant to fly or walk into the area. A similar deterrent that is

often used is a single string or wire suspended a foot or so above the ground along the length of the shoreline.

Pros
Depending on the type of barrier used, areas of exclusion will have less fecal mess and may have higher recreational uses. Vegetation that was overgrazed by geese may also be able to recover.

Cons
This technique will not be effective if the geese are using a large area. Also, use of the area by people is severely limited if netting is installed. Fences can also limit recreational uses. The single string or wire method may be effective at first, but geese often learn to go around, over, or under the string after a short period of time. Finally, excluding geese from one area will force them to another area on a different part of the same lake or another nearby lake. While this solves one property owners problem, it creates one (or makes one worse) for another. Also, problems associated with excess feces entering the lake (i.e., increased phosphorus levels) will continue.

Costs
The costs of these techniques are minimal, unless a wood or wire fence is constructed. String, wire, or netting can be purchased or made from materials at local stores.

Option 5: Habitat Alteration

One of the best methods to deter geese from using an area is through habitat alteration. Habitats that consist of mowed turfgrass to the edge of the shoreline are ideal for geese. Low vegetation near the water allows geese to feed and provides a wide view with which to see potential predators. In general, geese do not favor habitats with tall vegetation. Rivershire Pond 2 currently has a large amount of buffer in place along the shoreline, but it is in need of re-establishment and maintenance in order to create an area that is full and lush and will serve to adequately deter geese.

Geese prefer ponds and lakes that have shorelines with gentle slopes to ones with steep slopes. While this alone will not prevent geese from using an area, steeper slopes used along with other techniques will be more effective. This option may not be practical for existing lake shorelines since any grading and/or filling would require permits and surveys, which would drive up the costs of redoing the shoreline considerably.

Aeration systems that run into the fall and winter prevent the lake from freezing, thus not forcing geese to migrate elsewhere. To alleviate this problem, turn aerators off during fall and early winter. Once the lake freezes over and the geese have left, wait a few weeks before turning the aerators on again if needed.

Pros

Altering the habitat in an area can not only make the habitat less desirable for geese, but may be more desirable for many other species of wildlife. A buffer strip has additional benefits by filtering run-off of nutrients, sediments, and pollutants and protecting the shoreline from erosion from wind, wave, or ice action. Finally, the more of the area that is in natural vegetation, the less turfgrass that needs to be constantly manicured and maintained.

Cons

Converting a portion or all of an area to tall grass or shrub habitat may reduce the lake access or visibility. However, if this occurs, a small path can be made to the lake or shorter plants may be used at the access location in the buffer strip.

Costs

If minimal amount of site preparation is needed to create a buffer strip, costs can be approximately $10 per linear foot, plus labor. 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. Compensatory storage is the process of excavating in a portion of a property or floodplain to compensate for the filling in of another portion of the floodplain. The permitting process is costly, running as high as $1,000-2,000 depending on the types of permits needed.

Once established, a buffer strip of native plants needs little maintenance. If aerators are not run for several months, there will be a reduction in electrical costs.

Option 6: Do Not Feed Waterfowl!

There are few “good things”, if any, that come from feeding waterfowl. Birds become dependent on handouts, become semi-domesticated, and do not migrate. This causes populations to increase and concentrate, which may create additional problems such as diseases within waterfowl populations. The nutritional value in many of the “foods” (i.e., white bread) given to geese and other waterfowl are quite low. Since geese are physiologically adapted to eat a variety of foods, they can actually be harmed by filling-up on human food. Geese that are accustom to hand feeding may become aggressive toward other geese or even the people feeding the geese.

Costs

There are no costs to this option, except the public education that is needed to encourage people not to feed waterfowl. In some cases, signs could be posted to discourage waterfowl feeding. A sign designed by the Lake County Health Department can be purchased for approximately $35.

Reference:

Manny, B. A., R. G. Wetzel, and W. C. Johnson. 1975. Annual contribution of carbon, nitrogen, and phosphorus by migrant Canada geese to a hardwater lake. Verh. Internat. Verein. Limnol. 19:949-951.