2001 SUMMARY REPORT
of
TIMBER LAKE

Lake County, Illinois

Prepared by the

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EXECUTIVE SUMMARY

Timber Lake[1] is a 33-acre glacial lake with a maximum depth of 36 feet located in Antioch Township. A small portion of the lake lies within the municipal boundaries of the Village of Antioch. Little development exists around the lake except for a small grouping of cottages along the west shore. Timber Lake is in good condition because of the minimal disturbance around its shores.

The water clarity in the lake is good, with an average Secchi disk transparency reading of 7.12 feet during 2001. The lake has low concentrations of all solid parameters measured.

Good concentrations of dissolved oxygen were found in Timber Lake. The water column had dissolved oxygen concentrations of at least 1 mg/L from the surface down to14 feet during June and August of 2001 and deeper in the other months sampled.

Although the total phosphorus concentrations in Timber Lake averaged lower than the Lake County median, the seasonal averages have increased in the water column since 1995. Total Kjeldahl nitrogen throughout the water column and ammonia nitrogen in the hypolimnion also increased since 1995. Two intermittent tributaries, one at the northwestern shore, and the other entering the lake at the southeastern shore, drain adjacent agricultural land, and may be contributing phosphorus and nitrogen to the lake.

Eighteen aquatic plant species were found in Timber Lake. Plants covered about 10% of the lake bottom, and were not in nuisance populations. One area of concern was along the southwestern corner of the lake, where a small pocket of Eurasian water milfoil was discovered in September. The small bed of this aggressive, nonnative plant should be removed to prevent its spread in Timber Lake.

Most of the shoreline remains undeveloped (57%). Of the developed shoreline, the majority of it has good buffer strips of native vegetation between the lake and manicured lawns. Buffer strips not only curtail shoreline erosion, but also can slow stormwater runoff from sloping lawns, helping prevent nutrients and sediment from entering the water. They also benefit the lake by providing fish and wildlife habitat. However, staff did note the presence of some nonnative, aggressive plants growing within the buffer strips and along other parts of the lake shoreline. These included purple loosestrife, reed canary grass and buckthorn.

Good wildlife habitat is present around Timber Lake. A fish survey completed in 2003 by the Lake County Health Department (LCHD) and the Max McGraw Wildlife Foundation found the Iowa darter, an Illinois State endangered fish species.

[1] Historical names of this lake are Huntley's Lake, Old Huntley Lake and Pollock Lake.

LAKE IDENTIFICATION AND LOCATION

Timber Lake is a glacial lake located in northwestern Lake County, just east of the Village of Antioch (T46N, R10E, Section 23, NE ¼). A small portion of the northwestern shore is within the Village of Antioch municipal boundaries. Two small intermittent streams flow into Timber Lake, one at the northwestern corner of the lake and the other along the southeastern shoreline. The outflow at the northeast corner of the lake flows into a small wetland complex. The water eventually reaches Rasmussen Lake, which is a widening of North Mill Creek, a tributary of the Des Plaines River. Timber Lake is part of the North Mill Creek drainage basin within the Des Plaines River Watershed.

Timber Lake has a surface area of 33.4 acres with a maximum depth of 36 feet (April 2001). Because of a lack of a recent, accurate bathymetric map, the average depth can only be estimated at half the maximum depth, or 18 feet. The estimated volume is approximately 601 acre-feet. The shoreline length is 1.1 miles. In 1995, the LCHD sampled Timber Lake for water quality. Data from 1995 will be discussed in the appropriate sections of this report.

BRIEF HISTORY OF TIMBER LAKE

Timber Lake was formerly known as Pollock Lake, Huntley's Lake, and Old Huntley Lake. The land adjacent to the northeast corner of the lake was a campground that included a bathing beach, until 2000. Currently, there is no public access to this lake. One landowner owns much of the western shoreline, which consists of numerous small rented cottages. The Lake County Forest Preserve District (LCFPD) purchased the campground property and adjacent land in 2000 and now owns most of the lake bottom, the southern and eastern shorelines, and approximately half of the northern shoreline. Two other parcels located along the north and northeastern shorelines are privately owned, but not developed. No in-lake management practices are known to have occurred within Timber Lake.

In C.F. Johnson's 1896 book Angling in the Lakes of Northern Illinois: How and Where To Fish Them[2], Timber Lake (it was called Huntley's Lake at that time) was described as a good fishing lake, particularly for perch, which experienced low fishing pressure because it was "further away than the other lakes". See Figure 1 for a map of the lake from his book.

[2] The American Field Publishing Company, Chicago, IL

SUMMARY OF CURRENT AND HISTORICAL LAKE USES

Currently, the lake is used for fishing, nonmotorized boating, swimming and aesthetics by cottage renters. Before 2000, people visiting the Timber Lake Campground used the lake as well. The management of Timber Lake may be tested in the near future, since increased usage by the public is likely. LCFPD will eventually reopen the old campground area to the public. Plans for determining the types of public use are in progress at this time. In addition, a large housing development to the west of Timber Lake is also in the final planning process.

In both 1995 and 2001, domestic cattle were observed using a portion of the lake along the privately owned northern shoreline. Severe erosion was noted along this area and cattle were occasionally seen standing in shallow water.

LIMNOLOGICAL DATA - WATER QUALITY

Water samples were taken once a month, from May through September 2001, at the deepest location (See Figure 2). See Appendix B for water quality sampling and laboratory methods.

Timber Lake was thermally stratified each month of the sampling season during 2001. The thermocline ranged from 12 feet deep (June and July) to 22 feet deep (September). The water column in Timber Lake had dissolved oxygen (DO) concentrations of at least 1 mg/L from the surface down to14 feet during August of 1995, June of 2001 and August of 2001. In other months during the warm weather seasons of both years, adequate concentrations (> 1 mg/L) of DO were found deeper than 14 feet. Because a recent, accurate bathymetric map with volume calculations is not available, the volume of oxygenated water cannot be calculated. However, Timber Lake does not have a history of fish kills related to low DO concentrations.

Water clarity in Timber Lake during 1995 and 2001 was better than the Lake County median of 4.18 feet deep[3]. The seasonal averages were 9.35 feet and 7.12 feet in 1995 and 2001, respectively. The main reason for the drop in clarity from 1995 to 2001 was algae blooms which were occurring in May and June 2001, resulting in lower water clarity (2.72 feet in May and 7.74 feet in June). An algae bloom was not noted in May and June of 1995, when the water clarity was 14.8 and 13.1 feet deep, respectively. The concentrations of total suspended solids (TSS), which directly affect the water clarity, increased from an average of 2.6 mg/L in 1995 to 4.1 mg/L in 2001. The Lake County median TSS concentration near the surface is 5.7 mg/L. Total phosphorus (TP) concentrations in 2001 in Timber Lake average lower than the Lake County median. However, the seasonal TP average has increased in the water column since 1995. Surface TP in 1995 averaged 0.016 mg/L, whereas TP in 2001 averaged 0.027 mg/L.

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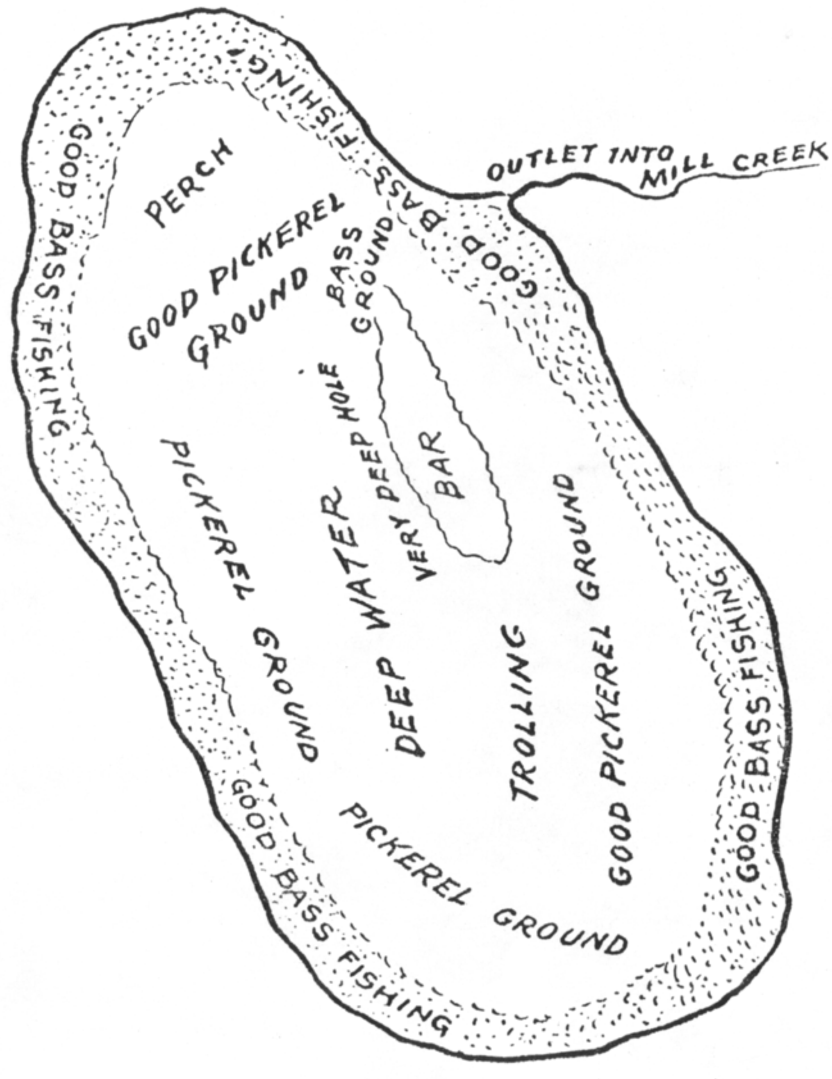
[3] The median value is the point at which half of the lake samples have clarity have data less than this value, and the other half have greater values. Median and average values were calculated using results of lakes sampled by the LCHD from 1995 through 2001.

Figure 1. 1896 C.F. Johnson's map of Huntley's (Timber) Lake.



TP concentrations near the bottom averaged 0.081 mg/L in 1995, and 0.211 mg/L in 2001. Two intermittent tributaries, one at the northwestern shore, and the other entering the lake at the southeastern shore, drain adjacent agricultural land, and may be contributing phosphorus to the lake. Although TP increased in Timber Lake since 1995, it ranked #24 out of 103 Lake County lakes based on average total phosphorus concentrations[4] (Table 2, Appendix A).

The trophic condition of a lake indicates the overall level of nutrient enrichment. A mesotrophic lake has an intermediate amount of nutrients and lower biological productivity than a lake with eutrophic status. Most lakes in Lake County are eutrophic or nutrient rich, and are productive lakes in terms of aquatic plants and/or algae and fish. In calculating the lake's trophic status in terms of its total phosphorus content, Timber Lake had a mesotrophic status in 1995. However, in 2001, the increase in total phosphorus had shifted the trophic status to eutrophic, bordering mesotrophic.

Total Kjeldahl nitrogen (TKN) concentration averages in both 2001 sample collection depths increased since 1995. The near surface samples in 1995 had a seasonal TKN average of 0.844 mg/L, which increased to 1.110 mg/L in 2001. The seasonal TKN averages in the hypolimnion increased from 3.072 mg/L in 1995 to 5.516 mg/L in 2001. Ammonia nitrogen (NH_3-N) concentrations also increased in the hypolimnion from an average of 1.980 mg/L in 1995 to 4.608 mg/L in 2001. These high ammonia nitrogen concentrations influenced the TKN concentrations as well, since ammonia nitrogen is included in TKN results. The strong thermal stratification in the lake trapped ammonia near the bottom as it was continually released by the sediment due to anoxic conditions (< 1mg/L of DO). Also, the adjacent agricultural land may be contributing these nitrogen forms to the lake.

The ratio of total nitrogen to total phosphorus (TN:TP) indicates if the lake is limited by phosphorus or nitrogen. Lakes with TN:TP ratios of more than 15:1 are usually limited by phosphorus. Those with ratios less than 10:1 are usually limited by nitrogen. In Timber Lake, the 2001 TN:TP ratio is 41:1, indicating a lake strongly limited by phosphorus. The 1995 TN:TP ratio was 64:1. Most lakes throughout Lake County are phosphorus limited.

Timber Lake's seasonal average conductivity readings in the epilimnion in 1995 (0.4580 milliSiemens/cm) and 2001 (0.5027 milliSiemens/cm) were lower than the Lake County average (0.7557 milliSiemens/cm). Similarly in the hypolimnion, average conductivity readings increased from 0.5040 milliSiemens/cm (1995) to 0.6591 milliSiemens/cm (2001), but were lower than the Lake County average in the hypolimnion (0.7919 milliSiemens/cm). Increases were also noted in the alkalinity results in the hypolimnion. The result in September (343 mg/L) was the highest recorded in the 1995-2001 LCHD database. Timber Lake was strongly stratified, allowing no mixing of the surface and bottom water layers. Carbonate, for example, which would influence the alkalinity readings, could be released from the sediment and underlying limestone bedrock.

[4] Data set from 1988 to 2001.

Staff also measured the water level each sampling month during 2001. The water level dropped steadily from May to July by a total of 8.4 inches. The water level increased 2.8 inches from July through September.

The Illinois Environmental Protection Agency has assessment indices to classify Illinois lakes for their ability to support aquatic life, swimming, or recreational uses. The guidelines consider several aspects, such as water clarity, phosphorus concentrations and aquatic plant coverage. Timber Lake fully supports aquatic life, recreational and swimming uses according to these guidelines. The overall use support category for Timber Lake is that of full support.

LIMNOLOGICAL DATA – AQUATIC PLANT ASSESSMENT

Staff randomly sampled locations in Timber Lake each month for aquatic plants, and identified eighteen species (Table 3). See Appendix B for methods. Aquatic plants species were not quantified in 1995. Table 4 in Appendix A lists the plant species and the frequency that they were found.

Table 3. Aquatic and shoreline plants on Timber Lake, May – September, 2001.

Aquatic Plants	
Coontail	*Ceratophyllum demersum*
Chara	*Chara*
Duckweed	*Lemna spp.*
Eurasian Water Milfoil	*Myriophyllum spicatum*
Slender Naiad	*Najas flexilis*
Yellow Pond Lily	*Nuphar advena*
White Water Lily	*Nymphaea tuberosa*
Water Smartweed	*Polygonum amphibium.*
American Pondweed	*Potamogeton americanus*
Largeleaf Pondweed	*Potamogeton amplifolius*
Curlyleaf Pondweed	*Potamogeton crispus*
Leafy Pondweed	*Potamogeton foliosus*
Illinois Pondweed	*Potamogeton illinoensis*
Floatingleaf Pondweed	*Potamogeton natans*
Small Pondweed	*Potamogeton pusillus*
Flatstem Pondweed	*Potamogeton zosteriformis*
Sago Pondweed	*Stuckenia pectinatus*
Common Bladderwort	*Utricularia vulgaris*
Wild celery	*Vallisneria americana*

Table 3. Aquatic and shoreline plants on Timber Lake, May – September 2001 (cont'd).

<u>*Shoreline Plants*</u>	
Sedge	*Carex spp.*
Joe-Pye Weed	*Eupatorium maculatum*
Purple Loosestrife	*Lythrum salicaria*
Reed Canary Grass	*Phalaris arundinacea*
Buckthorn	*Rhamnus spp.*
Hardstem Bulrush	*Scirpus acutus*
Common Cattail	*Typha latifolia*

Aquatic plants will not photosynthesize in water depths with less than 1% of the available sunlight. Water clarity and depth are the major limiting factors in determining the maximum depth at which aquatic plants will grow in a specific lake. In Timber Lake, aquatic plant beds were found most often along the north and west shorelines, and were scattered along the east shore. Plants covered about 10% of the lake bottom, and were not in nuisance populations. During 2001, the 1% light level was available down to 6 feet deep in May. However, the amount of available light was much deeper in the remaining months, ranging from 12 feet deep (September) to 18 feet deep (July). LCHD staff found plants growing at a maximum of 9.2 feet deep. Factors limiting plant growth in Timber Lake include substrate type or rapid depth changes. Along the southern and eastern littoral areas, the substrate consists of more sand than silt or muck; the plants were scattered closer to the shore here. Plants were found in denser beds along the northern shore (to about 100 feet out) and close to the western shore (to about 30 feet out). The morphometry of Timber Lake is such that the depth increases dramatically relatively close to the western shore. Depths are shallower farther out along the eastern and northern shorelines.

The three aquatic plants found most often were white water lily (in 63% of all samples), sago pondweed (in 40% of all samples) and American pondweed (in 37% of all samples). Emergent plants such as hardstem bulrush were also part of the habitat along the west shore plant beds. White water lilies dominated the plant beds along the north and northwestern shore. One area of concern was along the southwestern corner of the lake, where a small pocket of Eurasian water milfoil (EWM) was discovered in September (See Figure 2). The small bed of this aggressive, nonnative plant should be removed to prevent its spread in Timber Lake. Few lakes in this area have the good fortune not to be infested with nuisance beds of Eurasian water milfoil. Early prevention is a key component to combating this invasive plant. In 2003, EWM had spread to several other locations in Timber Lake. However, an insect that feeds on EWM, the water milfoil weevil (*E. lecontei*), was found in high densities on the EWM beds. *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 16 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.

Floristic quality index 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). These numbers are then used to calculate the floristic quality index (FQI). A high FQI number indicates that there are a large number of sensitive, high quality plant species present in the lake, and better plant diversity. Nonnative species are included in the FQI calculations for Lake County lakes. The floristic quality of 64 lakes measured in 2000 and 2001 range from 0 to 37.2, with an average FQI of 14. Timber Lake has a floristic quality of 25.5, indicating a high aquatic plant diversity based on the 64 lakes measured.

LIMNOLOGICAL DATA – SHORELINE ASSESSMENT

In August 2001, LCHD staff assessed the shoreline of Timber Lake. See Appendix B for a discussion of the methods used. Most of the shoreline remains undeveloped (57%). Of the developed shoreline, the majority has decent buffer strips of native vegetation that not only curtails shoreline erosion, but also adds to fish and wildlife habitat. However, staff did note the presence of some nonnative aggressive plants growing within the buffer strips and in other locations along the lake shoreline. These included purple loosestrife, reed canary grass and buckthorn shrubs.

Figure 3 identifies the shoreline types around Timber Lake. The two most common types of shoreline are buffer (30% or 1,545 feet of the total shoreline) and wetland (23% or 1,193 feet of the total shoreline). Neither of these shoreline types were experiencing erosion at this time. Along the north shore where an agricultural area meets the lake, the shoreline was classified as lawn, because of grazing cattle. This shoreline (approximately 235 feet) was severely eroding due to the cows entering and leaving the lake at this location (See Figure 4). This section of shoreline should be stabilized immediately and cattle not be allowed to use the area. This represented less than 5% of the total shoreline, and was the only area classified as severely eroding. No sections of shoreline were moderately eroding, and 23.4% (1,155 feet) of the total shoreline was slightly eroding. The shoreline types that were slightly eroding were prairie, woodland and shrub. These areas should be monitored for future erosion problems.

Figure 4

LIMNOLOGICAL DATA – WILDLIFE ASSESSMENT

Good numbers of wildlife, particularly birds, were noted on and around Timber Lake. See Appendix B for methods. Several of the species listed in Table 5 were seen during spring or fall migration and were assumed not to be nesting around the lake.

One fish species, the Iowa darter, is listed as endangered by the state of Illinois. In 1990, a study by the Illinois Department of Natural Resources (IDNR) found the Iowa darter in Timber Lake. In 2003, the Lakes Management Unit with the Max McGraw Wildlife Foundation found the Iowa darter during a non-game fish survey. One bird noted in 2001, the sandhill crane, is listed by the state of Illinois as a threatened species. Cranes were heard on several occasions, although often at a distance away from the lake, indicating that they were likely summer residents and may have nested near by.

Habitat around Timber Lake is good. The undeveloped areas have a mix of open fields and small woods. Deadfall is located along the southern and eastern shorelines providing habitat for many species. The developed areas provide some habitat in the form of the buffer strips located between the lake and manicured lawns. Increasing the buffer strip width would provide more habitat and help reduce future inputs of nutrients and pollutants. Additional habitat will be created by LCFPD as they convert the old campground and adjacent farm fields on the eastern shoreline to natural areas.

Table 5. Wildlife species observed on Timber Lake, May – September, 2001 and August 2003.

<u>*Birds*</u>	
Mallard	*Ana platyrhnchos*
Wood Duck	*Aix sponsa*
Great Blue Heron	*Ardea herodias*
Green Heron	*Butorides striatus*
Sandhill Crane+	*Grus canadensis*
Killdeer	*Charadrius vociferus*
Red-tailed Hawk	*Buteo jamaicensis*
Turkey Vulture	*Cathartes aura*
Mourning Dove	*Zenaida macroura*
Common Flicker	*Colaptes auratus*
Downy Woodpecker	*Picoides pubescens*
Red-bellied Woodpecker	*Melanerpes carolinus*
Eastern Kingbird	*Tyrannus tyrannus*
Eastern Pewee	*Contopus virens*
Barn Swallow	*Hirundo rustica*
Tree Swallow	*Iridoprocne bicolor*
Bank Swallow	*Riparia riparia*
American Crow	*Corvus brachyrhynchos*
Blue Jay	*Cyanocitta cristata*
Black-capped Chickadee	*Poecile atricapillus*
White-breasted Nuthatch	*Sitta carolinensis*
House Wren	*Troglodytes aedon*
Catbird	*Dumetella carolinensis*
American Robin	*Turdus migratorius*
Rock Dove	*Columba livia*
Cedar Waxwing	*Bombycilla cedrorum*
Warbling Vireo	*Vireo gilvus*
Black-throated Green Warbler	*Dendroica virens*
Yellow Warbler	*Dendroica petechia*
Chestnut-sided Warbler	*Dendroica pensylvanica*
Tennessee Warbler	*Vermivora peregrina*
Common Yellowthroat	*Geothlypis trichas*
Red-winged Blackbird	*Agelaius phoeniceus*
Common Grackle	*Quiscalus quiscula*
Bobolink	*Dolichonyx oryzivorus*
Starling	*Sturnus vulgaris*
Northern Oriole	*Icterus galbula*
Northern Cardinal	*Cardinalis cardinalis*

Table 5. Wildlife species observed on Timber Lake, May – September, 2001 (cont'd).

House Finch	*Carpodacus mexicanus*
American Goldfinch	*Carduelis tristis*
Indigo Bunting	*Passerina cyanea*
Chipping Sparrow	*Spizella passerina*
Song Sparrow	*Melospiza melodia*
Savannah Sparrow	*Passerculus sandwichensis*
<u>Mammals and Reptiles</u>	
None noted.	
<u>Amphibians</u>	
Bull Frog	*Rana catesbeiana*
Green Frog	*Rana clamitans melanota*
Western Chorus Frog	*Pseudacris triseriata triseriata*
<u>Fish</u>	
Largemouth Bass	*Micropterus salmoides*
Iowa Darter*(2003)	*Etheostoma exile*
Brook Silversides(2003)	*Labidesthes sicculus*
Bluntnose Minnow (2003)	*Pimephales notatus*
Bluegill (2003)	*Lepomis macrochirus*
Pumkinseed (2003)	*Lepomis gibbosus*
Johnny Darter (2003)	*Etheostoma nigrum*
White Bass (2003)	*Morone chrysops*
<u>Mussels</u>	
Giant Floater (2003)	*Pyganodon grandis*
<u>Insects</u>	
Caddisfly	
Cicadas	
Dragonfly	
Damselfly	
Black Swallowtail Butterfly	
Red Admiral Butterfly	
Clouded Sulphur Butterfly	
Monarch Butterfly	

*** Endangered in Illinois**
+Threatened in Illinois

EXISTING LAKE QUALITY PROBLEMS

- *Lack of a Quality 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 aquatic herbicide use, fish stocking, dredging, an alum treatment or aeration were part of the overall lake management plan. Timber Lake does not have a recent bathymetric map. Maps can be created by the Lake County Health Department – Lakes Management Unit or other agencies with a cost that varies from $3,000-$10,000, depending on lake size.

- *Invasive Shoreline and Aquatic Plant Species*

  LCHD staff noted the presence of aggressive exotic plant species in the lake, in the buffer strips on the west shore and along the wooded east shore. A small bed of Eurasian water milfoil was discovered growing in the southwestern corner of the lake. This small bed of this aggressive, nonnative plant should be removed to prevent its spread in Timber Lake and in order to maintain the present balance and density of native aquatic plants. If left unchecked, this plant could create major problems in Timber Lake. Additional EWM was found in 2003 in other locations.

  Other invasive plants included two herbaceous plants, purple loosestrife and reed canary grass, and buckthorn shrubs. These aggressive plants can crowd out native, beneficial plants. Although these plants are not in nuisance populations, their removal would be important to prevent further infestation.

- *Shoreline Erosion*

  Along the north shore where an agricultural area meets the lake, the shoreline was severely eroding due to the cows entering and leaving the lake at this location. This section of shoreline should be stabilized as soon as possible and cattle excluded from using the immediate area. This represented just under 5% or 235 feet of the total shoreline, and was the only area classified as severely eroding.

- *Lack of Historical Data*

  Except data collected by LCHD in 1995 and 2001, no additional long-term historical water quality data for Timber Lake exists. Participation in the Illinois Volunteer Lake Monitoring Program is recommended. This program will train and assist volunteers in collecting important information on the lake which will provide long-term trend analysis as well as educate the volunteers and residents around the lake.

POTENTIAL OBJECTIVES FOR TIMBER LAKE MANAGEMENT PLAN

I. Bathymetric Map
II. Illinois Volunteer Lake Monitoring Program
III. Shoreline Erosion Control
IV. Eliminate or Control Exotic Species

OPTIONS FOR ACHIEVING THE LAKE MANAGEMENT PLAN OBJECTIVES

Objective I: Bathymetric Map

A bathymetric (depth contour) map is an essential tool for effective lake management since it provides critical information on the morphometric features of the lake (i.e., acreage, depth, 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. Some bathymetric maps for lakes in Lake County do exist, but they are frequently old, outdated and do not accurately represent the current features of the lake. Currently, only an old bathymetric map of Timber Lake exists.

Maps can be created by agencies like the Lake County Health Department - Lakes Management Unit or other companies. Costs vary, but can range from $3,000-10,000 depending on lake size.

Objective II: 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, 150-200 lakes (out of 3,041 lakes in Illinois) are sampled by approximately 250 citizen volunteers. The volunteers are primarily lake shore residents, lake owners/managers, members of environmental groups, public water supply personnel, and citizens with interest in a particular lake.

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

For more information about the VLMP contact the VLMP Regional Coordinator:

Holly Hudson
Northeast Illinois Planning Commission
222 S. Riverside Plaza, Suite 1800
Chicago, IL 60606
(312) 454-4000

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 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.

Along Timber Lake, most of the shoreline is either not eroding or only slightly eroding. The exceptions are two small sections (235 total feet) at the north end of the lake that are severely eroding due to cattle entering and leaving the lake. Since the slopes at this location are nearly flat, the best options for rehabilitation would be buffer strips and/or bioengineering techniques (biologs, fiber rolls, or straw blankets with plantings).

Option 1: No Action

Pros

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

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

Cons

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

Costs

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

Option 2: Create a Buffer Strip

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

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

Buffer strips can be constructed in a variety of ways with various plant species. Generally, buffer strip vegetation consists of native terrestrial (land) species and emergent (at the land and water interface) species. Terrestrial vegetation such as native grasses and wildflowers can be used to create a buffer strip along lake shorelines. A table 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 a table 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 $10 per linear foot, plus labor. Cost of installing willow posts is approximately $15-20 per linear foot. The labor that is needed can be completed by the property owner in most cases, although consultants can be used to provide technical advice where needed. This cost will be higher if the area needs to be graded. If grading is necessary, appropriate permits and surveys are needed. If filling is required, additional costs will be incurred if compensatory storage is needed. The permitting process is costly, running as high as $1,000-2,000 depending on the types of permits needed.

<u>Option 3: Install Biolog, Fiber Roll, or Straw Blanket with Plantings</u>

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 $25 to $35 per linear foot of shoreline, including plantings. This does not include the necessary permits and surveys, which may cost $1,000 – 2,000 depending on the type of earthmoving that is being done. Additional costs may be incurred if compensatory storage is needed.

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 and 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, streambanks, marshes and exposed moist ground. Although it does serve to stabilize shorelines to some extent, it has low food value and does not provide winter habitat for wildlife. It is very successful in taking over disturbed areas and, if left unchecked, will dominate an area, particularly a wetland or shoreline, in a short period of time. Since it begins growing early in the spring, it quickly out-competes native vegetation that begins growth later in the year. Control of purple loosestrife, buckthorn, and reed canary grass are discussed below. However, these control measures can be similarly applied to other exotic species such as garlic mustard (*Allilaria officianalis*) or honeysuckle (*Lonicera* spp.) as well as some aggressive native species, such as box elder (*Acer negundo*).

Presence of exotic species along a lakeshore is by no means a death sentence for the lake or other plant and animal life. If controlled, many exotic species can perform many of the original functions that they were brought here for. For example, reed canary grass was imported for its erosion control properties. It still contributes to this objective (offering better erosion control than commercial turfgrass), but needs to be isolated and kept in control. Many exotics are the result of garden or ornamental plants escaping into the wild. One isolated plant along a shoreline will probably not create a problem by itself. However, problems arise when plants are left to spread, many times to the point where treatment is difficult or cost prohibitive. A monitoring program should be established, problem areas identified, and control measures taken when appropriate. This is particularly important in remote areas of lake shorelines where the spread of exotic species may go unnoticed for some time.

Option 1: No Action

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

Pros

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

Costs

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

Option 2: Control by Hand

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

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 3: 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 unpractical (i.e., large expanses of a wetland or woodland), chemical treatments may not be an option due to the fact that in order to chemically treat the area a broadcast application would be needed. Since many of the herbicides that are used are not selective, meaning they kill all plants they contact; this may be unacceptable if native plants are found in the proposed treatment area.

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

Pros
Herbicides provide a fast and effective way to control or eliminate nuisance vegetation. Unlike other control methods, herbicides kill the root of the plant,

which prevents regrowth. If applied properly, herbicides can be selective. This allows for removal of selected plants within a mix of desirable and undesirable plants.

Cons

Since most herbicides are non-selective, they are not suitable for broadcast application. Thus, chemical treatment of large stands of exotic species may not be practical. 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™), cost approximately $100 and $65 per gallon, 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.