2003 SUMMARY REPORT
of
OLD SCHOOL LAKE

Lake County, Illinois

Prepared by the

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EXECUTIVE SUMMARY

Old School Lake's water quality is better than many lakes in Lake County. All 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 9.40 feet for the season, which is over 2.5 times the county median of 3.41 feet.

Old School Lake had very low concentrations of total suspended solids (TSS) in the epilimnion. The 2003 epilimnetic average for TSS was 1.7 mg/L, compared to the county TSS median for near surface samples of 7.5 mg/L. TSS concentrations in the hypolimnion were only slightly higher (average=2.9 mg/L). The averages for both total dissolved solid concentrations and conductivity readings are well below county averages, and significantly better than Lambs Farm Lake that is directly east of Interstate 94.

The total phosphorus (TP) average concentration in the epilimnion (0.031 mg/L) was 90% lower than the county median for near surface samples (0.059 mg/L). The 2003 average TP concentration in the hypolimnion (0.065 mg/L) was nearly two times lower than the county median for anoxic samples (0.186 mg/L). The low TP concentrations can be attributed to the abundant aquatic plant populations in the lake, and from the minimal stormwater it receives from the surrounding area.

Eight aquatic plant species and several emergent shoreline plants were found in 2003. The most common aquatic plants in Old School Lake were coontail (found at 84% of all sites), Eurasian water milfoil (35%), curlyleaf pondweed (30%), white water lily (28%), and white water crowfoot (27%). Due to the good water clarity, aquatic plants covered the entire lake bottom. Control of invasive species may be necessary if they continue to expand and interfere with recreational activities.

The entire shoreline of Old School Lake was classified as undeveloped. The most common shoreline type was overwhelmingly buffer (99%), with the remaining 1% considered beach (Figure 3). While the buffer habitat was the dominant type around the lake, the quality of the buffer was variable, due to its minimal width and presence of exotic species. No erosion was detected around Old School Lake, due to the high percentage of buffer habitat and that the lake is sheltered from prevailing winds.

LAKE IDENTIFICATION AND LOCATION

Lake Name: Old School Lake

County: Lake

Nearest Municipality: Green Oaks

Location: T44N, R11E, Section 23

Watershed: Chicago River

Sub-Basin: Middle Fork

Major Tributaries: None

Receiving Water Body: None

Surface Area: 8.08 acres

Shoreline Length: 0.89 miles

Maximum Depth: 13.4 feet

Mean Depth: 6.7 feet (estimated)

Volume: 54.1 acre-feet (estimated)

Lake Type: Borrow Pit

Elevation: Approximately 690 feet above mean sea level

LIMNOLOGICAL DATA – WATER QUALITY

Water samples were taken monthly from May – September 2003 at the deep-hole location (Figure 2). See Appendix B for water sampling methods.

Old School 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 9.40 feet for the season, which is over 2.5 times the county median of 3.41 feet. Secchi disk readings were deepest in August (11.06 feet) and shallowest in September (6.92 feet). Both the June reading (7.22 feet) and the September reading were lower due to small algae blooms that were occurring at the time of sampling. The Secchi readings in Old School Lake are significantly better than readings from Lambs Farm Lake, which had a 2003 Secchi average of 4.17 feet. Both lakes, approximately 450 feet apart, separated by Interstate 94, were borrow pits created during the construction of the road. However, Old School Lake does not receive the large amount of stormwater runoff from the interstate that Lambs Farm Lake does. In addition, Old School Lake has an extensive aquatic plant community (as opposed to Lambs Farm Lake that has a minimal aquatic plant community), which increases the water clarity by stabilizing bottom sediments and utilizing available nutrients.

Old School 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 1.7 mg/L compared to the county median for near surface samples of 7.5 mg/L. The 2003 epilimnetic average for TVS was 87 mg/L, compared to the county median of 137 mg/L. In the hypolimnion, the 2003 TSS concentrations were only slightly higher, with an average of 2.9 mg/L. Nutrients and solids generally become concentrated in the hypolimnion as the summer progresses, due to the strengthening of the thermocline. As mentioned previously, the extensive aquatic plant populations aid in the utilization of nutrients and stabilization of lake bottom sediments.

We also observed low concentrations of total dissolved solids (TDS) and low conductivity readings in Old School Lake. The 2003 average epilimnetic TDS concentrations (268 mg/L) and conductivity readings (0.4670 milliSiemens/cm) were lower than the county medians for near surface samples (451 mg/L and 0.7503 milliSiemens/cm, respectively). For comparison, Lambs Farm Lake, which receives stormwater from Interstate 94, had epilimnetic averages for TDS concentrations and conductivity readings of 524 mg/L and 0.9826 milliSiemens/cm, respectively. Stormwater from the interstate and adjacent roads and parking lots in the Old School Forest Preserve are the greatest threat to the water quality of Old School Lake. Because of the lake's proximity to Interstate 94, one additional parameter, chloride, was collected since road salt, used in winter road deicing, is usually sodium chloride, calcium chloride,

Figure 1. 1939 photo.

Figure 2. Sample site.

potassium chloride, magnesium chloride or ferrocyanide salts. The seasonal averages for chloride in Old School Lake in 2003 were 52 mg/L in both the epilimnion and hypolimnion. The IEPA standard for chloride is 500 mg/L. Once values exceed this standard the water body is deemed to be impaired, thus impacting aquatic life. Some lakes in the county have seen a doubling of conductivity readings in the past 5-10 years. In a study by Environment Canada (equivalent to our USEPA), it was estimated that 5% of aquatic species such as fish, zooplankton and benthic invertebrates would be affected at chloride concentrations of about 210 mg/l. Additionally, shifts in algae populations in lakes were associated with chloride concentrations as low as 12 mg/l. At the present time, Old School Lake does not appear to be adversely impacted by chloride concentrations.

Total phosphorus (TP) average concentration in the epilimnion (0.031 mg/L) was 90% lower than the county median for near surface samples (0.059 mg/L). The 2003 average TP concentration in the hypolimnion (0.065 mg/L) was over two times lower than the county median for anoxic samples (0.186 mg/L). Values above 0.03 mg/L in the epilimnion are considered sufficient enough to cause algae blooms. Some planktonic and filamentous algae were seen during the season, but not at nuisance levels. As mentioned previously, small planktonic blooms were occurring at the time of sampling in June and September, resulting in poor clarity readings. The August TP concentration in the hypolimnion (0.134 mg/L) was significantly higher than the other months sampled. A probable explanation for this was that the thermocline and the sample depth were the same (10 feet) that month, which may have resulted in the collection of higher concentrations of nutrients that were trapped just below the thermocline.

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 Old School Lake in 2003 was 25:1, indicating a phosphorus-limited system. 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.

Old School Lake was thermally stratified from June through September. The thermocline was weakly established at seven feet in June and July, more strongly established in August at 10 feet, but weaker again in September at six feet. Dissolved oxygen (DO) concentrations in Old School Lake fluctuated during the season. Generally, concern arises when DO concentrations fall below 5 mg/L in the epilimnion. In 2003, all of the DO concentrations at the surface were >5mg/L. The entire water column was oxic in May and June. Anoxic conditions (where DO concentrations drop below 1 mg/L) did exist

below 7.5 feet in July, and below 9.5 feet in August and September. 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 only an old bathymetric map of Old School Lake (with no volumetric calculations) exists, an accurate assessment of the DO conditions cannot be made.

Water levels on Old School Lake fluctuated throughout the season. The maximum one-month change in water level occurred from May to June (6.50 inch decrease), with a maximum seasonal change of 14.25 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 Old School Lake, large fluctuations in water levels are not expected.

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 (1.19 inches), June (0.05 inches), July (1.53 inches), and August (1.09 inches) as recorded at the Lake County Stormwater Management Commission rain gage in Vernon Hills. 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 or in any of the other months sampled after a rain event.

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 Old School 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 Old School Lake in 2003 classified it as a eutrophic lake (TSIp = 53.7). For comparison, Lambs Farm Lake also had a TSIp of 53.7 in 2003. 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 (Old School Lake and Lambs Farm Lake are currently tied for #33 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 Old School Lake, the IEPA aquatic life impairment index was low, indicating a full degree of support for all aquatic organisms in the lake. Similarly, the swimming index indicated a full degree of support. However, due to the large amount of aquatic plants in the lake the recreation index indicated only a partial degree of support. The degree of

overall use of the lake was classified as full support. We did not test for bacteria or other harmful pathogens in Old School Lake in 2003.

LIMNOLOGICAL DATA – AQUATIC PLANT ASSESSMENT

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

The dominant aquatic plant in Old School Lake was coontail (found at 84% of all sites). Two invasive exotic species, Eurasian water milfoil (EWM; 35%) and curlyleaf pondweed (30%) were the next most common plants (Table 4, Appendix A), followed by white water lily (28%) and white water crowfoot (27%). Two free-floating aquatic plants, watermeal (3%) and duckweed (1%) were also found. The presence of EWM and curlyleaf pondweed is a concern, since these two species can quickly outcompete native aquatic plants.

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. We did find weevils in Old School Lake in 2003, although the population size and potential impact on EWM in unknown. However, given the presence of EWM and the natural shoreline of Old School 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. 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 at or near the bottom. In May, August, and September the 1% light level was found at approximately 11.5 feet, while in June and July the light levels reaching the lake bottom were greater than 1%. Similarly, the maximum depth where we found plants growing was 13.4 feet, which was the lake's maximum depth. Since we found plants at the deepest part of the lake, and because the 1% light levels were at or near the bottom all season, it was estimated that 100% 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). Although the lake bottom coverage is 100%, most of the aquatic plants did not reach the surface. Since there are no boats allowed on Old School Lake, the main recreational use that may be impeded by the aquatic plant growth would be fishing. If aquatic plant growth becomes excessive and requires active management, care should be taken to specifically control the invasive species (EWM, curlyleaf, and the native coontail) while having minimal impact on the other beneficial native species (i.e., sago pondweed, white water crowfoot, and white water lily). Additional monitoring of these aquatic plant communities should be included in the lake's overall management plan.

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, Old School Lake had a FQI of 13.1 (#65 of 118). The median FQI of lakes that we have studied from 2000-2003 is 14.0. For comparison, in 2003 Lambs Farm Lake had an FQI of 12.1.

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

Aquatic Plants	
Coontail	*Ceratophyllum demersum*
Small Duckweed	*Lemna minor*
Eurasian Water Milfoil[#]	*Myriophyllum spicatum*
White Water Lily	*Nymphaea tuberosa*
Curlyleaf Pondweed[#]	*Potamogeton crispus*
White Water Crowfoot	*Ranunculus longirostris*
Sago Pondweed	*Stuckenia pectinatus*
Watermeal	*Wolffia columbiana*
Shoreline Plants	
Sweet Flag	*Acorus calamus*
Water Plantain	*Alisma plantago-aquatica*
Swamp Milkweed	*Asclepias incarnata*
Common Milkweed	*Asclepias syriaca*
Chicory[#]	*Cichorium intybus*
Queen Anne's Lace[#]	*Daucus carota*
Slender Spikerush	*Eleocharis acicularis*
Joe-Pye Weed	*Eupatorium maculatum*
Purple Loosestrife[#]	*Lythrum salicaria*
White Sweet Clover[#]	*Melilotus alba*
Reed Canary Grass[#]	*Phalaris arundinacea*
Smartweed	*Polygonum* sp.
Pickerelweed	*Pontederia cordata*
Cottonwood	*Populus deltoides*
Buttercup	*Ranunculus* sp.
Buckthorn[#]	*Rhamnus cathartica*
Multiflora Rose[#]	*Rosa multiflora*
Willow	*Salix sp.*
River Bulrush	*Scirpus fluviatilis*
Softstem Bulrush	*Scirpus validus*
Common Bur-Reed	*Spaganium eurycarpum*
Cattail	*Typha* sp.

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 Old School Lake was classified as undeveloped. The most common shoreline type was overwhelmingly buffer (99%), with the remaining 1% considered beach (Figure 3). While the buffer habitat was the dominant type around the lake, the quality of the buffer was variable. In certain areas, the buffer was greater than 15 feet wide, but in other areas was less than 15 feet and often contained invasive exotic species such as buckthorn, multiflora rose, purple loosestrife, and reed canary grass. 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. Old School Lake is used by the public for many reasons, but fishing is one of the most common activities. Buffers could be expanded, while maintaining access to the lake for fishermen.

The shoreline was assessed for the degrees and types of shoreline erosion. Due to the high percentage of buffer habitat and the geographic position of the lake that shelters it from prevailing winds, no erosion was detected around Old School Lake (Figure 4).

LIMNOLOGICAL DATA – WILDLIFE ASSESSMENT

Good numbers of wildlife, particularly birds, were noted on and around Old School 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 Old School Lake was good. The habitat mix of small woodlots and open areas provides habitat for some wildlife species, however the presence of invasive exotic species degrades the quality of some habitat areas around the lake. The mature trees near the lake provide good habitat for many birds. As mentioned in the **Shoreline Assessment** section, the buffer that currently surrounds the lake is minimal in width in many places and includes many exotic species. Expansion of this buffer and the removal of exotic species would improve the wildlife habitat around Old School Lake.

The Illinois Department of Natural Resources assesses the fish populations in Old School Lake. The most recent assessment was in 2000 when only four species were found (black crappie, largemouth bass, golden shiner, and bluegill). However, 14 species have been found during surveys in the past 10 years, including the Iowa darter in 1997, which is listed as a threatened species in Illinois.

Figure 3.

Figure 4.

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

Birds	
Pied-billed Grebe	*Podilymbus podiceps*
Canada Goose	*Branta canadensis*
Mallard	*Anas platyrhnchos*
Great Blue Heron	*Ardea herodias*
Green Heron	*Butorides striatus*
Killdeer	*Charadrius vociferus*
Belted Kingfisher	*Megaceryle alcyon*
Common Flicker	*Colaptes auratus*
Eastern Kingbird	*Tyrannus tyrannus*
Willow Flycatcher	*Empidonax traillii*
Barn Swallow	*Hirundo rustica*
Tree Swallow	*Iridoprocne bicolor*
Blue Jay	*Cyanocitta cristata*
Black-capped Chickadee	*Poecile atricapillus*
Catbird	*Dumetella carolinensis*
American Robin	*Turdus migratorius*
Rock Dove	*Columba livia*
Cedar Waxwing	*Bombycilla cedrorum*
Warbling Vireo	*Vireo gilvus*
Yellow-rumped Warbler	*Dendroica coronata*
Yellow Warbler	*Dendroica petechia*
Red-winged Blackbird	*Agelaius phoeniceus*
Common Grackle	*Quiscalus quiscula*
Northern Cardinal	*Cardinalis cardinalis*
American Goldfinch	*Carduelis tristis*
Indigo Bunting	*Passerina cyanea*
Song Sparrow	*Melospiza melodia*
Mammals	
None noted	
Amphibians	
Bull Frog	*Rana catesbeiana*
Western Chorus Frog	*Pseudacris triseriata triseriata*
Reptiles	
Garter Snake	*Thamnophis* spp.
Painted Turtle	*Chrysemys picta*

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

Insects	
Cicadas	Cicadidae
Dragonfly	Anisoptera
Damselfly	Zygoptera
Mussels	
Giant Floater	*Pyganodon grandis*

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

EXISTING LAKE QUALITY PROBLEMS AND MANAGEMENT SUGGESTIONS

Old School 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 good habitat for plants, fish, and wildlife, although exotic species are present in the lake and surrounding terrestrial environment.

- *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, only an old map for Old School Lake exists. A map, which includes volumetric calculations at each depth, is needed.

- *Aquatic Plant Species*

  In the water, Eurasian water milfoil (EWM) and curlyleaf pondweed were found in Old School Lake, being the second and third most common plants, respectively. Their presence should be monitored. Currently, the aquatic plant coverage of the lake bottom is 100%, however, minimal surface coverage was noted. Any aquatic plant management plan should focus on controlling the invasive plants (EWM, curlyleaf pondweed, and coontail), while minimizing the impact to beneficial native species. However, traditional selective control of invasive species with herbicides (i.e., 2,4-D or fluridone) may be difficult with the species present (specifically, curlyleaf pondweed and coontail).

- *Terrestrial Exotic Plant Species and Buffers*

  Several other exotic species were found along Old School Lake shoreline including buckthorn, multiflora rose, purple loosestrife, and reed canary grass. These exotics have the potential to become a significant problem and should be removed or kept in control to prevent their spread. Buffers could be cleared of exotic species and expanded, while maintaining access to the lake for fishermen.