2003 SUMMARY REPORT
of
SCHREIBER LAKE

Lake County, Illinois

Prepared by the

LAKE COUNTY HEALTH DEPARTMENT
ENVIRONMENTAL HEALTH SERVICES
LAKES MANAGEMENT UNIT
3010 Grand Avenue
Waukegan, Illinois 60085

Michael Adam
Joseph Marencik
Christina L. Brant
Mary Colwell
Mark Pfister

February 2004

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Schreiber Lake's water quality is better than many lakes in Lake County. Most of the water quality parameters measured were below the averages or medians of other lakes that we have monitored. Water clarity, as measured by Secchi disk transparency readings, averaged 9.59 feet for the season, which is nearly three times the county median of 3.41 feet, but a slight decline from the 1999 average of 9.70 feet.

Schreiber Lake had very low concentrations of total suspended solids (TSS) and total volatile solids (TVS) in the epilimnion. The 2003 epilimnetic average for TSS was 3.1 mg/L (with one sample below the detection limit of 1.0 mg/L) compared to the county TSS median for near surface samples of 7.5 mg/L. TSS concentrations in the hypolimnion were much higher (average=27.0 mg/L) due to the strong thermocline that was established during the sampling season. The average total dissolved solid (TDS) concentrations have increased since 1999 by 10% in the epilimnion and 23% in the hypolimnion. Similarly, the conductivity readings have increased in the lake since 1999. The averages for both TDS concentrations and conductivity readings are still well below county averages, but the increases are a concern.

The total phosphorus (TP) average concentration in the epilimnion (0.043 mg/L) was 37% lower than the county median for near surface samples (0.059 mg/L), but 23% higher than the 1999 average (0.035 mg/L). The 2003 average TP concentration in the hypolimnion (0.423 mg/L) was greater than twice the county median for anoxic samples (0.186 mg/L), but unchanged from 1999 (average of 0.423 mg/L). The high concentrations in the hypolimnion are not uncommon in highly organic lakes like Schreiber Lake that strongly stratify in the summer months.

Seventeen aquatic plant species, including the macro-algae *Chara*, and several emergent shoreline plants were found in 2003 (compared to 22 species in 1999). The most common aquatic plants in Schreiber Lake were coontail (found at 77% of all sites), flatstem pondweed (56%), common bladderwort (46%), star duckweed (44%), white water lily (41%), common duckweed (39%), and watermeal (29%). The only submersed exotic species found was Eurasian water milfoil (EWM). It was found at only 7% of the sites. One state endangered aquatic plant species, fernleaf pondweed, was found in Schreiber Lake in 2003, although in low numbers (3%). This species was also found in the 1999 study along with another state endangered species, white-stemmed pondweed. However, white-stem pondweed was not seen in 2003.

The entire shoreline of Schreiber Lake was classified as undeveloped. The most common shoreline type was wetland (58%), followed by woodland (22%) and shrub (20%). Due to the high percentage of wetland habitat, which was comprised mostly of cattails, no erosion was detected around Schreiber Lake.

A black-crowned night heron (state endangered) were seen on Schreiber Lake. The heron was seen on several occasions and may have been a summer resident.

LAKE IDENTIFICATION AND LOCATION

Lake Name: Schreiber Lake

County: Lake

Nearest Municipality: Wauconda

Location: T44N, R10E, Section 29

Watershed: Fox River

Sub-Basin: Squaw Creek

Major Tributaries: None

Receiving Water Body: Davis Lake

Surface Area: 5.36 acres

Shoreline Length: 0.36 miles

Maximum Depth: 25.0 feet

Mean Depth: 12.5 feet (estimated)

Volume: 67 acre-feet (estimated)

Lake Type: Glacial

Elevation: Approximately 835 feet above mean sea level

Watershed Size: 44.4 Acres

LIMNOLOGICAL DATA – WATER QUALITY

Schreiber Lake has remained relatively unchanged for many years. Figure 1 shows the lake in a 1939 aerial photograph. The lake has a small (44 acre) watershed that is entirely within the Lakewood Forest Preserve (Figure 2). This is both an asset and a liability since the lake is not as vulnerable to land use changes as many lakes are in the county, however, any changes that do occur within the watershed may have significantly negative impacts to this unique natural resource.

Water samples were taken monthly from May - September at the deep-hole location (Figure 3). See Appendix B for water sampling methods.

Schreiber Lake's water quality is better than many lakes in Lake County (Table 1 in Appendix A). Most of the water quality parameters measured were below the averages or medians (where 50% of the lakes are above and below this value) of other lakes that we have monitored. Several important findings were noted.

Water clarity, as measured by Secchi disk transparency readings, averaged 9.59 feet for the season, which is nearly three times the county median of 3.41 feet. Secchi disk readings were deepest in September (11.94 feet) and shallowest in June (4.79 feet). The June reading was poor due to an algae bloom that was occurring at the time of sampling. The 2003 Secchi disk average decreased slightly from the 1999 average of 9.70 feet. In 1999, the deepest reading also occurred in September (12.10 feet) and the shallowest in July (6.40 feet). The reading in June 1999 was also lower (7.50 feet), similar to what was observed in 2003.

Schreiber Lake had very low concentrations of total suspended solids (TSS) and total volatile solids (TVS) in the epilimnion. The 2003 epilimnetic average for TSS was 3.1 mg/L (with one sample below the detection limit of 1.0 mg/L) compared to the county median for near surface samples of 7.5 mg/L. The 2003 epilimnetic average for TVS was 79 mg/L, compared to the county median of 137 mg/L. The 1999 averages are similar (TSS=3.4 mg/L and TVS=64 mg/L). In the hypolimnion, the 2003 TSS concentrations were much higher, with an average of 27.0 mg/L compared to the 1999 average of 12.9 mg/L. Nutrients and solids become concentrated in the hypolimnion as the summer progresses, due to the strengthening of the thermocline. Additional nutrients are released from the sediment under anoxic conditions (< 1 mg/L of dissolved oxygen). In highly organic lakes, like Schreiber Lake, the concentrations of these nutrients and solids in the hypolimnion can be very high.

We also observed low concentrations of total dissolved solids (TDS) and low conductivity readings in Schreiber Lake. The 2003 average epilimnetic TDS concentrations (172 mg/L) and conductivity readings (0.2882 milliSiemens/cm) were lower than the county medians for near surface samples (451 mg/L and 0.7503 milliSiemens/cm, respectively). The 2003 hypolimnion average was 214 mg/L, but not

Figure 1. 1939 photo.

Figure 2. Watershed

Figure 3. Sample point

high for a strongly stratified lake. However, the average TDS concentrations have increased since 1999 by 10% in the epilimnion and 23% in the hypolimnion (1999 averages of 156 mg/L, and 174, respectively). Similarly, the conductivity readings have increased in the lake since 1999. The 2003 averages were 0.2882 milliSiemens/cm in the epilimnion and 0.4499 milliSiemens/cm in the hypolimnion. The 1999 averages were 0.2746 milliSiemens/cm in the epilimnion and 0.2988 milliSiemens/cm in the hypolimnion. All of these averages are well below the county medians of 0.7503 milliSiemens/cm and 0.7917 milliSiemens/cm in the epilimnion and hypolimnion, respectively. However, the increase from 1999 to 2003 is a concern and should be monitored in the future. Many lakes in the county have seen a doubling of conductivity readings in the past 5-10 years, due to the use of road salt for winter road maintenance. Schreiber Lake has a small watershed and may be buffered by influences such as road salt. However, Schwerman Road is approximately 900 feet from the lake and may be the source of some road salt. A study by Environment Canada (equivalent to our USEPA), found that aquatic species such as fish, zooplankton and benthic invertebrates could be affected by high concentrations of chlorides (which are common in road salt mixes).

Total phosphorus (TP) average concentration in the epilimnion (0.043 mg/L) was 37% lower than the county median for near surface samples (0.059 mg/L), but 23% higher than the 1999 average (0.035 mg/L). The 2003 average TP concentration in the hypolimnion (0.423 mg/L) was greater than twice the county median for anoxic samples (0.186 mg/L), but unchanged from 1999 (average of 0.423 mg/L). The high concentrations in the hypolimnion are not uncommon in highly organic lakes like Schreiber Lake that strongly stratify in the summer months. The lake was strongly stratified during the entire sampling season, when a thermocline was established between six and 12 feet. The increase in TP concentrations in the epilimnion from 1999 to 2003 is a concern and should be monitored in the future. Values above 0.03 mg/L in the epilimnion are considered sufficient enough to cause algae blooms. Both planktonic and filamentous algae were seen during the season. As mentioned previously, a planktonic algae bloom was occurring at the time of sampling in June, resulting in a poor clarity reading.

High nutrient concentrations are usually indicative of water quality problems. Algae need light and nutrients, most importantly carbon, nitrogen (N) and phosphorus (P), to grow. Light and carbon are not normally in short supply (limiting). This means that nutrients (N&P) are usually the limiting factors in algal growth. Nitrogen, as well as carbon, naturally occur in high concentrations and come from a variety of sources (soil, air, etc.) that are more difficult to control than sources of phosphorus. To compare the availability of these nutrients, a ratio of total nitrogen to total phosphorus is used (TN: TP). Ratios < 10:1 indicate nitrogen is limiting. Ratios of >15:1 indicate phosphorus is limiting. Ratios >10:1, <15:1 indicate that there is enough of both nutrients for excessive algal growth. The average ratio between total nitrogen and total phosphorus for Schreiber Lake in 2003 was 29:1, indicating a phosphorus-limited system. The 1999 ratio was 35:1. This change is due to the increase of TP from 1999 to 2003. Most lakes in Lake County are phosphorus-limited. Lakes that are phosphorus-limited may be easier to manage, since controlling phosphorus is more feasible than controlling nitrogen or carbon.

Schreiber Lake was strongly stratified during the sampling season. A thermocline was present between 6-12 feet in all months, being particularly strong in July and August. Dissolved oxygen (DO) concentrations in Schreiber Lake fluctuated during the season. Generally concern arises when DO concentrations fall below 5 mg/L in the epilimnion. In 2003, the DO concentrations at the surface were >5mg/L in May, June, and July. DO concentrations were below 5 mg/L at the surface in August (3.19 mg/L) and September (4.99 mg/L). Anoxic conditions (where DO concentrations drop below 1 mg/L) did exist below approximately 20 feet in May and June, below 13 feet in July, and below 9 feet in August and September. In 1999, all of the surface readings were at or above 5 mg/L (the August reading was exactly 5 mg/L). Conditions in the lake (i.e., high organic content, strong stratification, and algae and macrophyte prevalence) may cause DO concentrations to fluctuate widely, which may result in low DO concentrations at various times. In order to determine if these DO conditions are a problem, the percent of volume at specific depths (preferably in one foot increments) is needed. Since no bathymetric map of Schreiber Lake exists, an accurate assessment of the DO conditions cannot be made.

Water levels on Schreiber Lake fluctuated throughout the season. The maximum one-month change in water level occurred from May to June (4.82 inch decrease), with a maximum seasonal change of 8.25 inches (decrease) during the study. Fluctuations in water levels may be the result of natural rain events or lack thereof. Significant changes in water levels may have a negative impact on water quality. In addition, lakes with fluctuating water levels potentially have more shoreline erosion problems. Due to the small watershed of Schreiber Lake, large fluctuations in water levels are not expected. Water level issues in the lake are likely to be more influenced by beaver activity. A beaver dam currently exists at the lake's outlet at the northeastern portion of the lake. Significant flooding of the lake and surrounding terrestrial habitats may also damage both aquatic and terrestrial plants, some of which are endangered species (see **Aquatic Plant Assessment**).

Rain events sometime contribute additional sediment or nutrients (like phosphorus) to a lake, which may influence water sample results. Rain occurred within 48 hours prior to water sampling in May (0.34 inches) and July (1.27 inches) as recorded at the Lake County Stormwater Management Commission rain gage in Wauconda. The July rain event did raise the water level in the lake slightly, but did not appear to affect the water quality parameters collected that month.

Based on data collected in 2003, standard classification indices compiled by the Illinois Environmental Protection Agency (IEPA) were used to determine the current condition of Schreiber Lake. A general overall index that is commonly used is called a trophic state index or TSI. The TSI index classifies the lake into one of four categories: oligotrophic (nutrient-poor, biologically unproductive), mesotrophic (intermediate nutrient availability and biological productivity), eutrophic (nutrient-rich, highly productive), or hypereutrophic (extremely nutrient-rich productive). This index can be calculated using total phosphorus values obtained at or near the surface. The TSIp for Schreiber Lake in 2003 classified it as a eutrophic lake (TSIp = 58.5). This is a slight increase from the

1999 TSIp of 55.3. Eutrophic lakes are the most common type of lake throughout the lower Midwest, and they are particularly common among manmade lakes. See Table 2 in Appendix A for a ranking of average TSIp values for Lake County lakes (Schreiber Lake is currently #47 of 130). This ranking is only a relative assessment of the lakes in the county. The current rank of a lake is dependent upon many factors including lake origin, water source, nutrient loads, and morphometric features (volume, depth, substrate, etc.). Thus, a small, shallow, manmade lake with high nutrient loads may not expect to achieve a high ranking even with intensive management.

In Schreiber Lake, the IEPA aquatic life impairment index was low, indicating a full degree of support for all aquatic organisms in the lake. However, due to the eutrophic state of the lake the swimming and recreation indices indicated only a partial degree of support for these activities. The degree of overall use of the lake was classified as a partial impairment. We did not test for bacteria or other harmful pathogens in Schreiber Lake in 2003.

LIMNOLOGICAL DATA – AQUATIC PLANT ASSESSMENT

Aquatic plant species presence and distribution in Schreiber Lake were assessed monthly from May through September 2003 (see Appendix B for methods). Seventeen aquatic plant species, including *Chara*, and several emergent shoreline plants were found (see Table 3, below). Terrestrial shoreline plants were also noted, but not quantified.

The most common aquatic plants in Schreiber Lake were coontail (found at 77% of all sites), flatstem pondweed (56%), common bladderwort (46%), star duckweed (44%), white water lily (41%), common duckweed (39%), and watermeal (29%; Table 4, Appendix A). All other species were found at less than 15% of all sites. The only exotic species found was Eurasian water milfoil (EWM). It was found at only 7% of the sites.

During the plant sampling we searched for the milfoil weevil (*Euhrychiopsis lecontei*) on EWM plants. This weevil attacks the tip and stem of the plant and is currently being used as a biological control for EWM in many lakes in the Midwest. The weevils are found naturally in many lakes. Unfortunately, no weevils were found in Schreiber Lake in 2003. However, given the presence of EWM and the natural shoreline of Schreiber Lake, natural or introduced populations of milfoil weevils to control EWM may be a feasible management option in the future if EWM stands expand dramatically. The healthy native plant populations in the lake may also control the EWM. Also, EWM does not grow as well in lakes with highly organic substrate as found in Schreiber Lake. It is recommended that the aquatic plant populations, with particular attention given to EWM, in the lake be closely monitored.

The 1% light levels (the point where plant photosynthesis ceases) during the season were found between 10-12 feet (no light data was collected in May). Similarly, the maximum depth where we found plants growing was 8.6 feet. However, our depth soundings during the year indicated that a large portion of the main body of the lake is deeper than 10 feet.

Thus, it was estimated that approximately 10% of the lake bottom was covered with aquatic plants (note: this is plant coverage on the lake bottom and not an estimate of plants at the water's surface).

One state endangered aquatic plant species, fernleaf pondweed, was found in Schreiber Lake in 2003, although in low numbers (3%). This species was also found in our 1999 study along with another state endangered species, whitestem pondweed. However, whitestem pondweed was not seen in 2003. The aquatic plant diversity in Schreiber Lake has declined since 1999, when 22 species were found (excluding emergent plants). Several pondweed species (American, floatingleaf, largeleaf, leafy, and Illinois pondweeds) were seen in 1999, but not in 2003 (Table 5 in Appendix A). In addition, northern water milfoil and elodea were found in 1999, but not in 2003. Only *Chara*, giant duckweed, and water stargrass were found in 2003, but not in 1999. All three of these species were found in small numbers in 2003 and may have been present in 1999. While we do not have quantitative data from 1999, the species found in 1999 may have been present in the lake in 2003, but in such low numbers that they were not detected with the sampling methodology used. Also, native plant populations often fluctuate, even on an annual basis depending on many factors (i.e., water levels, predation by animals, climatic conditions, seed production, etc.). Additional monitoring should be included in the lake's overall management plan.

In addition to the differences in aquatic plant populations in the lake from 1999 to 2003, a species of freshwater sponge was found in 1999. However, we did not find the sponge in 2003.

Floristic quality index (FQI; Swink and Wilhelm 1994) is an assessment tool designed to evaluate the closeness that the flora of an area is to that of undisturbed conditions. It can be used to: 1) identify natural areas, 2) compare the quality of different sites or different locations within a single site, 3) monitor long-term floristic trends, and 4) monitor habitat restoration efforts. Each aquatic plant in a lake is assigned a number between 1 and 10 (10 indicating the plant species most sensitive to disturbance). This is done for every floating and submersed plant species found in the lake. These numbers are averaged and multiplied by the square root of the number of species present to calculate an FQI. A high FQI number indicates that there are a large number of sensitive, high quality plant species present in the lake. Non-native species were counted in the FQI calculations for Lake County lakes. In 2003, Schreiber Lake had a FQI of 26.8 (#9 of 118 lakes). The median FQI of lakes that we have studied from 2000-2003 is 14.0. For comparison, in 1999 Schreiber Lake had an FQI of 30.6.

Table 3. Aquatic and shoreline plants on Schreiber Lake, May - September 2003.

Aquatic Plants	
Coontail	*Ceratophyllum demersum*
Chara	*Chara* sp.
Water Stargrass	*Heteranthera dubia*
Small Duckweed	*Lemna minor*
Star Duckweed	*Lemna trisulca*
Eurasian Water Milfoil[#]	*Myriophyllum spicatum*
Slender Naiad	*Najas flexilis*
Spatterdock	*Nuphar variegata*
White Water Lily	*Nymphaea tuberosa*
Small Pondweed	*Potamogeton pusillus*
Fern-leaf Pondweed*	*Potamogeton robbinsii*
Flatstem Pondweed	*Potamogeton zosterifomis*
White Water Crowfoot	*Ranunculus longirostris*
Giant Duckweed	*Spirodella polyrhiza*
Sago Pondweed	*Stuckenia pectinatus*
Common Bladderwort	*Utricularia vulgaris*
Watermeal	*Wolffia columbiana*
Shoreline Plants	
Water Plantain	*Alisma plantago-aquatica*
Swamp Milkweed	*Asclepias incarnata*
Aster	*Aster sp.*
Sedges	*Carex spp.*
Spikerush	*Eleocharis* sp.
Ash	*Fraxinus* sp.
Jewelweed	*Impatiens pallida*
Rushes	*Juncus* sp.
Purple Loosestrife[#]	*Lythrum salicaria*
Smartweed	*Polygonum* sp.
Pickerelweed	*Pontederia cordata*
American Plum	*Prunus americana*
Buckthorn[#]	*Rhamnus cathartica*
Arum-Leaved Arrowhead	*Sagittaria cuneata*
Common Arrowhead	*Sagittaria latifolia*
Willow	*Salix sp.*
Chairmaker's Rush	*Scirpus pungens*
Cattail	*Typha* sp.
Blue Vervain	*Verbena hastata*
White Oak	*Quercus alba*
Wild Grape	*Vitis sp.*

***Endangered in Illinois**

[#] Exotic species

LIMNOLOGICAL DATA – SHORELINE ASSESSMENT

A shoreline assessment was conducted in August 2003 to determine the condition of the lake shoreline (see Appendix B for methods). Of particular interest was the condition of the shoreline at the water/land interface.

The entire shoreline of Schreiber Lake was classified as undeveloped. The most common shoreline type was wetland (58%), followed by woodland (22%) and shrub (20%; Figure 3). The wetland type was dominated by cattails with some willows and is known to harbor Illinois threatened and endangered plant species (*Carex chordorrhiza, Carex echinata, Drosera rotundifolia, Rhynchospora alba, Scirpus smithii,* and *Vaccinnium oxycocus*; per Lake County Forest Preserve District).

The shoreline was assessed in August for the degrees and types of shoreline erosion. Due to the high percentage of wetland habitat, no erosion was detected around Schreiber Lake (Figure 4). However, fluctuating water levels, due to beaver activity, may cause future erosion and should be monitored.

Several exotics were found growing along the shoreline, including buckthorn and purple loosestrife. Buckthorn was the most common, particularly in the wooded and shrub habitats. Similar to aquatic exotics, these terrestrial exotics are detrimental to the native plant ecosystems around the lake. Removal or control of exotic species is recommended.

LIMNOLOGICAL DATA – WILDLIFE ASSESSMENT

Good numbers of wildlife, particularly birds, were noted on and around Schreiber Lake. See Appendix B for methods. Several of the species listed in Table 6 (below) were seen during spring or fall migration and were assumed not to be nesting around the lake.

Habitat around Schreiber Lake was good. The dominance of cattails provides habitat for some wildlife species, but precludes a more diverse abundance of species due to its lack of plant diversity. The mature trees around the lake provide good habitat for many birds, including several species (i.e., scarlet tanager, red-eyed vireo, and wood thrush) that need larger woodlands. In addition, the fluctuating water levels in the past have created large numbers of dead shrubs and trees that were killed when flooded. These dead trees provide excellent habitat for many species of wildlife including a variety of birds, mammals (particularly bats), and reptiles and amphibians. Turtles specifically use the trees after they had fallen in the water.

One bird species listed as threatened or endangered by the state of Illinois was found on Schreiber Lake. The black-crowned night heron (state endangered) was seen on more than one occasion and may have been a summer resident. Schreiber Lake provides ample habitat for nesting herons as well as other species.

Figure 4.

Figure 5.

Table 6. Wildlife species observed on Schreiber Lake, April – September 2003.

Birds	
Pied-billed Grebe	*Podilymbus podiceps*
Double-crested Cormorant	*Phalacrocorax auritus*
Canada Goose	*Branta canadensis*
Mallard	*Anas platyrhnchos*
Wood Duck	*Aix sponsa*
American Coot	*Fulica americana*
Great Egret	*Casmerodius albus*
Great Blue Heron	*Ardea herodias*
Green Heron	*Butorides striatus*
Black-crowned Night Heron*	*Nycticorax nycticorax*
Red-tailed Hawk	*Buteo jamaicensis*
Turkey Vulture	*Cathartes aura*
Mourning Dove	*Zenaida macroura*
Belted Kingfisher	*Megaceryle alcyon*
Red-headed Woodpecker	*Melanerpes erythrocephalus*
Common Flicker	*Colaptes auratus*
Red-bellied Woodpecker	*Melanerpes carolinus*
Downy Woodpecker	*Picoides pubescens*
Eastern Kingbird	*Tyrannus tyrannus*
Great Crested Flycatcher	*Myiarchus crinitus*
Eastern Phoebe	*Sayornis phoebe*
Eastern Pewee	*Contopus virens*
Barn Swallow	*Hirundo rustica*
Tree Swallow	*Iridoprocne bicolor*
Rough-wing Swallow	*Stelgidopteryx ruficollis*
Chimney Swift	*Chaetura pelagica*
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*
Wood Thrush	*Hylocichla mustelina*
Cedar Waxwing	*Bombycilla cedrorum*
Red-eyed Vireo	*Vireo olivaceus*
Yellow-rumped Warbler	*Dendroica coronata*
Yellow Warbler	*Dendroica petechia*
Northern Parula Warbler	*Parula americana*
Common Yellowthroat	*Geothlypis trichas*
Red-winged Blackbird	*Agelaius phoeniceus*
Common Grackle	*Quiscalus quiscula*

Table 6. Wildlife species observed on Schreiber Lake, April – September 2003 (cont'd).

Starling	*Sturnus vulgaris*
Northern Oriole	*Icterus galbula*
Scarlet Tanager	*Piranga olivacea*
Northern Cardinal	*Cardinalis cardinalis*
American Goldfinch	*Carduelis tristis*
Eastern Towhee	*Pipilo erythrophthalmus*
Field Sparrow	*Spizella pusilla*
Song Sparrow	*Melospiza melodia*
Mammals	
Beaver	*Castor canadensis*
Eastern Chipmunk	*Tamias striatus*
White-tailed Deer	*Odocoileus virginianus*
Amphibians	
Bull Frog	*Rana catesbeiana*
Green Frog	*Rana clamitans melanota*
Reptiles	
Painted Turtle	*Chrysemys picta*
Insects	
Cicadas	Cicadidae
Dragonfly	Anisoptera
Damselfly	Zygoptera
Painted Lady Butterfly	*Vanessa cardui*
Monarch Butterfly	*Danaus plexippus*

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

EXISTING LAKE QUALITY PROBLEMS AND MANAGEMENT SUGGESTIONS

Schreiber Lake has good water quality compared to many of the other lakes in the county. Many of the water quality parameters measured were either at or below county medians. The lake provides excellent habitat for plants, fish, and wildlife, including species listed as threatened or endangered in Illinois. These are some of the reasons that the lake is designated as an Illinois Natural Area. Schreiber Lake is a unique resource in Lake County and its preservation should be a high priority.

- *Lack of a Quality 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. Currently, no map for Schreiber Lake exists. A map, which includes volumetric calculations at each depth, is needed.

- *Aquatic Plant Species*

  In the water, Eurasian water milfoil (EWM) was found in Schreiber Lake, but in low numbers. Its presence should be monitored. The native plant populations and the highly organic sediment, which is not the preferred growth medium for EWM, may control it naturally.

  The aquatic plant diversity declined from 1999 to 2003 from 22 species to 17. Whether this is a function of a real decline or an annual population fluctuation is undetermined. The management policy of the lake's aquatic plant population should be one of "no action" at this time. However, the populations in the lake should be closely monitored to protect the diversity in the lake (including the endangered plant species found in 1999 and 2003).

- *Terrestrial Exotic Plant Species*

  Several other exotic species were found along Schreiber Lake shoreline including buckthorn and purple loosestrife. Buckthorn was most common along the woodland and shrub habitat. These exotics have the potential to become a significant problem and should be removed or kept in control to prevent their spread.

- *Nutrient and Solid Concentrations*

  Most of the nutrient and solid concentrations in the lake have remained stable from 1999. We did observe increases (from 1999 to 2003) in concentrations of total phosphorus and total dissolved solids, and slightly higher conductivity readings, mainly in the epilimnion. These parameters should be monitored in the future to ascertain any pattern in declining water quality in Schreiber Lake.