2004 SUMMARY REPORT
of
LAKE KATHRYN

Lake County, Illinois

Prepared by the

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EXECUTIVE SUMMARY

Lake Kathryn was created in the 1960's as a borrow pit during the construction of Interstate Highway 94. The lake was privately owned prior to 1999 when the Village of Green Oaks purchased it and the surrounding land. The Village plans to develop the surrounding property as a park for residents. As part of that plan, they filled approximately two acres at the northern end of the lake with soil and concrete chunks during June 2004. A barrier was set in the water to protect the remaining portion of the lake, which proved to be very effective, indicated by the good water clarity over the duration of the sampling season.

The average water clarity was good (9.4 feet) all season due to the low amount of total suspended solids. Very little algae was present because nitrogen and phosphorus, two key nutrients for algal growth, were very low (three to five times lower than Lake County medians). The large aquatic plant community helped keep total phosphorus concentrations low by competing with planktonic algae for nutrients. Plant roots also stabilized the sediment, hence reducing sediment resuspension in shallow areas.

Due to temperature changes in the water column, water layers with different densities form, which is termed thermal stratification. Lake Kathryn was weakly thermally stratified in July and August. During the stratified months, the bottom layer of the lake near the deep hole did not mix, and therefore had low oxygen levels (hypoxic). However, the deep hole in this lake appears to be very small according our depth measurements, which may indicate that the majority of the lake, which is shallower, had sufficient dissolved oxygen to sustain aquatic life throughout the season.

The aquatic plants throughout the lake covered nearly 100% of the bottom. We identified 10 aquatic plants including *Chara*, a beneficial algal species. Nine of these species were native, beneficial plants. Eurasian Watermilfoil was the only invasive, exotic species we found. Eurasian Watermilfoil, Northern Watermilfoil and Sago Pondweed were the aquatic plants most frequently found. Evidence of the milfoil weevil, an insect that has been known to control Eurasian Watermilfoil, was noted. Although the weevils did not control the milfoil beds in Lake Kathryn in 2004, they may do so in the future.

After conducting a shoreline assessment, it was determined that about 60% is developed, with the majority (70%) typified as wooded buffer. Approximately 64% of the shoreline was classified as exhibiting some level of erosion. The majority of the shoreline had invasive, exotic shoreline plant species, which were usually Buckthorn and Honeysuckle shrubs. The wildlife species we noted consisted mainly of birds that are common to this area. No known fishery assessment has been conducted on this lake, so the status of the fish populations and the fishery condition are unknown.

LAKE IDENTIFICATION AND LOCATION

Lake Kathryn, owned by the Village of Green Oaks, is located in east central Lake County (T44N, R11E, S2), just west of Interstate 94 on Illinois Route 137. It has a small watershed of 32.5 acres, with a majority of the watershed being developed into single-family homes in 2004 (Figures 1 and 2). The lake drains through a culvert on the southwest corner, which then connects to the North Branch of the Chicago River.

Lake Kathryn covers 5.3 acres and has a maximum depth of 16 feet. Because the lake does not have a recent, accurate bathymetric map with volume calculations, the average depth and total lake volume are estimated. The lake has an estimated average depth of 8 feet, and an estimated volume of 42.2 acre-feet, or 13 million gallons. The length of shoreline is 0.39 miles with a lake elevation of 688 feet above mean sea level. Based on the calculated runoff from the watershed and the estimated volume of Lake Kathryn, the approximate retention time of the lake is 2.6 years.

BRIEF HISTORY OF LAKE KATHRYN

Lake Kathryn was created as a five acre borrow pit during the construction of Interstate 94 in the 1960's. The north portion of the lake was expanded by about two additional acres at an unknown date by a private owner. The owner used the lake for water skiing, and at one point affixed tires around parts of the shoreline with the thought that skiers wouldn't be injured as badly if they fell and hit the shoreline. This same owner installed a homemade wind driven aeration unit, which was inoperable but still present during our investigation. In April of 1999, the Village of Green Oaks purchased the parcel including the lake and surrounding property. The Village decided to increase the amount of land on the property, and gained permits from the US Army Corps of Engineers to fill in the northern two acres of the lake. After our June 2004 sampling date, a protective barrier (silt curtain) was set in place, separating the northern two acres in order to prevent fill from entering the remainder of the lake. Soil and concrete chunks were used to fill this northern section.

SUMMARY OF CURRENT AND HISTORICAL LAKE USES

Before the Village of Green Oaks owned Lake Kathryn, a private owner used the lake for water skiing. The Village is formulating plans for the area to develop a park for its residents. The plans may include a ball field, a lakeside walking path and a fishing pier. There is no intent to allow boating on the lake. At this time, public access to the property and the lake are prohibited.

Insert fig 1 watershed

Insert figure 2. land use map

LIMNOLOGICAL DATA – WATER QUALITY

Water samples were collected each month, from May through September 2004, at the deepest point in the lake (see Figure 3). All samples were analyzed for a variety of parameters. The 2004 water quality data can be found in Table 1, Appendix A.

During 2004, Lake Kathryn was polymictic. The water column in a polymictic lake will thermally stratify and then mix periodically. 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 can become anoxic (dissolved oxygen <1 mg/L) by mid-summer. This phenomenon is a natural occurrence and is not necessarily a bad thing if enough of the lake volume remains well oxygenated. Lake Kathryn had not yet stratified in May and June, and had good dissolved oxygen (DO) concentrations (>5 mg/L) recorded to the bottom. In July, the lake had stratified however DO was oxic (>1 mg/L) throughout the water column. The lake was stratified again in August, but then was destratified in September. During these months, anoxic conditions were recorded at 12 and 11 feet, respectively. It is difficult to determine the actual water volume that was lacking DO because there is no recent bathymetric map with volume calculations for this lake. The deepest portion according to the many depth readings we took during our investigation was very small. This may indicate that the majority of the lake, which is shallower, had sufficient DO to sustain aquatic life.

When the lake stratified and the bottom waters became hypoxic, chemical reactions at the sediment surface occurred. These reactions resulted in the release of phosphorus and nitrogen from the sediment interface into the water column. These two nutrients are key ingredients for algal growth. In high concentrations, these nutrients can cause nuisance algal blooms that cloud the water. Typically as the hypolimnion is thermally isolated from the epilimnion during the summer, these nutrients are trapped in the bottom water and increase over the season. This pattern did not occur in Lake Kathryn during 2004 because it was polymictic. The nutrient concentrations were very low in Lake Kathryn due to the lake's small watershed and borrow pit origin.

During 2004, Lake Kathryn had an average epilimnion TP concentration of 0.020 mg/L. This is over three times lower than the Lake County TP median (0.063 mg/L). TKN concentrations in the epilimnetic samples averaged 0.60 mg/L over the season, which is two times lower than the Lake County median (1.220 mg/L). As a result of the low nutrients in the water, planktonic algal growth was limited in Lake Kathryn.

Water clarity, measured with a Secchi disk, is usually the first thing people notice about a lake. In Lake Kathryn, the Secchi disk could be seen down to an average of 9.39 feet over the 2004 season, which is far better than the Lake County median of 3.08 feet. Water clarity is directly related to the total suspended solids (TSS) concentration in the water column. TSS are composed of nonvolatile suspended solids (NVSS) such as non-organic clay or sediment materials, and volatile suspended solids (VSS) such as algae and other organic matter. As TSS increases in the water column, the water clarity decreases.

INSERT FIG 3 SAMPLING

During 2004, Lake Kathryn showed a negative correlation between TSS and Secchi disk readings (Figure 4), with a very low seasonal TSS average (2.1 mg/L), nearly four times lower than the Lake County median of 7.9 mg/L.

The low nutrient concentrations and good water clarity in Lake Kathryn are exceptional for Lake County. Sources of TP are usually a result of internal loading from the sediment and external sources from watershed runoff. Lake Kathryn's watershed is very small at only 32.5 acres. Its watershed to lake surface area ratio of 6.4:1 is also small. Lakes with watershed:lake ratios of 40:1 or larger are considered to be difficult to manage, especially when dominated by developed land uses. Small watersheds generally transport less pollutant loading from stormwater runoff to lakes than larger watersheds. However, the quality of the stormwater entering a lake depends on the land uses within that watershed. Developed land can deliver more pollutants such as sediment and nutrients than undeveloped areas such as prairies or forests. During 2004, several single-family homes were built to the immediate east of the lake, and a stormsewer pipe had been placed along the shoreline for drainage to the lake. Prior to this construction, only three houses were within the watershed, with only one of these along the shoreline. The residential land use now covers 50% of the watershed (Table 2, Appendix A). Calculations that predict the amount of runoff indicate that about 16.4 acre/feet of runoff will enter Lake Kathryn each year, with nearly 67% coming from residential land use. Because the east portion of the watershed changed from undeveloped land to residential land use, the incoming stormwater may be of poorer quality than before. This stormwater could become a source of TP, nitrogen, sediment and road salt to this lake, and negatively impact Lake Kathryn's good water quality over time.

The ratio of total nitrogen (TN) to total phosphorus (TP) indicates which nutrient the lake is in shorter supply of. Lakes with TN:TP ratios greater than 15:1 are limited by phosphorus. Those with ratios equal to or less than 10:1 are limited by nitrogen. In 2004, the TN:TP ratio of Lake Kathryn was 30:1, indicating phosphorus limitation. Most lakes throughout Lake County have the same limitation. TP also can be used for the trophic state index (TSI), which classifies lakes according to the overall level of nutrient enrichment. Using the TP concentration in the epilimnion, the TSIp score can be calculated. The TSIp score falls within the range of one of four categories: hypereutrophic, eutrophic, mesotrophic and oligotrophic. Hypereutrophic lakes are those that have excessive nutrients, with nuisance algae growth reminiscent of "pea soup" and have a TSIp score greater than 70. Lakes with a TSIp score of 50 or greater are classified as eutrophic or nutrient rich, and are productive lakes in terms of aquatic plants and/or algae and fish. Mesotrophic and oligotrophic lakes are those with lower nutrient levels. These are very clear lakes, with little algal growth. Most lakes in this area are rich in TP, resulting in a eutrophic condition. Out of 161 Lake County lakes, there are 15 known to be mesotrophic (eight are old borrow pits), and Lake Kathryn was one of them in 2004, with a TSIp of 47.3. The lake ranked 10^{th} out of the 161 Lake County lakes based on average total phosphorus concentrations of lakes studied since 2000 (See Table 3 in Appendix A).

Insert figure 4, TSS VS SECCHI

The Illinois Environmental Protection Agency (IEPA) has indices to classify Illinois lakes for their ability to support aquatic life, swimming, or recreational uses. The guidelines consider several aspects, such as phosphorus concentrations, water clarity and aquatic plant coverage. Lake Kathryn fully supports aquatic life and swimming uses according to these guidelines. The lake has partial support for in-lake recreational activities due to the substantial amount of aquatic plant coverage, but the overall use category for Lake Kathryn is that of full support.

Conductivity is a measurement of how well water conducts electricity via total dissolved solids (TDS), which are composed of dissolved minerals (i.e., limestone) or salts in the. Because of the use of road salts, lakes with residential and/or urban land uses are often noted to have higher conductivity readings and higher TDS concentrations than lakes that are not surrounded by development. Stormwater runoff from impervious surfaces such as asphalt and concrete can deliver high concentrations of these salts to nearby lakes and ponds. The Lake County median conductivity reading of water near the surface is 0.7652 mS/cm. During 2004, the conductivity readings in Lake Kathryn were lower, averaging only 0.3156 mS/cm near the surface. The conductivity readings in the lake decreased overall from May through August, and then increased slightly in September. Typically, lakes that receive road salts through stormwater runoff have a steady decline in conductivity readings throughout the season. The conductivity readings are low mainly because Lake Kathryn is an old borrow pit and has a small watershed, and until now, much of it was undeveloped. Conductivity readings in this lake may increase as the newly developed roads are treated with de-icing salts. The TDS concentrations were also low, corresponding with the conductivity pattern. The seasonal average of 172 mg/L was almost three times lower than the Lake County median of 454 mg/L. The concentration of 150 mg/L noted in July and August, is the lowest TDS concentration in Lake County lakes.

Readings for pH in the epilimnion averaged 8.72 over the season, higher than the Lake County average of 8.31. Higher pH is often found in old borrow pits in Lake County as nutrient-rich organic matter has not accumulated over time over the rock bottom. Calcium carbonate may be released from bottom, which can elevate the pH. In addition, the pH increased after June when the two acres in the northern portion of the lake was being filled in. As mentioned previously, much of the fill was concrete rock, which may have also contributed the pH increase.

Lake elevation was also measured each month, which fluctuated over the season, but did not appear to correlate with the rainfall except in September. As the north portion of the lake was being filled with rain, water was being displaced from that area, through the protective barrier, possibly causing the lake elevation changes.

The water quality in Lake Kathryn should be monitored periodically due to the major developments in the surrounding watershed. One possibility is to participate in the Illinois Volunteer Lake Monitoring Program (VLMP). This program was established by the Illinois Environmental Protection Agency (Illinois EPA) to gather fundamental information on Illinois inland lakes. Volunteers are trained by professionals to collect water quality information such as water clarity, and in some cases, other chemical parameters. More information can be found in the section titled, “Potential Objectives for the Lake Kathryn Management Plan” in this report.

LIMNOLOGICAL DATA – AQUATIC PLANT ASSESSMENT

We randomly sampled locations in Lake Kathryn each month for aquatic plants, macroalgae and shoreline plants. Aquatic species were quantified, but shoreline plants were not (Table 4). Except for a small area at the deep hole in the lake, aquatic plants covered the entire lake bottom. To maintain a healthy bluegill/bass fishery, the optimal plant coverage is 30% to 40% of the lake bottom. Table 5 in Appendix A lists the aquatic plant species and the frequency that they were found. The three plants found most often were Eurasian Watermilfoil (79% of all samples), Northern Watermilfoil (60%), and Sago Pondweed (38%). Eurasian Watermilfoil (EWM) is an aggressive, invasive plant species. The other nine aquatic plants are all beneficial species, and the macroalgae, *Chara*, is also beneficial. The milfoil weevil (*Euhrychiopsis lecontei*) has periodically controlled EWM. *E. lecontei* is a native weevil that feeds exclusively on milfoil plant species. It was originally discovered while investigating declines of EWM beds in a Vermont lake in the early 1990s. It was first observed in northeastern Illinois lakes in 1995. The weevils can control EWM best in lakes that have milfoil infestations in shallow depths that are undisturbed by recreational and management activities. Lake Kathryn fits this description. In 2004, we saw evidence of these weevils in Lake Kathryn, but no noticeable decrease in the milfoil beds. Research has shown that approximately 1-2 weevils per stem are needed in order to see significant damage and decline of an EWM bed. During 2004, the weevil density may not have been high enough to have a large impact on the EWM in Lake Kathryn. There are no other plant management techniques being employed in this lake that could undermine their population growth, and Lake Kathryn is also a relatively undisturbed system with a high amount of native shoreline for the weevils’ overwintering habitat. For these reasons, it is possible that in the future the weevil population may increase to a density capable of severely reducing the EWM population.

Aquatic plants will not photosynthesize at water depths receiving less than 1% of the available surface sunlight, which means that water clarity and depth are the major limiting factors in determining the maximum depth at which aquatic plants will grow. Because of the excellent water clarity in 2004, the 1% light level reached the bottom in May and July. During the other months, the 1% light level reached from 9.8 to 13.8 feet deep. Because the lake is 16 feet deep in only a very small area, the plant beds were able to grow across most of the lake bottom.

Table 4. Aquatic and shoreline plants on Lake Kathryn, May – September, 2004.

Aquatic Plants	
Chara	*Chara* sp.
Elodea	*Elodea canadensis*
Northern Watermilfoil	*Myriophyllum sibiricum*
Eurasian Watermilfoil^	*Myriophyllum spicatum*
Slender Naiad	*Najas flexilis*
Small Pondweed	*Potamogeton pusillus*
Flatstem Pondweed	*Potamogeton zosteriformis*
White Water Crowfoot	*Ranunculus longirostris*
Sago Pondweed	*Stuckinia pectinatus*
Common Bladderwort	*Utricularia vulgaris*
Shoreline Plants	
Common Ragweed	*Ambrosia artemisiifolia*
Common Milkweed	*Asclepias syriaca*
Aster	*Aster* sp.
Beggar Ticks	*Bidens* sp.
Canada Thistle^	*Cirsium arvense*
Bull Thistle^	*Cirsium vulgare*
Crown-vetch^	*Coronilla varia*
Oxeye Daisy	*Chrysanthemum leucanthemum*
Eastern Joe-Pye Weed	*Eupatorium dubium*
Wild Strawberry	*Fragaria* sp.
Hawkweed	*Hieracium* sp.
Yellow Sweet Clover^	*Melilotus officinalis*
Multiflora Rose^	*Rosa multiflora*
Dock	*Rumex* sp.
Bittersweet Nightshade^	*Solanum dulcamara*
Goldenrod	*Solidago* sp.
Clover	*Trifolium* sp.
Common Mullein^	*Verbascum thapsus*
Wild Grape	*Vitus* sp.
Trees and Shrubs	
Box Elder	*Acer negundo*
Serviceberry	*Amelanchier canadensis*
Dogwood	*Cornus* sp.
Hawthorn	*Crataegus* sp.
Green Ash	*Fraxinus pennsylvanica*
Red Cedar	*Juniperus virginiana*

Table 4. Aquatic and shoreline plants on Lake Kathryn, May – September, 2004, (cont'd).

Honeysuckle^	*Lonicera* sp.
Red Pine	*Pinus resinosa*
Cottonwood	*Populus deltoides*
<u>*Trees and Shrubs*</u>	
Cherry	*Prunus* sp.
Common Buckthorn^	*Rhamnus* sp.
Staghorn Sumac	*Rhus typhina*
Willow	*Salix* sp.
Chinese Elm^	*Ulmus parvifolia*
Viburnum	*Viburnum* sp.

^Exotic species

Floristic quality index (FQI) is a measurement designed to evaluate the closeness of the flora (plants species) of an area to that with 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. Each floating and submersed aquatic plant in a lake is assigned a number between 1 and 10 (10 indicating the plant species most sensitive to disturbance), and these numbers are then used to calculate the FQI. A high FQI number indicates that there are a large number of sensitive, high quality plant species present in the lake, and higher plant diversity. The FQI scores of 150 lakes measured from 2000 through 2004 range from 0 to 37.2, with an average of 14.3. Lake Kathryn has a floristic quality of 19.6, indicating its aquatic plant diversity is above average. Lake Kathryn ranks 33rd out of 150 lakes in Lake County.

LIMNOLOGICAL DATA – SHORELINE ASSESSMENT

The Lake Kathryn shoreline was assessed on June 14, 2004 for a variety of criteria (See Appendix B for methods). Based on these assessments, several important observations could be made. About 60% of the shoreline is considered developed, with the majority (70%) typified as wooded buffer (Figure 5). The other shoreline types are seawall, shrub, lawn and riprap. A large part of the "seawall" portion of the lake was actually the barrier at the north end of the lake. The barrier was set in the water to protect the remaining portion of the lake while the Village filled in the northern two acres in June. The shoreline does have a problem with erosion, with about 64% of the shoreline eroding to some degree (Figure 6). About 50% of the total shoreline is slightly eroding, and about 13% is severely eroding. Less than 1% is moderately eroding. These shorelines should be mitigated before further erosion occurs. Options for erosion control are in the section "Potential Objectives for the Lake Kathryn Management Plan".

An unusual aspect of the shoreline was the tires that had been placed in some areas right at the water line. The owner of the parcel who had used the lake for water skiing installed the tires with the thought that skiers wouldn't be injured as badly if they fell. The Village removed the tires in the fall of 2004. The action of removing the tires may have disturbed these parts of the shoreline, making them more vulnerable to erosion, especially since most of the shoreline is steep. These sections of shoreline should be monitored in order to repair and prevent any further damage.

Several sections of the shoreline were host to invasive, exotic shoreline plants (Figure 7). These invasive plants included Buckthorn, Multiflora Rose and Honeysuckle. These plants have been known to crowd out native species as they multiply, decreasing the habitat value to wildlife. The roots of Buckthorn shrubs also produce a chemical that discourages understory plant growth, leaving the soil bare to erosion. These species should be removed and replaced with native vegetation. The addition of the native vegetation not only increases the habitat value for wildlife, but also can protect the shoreline from erosion because of their roots. This buffer strip can also help filter pollutants and nutrients before entering the lake. Buffer strips are also not favored habitat of Canada geese.

LIMNOLOGICAL DATA – WILDLIFE ASSESSMENT

Wildlife observations were made on a monthly basis during water quality and plant sampling activities (See Appendix B for methodology). The wildlife species noted are common to this area (Table 6). Bluegills were observed swimming in the lake, but since no known fishery assessment on this lake has been conducted, it is unknown what the fishery is like. The aquatic plant diversity in the lake is good, which is a positive aspect of the habitat in the lake. However, the plants cover nearly 100% of the bottom. To maintain a healthy bluegill/bass fishery, the optimal plant coverage is 30% to 40% on the lake bottom. The plant density could decline if the milfoil weevil begins to control more of the Eurasian Watermilfoil beds in the future. Although some invasive species were present, the shoreline buffer along the lake had woody and herbaceous plants that offer some good wildlife habitat. To enhance this shoreline habitat, the invasive species should be removed and replaced with native species.

INSERT FIGURE 5, SHORELINE TYPES

INSERT FIGURE 6, SHORELINE EROSION

INSERT FIGURE 7 INVASIVE PLANTS

Table 6. Wildlife species observed on Lake Kathryn, May – September, 2004.

Birds	
Canada Goose	*Branta canadensis*
Mallard	*Anas platyrhnchos*
Great Egret	*Casmerodius albus*
Green Heron	*Butorides striatus*
Red-tailed Hawk	*Buteo jamaicensis*
Mourning Dove	*Zenaida macroura*
Belted Kingfisher	*Megaceryle alcyon*
Common Flicker	*Colaptes auratus*
Eastern Phoebe	*Sayornis phoebe*
Eastern Pewee	*Contopus virens*
Willow Flycatcher	*Empidonax traillii*
Rough-wing Swallow	*Stelgidopteryx ruficollis*
American Crow	*Corvus brachyrhynchos*
Black-capped Chickadee	*Poecile atricapillus*
House Wren	*Troglodytes aedon*
Catbird	*Dumetella carolinensis*
American Robin	*Turdus migratorius*
Cedar Waxwing	*Bombycilla cedrorum*
Red-eyed Vireo	*Vireo olivaceus*
Yellow-rumped Warbler	*Dendroica coronata*
Wilson's Warbler	*Wilsonia pusilla*
Yellow Warbler	*Dendroica petechia*
Red-winged Blackbird	*Agelaius phoeniceus*
Brown-headed Cowbird	*Molothrus ater*
Common Grackle	*Quiscalus quiscula*
Northern Oriole	*Icterus galbula*
Birds	
Northern Cardinal	*Cardinalis cardinalis*
American Goldfinch	*Carduelis tristis*
Song Sparrow	*Melospiza melodia*
Mammals	
Eastern Chipmunk	*Tamias striatus*
Amphibians	
Western Chorus Frog	*Pseudacris triseriata triseriata*
Fish	
Bluegill	*Lepomis macrochirus*

EXISTING LAKE QUALITY PROBLEMS

- *Lack of a Bathymetric Map*

  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 practices such as fish stocking, aquatic herbicide use, or dredging were part of a future overall lake management plan. Lake Kathryn does not have a recent bathymetric map. Maps can be created by the Lake County Health Department – Lakes Management Unit or other agencies for costs that vary from $2,000-$10,000, depending on lake size.

- *Shoreline Erosion*

  About 64% of the shoreline is eroding. Even though most of the shoreline erosion is slight, continued neglect of these steep shorelines could lead to further erosion, resulting in a loss of property and soil inputs into the water that negatively affect water clarity. It is much easier and less costly to mitigate slightly eroding shorelines than those with more severe erosion. About 13% of the shoreline is severely eroding and will continue to erode if no further action is taken.

- *Invasive Shoreline Plant Species*

  Many sections of the shoreline host aggressive, invasive shoreline plants such as Buckthorn, Honeysuckle and Multiflora Rose. These species are detrimental, as they do not offer good wildlife habitat, and can crowd out native beneficial plants. They should be removed and replaced with beneficial native species.

- *Invasive Aquatic Plants*

  Eurasian Watermilfoil, an invasive, exotic plant species, dominating the aquatic plant community of Lake Kathryn. Although this lake also hosts a good variety of native aquatic plants, Eurasian Watermilfoil can pose a problem to these species. We saw evidence of the milfoil weevil (*Euhrychiopsis lecontei*) in Lake Kathryn. *E. lecontei* is a native weevil, which feeds exclusively on milfoil species. We did not see a noticeable decrease in the milfoil beds in Lake Kathryn in 2004, but it is possible that their populations may increase and help control the milfoil.

- *Lack of Fishery Information*

  At this time, no known information about the fishery in Lake Kathryn is known. If the Village of Green Oaks intends to open the lake to fishing for its residents, this information would be important to have if any fishery management activities such as stocking are considered.

POTENTIAL OBJECTIVES FOR
LAKE KATHRYN MANAGEMENT PLAN

I. Create a New Bathymetric Map Including a Morphometric Table
II. Illinois Volunteer Lake Monitoring Program
III. Shoreline Erosion Control
IV. Eliminate or Control Exotic Species
V. Aquatic Plant Management Options
VI. Conduct a Fisheries Assessment

OPTIONS FOR ACHIEVING THE LAKE MANAGEMENT PLAN OBJECTIVES

Objective I: Create a Bathymetric Map Including a Morphometric Table

No recent, accurate bathymetric map with volume calculations exists for Lake Kathryn. A bathymetric map (depth contour) map is an essential tool for effective lake management since it provides critical information about the physical features of the lake, such as depth, surface area, volume, etc. This information is particularly important when intensive management techniques (i.e., chemical treatments for plant or algae control, dredging, fish stocking, etc.) are part of the lake's overall management plan. Maps can be created by agencies like the Lake County Health Department - Lakes Management Unit or other companies. Costs vary, but can range from $2,000-10,000 depending on lake size.

Objective II: Participate in the Illinois 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, approximately 165 lakes (out of 3,041 lakes in Illinois) are sampled by about 300 citizen volunteers. The volunteers are primarily lakeshore residents, lake owners/managers, members of environmental groups, public water supply personnel, and citizens with interest in a particular lake.

The VLMP relies on volunteers to gather a variety of information on their chosen lake. The primary measurement is Secchi disk transparency or Secchi depth. Analysis of the Secchi disk measurement provides an indication of the general water quality condition of the lake, as well as the amount of usable habitat available for fish and other aquatic life.

Microscopic plants and animals, water color, and suspended sediments are factors that interfere with light penetration through the water column and lessen the Secchi disk depth. As a rule, one to three times the Secchi depth is considered the lighted or euphotic zone of the lake. In this region of the lake there is enough light to allow plants to survive and produce oxygen. Water below the lighted zone can be expected to have little or no dissolved oxygen. Other observations such as water color, suspended algae and sediment, aquatic plants, and odor are also recorded. The sampling season is May through October with volunteer measurements taken twice a month. After volunteers have completed one year of the basic monitoring program, they are qualified to participate in the Expanded Monitoring Program. In the expanded program, selected volunteers are trained to collect water samples that are shipped to the Illinois EPA laboratory for analysis of total and volatile suspended solids, total phosphorus, nitrate-nitrite nitrogen and ammonia nitrogen. Other parameters that are part of the expanded program include dissolved oxygen, temperature, and zebra mussel monitoring. Additionally, chlorophyll *a* monitoring has been added to the regiment of selected lakes. These water quality parameters are routinely measured by lake scientists to help determine the general health of the lake ecosystem.

Lake Kathryn is not currently participating in the VLMP at this time, and 2004 marks the only year in which any water quality information has been collected. It would be beneficial for to obtain more water quality information such as the data gathered for the VLMP program. The VLMP Regional Coordinator is:

Holly Hudson
Northeast Illinois Planning Commission
222 S. Riverside Plaza, Suite 1800
Chicago, IL 60606
(312) 454-0400

Objective III: Shoreline Erosion Control

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 also 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.

There are several locations along the Lake Kathryn shoreline that are eroding. Much of the shoreline is steep, which can aggravate these conditions and make it difficult to repair. If these shorelines are left alone they will continue to erode into the water.

<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: Install a Seawall

Seawalls are designed to prevent shoreline erosion on lakes in a similar manner they are used along coastlines to prevent beach erosion or harbor siltation. Today, seawalls are generally constructed of steel, although in the past seawalls were made of concrete or wood (frequently old railroad ties). Concrete seawalls cracked or were undercut by wave action required routine maintenance. Wooden seawalls made of old railroad ties are not used anymore since the chemicals that made the ties rot-resistant could be harmful to aquatic organisms. A new type of construction material being used is vinyl or PVC. Vinyl seawalls are constructed of a lighter, more flexible material as compared to steel. Also, vinyl seawalls will not rust over time as steel will.

A seawall should be considered as a last resort for Lake Kathryn. Seawalls will impact the beneficial in-lake habitat that exists at the near-shore area.

Pros

If installed properly and in the appropriate areas (i.e., shorelines with severe erosion) seawalls provide effective erosion control. Seawalls are made to last numerous years and have relatively low maintenance.

Cons

Seawalls are disadvantageous for several reasons. One of the main disadvantages is that they are expensive, since a professional contractor and heavy equipment are needed for installation. Any repair costs tend to be expensive as well. If any fill material is placed in the floodplain along the shoreline, compensatory storage may also be 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. Permits and surveys are needed whether replacing and old seawall or installing a new one (see costs below).

Wave deflection is another disadvantage to seawalls. Wave energy not absorbed by the shoreline is deflected back into the lake, potentially causing sediment disturbance and resuspension, which in turn may cause poor water clarity and problems with nuisance algae, which use the resuspended nutrients for growth. If seawalls are installed in areas near channels, velocity of run-off water or channel flow may be accelerated. This may lead to flooding during times of high rainfall and run-off, shoreline erosion in other areas of the lake, or a resuspension of sediment due to the agitation of the increased wave action or channel flow, all of which may contribute to poor water quality conditions throughout the lake. Plant growth may be limited due to poor water clarity, since the photosynthetic zone where light can penetrate, and thus utilized by plants, is reduced. Healthy plants are important to the lake's overall water clarity since they can help filter some of the incoming sediment, prevent resuspension of bottom sediment, and compete with algae for nutrients. However, excessive sediment in the water and high turbidity may overwhelm these benefits.

Finally, seawalls provide no habitat for fish or wildlife. Because there is no structure for fish, wildlife, or their prey, few animals use shorelines with seawalls. In addition, poor water clarity that may be caused by resuspension of sediment from deflected wave action contributes to poor fish and wildlife habitat, since sight feeding fish and birds (i.e., bass, herons, and kingfishers) are less successful at catching prey. This may contribute to a lake's poor fishery (i.e., stunted fish populations).

Costs

Depending on factors such as slope and shoreline access, cost of seawall installation ranges from $85-100 per linear foot for steel and $95-110 per linear foot for vinyl. A licensed contractor installs both types of seawall. Additional costs may occur if the shoreline needs to be graded and backfilled, has a steep slope, or poor accessibility. Price does not include the necessary permits required. Additional costs will be incurred if compensatory storage is needed. Prior to the initiation of work, permits and/or surveys from the appropriate government agencies need to be obtained. For seawalls, a site development permit and a building permit are needed. Costs for permits and surveys can be $1,500-2,000 for installation of a seawall. Contact the Army Corps of Engineers, local municipality, or the Lake County Planning and Development Department.

Option 3: Install Rock Rip-Rap or Gabions

Rip-rap is the term for using rocks to stabilize shorelines. Size of the rock depends on the severity of the erosion, distance to rock source, and aesthetic preferences. Generally, four to eight inch diameter rocks are used. Gabions are wire cages or baskets filled with rock. They provide similar protection as rip-rap, but are less prone to displacement. They can be stacked, like blocks, to provide erosion control for extremely steep slopes. Both rip-rap and gabions can be incorporated with other erosion control techniques such as plant buffer strips. If any plants will be growing on top of the rip-rap or gabions, fill will probably be needed to cover the rocks and provide an acceptable medium for plants to grow on. Prior to the initiation of work, permits and/or surveys from the appropriate government agencies need to be obtained (see costs below).

Similar to the seawalls, gabions and rip-rap will alter the beneficial in-lake habitat that exists at Lake Kathryn's near-shore area. However, in the areas of severe erosion, rip-rap may be needed to secure the eroding slope. Habitat could be replaced by adding a buffer strip of native beneficial plant species above the riprap.

Pros

Rip-rap and gabions can provide good shoreline erosion control. Rocks can absorb some of the wave energy while providing a more aesthetically pleasing appearance than seawalls. If installed properly, rip-rap and gabions will last for many years. Maintenance is relatively low, however, undercutting of the bank can cause sloughing of the rip-rap and subsequent shoreline. Areas with severe erosion problems may benefit from using rip-rap or gabions. In all cases, a filter fabric should be installed under the rocks to maximize its effectiveness.

Fish and wildlife habitat can be provided if large boulders are used. Crevices and spaces between the rocks can be used by a variety of animals and their prey. Small mammals, like shrews can inhabit these spaces in the rock above water and prey upon many invertebrate species, including many harmful garden and lawn pests. Also, small fish may utilize the structure underwater created by large boulders for foraging and hiding from predators.

Cons

A major disadvantage of rip-rap is the initial expense of installation and associated permits. Installation is expensive since a licensed contractor and heavy equipment are generally needed to conduct the work. Permits are required if replacing existing or installing new rip-rap or gabions and must be acquired prior to work beginning. If any fill material is placed in the floodplain along the shoreline, compensatory storage may also be 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.

While rip-rap and gabions absorb wave energy more effectively than seawalls, there is still some wave deflection that may cause resuspension of sediment and nutrients into the water column.

Small rock rip-rap is poor habitat for many fish and wildlife species, since it provides limited structure for fish and cover for wildlife. As noted earlier, some small fish and other animals will inhabit the rocks if boulders are used. Smaller rip-rap is more likely to wash away due to rising water levels or wave action. On the other hand, larger boulders are more expensive to haul in and install.

Rip-rap may be a concern in areas of high public usage since it is difficult and possibly dangerous to walk on due to the jagged and uneven rock edges. This may be a liability concern to property owners.

Costs

Cost and type of rip-rap used depend on several factors, but average cost for installation (rocks and filter fabric) is approximately $35-50 per linear foot. For the 270 feet of severely eroding shoreline along Lake Kathryn, costs for rip-rap would be about $9,450-$13,500. Costs for gabions are approximately $70-100 per linear foot when filled with rocks. The steeper the slope and severity of erosion, the larger the boulders that will need to be used and thus, higher installation costs. In addition, costs will increase with poor shoreline accessibility and increased distance to rock source. Costs for permits and surveys can be $1,500-2,000 for installation of rip-rap or gabions, depending on the circumstances. Additional costs will be incurred if compensatory storage is needed. Contact the Army Corps of Engineers, local municipalities, and the Lake County Planning and Development Department.

Option 4: 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. This might be the case for the severely eroding areas along Lake Kathryn.

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 in 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.

A technique that is sometimes implemented along shorelines is the use of willow posts, or live stakes, which are harvested cuttings from live willows (*Salix* spp.). They can be planted along the shoreline along with a cover crop or native seed mix. The willows will resprout and begin establishing a deep root structure that secures the soil. If the shoreline is highly erodible, willow posts may have to be used in conjunction with another erosion control technique such as biologs, A-Jacks ®, or rip-rap.

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 in 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. Two invertebrates of particular importance for lake management, the water-milfoil weevils (*Euhrychiopsis lecontei* and *Phytobius leucogaster*), which have been shown to naturally reduce stands of exotic Eurasian water-milfoil (*Myriophyllum spicatum*). Weevils need proper over wintering habitat such as leaf litter and mud which are typically found on naturalized shorelines or shores with good buffer strips. Many species of amphibians, birds, fish, mammals, reptiles, and invertebrates have suffered precipitous declines in recent years primarily due to habitat loss. Buffer strips may help many of these species and preserve the important diversity of life in and around lakes.

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 $15 per linear foot, plus labor. Cost of installing willow posts is approximately $20-25 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 $1,500-2,000 depending on the types of permits needed.

Option 5: Install A-Jacks®

A-Jacks® are made of two pieces of pre-cast concrete when fitted together resemble a child's playing jacks. These structures are installed along the shoreline and covered with soil and/or an erosion control product. Native vegetation is then planted on the backfilled area. They can be used in areas where severe erosion does not justify a buffer strip alone, such as the severely eroding areas along Lake Kathryn's shoreline.

Pros

The advantage to A-Jacks® is that they are quite strong and require low maintenance once installed. In addition, once native vegetation becomes established the A-Jacks® can not be seen. They provide many of the advantages that both rip-rap and buffer strips have. Specifically, they absorb some of the wave energy and protect the existing shoreline from additional erosion. The added benefit of a buffer strip gives the A-Jacks® a more natural appearance, which may provide wildlife habitat and help filter run-off nutrients, sediment, and pollutants. Less run-off entering a lake may have a positive effect on water quality.

Cons

The disadvantage is that installation cost can be high since labor is intensive and requires some heavy equipment. A-Jacks® need to be pre-made and hauled in from the manufacturing site. These assemblies are not as common as rip-rap, thus only a limited number of contractors may be willing to do the installation.

Costs

The cost of installation is approximately $50-75 per linear foot, but does not include permits and surveys, which can cost $1,500-2,000 and must be obtained prior to any work implementation. Additional costs will be incurred if compensatory storage is needed. For the 270 feet of severely eroding shoreline along Lake Kathryn, costs for A-Jacks® would be about $13,500-20,250.

Option 6: Install Biolog, Fiber Roll, or Straw Blanket with Plantings

These products are long cylinders of compacted synthetic or natural fibers wrapped in mesh. The rolls are staked into shallow water. Once established, a buffer strip of native plants can be planted along side or on top of the roll (depending if rolls are made of synthetic or natural fibers). They are most effective in areas where plantings alone are not effective due to already severe erosion. In areas of severe erosion, other techniques may need to be employed or incorporated with these products.

Pros

Biologs, fiber rolls, and straw blankets provide erosion control that secure the shoreline in the short-term and allow native plants to establish which will eventually provide long-term shoreline stabilization. They are most often made of bio-degradable materials, which break down by the time the natural vegetation becomes established (generally within 3 years). They provide additional strength to the shoreline, absorb wave energy, and effectively filter run-off from terrestrial sources. These factors help improve water quality in the lake by reducing the amount of nutrients available for algae growth and by reducing the sediment that flows into a lake.

Cons

These products may not be as effective on highly erodible shorelines or in areas with steep slopes, as wave action may be severe enough to displace or undercut these products. On steep shorelines grading may be necessary to obtain a 2:1 or 3:1 slope or additional erosion control products may be needed. If grading or filling is needed, the appropriate permits and surveys will have to be obtained.

Costs

Costs range from $40 to $45 per linear foot of shoreline, including plantings. This does not include the necessary permits and surveys, which may cost $1,500 – 2,000 depending on the type of earthmoving that is being done. Additional costs may be incurred if compensatory storage is needed. For the 1,352 feet of eroding shoreline on Lake Kathryn, costs would be about $10,800-12,150.

Objective IV: Eliminate or Control Exotic Species

Numerous exotic plant species have been introduced into our local ecosystems. Some of these plants are aggressive, quickly out-competing native vegetation and flourishing in an environment where few natural predators exist. Plants such as purple loosestrife (*Lythrum salicaria*), buckthorn (*Rhamnus cathartica*), and reed canary grass (*Phalaris arundinacea*) are three examples. The outcome is a loss of plant and animal diversity. This section will address terrestrial shoreline exotic species.

Purple loosestrife is responsible for the “sea of purple” seen along roadsides and in wetlands during summer. It can quickly dominate a wetland or shoreline. Due in part to an extensive root system, large seed production (estimates range from 100,000 to 2.7 million seeds per plant), and high seed germination rate, purple loosestrife spreads quickly. Buckthorn is an aggressive shrub species that grows along lake shorelines as well as most upland habitats. It shades out other plants, its roots exude a chemical that discourages other plant growth, and it is quick to become established on disturbed soils. Reed canary grass is an aggressive plant species that was introduced as a shoreline stabilizer. It is found on lakeshores, stream banks, marshes and exposed moist ground. Although it does serve to stabilize shorelines to some extent, it has low food value and does not provide winter habitat for wildlife. It is very successful in taking over disturbed areas and, if left unchecked, will dominate an area, particularly a wetland or shoreline, in a short period of time. Since it begins growing early in the spring, it quickly 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*).

The 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, but its removal early on is best. Problems arise when plants are left to spread, many times to the point where treatment is difficult or cost prohibitive. A monitoring program should be established, problem areas identified, and control measures taken when appropriate. This is particularly important in remote areas of lake shorelines where the spread of exotic species may go unnoticed for some time.

Along the shoreline of Lake Kathryn, several of these types of plants were identified, including crown vetch, buckthorn, multiflora rose and honeysuckle. In some areas the infestation was fairly heavy, especially with buckthorn and crown vetch. These plants should be removed and replaced with beneficial native species. A listing of native plants that are often used in these types of projects can be found in Table 7, in Appendix A.

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 whenever possible. Table 7 in 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 zeroing 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: Biological Control

Biological control (bio-control) is a means of using natural relationships already in place to limit, stop, or reverse an exotic species' expansion. In most cases, insects that prey upon the exotic plants in its native ecosystem are imported. Since there is a danger of bringing another exotic species into the ecosystem, state and federal agencies require testing before any bio-control species are released or made available for purchase.

Recently two leaf beetles (*Galerucella pusilla* and *G. calmariensis*) and two weevils, one a root-feeder (*Hylobius transversovittatus*) and one a flower-feeder (*Nanophyes* *marmoratus*) have offered some hope to control purple loosestrife by natural means. These insects feed on the leaves, roots, or flowers of purple loosestrife, eventually weakening and killing the plant or, in the case of the flower-feeder, prevent seeding. In large stands of loosestrife, the beetles and weevils naturally reproduce and in many locations, significantly reduce plant densities. The insects are host specific, meaning that they will attack no other plant but purple loosestrife. Currently, the beetles have proven to be most effective and are available for purchase. There are no designated stocking rate recommendations, since using bio-control insects are seen as an inoculation and it may take 3-5 years for beetle populations to increase to levels that will cause significant damage. Depending on the size of the infested area, it may take 1,000 or more adult beetles per acre to cause significant damage.

Pros

Control of exotics by a natural mechanism is preferable to chemical treatments. Insects, being part of the same ecological system as the exotic plant (i.e., the beetles and weevils and the purple loosestrife) are more likely to provide long-term control. Chemical treatments are usually non-selective while bio-control measures target specific plant species. This technique is beneficial to the ecosystem since it preserves, even promotes, biodiversity. As the exotic plant dies back, native vegetation can reestablish the area.

Cons

Few exotics can be controlled using biological means. Currently, there are no bio-control techniques for plants such as buckthorn, reed canary grass, or a host of other exotics. One of the major disadvantages of using bio-control is the costs and labor associated with it.

Use of biological mechanisms to control plants such as purple loosestrife is still under debate. Similar to purple loosestrife, the beetles and weevils that control it are not native to North America. Due to the poor historical record of introducing non-native species, even to control other non-native species, this technique has its critics.

Costs

The New York Department of Natural Resources at Cornell University (email: bb22@cornell.edu, 607-255-5314, or visit the website: www.invasiveplants.net) sells overwintering adult leaf beetles (which will lay eggs the year of release) for $1 per beetle and new generation leaf beetles (which will lay eggs beginning the following year) at $0.25 per beetle. The root beetles are sold for $5 per beetle. Some beetles may be available for free by contacting the Illinois Natural History Survey (INHS; 217-333-6846). The INHS also conducts a workshop each spring at Volo Bog for individuals and groups interested in learning how to rear their own beetles.

Option 3: 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, 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 since regrowth is common. Many exotic species, such as purple loosestrife, buckthorn, and garlic mustard are proficient at colonizing disturbed sites.

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.

Option 4: Herbicide Treatment

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 impractical (i.e., large expanses of a wetland or woodland), chemical treatments may not be an option because in order to chemically treat the area, a broadcast application would be needed. Because many of the herbicides 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 an herbicide-soaked device. Trees are normally treated by cutting off a ring of bark around the trunk (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. 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 V: Aquatic Plant Management Options

All aquatic plant management techniques have both positive and negative characteristics. If used properly, they can all be beneficial to a lake's well being. If misused or abused, they all share similar outcomes - negative impacts to the lake. Putting together a good aquatic plant management plan should not be rushed. Plans should consist of a realistic set of goals well thought out before implementation. The plan should be based on the management goals of the lake and involve usage issues, habitat maintenance/restoration, and limitations of the lake. For an aquatic plant management plan to achieve long term success, follow up is critical. A good aquatic plant management plan considers both the short and long-term needs of the lake. The management of the lake's vegetation does not end once the nuisance vegetation has been reduced/eliminated. It is critical to continually monitor problematic areas for regrowth and remove as necessary. An association or property owner should not always expect immediate results. A quick fix of the vegetation problems may not always be in the best interest of the lake. Sometimes the best solutions take several seasons to properly solve the problem. The management options covered below are commonly used techniques that are coming into wider acceptance and have been used in Lake County. There are other plant management options that are not covered below as they are not very effective, unreliable, or are too experimental to be widely used.

To maintain a healthy bluegill/bass fishery, the optimal plant coverage is 30% to 40% across the lake bottom. Plants cover nearly 100% of the lake bottom in Lake Kathryn. This could prove to be too much for the fishery, since the predatory species have difficulty catching smaller fish through the dense growth. Often, the result of too many plants is stunted panfish, because the larger predators cannot control their population. Eurasian water milfoil is causing the majority of the problem in Lake Kathryn. However, a positive aspect is that we noted evidence of the water milfoil weevil, an insect that has been credited with controlling Eurasian water milfoil. They do best in lakes without extensive aquatic plant management activities such as herbicides. Their population in 2004 was not enough to control the milfoil, but it's possible that their populations could increase, and do more damage. Although aquatic herbicides are frequently employed to control plants, without a very careful plan, aquatic plant control via herbicides can lead to too much plant removal, and subsequent detrimental water quality changes. For example, the over-removal of plants can leave the lake open to nuisance algae infestation. Plants are in competition with algae for resources such as nutrients and sunlight in the lake, and without them, algae can overpopulate and cause unsightly conditions. This change is very difficult to reverse. At this time, recreation on Lake Kathryn is prohibited, so the plant beds are not interfering with recreational activities. With these things in mind, it may be best to have a "hands off" policy for the plants in this lake to see if the water milfoil weevil can help control the Eurasian water milfoil in the future.

Option 1: No Action

If the lake is dominated by *native, non-invasive* species, the "no action" option could be ideal. Under these circumstances native plant populations could flourish and keep nuisance plants from becoming problematic. However, if a "no action" aquatic plant management plan in a lake with non-native, invasive species, nothing would be done to control the aquatic plant population of the lake regardless of the type and extent of the vegetation. Nuisance vegetation could continue to grow until epidemic proportions are reached. Growth limitations of the plant and the characteristics of the lake itself (light penetration, lake morphology, substrate type, etc.) will dictate the extent of infestation. Rooted plants, such as curly leaf pondweed (*Potamogeton crispus*) and elodea (*Elodea canadensis*), will be bound by physical factors such as substrate type and light availability.

Pros

There are positive aspects associated with the “no action” option for plant management. The first, and most obvious, is that there is no cost. However, if an active management plan for vegetation control were eventually needed, the cost could be substantially higher than if an active management plan had been followed in the first place. Another benefit of this option would be the lack of environmental manipulation. Under the “no action” option, no chemicals, mechanical alteration, or introduction of any organisms would take place. This is important since studies have shown that nuisance plants are more likely to invade disrupted areas. If the lake contains native, non-invasive plant species, expansion of the native plant population would increase the overall biodiversity and health of the lake. Habitat, breeding areas, and food source availability would greatly improve. Use of the lake would continue as normal and in some cases might improve (fishing) if native plants keep “weedy” plants under control.

An additional benefit of the “no action” option is the possible improvement in water quality. Turbidity could decrease and clarity should increase due to sediment stabilization by the plant’s roots. Algal blooms could be reduced due to decreased resource availability and sediment stabilization. However, the occurrence of filamentous algae may increase/remain stable due to their surface growth habitat. The lake’s fishery could improve due to habitat availability, which in turn would have numerous positive effects on the rest of the lake’s ecosystem.

Cons

Under the “no action” option, if nuisance vegetation is dominant in the lake and were uninhibited and able to reach epidemic proportions, there will be many negative impacts on the lake. By their weedy nature, the nuisance plants would out-compete the more desirable native plants. This could eventually, drastically reduce or even eliminate the native plant population of the lake and reduce the lake’s biodiversity. The fishery of the lake may become stunted due the to lack of quality forage fish habitat and reduced predation. Predation will decrease due to the difficulty of finding prey in the dense stands of vegetation. This will cause an explosion in the small fish population and with food resources not increasing, growth of fish will be reduced. Decreased dissolved oxygen levels, due to high biological oxygen demand from the excessive vegetation, will also have negative impacts on the aquatic life. Wildlife populations may also be negatively impacted by these dense stands of vegetation. Birds and waterfowl may have difficulty finding quality plants for food or in locating prey within the dense plant stands.

Water quality could also be negatively impacted with the implementation of the “no action” option. Deposition of large amounts of organic matter and release of nutrients upon the death of the massive stands of vegetation is a probable outcome of the “no action” option. These dead plants will contribute to the sediment load of the lake and could accelerate its filling in. The large nutrient release when the plants die back in the fall could lead to lake-wide algae blooms and an overall increase of the internal nutrient load. In addition, the decomposition of the massive amounts of vegetation will lead to a depletion of the lakes dissolved oxygen. This can cause fish stress, and eventually, if the stress is frequent or severe enough, fish kills. All of the impacts above could in turn have negative impacts on numerous aspects of the lake’s ecosystem.

In addition to the ecological impacts, many physical uses of the lake will be negatively impacted. Boating could be nearly impossible without becoming entangled in thick stands of plants. Swimming could also become increasingly difficult due to thick vegetation that would develop at beaches. Fishing could become more and more exasperating due in part to the thick vegetation and also because of the stunted fish population. In addition, the aesthetics of the lake will also decline due to large areas of the lake covered by tangled mats of vegetation and the odors that will develop when they decay. The combination of the above events could cause property values on the lake to suffer. Property values on lakes with weedy plant/algae problems have been shown to decrease by as much as 15-20%.

Costs
No cost will be incurred by implementing the “no action” management option. However, if in the future a management plan was initiated, costs might be significantly higher since a “no action” plan was originally followed.

<u>Option 2: Aquatic Herbicides</u>

Aquatic herbicides are not recommended for Lake Kathryn at this time. It’s possible that control may be achieved by the water milfoil weevil. The weevils do best in lakes without extensive aquatic plant management activities such as herbicides. Their population in 2004 was not enough to control the milfoil, but it’s possible that their populations could increase, and do more damage. Although aquatic herbicides are frequently employed to control plants, without a very careful plan, aquatic plant control via herbicides can lead to too much plant removal, and subsequent detrimental water quality changes. For example, the over-removal of plants can leave the lake open to nuisance algae infestation. Plants are in competition with algae for resources such as nutrients and sunlight in the lake, and without them, algae can overpopulate and cause unsightly conditions. This change is very difficult to reverse.

Aquatic herbicides are the most common method to control nuisance vegetation/algae. When used properly, they can provide selective and reliable control. Products can not be licensed for use in aquatic situations unless there is less than a 1 in 1,000,000 chance of any negative effects on human health, wildlife, and the environment. Aquatic herbicides are not allowed to be environmentally persistent, bioaccumulate, or have any bioavailability. Prior to herbicide application, licensed applicators should evaluate the lake's vegetation and, along with the lake's management plan, choose the appropriate herbicide and treatment areas, and apply the herbicides during appropriate conditions (i.e., low wind speed, DO concentration, temperature).

There are two groups of herbicides: contact and systemic. Contact herbicides, like their name indicates, kill on contact. These herbicides affect only the above ground portion of the plant that they come into contact with and therefore do not kill the root system. An example of a contact herbicide is diquat. Systemic herbicides are taken up by the plant and disrupt cellular processes, which in turn cause plant death. These herbicides kill both the above ground portions of the plant as well as the root system. An example of a systemic herbicide is fluridone. Both types of herbicides are available in liquid or granular forms. Liquid forms are concentrated and need to be mixed into water to obtain the desired concentration. The solution is then sprayed on the water's surface or injected into the water in the treatment areas. Granular herbicides are broadcast in a known rate over the treatment area where they sink to the bottom. Some granular products slowly release the herbicide, which is then taken up by the plant. These are referred to as SRP formulations (Slow Release Pellet). Other granular herbicides come in crystal form and dissolve as they come in contact with water. This is typical of herbicides such as copper sulfate. Many herbicides come in both liquid and granular forms to fit the management needs of the lake. Herbicide applications can either be done as whole lake treatments or as more selective spot treatments. Multiple herbicides are often mixed and applied together. This is called a tank mix. This is done to save time, energy, and cost.

Aquatic herbicides are best used on actively growing plants to ensure optimal herbicide uptake. For this reason, herbicides are normally applied mid to late spring when water temperatures are above 60^0F. This is the time of year when the plants are most actively growing and before seed/vegetative propagule formation. Follow up applications should be done as needed. When choosing an aquatic herbicide it is important to know what plants are present, which ones are problematic, which plants are beneficial, and how a particular herbicide will act upon these plants. The herbicide label is very important and should always be read before use. There may be more than one herbicide for a given plant. As with other management options, proper usage is the key to their effectiveness, benefits, and disadvantages.

Pros

When used properly, aquatic herbicides can be a powerful tool in management of excessive vegetation. Often, aquatic herbicide treatments can be more cost effective in the long run compared to other management techniques. A properly implemented plan can often provide season long control with minimal applications. Ecologically, herbicides can be a better management option than using mechanical harvesting or grass carp. When properly applied, aquatic herbicides may be selective for nuisance plants such as Eurasian water milfoil but allow desirable plants such as American pondweed (*Potamogeton nodosus*) to remain. This removes the problematic vegetation and allows native and more desirable plants to remain and flourish with minimal manipulation.

The fisheries and waterfowl populations of the lake would benefit greatly due to an increase in quality habitat and food supply. Dense stands of plants would be thinned out and improve spawning habitat and food source availability for fish. Waterfowl population would greatly benefit from increases in quality food sources, such as large-leaf pondweed (*Potamogeton amplifolius*). Another environmental benefit of using aquatic herbicides over other management options is that they are organism specific. The metabolic pathways by which herbicides kill plants are plant specific that humans and other organisms do not carry out. Organisms such as fish, birds, mussels, and zooplankton are generally unaffected.

By implementing a good management plan with aquatic herbicides, usage opportunities of the lake would increase. Activities such as boating and swimming would improve due to the removal of dense stands of vegetation. The quality of fishing may improve because of improved habitat. In addition to increased usage opportunities, the overall aesthetics of the lake would improve, potentially increasing property values on the lake.

Cons

The most obvious drawback of using aquatic herbicides is the input of chemicals into the lake. Even though the United States Environmental Protection Agency (USEPA) approved these chemicals for use, human error can make them unsafe and bring about undesired outcomes. If not properly used, aquatic herbicides can remove too much vegetation from the lake. This could drastically alter biodiversity and ecological. Total or over-removal of plants can cause a variety of problems lake-wide. The fishery of the lake may decline and/or become stunted due to predation issues related to decreased water clarity. Other wildlife, such as waterfowl, which commonly forage on aquatic plants, would also be negatively impacted by the decrease in food supply.

Another problem associated with removing too much vegetation is the loss of sediment stabilization by plants, which can lead to increased turbidity and resuspension of nutrients. The increase in turbidity can cause a decrease in light penetration, which can further aggravate the aquatic plant community. The resuspension of nutrients will contribute to the overall nutrient load of the lake, which can lead to an increased frequency of noxious algal blooms. Furthermore, the removal of aquatic vegetation, which competes with algae for resources, can directly contribute to an increase in blooms.

After the initial removal, there is a possibility for regrowth of vegetation. Upon regrowth, weedy plants such as Eurasian water milfoil and coontail quickly reestablish, form dense stands, and prevent the growth of desirable species. This causes a decrease in plant biodiversity. Additionally, these dense stands of nuisance vegetation can lead to an overpopulation of stunted fish due to a decrease in predation of forage species by predatory fish. This disruption in the fisheries can have negative impacts throughout the ecosystem from zooplankton to higher organisms such as waterfowl and other wildlife. Additionally, some herbicides have use restrictions regarding their use in relation to fish, swimming, irrigation, etc.

Over-removal, and possible regrowth of nuisance vegetation that may follow will drastically impair recreational use of the lake. Swimming could be adversely affected due to the likelihood of increased algal blooms. Swimmers may become entangled in large mats of filamentous algae. Blooms of planktonic species, such as blue-green algae, can produce harmful toxins as well produce noxious odors. If regrowth of nuisance vegetation were to occur, motors could become entangled making boating difficult. Fishing would also be negatively impacted due to the decreased health of the lake's fishery. The overall appearance of the lake would also suffer due to an increase in unsightly algal blooms and massive stands of vegetation. This in turn could have an unwanted effect on property values. Studies have shown that problematic algal blooms can decrease property values by 15-20%.

Option 3: Water Milfoil Weevil

Euhrychiopsis lecontei (*E. lecontei*) is a biological control organism used to control Eurasian water milfoil (EWM). *E. lecontei* is a native weevil, which feeds exclusively on milfoil species. It was originally discovered while investigating declines of EWM in a Vermont lake in the early 1990s. It was discovered in northeastern Illinois lakes by 1995. Another weevil, *Phytobius leucogaster,* also feeds on EWM but does not cause as much damage as *E. lecontei*. Therefore, *E. lecontei* is stocked as a biocontrol and is commonly referred to as the Eurasian water milfoil weevil. Currently, the LCHD-Lakes Management Unit has documented weevils (*E. lecontei* and/or *P. leucogaster*) in 35 Lake County lakes. Many of these lakes have seen declines in EWM densities in recent years. It is highly likely that *E. lecontei* and/or *P. leucogaster* occurs in all lakes in Lake County that have excessive EWM growth.

Weevils are stocked in known quantities to achieve a density of 1-4 weevils per stem. As weevil populations expand, EWM populations may decline. After EWM declines, weevil populations decline and do not feed on any other aquatic plants. When EWM starts to grow again in the spring, the weevil populations respond by keeping the increasing milfoil under control before it becomes a problem. Once the weevil is established, EWM should no longer reach nuisance proportions and begins to become less dense. Best results are achieved in lakes that have shallow EWM infestations in areas where it is undisturbed by recreational and management actives. Weevils need proper overwintering habitat such as leaf litter and mud, which are typically found on naturalized shorelines or shores with good buffer strips. Additionally, water temperatures need to be 68-70^{o}F for maximum weevil activity. For this reason, weevils are typically stocked in late spring/early summer. Currently only one company, EnviroScience Inc., has a stocking program (called the MiddFoil® process). The program includes evaluation of EWM densities, of current weevil populations (if any), stocking, monitoring, and restocking as needed.

Lake Kathryn already has a weevil population. In order to save money, the Village could wait and see if this population expands. If this does happen, the Eurasian water milfoil could be controlled without the additional expense.

Pros

The milfoil weevil can provide long-term control of EWM. Typically, by the end of June EWM stands are starting to decline due to weevil damage. In many situations, EWM beds might not reach the surface before weevil damage causes declines. *E. lecontei* is also a selective means to control EWM. Studies have shown that *E. lecontei* has a strong preference for EWM and the only other plant it possibly will feed on is northern water milfoil. Since milfoil weevils are found to naturally occur in several lakes in Lake County, weevil stocking would be an augmentation rather than an introduction, making it a more natural control option.

If control with milfoil weevils were successful, the quality of the lake would be improved. Native plant populations could then start to grow back or increase. Fisheries of the lake would improve due to more balanced predation and higher quality habitat. Waterfowl would benefit due to increased food sources and availability of prey. Recreational activities such as fishing, swimming, and boating would be easier and more enjoyable with the removal of inhibiting stands of EWM.

Cons

Use of milfoil weevils does have some drawbacks. Control using the weevil has been inconsistent in many cases. EWM has been reduced one year, only to be unaffected the next. Reasons for these inconsistencies are under investigation. One possible explanation is lack of suitable overwintering habitat. The highly developed, manicured shorelines of many lakes in the County are not suitable habitat for weevil overwintering. Another possible explanation is cooler than normal summer water temperatures. Studies have shown that cooler water temperatures reduce weevil feeding and egg production.

Milfoil control using weevils may not work well on plants in deep water. Plants are able to compensate for weevil damage on upper portions of the plant by increasing growth on lower portions where weevil does not feed. Furthermore, weevils do not work well in areas where plants are continuously disturbed by activities such as powerboats and swimming, harvesting or herbicide use. In areas where weevils are to be stocked, activity should be reduced as much as possible. This may either limit the extent to which the weevils can be used or limit recreational use of the lake.

One of the most prohibitive aspects to weevil use is price. Typically weevils are stocked to achieve a density of 1-4 weevils per stem. This translates to 500-3000 weevils per acre. At a cost of $1 per weevil plus labor, a EWM management program using weevils can be expensive. Additionally, there is no guarantee that weevils will provide long term control or even produce any results at all.

Costs

EnviroScience, Inc.
3781 Darrow Road
Stow, Ohio 44224
1(800) 940-4025

Weevils are sold in units of 1000 bugs/unit and stocking rates must be at least 1 unit/stocked area. Normally there is a minimum purchase of 5-10 units. The cost of the weevils does not include the labor involved in initial surveys, stocking, and monitoring, which typically run an additional $3,500-$4,500.

Objective VI: Conduct a Fisheries Assessment

Many lakes in Lake County have a fish stocking program in which fish are stocked every year or two to supplement fish species already occurring in the lake or to introduce additional fish species into the system. However, very few lakes that participate in stocking check the progress or success of these programs with regular fish surveys. Lake managers should have information about whether or not funds delegated to fish stocking are being well spent, and it is very difficult to determine how well stocked fish species are surviving and reproducing or how they are affecting the rest of the fish community without a comprehensive fish assessment. If the Village of Green Oaks intends to open Lake Kathryn to fishing and they intend to stock the lake, a fisheries assessment would be valuable information to have beforehand.

A simple, inexpensive way to derive direct information on the status of a fishery is to sample anglers and evaluate the types, numbers and sizes of fish caught by anglers actively involved in recreational fishing on the lake. Such information provides insight on the status of fish populations in the lake, as well as a direct measure of the quality of fishing and the fishing experience. However, the numbers and types of fish sampled by anglers are limited, focusing on game and large, catchable-sized fish. Thus, in order to obtain a comprehensive assessment of the fish community status, including non-game fish species, more quantitative methods must be employed. These include gill netting, trap netting, seining, trawling, angling (hook and line fishing) and electroshocking. Each method has its advantages and limitations, and frequently multiple gear and approaches are employed. The best gear and sampling methods depend on the target fish species and life stage, the types of information desired and the environment to be sampled.

The best time of year to monitor fish populations depends on the sampling method, the target fish species and the types of data to be collected. In many lakes and regions, the best time to sample fish is during the fall turnover period after thermal stratification breaks down and the lake is completely mixed because (1) YOY and age 1+ (one year or older) fish of most target species should be present and vulnerable to most standard collection gear, including seines, trap nets and electroshockers; (2) species that dwell in the hypolimnion during the summer may be more vulnerable to capture during fall overturn; and (3) lower water temperatures in the fall can help reduce sampling-related mortality. Sampling locations are also species-, life stage-, and gear-dependent. As with sampling methods and time, locations should be selected to maximize capture efficiency for the target species of interest and provide the greatest gain in information for the least amount of sampling effort.

The Illinois Department of Natural Resources (IDNR) will perform a fish survey at no charge on most public and some private water bodies. In order to determine if your lake is eligible for a survey by the IDNR, contact Frank Jakubecik, Fisheries Biologist, at (815) 675-2319. If a lake is not eligible for an IDNR fish survey or if a more comprehensive survey is desired, two known consulting firms have previously conducted fish surveys in Lake County: EA Engineering, Deerfield, IL, (847) 945-8010 and Richmond Fisheries, Richmond, IL, (815) 675-6545.