LAKE COUNTY, ILLINOIS

2010 REDWING SLOUGH SUMMARY REPORT

PREPARED BY ENVIRONMENTAL SERVICES

LAKE COUNTY HEALTH DEPARTMENT

POPULATION HEALTH ENVIRONMENTAL SERVICES

An aerial view of Redwing Slough, 2009

Redwing Slough is a 203-acre glacial marsh east of Antioch in northern Lake County. Redwing Slough drains to Deer Lake and eventually to North Mill Creek.

The Lake County Health Department - Environmental Services (LCHD-ES) sampled the lake and stream water quality of the North Mill Creek watershed in 2010. Other lakes sampled include Deer Lake, Timber Lake, White Lake, Lake Linden, Waterford Lake, Potomac Lake, McDonald Lake 1 and 2, Hastings Lake, Crooked Lake, and Slough Lake. Reports for these lakes can be found in the detailed lake reports section of our website: LCHD-ES Lake Reports.

Redwing Slough is listed as an ADID (advanced identification) wetland by the U.S. Environmental Protection Agency and an Illinois Natural Areas Inventory (INAI) by the state of Illinois. This indicates that the lake and surrounding natural environments have potential to have high quality aquatic resources based on water quality and hydrology values.

Redwing Slough and the land surrounding it are primarily owned by the Illinois Department of Natural Resources (IDNR). There is one privately owned parcel on the southeast portion of the lake.

The lake is used primarily for waterfowl hunting. Hunters must successfully draw a permit from the IDNR to use Redwing Slough during the fall hunting season.

In 2010 the LCHD-ES collected water samples at the inlet and outlet May - September and conducted an aquatic plant survey in July.

SPECIAL POINTS OF INTEREST:

- *ADID wetland*
- *Managed by IDNR*
- *Waterfowl hunting program*
- *Abundant wildlife*
- *Home to the endangered plant - Water Marigold*

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Health Department and
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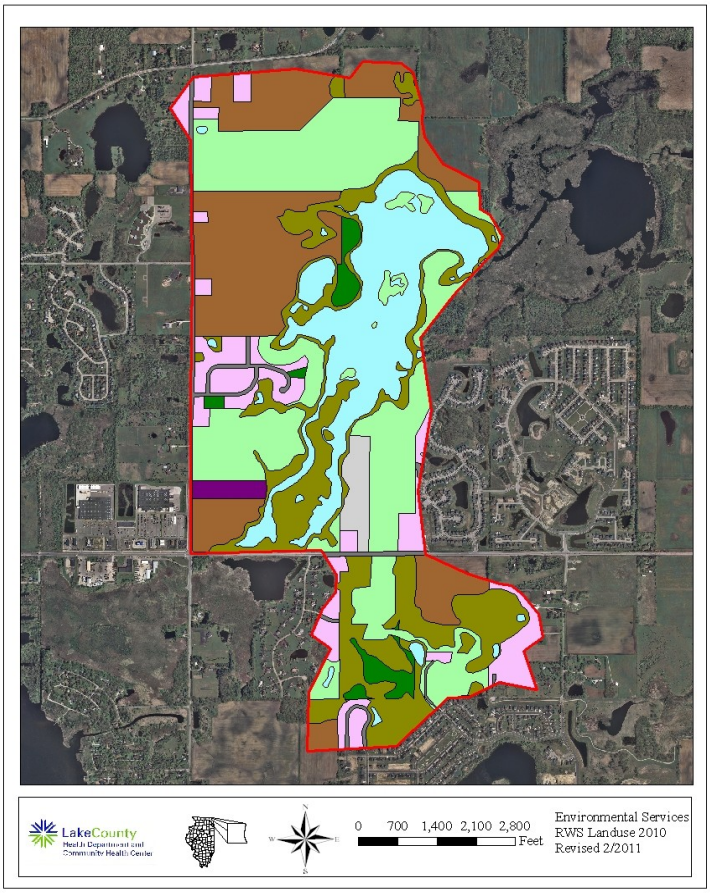
WATERSHED

- Agricultural
- Disturbed Land
- Forest and Grassland
- Government and Institutional
- Industrial
- Public and Private Open Space
- Retail/Commercial
- Single Family
- Transportation
- Water
- Wetlands

Land use within the Redwing Slough watershed



We all live in a watershed. A watershed is the land and water around a lake that drains to that lake. This means that any management of the land within the watershed can directly affect the lake.

What can you do to help protect Redwing Slough?

The health of a lake is directly affected by the health of its watershed. This means that any management of the land within the watershed can directly affect the lake. Redwing Slough has a watershed area of 1147 acres that carries nutrients and pollutants to the lake with each rainfall. Redwing Slough is part of the North Mill Creek Watershed. The LCHD-ES sampled all the lakes within the North Mill Creek watershed except for Rasmussen Lake in 2006 and 2010 and some comparisons will be made to that data. Rasmussen Lake was not sampled because the dam is in the process of being removed.

Generally, the lake health decreases from top to bottom of the watershed due to increased inputs. Redwing Slough had better water quality then Deer Lake in the form of lower average total phosphorus and chloride concentration in 2010.

The major land uses within the Redwing Slough watershed were public and private open space (28%), agriculture (21%), and wetland (20%). Each type of land use contributes differently to the stormwater run-off. The developed land uses contain more impervious surface and allow less infiltration. Public and private open space (33%), Single family (22%) and transportation (14%) were the land uses contributing the highest percentages of estimated run-off. Any increase in urban and transportation land use will likely increase the amount of chlorides (Cl^-) entering the lake due to the increased surface area that will require winter de-icing. It is important to keep in mind that although the amount of estimated run-off from certain areas may be low, those areas can still deliver high concentrations of sediment and nutrients.

To reduce impacts to the lake residents should apply phosphorous free fertilizer to their lawns, have their septic systems pumped and serviced regularly, and use alternative to salt for winter de-icing. The use of rain gardens can help stormwater infiltrate into the ground producing less run-off and help recharge groundwater. Also, increased impervious surface creates increased run-off which can raise lake levels. Increased water in a lake creates a larger volume of water which can hold more nutrients and can also lead to flooding.

The retention time (the amount of time it takes for water entering a lake to flow out of it again) of Redwing Slough was calculated to be approximately 372 days.

It is also important to monitor any existing and future development within the watershed and encouraged the health of Redwing Slough be considered in the development plans.

Total Suspended Solids

Total suspended solids (TSS) are composed of nonvolatile suspended solids, non-organic clay or sediment materials, and volatile suspended solids, algae and other organic matter.

The 2010 average TSS concentration at the inlet was 33.3 mg/L, which was more than three times higher than the county median of 8.1 mg/L. This was a 7.5 fold increase from 2000 when the average TSS concentration was 3.9 mg/L. The TSS concentrations at the inlet were likely higher in 2010 due to the bottom being disturbed during sample collection and/or the bottom being disturbed by the water flowing over a log as it spilled into the pooled area. The TSS at the outlet decreased 39% from the 2006 average of 18.1 mg/L to the 2010 average of 11.0 mg/L. Both of these values were higher than the 2010 County average of 8.1 mg/L. The higher TSS concentrations in 2006 and 2010 could have been due to the abundance of free floating aquatic macrophytes and algae. Also, low water levels in the slough may have caused fish to congregate near the outlet where they disturbed the bottom sediment, also increasing the TSS levels. In addition, wind could have caused the flocculent bottom to become resuspended.

Development in the watershed can have negative impacts on TSS by improper erosion control practices and allowing sediment to leave the construction site.

Lake Facts:

Major Watershed: Des Plaines River

Sub-Watershed: North Mill Creek

Location: T46N, R10E, Sections 10 and 15

Surface Area: 230.4 acres

Shoreline Length: 7.8 miles

Maximum Depth: 4.0 feet

Average Depth: 2.0 feet

Lake Volume (est.): 406.8 acre-feet

Watershed Area: 1146.8 acres

Lake Type: Glacial

Management Entity: Illinois Department of Natural Resources

Current Uses: Hunting

Dissolved Oxygen

A dissolved oxygen (DO) concentration of 5.0 mg/L is considered adequate to support a gamefish fishery, since these fish can suffer oxygen stress below this amount. Good DO conditions existed in May at both the inlet and outlet of Redwing Slough. However, the DO concentrations were less than 5.0 mg/L for the remaining months of sampling at both the inlet and the outlet. Anoxic conditions exist when DO levels fall below 1.0 mg/L and existed in July 2010. The DO conditions were similar during the previous sampling of 2006 and 2000. There was limited flow at the inlet. The sampling was done at an area of pooled water along highway 173 before entering into the slough. Also, the large surface coverage of macrophytes and the shallow nature of Redwing Slough likely contributed to the low DO conditions at the outlet. The low DO concentrations make Redwing Slough a poor candidate for a gamefish fishery, however it may harbor important non-game fish species.

Nutrients

Nutrient concentrations can also play a role in lake health. Elevated levels of the nutrients Nitrogen or Phosphorus are a common cause of poor lake health. A ratio of Total Nitrogen (TN) to Total Phosphorus (TP) is used to determine which nutrient is limiting the lakes productivity. In 2010, Redwing Slough had a TN:TP ratio of 22:1 indicating that phosphorus was the limiting nutrient. This is consistent with previous monitoring. In 2000 the TN:TP ratio was 28:1 and in 2006 it was 25:1. This being the case, any addition of phosphorus to Redwing Slough would likely cause an increase in plant and/or algal growth. The source of phosphorus was difficult to pinpoint, however agricultural practices around the slough may have contributed to the nutrient levels recorded. Additional sources may be the housing developments that have occurred south and west of the slough and the use of the area by migrating waterfowl. Also, wetland soils are naturally high in nutrients.

Redwing Slough had a 2010 seasonal average TP concentration at the inlet of 0.275 mg/L, which was four times greater than the county median of 0.065 mg/L and an increase of 293% from the 2000 average of 0.070 mg/L. The 2010 average at the outlet was 0.082 mg/L which was down from the 2006 average of 0.107 mg/L but up from the 2000 average of 0.071 mg/L.

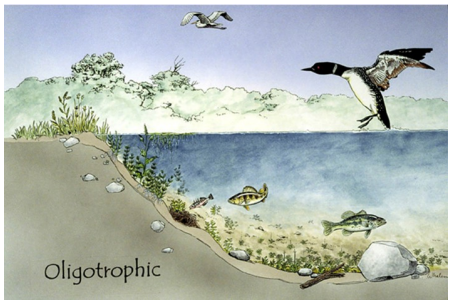
Tips to limit phosphorus

- ⇒ Use phosphorus free lawn fertilizers
- ⇒ Have your septic system maintained on a regular basis
- ⇒ Do not burn leaves/ brush where ashes will was into the lake
- ⇒ Install buffer strips or rain gardens to filter run off.
- ⇒ Do not feed wildlife such as waterfowl and fish.

TROPHIC STATE INDEX

Total phosphorous can be used to calculate the trophic state index (TSIp), which classifies lakes according to the overall level of nutrient enrichment. The trophic state of Redwing Slough in terms of its phosphorus concentration during 2000 was eutrophic, with a TSIp score of 65.4. In 2006 the higher TP levels caused the TSIp score increased to 71.6 and classifying the slough as hypereutrophic. In 2010 the TSIp dropped to 67.7 and returned Redwing Slought to a eutrophic status, ranking it 90th out of 165 lakes in Lake County based on average TP concentrations.

It is strongly recommended that homeowners within the watershed only use lawn fertilizers that contain no phosphorus unless a soil test indicates the need for phosphorus. This would help reduce further inputs of phosphorus to Redwing Slough.



Oligotrophic lakes have low nutrient levels. They are often clear lakes with little aquatic plant and/or algae growth. Oligotrophic lakes have a TSIp score less than 40.

Mesotrophic lakes have moderate nutrient levels. These lakes are generally clear with beds of submersed aquatic vegetation. Mesotrophic lakes have a TSIp score between 40 and 50.

Eutrophic lakes are nutrient rich and productive in the terms of aquatic plants and/or algae. Eutrophic Lakes have a TSIp score between 50 and 70. Lakes with a TSIp score of greater than 70 would be classified as Hypereutrophic.

Illustrations from the Wisconsin Department of Natural Resources

IEPA ASSESSMENT

The Illinois Environmental Protection Agency (IEPA) has assessment indices to classify Illinois lakes for their ability to support aquatic life and recreational uses. The guidelines consider several aspects, such as water clarity, phosphorus concentrations (TSIp), and aquatic plant coverage. According to this index, Redwing Slough provided *Full* support of aquatic life and *Partial* support of recreational activities. The slough provided *Partial* overall use due to the abundant plants, low DO, and elevated phosphorus levels.

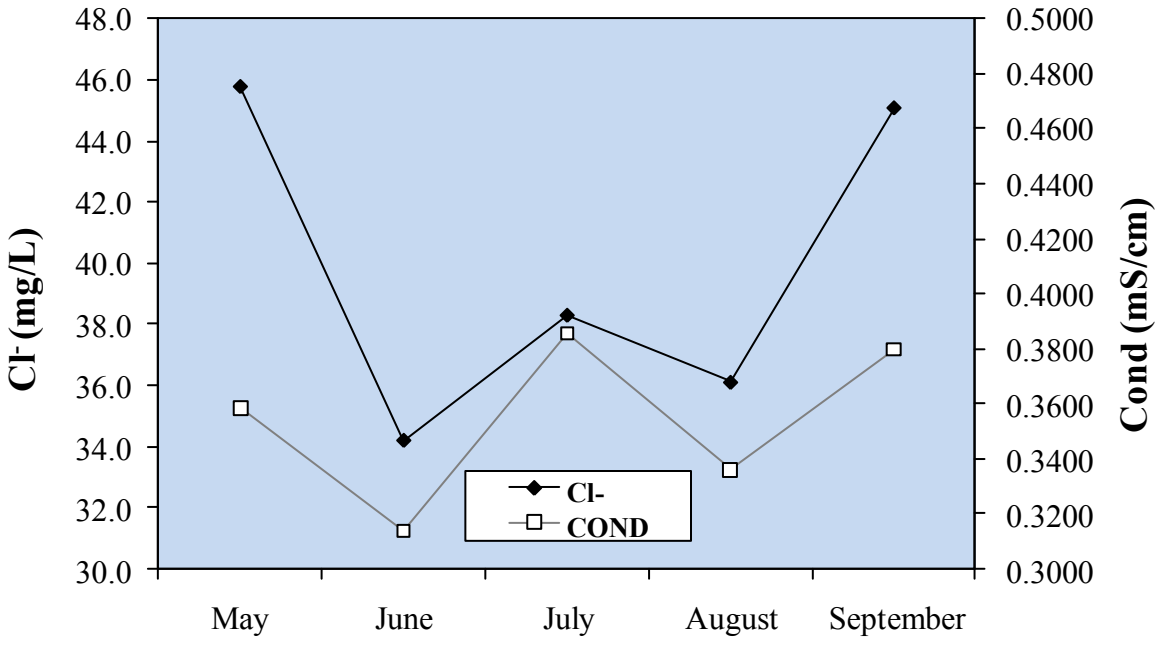
CONDUCTIVITY/CHLORIDES

Conductivity is a measurement of water's ability to conduct electricity and is correlated with chloride (Cl^-) concentrations. Lakes with residential and urban land uses in their watershed often have higher conductivity readings and Cl^- concentrations because of the use of road salts, compared to lakes in undeveloped areas. Stormwater runoff from impervious surfaces such as roads and parking lots can deliver high concentrations of Cl^- to nearby waterbodies. The Lake County epilimnetic median conductivity reading was 0.7800 milliSiemens/cm (mS/cm). During 2010, the Redwing Slough average conductivity reading at the inlet was higher, at 1.0318 mS/cm and an increase from thhe 2000 average of 0.6476 mg/L. This increase in likely due to some type of input from within the watershed. In December 2010, additional samples were taken on both sides of highway 173. The conductivity was 1.3590 mS/cm on the south side of the road and increased to 2.5960 mS/cm on the north side of the road. Further investigation was conducted of the surrounding homes, but nothing could be determined, but warrants further investigation.

The Conductivity at the outlet remained more consistent during 2010. The outlet average conductivity in 2010 was 0.3547 mS/cm which was a decrease from the 2006 average of 0.6104 mS/cm, but similar to the 2000 average of 0.3551 mS/cm. The higher reading in 2006 was likely due to the lower water level that year concentrating the Cl^- ions.

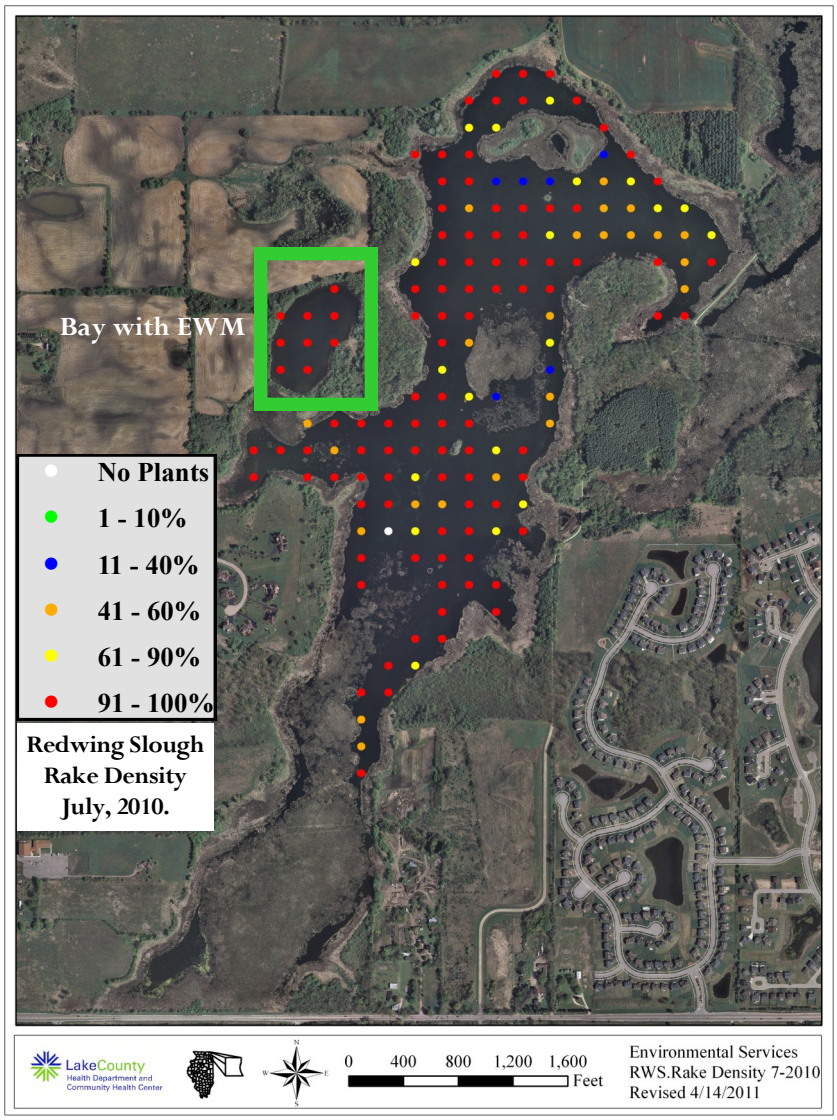
The Cl^- concentration at the inlet of Redwing Slough was greater than the Lake County epilimnetic median of 142 mg/L during 2010, with an epilimnetic average of 165 mg/L. Although there is no chloride data for the 2000 monitoring, the increased conductivity indicates an increase in Cl^- concentration. The Cl^- concentration increased dramatically from August (34 mg/L) to September (622 mg/L). As stated earlier, further investigation was conducted and the December monitoring yielded Cl^- concentrations of 213 mg/L on the south side and 559 mg/L on the north side of highway 173. Again, no determination of these Cl^- inputs could be determined.

It has been determined by the Environmental Canada (similar to the USEPA) that chloride concentrations higher than 230 mg/L have a negative impact on aquatic systems and prolonged exposure can harm up to 10% of aquatic species. Additionally, shifts in algal populations were associated with chloride concentrations as low as 12 mg/L. The USEPA limit of 230 mg/L is equal to 1 teaspoon of table salt added to 5 gallons of water.



An illustration of the positive correlation between chloride concentration and conductivity

AQUATIC PLANTS - SUMMARY



In July of 2010, the LCHD-ES conducted an aquatic plan survey of Redwing Slough. Using ArcGis mapping software, the LCHD-ES created a sampling grid consisting of 225 points with each point being 60 meters apart. In 2006 the water level was too low to use the sampling grid.

In July 2010, 150 points were sampled with plants found at 149 sites. The southern end of the slough was not sampled due to the abundant cattail growth making the slough impassable. The maximum depth plants were found was 2.6 feet.

The most abundant plant found in 2010 was Flatstem Pondweed at 89% of the sampled sites. The next most common species were Sago Pondweed (82%), Duckweed (79%), and Coontail (76%). There were 15 aquatic plant species and one macro-algae species (Chara) found. This was an increase in plant diversity from 2006 when eight aquatic plant species and one macro-algae (Chara) were found. However, the 2006 sampling only consisted of canoeing the northern part of the slough and noting the types and abundances of plant species present. The different sampling technique and the low water level likely contributed to the varied plant diversity. In 2000, there were 16 aquatic plant species and one macro-algae (Chara) found. The plants found in 2000 only were Floatingleaf Pondweed, Leafy Pondweed, and Horned Pondweed while the plants found only in 2010 were Eurasian Watermilfoil (EWM) and Water Marigold.

Water Marigold is endangered in Illinois. The LCHD-ES has only found Water Marigold in four other lakes in Lake County. Those lakes are Cedar Lake, Deep Lake, and Grays Lake.

In 2010 two exotic plant species were found in Redwing Slough, EWM and Curlyleaf Pondweed (CLP). CLP was found at 25% of the sampled sites. Since the survey was done in July, most of the CLP may had already died off for the season so the density may be misrepresented.

The EWM was found only in the bay along the west shoreline and not actually in the main body of the slough. This bay is actually isolated from the rest of the slough by abundant cattails and a narrow earthen berm. It is strongly recommended that this bay be treated before the EWM invades the rest of the slough.

A floristic quality index (FQI) has been developed to rank lakes on there plant diversity and abundance. A high FQI number indicates that there was a large number of sensitive, high quality plant species present in the lake. Redwing Slough had a FQI of 24.0 ranking it 21st among lakes in Lake County. This is an increase from the 2006 value of 15.6 and is due to the increase in plant diversity including the discovery of Water Marigold.

Any aquatic plant management of Redwing Slough should consider the long term goals to preserve and

WATER MARIGOLD

Bidens beckii, also known as Water Marigold was found in Redwing Slough in 2010. It has also been documented in Cedar Lake, Deep Lake, and Grays Lake in Lake County. Water Marigold is found throughout the northern Midwest and east to the Atlantic Coast. It can also be found in the Northwestern states. Even with this broad range, it is listed as endangered in Illinois.

Water Marigold can be found in both emergent and submerged plant communities. It grows in soft substrates at depths from 0.5 to 9 feet.

Water Marigold is an indicator species which means it is sensitive to changes in water quality and likely one of the first plants to disappear as water quality declines.

Water Marigold emerge from hardy root stalks and rhizomes. There are two distinct leaf types depending on whether the stem is above or below the water. The emerged leaves are lance-shaped, have a toothed margin, are oppositely arranged and attach directly to the stem. The submersed leaves are finely divided into thread-like leaflets. These leaves are also oppositely arranged on the stem. In many instances only the submersed part of the plant is present. When flowers develop, a yellow bloom develops on the top of the emergent stem.

There are several aquatic plant species that can be confused with Water Marigold. When the plants are only have the submersed portion present it can look like Coontail (*Ceratophyllum demersum*), Water Crowfoot (*Ranunculus* sp.) or even Watermilfoil (*Myriophyllum* sp.) Coontail will have stiff leaves with toothed margins while Water Marigold has toothless and flexible leaves. The leaf position is what separates Water Marigold from Water Crowfoot. Crowfoot leaves will be alternate along the stem. Milfoil leaves will be feather-like and whorled around the stem.

Water Marigold is valuable to the aquatic community. When flowering the bright yellow flower attracts insects. The submersed leaves provide food, shelter, and shade for fish and macro-invertebrates. Also, the seed of the plant provide food for waterfowl and other birds.

This plant is unique and steps should be taken to ensure that it remains a part of the plant community of Redwing Slough.

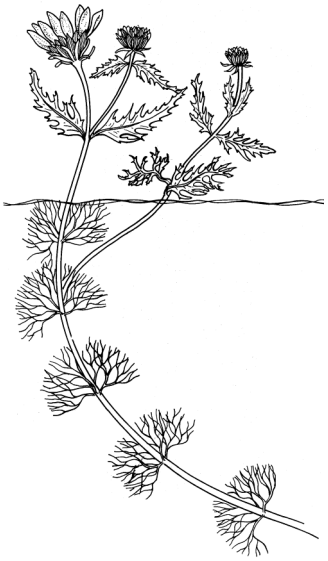


Image from "Through the Looking Glass...A Field Guide to Aquatic Plants", c1997

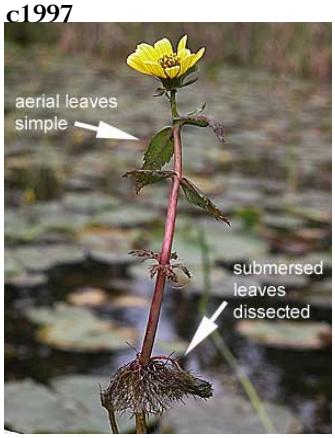


Photo by Gary Fewless, Cofrin Center for Biodiversity, University of Wisconsin-Green Bay

Noteworthy Observations

Each time the LCHD-ES visited Redwing Slough they recorded any wildlife observed. The slough has excellent habitat for a variety of birds, mammals, and other wildlife since it is located in a rural, undeveloped setting. Good numbers of wildlife, particularly birds, were noted on and around Redwing Slough. Two Sandhill Cranes, a threatened species in Illinois, were seen on just north of State Highway 173 on Redwing Slough in March and another one was noted along the dike between Redwing Slough and Deer Lake in May. Other notable animals seen on the drive into the lake include White-tailed Deer and Wild Turkey.

Habitat around Redwing Slough was good. The undeveloped areas had a mix of open fields and small woods. Deadfalls and snag trees, which provide valuable habitat for cavity nesters, were located within the forested areas around Deer Lake and Redwing Slough.

Redwing Slough is almost entirely surrounded by cattails, which provided habitat to a variety of wildlife. Red-wing Blackbirds, Marsh Wrens, and Yellow Finches were observed within the cattails. Other birds seen included Mallard Ducks, Wood Ducks, Canada Geese, and Mute Swans along with Great Blue Herons, Egrets, Green Herons, Cormorants, and Caspian Terns.

In addition to birds, Painted Turtles, Green Frogs, Bull Frogs, and Beaver were seen inhabiting the area.

The shallow nature of the slough, the abundant plants, and low dissolved oxygen levels do not lend Redwing Slough to any type of sport fishery.

Sandhill Crane

Sandhill Crane in Middlefork Savanna, Lake County, IL.

Sandhill Cranes were seen on two different occasions around Redwing Slough. The Sandhill Crane was listed as threatened in Illinois until the list was updated in 2010. Under the Endangered Species Act, "threatened" is defined as "any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range". The Illinois Department of Natural Resources removed it from the threatened status because it is now considered to be recovered from endangerment or the threat of endangerment in Illinois.

The Sandhill Crane, *Grus canadensis*, is a large bird with a long neck and legs. The adult will generally be gray in appearance, but may be stained reddish. The top of the head is red and the cheeks will be white. Full grown birds will have a six to eight foot wingspan.

The morphology of Redwing Slough makes it ideal Sandhill Crane habitat. They breed on open marshes, bogs, wetlands, or meadows. They build a nest out of vegetation that will be out in the water. The Sandhill Crane feeds on grains, seeds, insects, invertebrates, and small vertebrates that they find in marshes or grain fields.

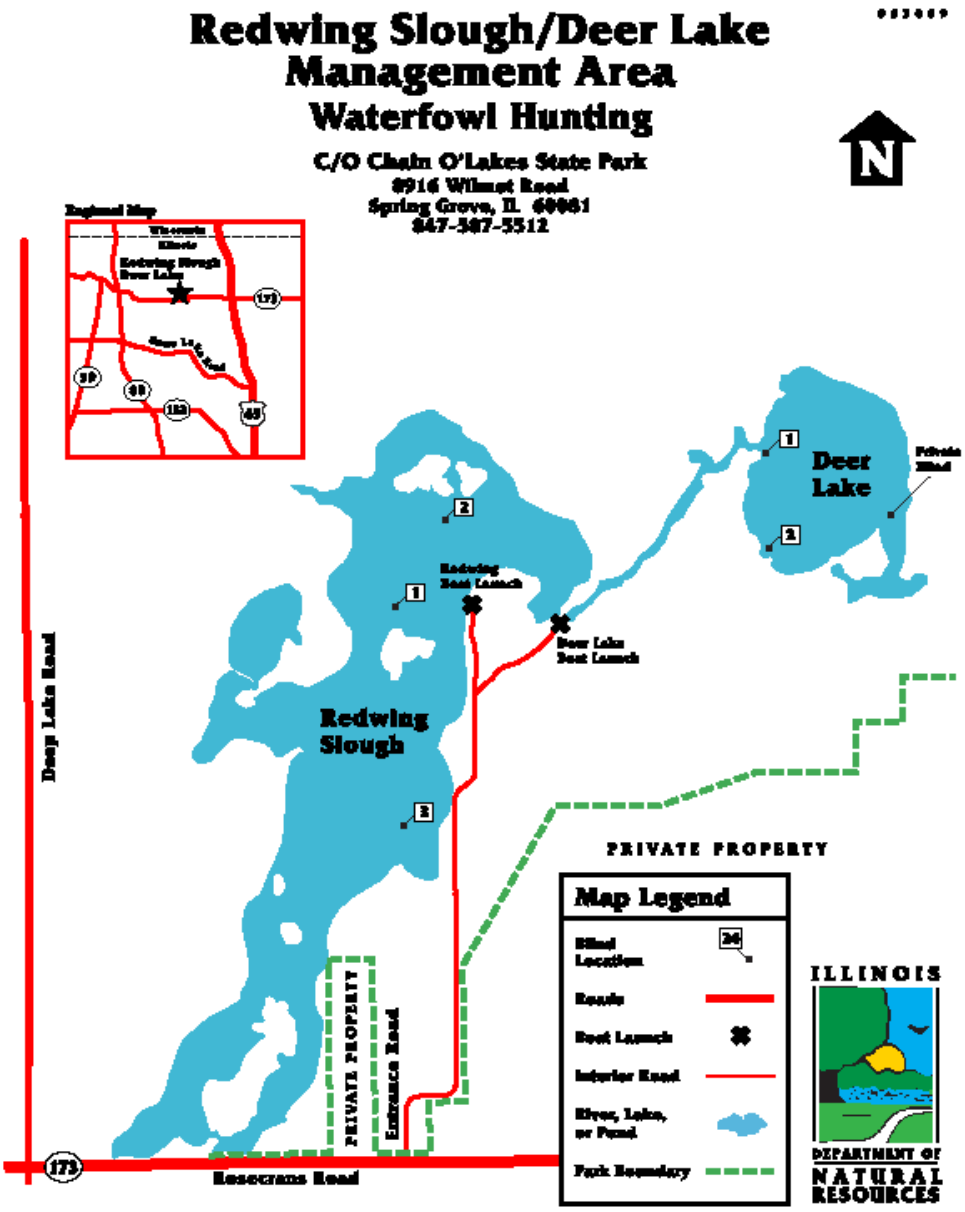
The Sandhill Crane does not breed until it is two to seven years old. Once a mate is found, they stay together year round and migrate south with their young. Sandhill Cranes can live up to 20 years.

Locally, the Sandhill Crane is often confused with the Great Blue Heron. Although they are similar in size, the Great Blue Heron is most often found on the shore of a lake or river. Also, the Great Blue Heron will nest in trees versus on the water. While in flight the Sandhill Crane will have it's neck fully extended while the Great Blue Heron will have it's neck tucked in tight to its body like other herons.

WATERFOWL HUNTING PROGRAM

The Illinois Department of Natural Resources is responsible for providing outdoor recreation opportunities for the residents of the State. Of particular concern is providing adequate safe hunting areas on public lands throughout the State. The waterfowl hunting program at Redwing Slough/Deer Lake provides a quality hunting experience by limiting hunting pressure to that which occurred historically on the site. The cultural heritage of waterfowl hunting on the site dates back to the days when market hunting for waterfowl was unregulated. The Department of Natural Resources is pleased to continue the tradition of waterfowl hunting on this unique site.

The number of hunters is regulated through a public drawing. Potential hunters must register in person for the drawing. The place and time for the drawing is publicly announced by the IDNR. When registering, hunters must choose whether they want to hunt Deer Lake or Redwing Slough as they are not able to register for both.



Map courtesy of the Illinois Department of Natural Resources

In addition to the state and federal regulations, the IDNR has some site specific regulations for the Redwing Slough/Deer Lake Management Area.

⇒ Hunting is only allowed on Saturday, Sunday, and Monday only.

⇒ Outboard motors must of six horsepower or less are permitted for blind building and hunting.

⇒ No more than four people may occupy a blind at any one time

⇒ Weeds and brush may not be controlled around the blind unless approved by the IDNR.

⇒ The use of Purple Loosestrife and Giant Reed as blind brush is prohibited.

⇒ The only waterfowl season allowed is the Northern Zone duck season.

⇒ Shooting hours are from legal opening until 1:00 p.m.

⇒ No person shall buy, sell, or commercialize hunting rights

⇒ Bogging of blinds is prohibited.

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http://www.lakecountyil.gov/Health/want/BeachLakeInfo.htm

Protecting the quality of our lakes is an increasing concern of Lake County residents. Each lake is a valuable resource that must be properly managed if it is to be enjoyed by future generations. To assist with this endeavor, Population Health Environmental Services provides technical expertise essential to the management and protection of Lake County surface waters.

Environmental Service's goal is to monitor the quality of the county's surface water in order to:

- Maintain or improve water quality and alleviate nuisance conditions
- Promote healthy and safe lake conditions
- Protect and improve ecological diversity

Services provided are either of a technical or educational nature and are provided by a professional staff of scientists to government agencies (county, township and municipal), lake property owners' associations and private individuals on all bodies of water within Lake County.

MANAGEMENT RECOMMENDATIONS

Redwing Slough has seen some changes in water quality since 2006. The largest concern seems to be chlorides. At the outlet the chloride concentration had decreased, however the September and December samples taken near the inlet show a dramatic increase in chloride input. Continued monitoring of the inlet is recommended to determine the source of the chlorides. Redwing Slough has high nutrient concentrations, abundant aquatic plants, and low dissolved oxygen. Eurasian Watermilfoil was found in the secluded bay along the northwest side of the slough. It is strongly recommended that this area be addressed to remove the invasive, exotic plant before it spreads to the rest of the slough. The current use management as a wetland basin for waterfowl hunting seems to be the best fit for Redwing Slough.

To help improve and maintain the overall quality of Redwing Slough, the LCHD- ES has the following recommendations:

- **Educate lake users on how to control the spread of exotic species**
- **Develop an aquatic plant management plan that targets the removal of Eurasian Watermilfoil .**
- **Reduce nutrients and chlorides within the watershed.**

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When you leave a body of water:

- Remove any visible mud, plants, fish or animals before transporting equipment.
- Eliminate water from equipment before transporting.
- Clean and dry anything that comes into contact with water (boats, trailers, equipment, clothing, dogs, etc.).
- Never release plants, fish or animals into a body of water unless they came out of that body of water.

Water quality sampling sites on Redwing Slough, 2010

Water quality data for Redwing Slough 2000, 2006, and 2010.

2010	Inflow														
DATE	DEPTH	ALK	TKN	NH_3-N	NO_2+NO_3-N	TP	SRP	Cl^-	TDS	TSS	TS	TVS	COND	pH	DO
12-May	0	227	0.96	<0.1	<0.05	0.074	0.024	52	NA	40.4	368	106	0.5582	9.36	8.70
9-Jun	0	208	0.94	<0.1	0.891	0.148	0.074	40	NA	5.8	322	94	0.5103	7.90	4.58
14-Jul	0	297	2.37	0.500	<0.05	0.577	0.071	77	NA	57.6	539	130	0.8116	7.62	3.68
11-Aug	0	248	1.78	0.418	0.066	0.373	0.071	34	NA	22.0	387	114	0.5870	7.59	2.76
15-Sep	0	381	1.00	0.229	<0.05	0.202	0.026	622	NA	40.8	1560	279	2.6920	7.39	1.32
	Average	272	1.41	0.382[k]	0.479[k]	0.275	0.053	165	NA	33.3	635	145	1.0318	7.97	4.21

2006	Inflow														
DATE	DEPTH	ALK	TKN	NH_3-N	NO_2+NO_3-N	TP	SRP	Cl^-	TDS	TSS	TS	TVS	COND	pH	DO
10-May	0	235	0.977	<0.1	<0.05	0.066	0.031	83	NA	9.4	479	123	0.4080	NA	7.41
14-Jun	0	**	**	**	**	**	**	**	**	**	**	**	**	**	**
12-Jul	0	**	**	**	**	**	**	**	**	**	**	**	**	**	**
9-Aug	0	**	**	**	**	**	**	**	**	**	**	**	**	**	**
13-Sep	0	**	**	**	**	**	**	**	**	**	**	**	**	**	**
	Average	235	0.977	<0.1	<0.05	0.066	0.009[k]	83	NA	9.4	479	123	0.4080	NA	7.41

2000	Inflow														
DATE	DEPTH	ALK	TKN	NH_3-N	NO_3-N*	TP	SRP	Cl^-	TDS	TSS	TS	TVS	COND	pH	DO
24-May	0	134	1.27	<0.1	0.070	0.035	<0.005	NA	268	0.5	278	134	0.5109	7.53	5.30
28-Jun	0	193	1.12	<0.1	0.156	0.126	0.091	NA	288	4.2	303	116	0.4300	7.47	5.50
26-Jul	0	105	1.03	<0.1	0.070	0.062	0.050	NA	190	6.8	219	103	0.5555	7.56	5.70
30-Aug	0	**	**	**	**	**	**	NA	**	**	**	**	**	**	**
27-Sep	0	208	1.10	<0.1	<0.5	0.056	0.019	NA	282	4.1	309	88	0.4791	7.49	7.60
	Average	160	1.13	<0.1[k]	0.099[k]	0.070	0.053[k]	NA	257	3.9	277	110	0.4939	7.51	6.03

Glossary

ALK = Alkalinity, mg/L $CaCO_3$
TKN = Total Kjeldahl nitrogen, mg/L
NH_3-N = Ammonia nitrogen, mg/L
NO_2+NO_3-N = Nitrate + Nitrite nitrogen, mg/L
NO_3-N = Nitrate nitrogen, mg/L
TP = Total phosphorus, mg/L
SRP = Soluble reactive phosphorus, mg/L
Cl^- = Chloride, mg/L
TDS = Total dissolved solids, mg/L
TSS = Total suspended solids, mg/L
TS = Total solids, mg/L
TVS = Total volatile solids, mg/L
SECCHI = Secchi disk depth, ft.
COND = Conductivity, milliSiemens/cm
DO = Dissolved oxygen, mg/L

** = No sample was taken due to lack of flow
k = Denotes that the actual value is known to be less than the value presented.
NA= Not applicable

* = Prior to 2006 only Nitrate - nitrogen was analyzed

Water quality data for Redwing Slough 2003, 2006, and 2010. Continued.

2010	Outflow														
DATE	DEPTH	ALK	TKN	NH_3-N	NO_2+NO_3-N	TP	SRP	Cl^-	TDS	TSS	TS	TVS	COND	pH	DO
12-May	0	126	1.04	<0.1	<0.05	0.047	0.01	46	NA	2.4	247	91	0.3585	9.20	10.29
9-Jun	0	154	1.76	0.420	<0.05	0.059	0.016	34	NA	3.4	262	196	0.3137	7.94	3.85
14-Jul	0	123	2.1	<0.1	0.51	0.132	0.032	38	NA	13	263	94	0.3855	7.26	0.96
11-Aug	0	102	1.41	<0.1	<0.05	0.051	0.01	36	NA	4.3	219	84	0.3360	7.94	1.60
15-Sep	0	114	2.38	<0.1	<0.05	0.122	<0.005	45	NA	32.0	288	111	0.3797	7.74	2.30
	Average	124	1.74	0.420[k]	0.510[k]	0.082	0.017[k]	40	NA	11.0	256	115	0.3547	8.02	3.80

2006	Outflow														
DATE	DEPTH	ALK	TKN	NH_3-N	NO_2+NO_3-N	TP	SRP	Cl^-	TDS	TSS	TS	TVS	COND	pH	DO
10-May	0	163	1.98	0.257	0.103	0.076	0.032	71	NA	3.9	399	118	0.6440	NA	5.77
14-Jun	0	113	2.35	0.297	<0.05	0.142	0.044	74	NA	23.7	406	158	0.5240	8.45	3.91
12-Jul	0	120	2.35	0.113	<0.05	0.098	0.024	78	NA	7.7	402	168	0.5270	7.95	1.73
9-Aug	0	161	3.13	0.136	<0.05	0.138	0.015	101	NA	35.2	494	182	0.6870	7.41	0.94
13-Sep	0	157	3.30	0.361	<0.05	0.082	0.012	107	NA	20.0	446	153	0.6700	7.92	4.92
	Average	143	2.62	0.233	0.103[k]	0.107	0.025	86	NA	18.1	429	156	0.6104	7.93[a]	3.45

2000	Outflow														
DATE	DEPTH	ALK	TKN	NH_3-N	NO_3-N*	TP	SRP	Cl^-	TDS	TSS	TS	TVS	COND	pH	DO
24-May	0	173	1.78	<0.1	1.080	0.084	0.049	NA	306	4.6	337	125	0.3997	9.15	9.50
28-Jun	0	99	1.22	<0.1	0.062	0.070	0.025	NA	216	2.0	213	96	0.2843	8.81	3.00
26-Jul	0	248	0.97	<0.1	0.262	0.062	0.05	NA	344	3.7	367	138	0.2804	7.97	2.90
30-Aug	0	158	1.7	0.184	0.077	0.066	0.01	NA	222	7.3	272	119	0.3946	7.24	0.80
27-Sep	0	178	2.24	0.85	<0.5	0.071	0.013	NA	250	6.4	265	88	0.4165	7.68	6.40
	Average	171	1.582	0.517[k]	0.370[k]	0.071	0.029	NA	268	4.8	291	113	0.3551	8.17	4.52

Glossary

ALK = Alkalinity, mg/L $CaCO_3$

TKN = Total Kjeldahl nitrogen, mg/L

NH_3-N = Ammonia nitrogen, mg/L
NO_2+NO_3-N = Nitrate + Nitrite nitrogen, mg/L

NO_3-N = Nitrate nitrogen, mg/L

TP = Total phosphorus, mg/L

SRP = Soluble reactive phosphorus, mg/L

Cl^- = Chloride, mg/L

TDS = Total dissolved solids, mg/L

TSS = Total suspended solids, mg/L

TS = Total solids, mg/L

TVS = Total volatile solids, mg/L

SECCHI = Secchi disk depth, ft.

COND = Conductivity, milliSiemens/cm

DO = Dissolved oxygen, mg/L

a = Does not include May due to bad pH probe

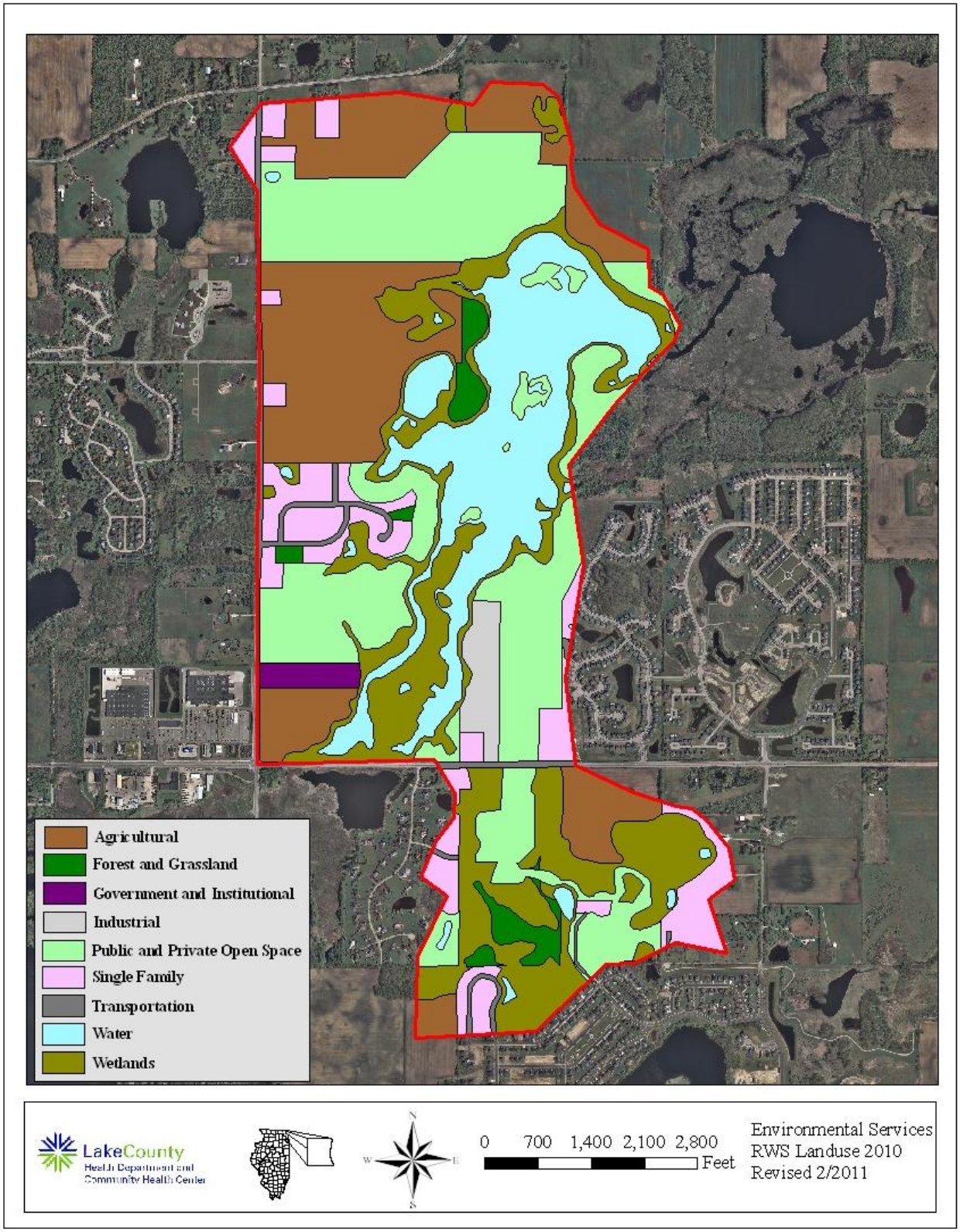
k = Denotes that the actual value is known to be less than the value presented.

NA= Not applicable

* = Prior to 2006 only Nitrate - nitrogen was analyzed

Approximate watershed delineation for Redwing Slough, 2010

Approximate land use within the Redwing Slough watershed, 2010



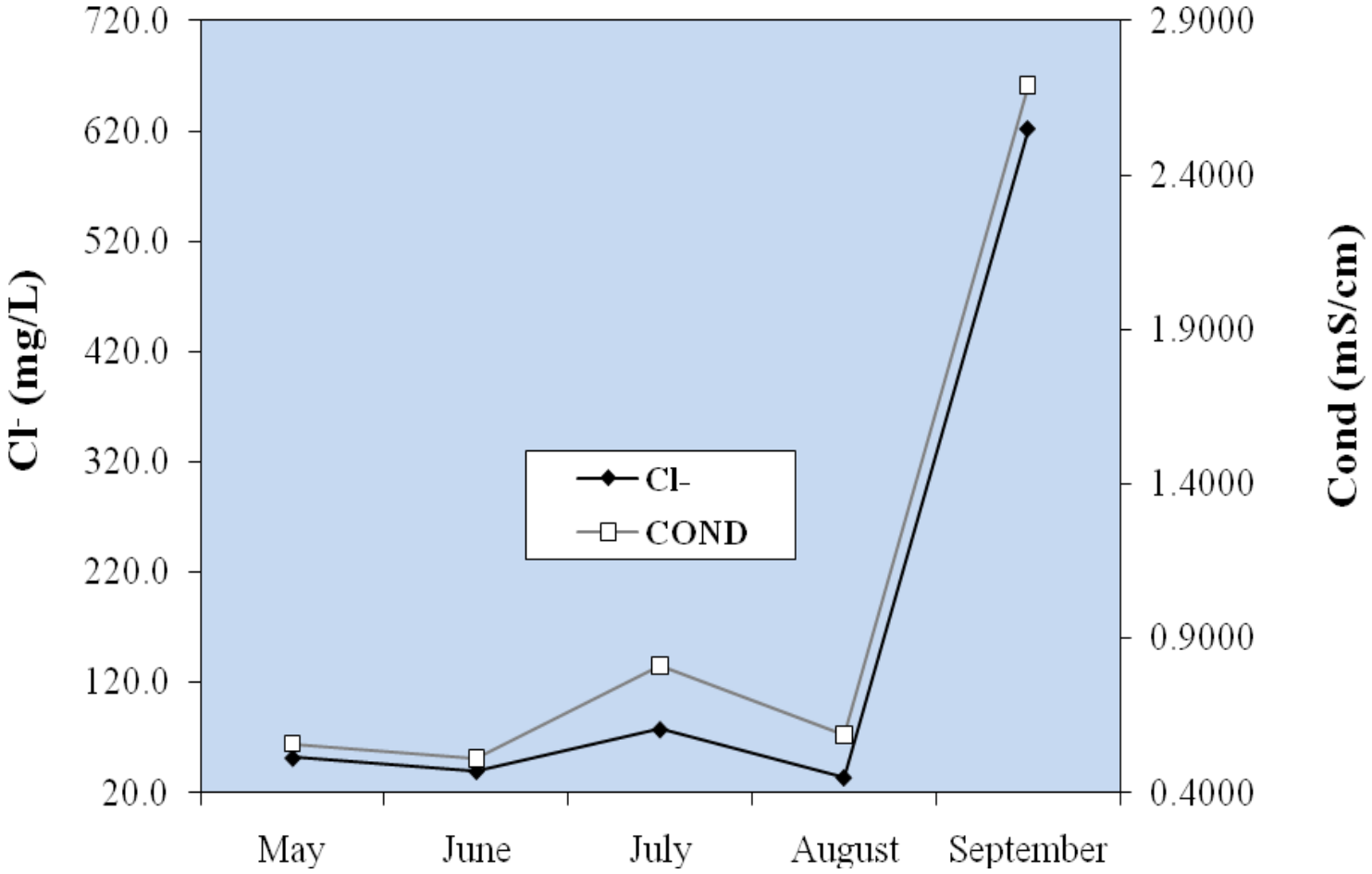
Approximate land uses and retention time for Redwing Slough, 2010

Land Use	Acreage	% of Total
Agricultural	238.27	20.8%
Forest and Grassland	26.47	2.3%
Government and Institutional	10.08	0.9%
Industrial	19.35	1.7%
Public and Private Open Space	316.28	27.6%
Single Family	105.21	9.2%
Transportation	23.52	2.1%
Water	180.16	15.7%
Wetlands	227.46	19.8%
Total Acres	**1146.80**	**100.0%**

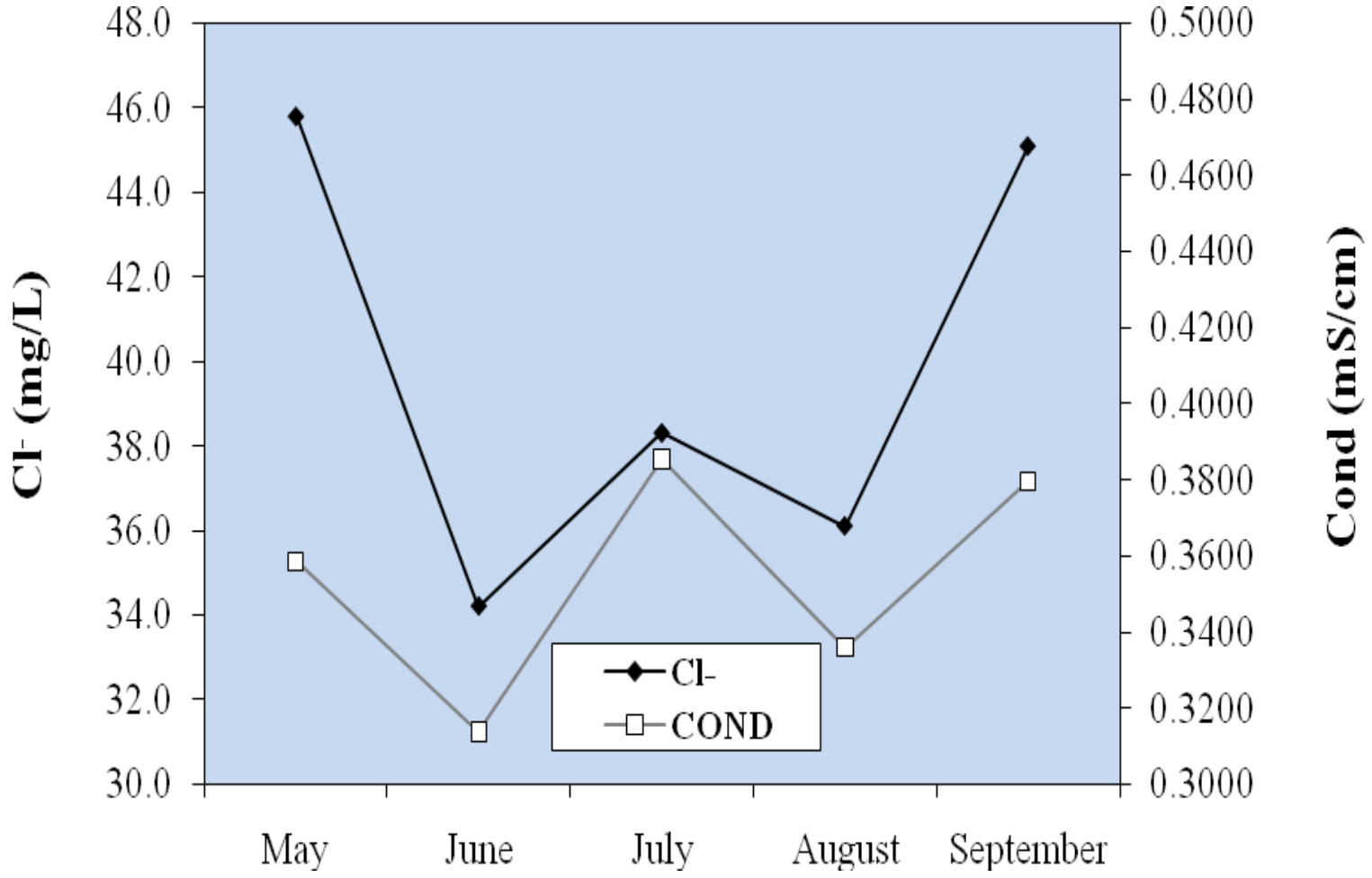
Land Use	Acreage	Runoff Coeff.	Estimated Runoff, acft.	% Total of Estimated Runoff
Agricultural	238.27	0.05	32.8	8.2%
Forest and Grassland	26.47	0.05	3.6	0.9%
Government and Institutional	10.08	0.50	13.9	3.5%
Industrial	19.35	0.85	45.2	11.3%
Public and Private Open Space	316.28	0.15	130.5	32.7%
Single Family	105.21	0.30	86.8	21.8%
Transportation	23.52	0.85	55.0	13.8%
Water	180.16	0.00	0.0	0.0%
Wetlands	227.46	0.05	31.3	7.8%
TOTAL	**1146.80**		**399.0**	**100.0%**

Lake volume	**406.8**	**acre-feet**
Retention Time (years)= lake volume/runoff	**1.02**	**years**
	372.13	**days**

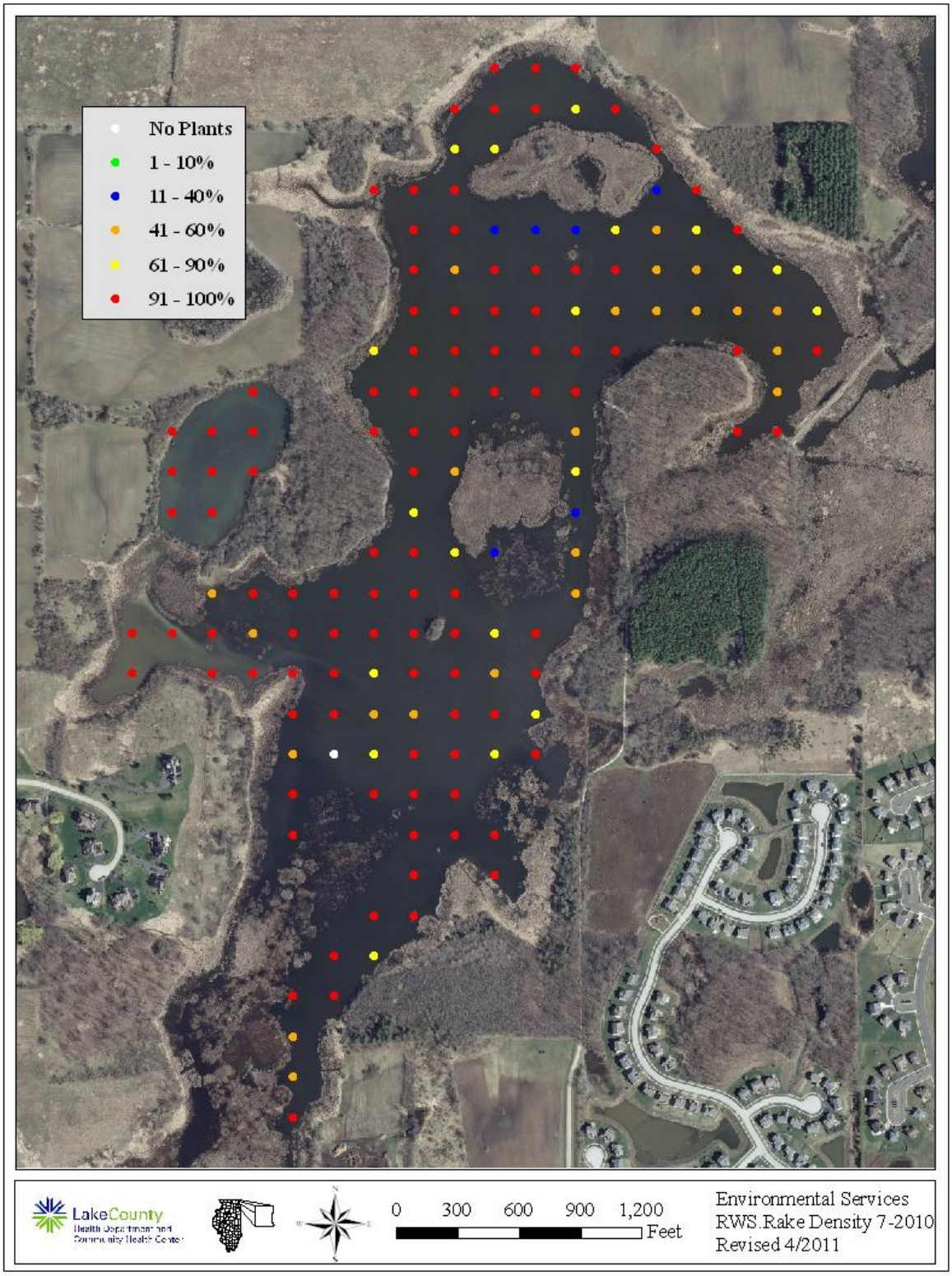
Chloride (Cl^-) concentration vs. conductivity for Redwing Slough inlet, 2010



Chloride (Cl^-) concentration vs. conductivity for Redwing Slough outlet, 2010



Aquatic plant sampling grid that illustrates plant density on Redwing Slough, July 2010



Aquatic plant species found at the 142 sampling sites on Redwing Slough, Julye 2010
Maximum depth that plants were found was 2.6 feet

Plant Density	Common Bladderwort	Chara	Coontail	Curlyleaf Pondweed	Duckweed	Elodea	Eurasian Watermilfoil	Flatstem Pondweed	Giant Duckweed	Water Marigold	Northern Watermilfoil	Sago Pondweed	Star Duckweed	Vallisneria	Whitewater Crowsfoot	Watermeal
Absent	148	56	36	112	32	126	140	17	75	149	149	27	141	149	147	68
Present	1	13	42	30	94	18	2	10	64	1	1	15	8	1	3	60
Common	1	22	43	4	9	3	0	37	9	0	0	42	1	0	0	13
Abundant	0	24	18	3	13	2	0	39	2	0	0	34	0	0	0	7
Dominant	0	35	11	1	2	1	8	47	0	0	0	32	0	0	0	2
% Plant Occurrence	1.3%	62.7%	76.0%	25.3%	78.7%	16.0%	6.7%	88.7%	50.0%	0.7%	0.7%	82.0%	6.0%	0.7%	2.0%	54.7%

Distribution of rake density across all sampling points

Rake Density (Coverage)	# of Sites	%
No plants	1	0.7
>0 to 10%	0	0.0
>10 to 40%	6	4.0
>40 to 60%	23	15.3
>60 to 90%	19	12.7
>90%	101	67.3
Total Sites with Plants	149	99.3
Total # of Sites	150	100.0

Lake County average Floristic Quality Index (FQI) ranking 2000-2010.

RANK	LAKE NAME	FQI (w/A)	FQI (native)
1	Cedar Lake	38.0	40.0
2	Cranberry Lake	34.4	34.4
3	West Loon Lake	34.3	35.7
4	East Loon Lake	33.6	35.0
5	Little Silver	31.6	29.6
6	Deep Lake	31.2	29.7
7	Round Lake Marsh North	29.9	29.1
8	Bangs Lake	29.8	32.0
9	Sullivan Lake	28.5	26.9
10	Independence Grove	27.5	24.6
11	Lake Zurich	27.1	24.3
12	Sterling Lake	26.9	24.5
13	Sun Lake	26.1	24.3
14	Round Lake	25.9	23.5
15	Druce Lake	25.2	22.8
16	Honey Lake	25.1	23.3
17	Schreiber Lake	24.8	23.9
18	Fourth Lake	24.8	23.0
19	Lake of the Hollow	24.8	23.0
20	Lakewood Marsh	24.7	23.8
21	Redwing Slough	24.0	25.8
22	Deer Lake	23.5	24.4
23	Butler Lake	23.1	21.4
24	Third Lake	23	24.7
25	Duck Lake	22.9	21.1
26	Countryside Glen Lake	22.8	21.9
27	Cross Lake	22.4	24.2
28	McGreal Lake	22.1	20.2
29	Wooster Lake	21.9	23.6
30	Davis Lake	21.4	21.4
31	Broberg Marsh	21.4	20.5
32	Fish Lake	21.2	19.3
33	Redhead Lake	21.2	19.3
34	Turner Lake	21.2	18.6
35	Timber Lake (North)	20.9	23.4
36	Lake Kathryn	20.7	19.6
37	ADID 203	20.5	20.5
38	Lake Miltmore	20.3	18.4
39	Salem Lake	20.2	18.5
40	Gray's Lake	19.8	16.9
41	Old Oak Lake	19.1	18.0
42	Highland Lake	18.9	16.7
43	Forest Lake	18.0	19.0
44	Lake Helen	18.0	18.0
45	Potomac Lake	17.8	17.8
46	Bresen Lake	17.8	16.6
47	Hendrick Lake	17.7	17.7
48	Lake Barrington	17.7	16.7
49	Windward Lake	17.6	16.3
50	Diamond Lake	17.4	16.3
51	Owens Lake	17.3	16.3
52	Osprey Lake	17.3	15.5
53	Long Lake	17.2	19.0
54	Lake Tranquility (S1)	17.0	15.0

Lake County average Floristic Quality Index (FQI) ranking 2000-2010.

Rank	LAKE NAME	FQI (w/A)	FQI (native)
55	McDonald Lake 1	16.7	17.7
56	Island Lake	16.6	14.7
57	Lake Fairview	16.3	15.2
58	Grand Avenue Marsh	16.3	14.3
59	Lake Nippersink	16.3	14.3
60	Taylor Lake	16.3	14.3
61	White Lake	16.0	17.0
62	Dog Training Pond	15.9	14.7
63	Dog Bone Lake	15.7	15.7
64	Seven Acre Lake	15.5	17.0
65	Ames Pit	15.5	13.4
66	Heron Pond	15.1	15.1
67	Dugdale Lake	15.1	14.0
68	Eagle Lake (S1)	15.1	14.0
69	Mary Lee Lake	15.1	13.1
70	Old School Lake	15.1	13.1
71	Hastings Lake	15.0	17.0
72	North Churchill Lake	15.0	15.0
73	Bishop Lake	15.0	13.4
74	Sand Lake	14.8	12.5
75	Countryside Lake	14.7	14.7
76	Timber Lake (South)	14.7	12.7
77	Buffalo Creek Reservoir	14.3	13.1
78	Lake Carina	14.3	12.1
79	Lake Leo	14.3	12.1
80	Lambs Farm Lake	14.3	12.1
81	Crooked Lake	14.0	16.0
82	Longview Meadow Lake	13.9	13.9
83	Dunn's Lake	13.9	12.7
84	Summerhill Estates Lake	13.9	12.7
85	Lake Napa Suwe	13.9	11.7
86	Lake Minear	13.9	11.0
87	Stockholm Lake	13.5	12.1
88	Antioch Lake	13.4	11.3
89	Hook Lake	13.4	11.3
90	Lake Charles	13.4	11.3
91	Rivershire Pond 2	13.3	11.5
92	Flint Lake	13.0	11.8
93	Harvey Lake	13.0	11.8
94	McDonald Lake 2	12.5	12.5
95	Stone Quarry Lake	12.5	12.5
96	Lake Naomi	12.5	11.2
97	Pulaski Pond	12.5	11.2
98	Pond-A-Rudy	12.1	12.1
99	Loch Lomond	12.1	9.4
100	Grassy Lake	12.0	12.0
101	Lake Matthews	12.0	12.0
102	Nielsen Pond	12.0	10.7
103	Werhane Lake	12.0	9.8
104	Lake Lakeland Estates	11.5	10.0
105	Redwing Marsh	11.0	11.0
106	Tower Lake	11.0	11.0
107	West Meadow Lake	11.0	11.0
108	Big Bear Lake	11.0	9.5
109	Little Bear Lake	11.0	9.5
110	Fischer Lake	11.0	9.0
111	Grandwood Park Lake	11.0	9.0
112	Lake Holloway	10.6	10.6

Lake County average Floristic Quality Index (FQI) ranking 2000-2010.

Rank	LAKE NAME	FQI (w/A)	FQI (native)
113	Lake Fairfield	10.4	9.0
114	Lake Louise	10.4	9.0
115	College Trail Lake	10.0	10.0
116	Gages Lake	10.0	5.8
117	Valley Lake	9.9	9.9
118	Woodland Lake	9.9	8.1
119	Lake Christa	9.8	8.5
120	Lake Farmington	9.8	8.5
121	Lucy Lake	9.8	8.5
122	Columbus Park Lake	9.2	9.2
123	Sylvan Lake	9.2	9.2
124	Waterford Lake	9.2	9.2
125	Banana Pond	9.2	7.5
126	Leisure Lake	9.0	6.4
127	Albert Lake	8.7	7.5
128	Fairfield Marsh	8.7	7.5
129	Lake Eleanor	8.7	7.5
130	Ozaukee Lake	8.7	6.7
131	East Meadow Lake	8.5	8.5
132	South Churchill Lake	8.5	8.5
133	Lake Forest Pond	8.5	6.9
134	Peterson Pond	8.5	6.0
135	Bittersweet Golf Course #13	8.1	8.1
136	Lake Linden	8.0	8.0
137	Patski Pond	7.1	7.1
138	Rasmussen Lake	7.1	7.1
139	Slocum Lake	7.1	5.8
140	IMC Lake	7.1	5.0
141	Lucky Lake	7.0	7.0
142	Deer Lake Meadow Lake	6.4	5.2
143	ADID 127	5.0	5.0
144	Liberty Lake	5.0	5.0
145	Oak Hills Lake	5.0	5.0
146	Slough Lake	5.0	5.0
147	Sand Pond (IDNR)	5.0	3.5
148	Half Day Pit	5.0	2.9
149	Lochanora Lake	5.0	2.5
150	Echo Lake	0.0	0.0
151	Hidden Lake	0.0	0.0
152	North Tower Lake	0.0	0.0
153	St. Mary's Lake	0.0	0.0
154	Willow Lake	0.0	0.0
	Mean	**15.3**	**14.4**
	Median	**14.3**	**12.9**

Lake County average TSI phosphorus (TSIp) ranking 2000-2010.

RANK	LAKE NAME	TP AVE	TSIp
1	Lake Carina	0.0100	37.35
2	Sterling Lake	0.0100	37.35
3	Indpendence Grove	0.0130	41.14
4	Lake Zurich	0.0135	41.68
5	West Loon Lake	0.0140	42.21
6	Cedar Lake	0.0150	43.20
7	Windward Lake	0.0160	44.13
8	Sand Pond (IDNR)	0.0165	44.57
9	Fourth Lake	0.0180	45.83
10	Pulaski Pond	0.0180	45.83
11	Banana Pond	0.0200	47.35
12	Lake Kathryn	0.0200	47.35
13	Lake Minear	0.0200	47.35
14	Highland Lake	0.0202	47.49
15	Timber Lake (North)	0.0210	48.05
16	Cross Lake	0.0220	48.72
17	Dog Training Pond	0.0220	48.72
18	Sun Lake	0.0220	48.72
19	Deep Lake	0.0230	49.36
20	Lake of the Hollow	0.0230	49.36
21	Round Lake	0.0230	49.36
22	Stone Quarry Lake	0.0230	49.36
23	Druce Lake	0.0240	49.98
24	Bangs Lake	0.0250	50.57
25	Little Silver Lake	0.0250	50.57
26	Lake Leo	0.0260	51.13
27	Dugdale Lake	0.0270	51.68
28	Peterson Pond	0.0270	51.68
29	Lake Miltmore	0.0280	52.20
30	Gray's Lake	0.0300	53.20
31	Lake Fairfield	0.0300	53.20
32	Lake Catherine	0.0310	53.67
33	Lambs Farm Lake	0.0310	53.67
34	Old School Lake	0.0310	53.67
35	Sand Lake	0.0320	54.13
36	Third Lake	0.0320	54.13
37	Gages Lake	0.0340	55.00
38	Hendrick Lake	0.0340	55.00
39	Honey Lake	0.0340	55.00
40	Cranberry Lake	0.0360	55.82
41	Diamond Lake	0.0370	56.22
42	Sullivan Lake	0.0370	56.22
43	Channel Lake	0.0380	56.60
44	Ames Pit	0.0390	56.98
45	Schreiber Lake	0.0400	57.34
46	Waterford Lake	0.0400	57.34

Lake County average TSI phosphorus (TSIp) ranking 2000-2010.

RANK	LAKE NAME	TP AVE	TSIp
47	Hook Lake	0.0410	57.70
48	Duck Lake	0.0430	58.39
49	Nielsen Pond	0.0450	59.04
50	Seven Acre Lake	0.0460	59.36
51	Turner Lake	0.0460	59.36
52	Willow Lake	0.0460	59.36
53	East Meadow Lake	0.0480	59.97
54	Lucky Lake	0.0480	59.97
55	Old Oak Lake	0.0490	60.27
56	College Trail Lake	0.0500	60.56
57	East Loon Lake	0.0520	61.13
58	Hastings Lake	0.0520	61.13
59	Lake Lakeland Estates	0.0520	61.13
60	Butler Lake	0.0530	61.40
61	West Meadow Lake	0.0530	61.40
62	Little Bear Lake	0.0550	61.94
63	Lucy Lake	0.0550	61.94
64	Lake Linden	0.0570	62.45
65	Lake Napa Suwe	0.0570	62.45
66	Lake Charles	0.0580	62.70
67	Lake Christa	0.0580	62.70
68	Owens Lake	0.0580	62.70
69	Lake Naomi	0.0620	63.66
70	Lake Tranquility (S1)	0.0620	63.66
71	Liberty Lake	0.0630	63.89
72	Werhane Lake	0.0630	63.89
73	Countryside Glen Lake	0.0640	64.12
74	Davis Lake	0.0650	64.34
75	Lake Fairview	0.0650	64.34
76	Leisure Lake	0.0650	64.34
77	Wooster Lake	0.0650	64.34
78	Tower Lake	0.0660	64.56
79	St. Mary's Lake	0.0670	64.78
80	Mary Lee Lake	0.0680	65.00
81	Crooked Lake	0.0700	65.41
82	Lake Helen	0.0720	65.82
83	ADID 203	0.0730	66.02
84	Bluff Lake	0.0730	66.02
85	Spring Lake	0.0730	66.02
86	Harvey Lake	0.0770	66.79
87	Broberg Marsh	0.0780	66.97
88	Sylvan Lake	0.0790	67.16
89	Big Bear Lake	0.0810	67.52
90	Redwing Slough	0.0822	67.73
91	Petite Lake	0.0830	67.87
92	Lake Marie	0.0850	68.21

Lake County average TSI phosphorus (TSIp) ranking 2000-2010.

RANK	LAKE NAME	TP AVE	TSIp
93	Potomac Lake	0.0850	68.21
94	Timber Lake (South)	0.0850	68.21
95	White Lake	0.0862	68.42
96	Grand Ave Marsh	0.0870	68.55
97	North Churchill Lake	0.0870	68.55
98	Grandwood Park Lake	0.0880	68.71
99	McDonald Lake 1	0.0880	68.71
100	North Tower Lake	0.0880	68.71
101	Rivershire Pond 2	0.0900	69.04
102	South Churchill Lake	0.0900	69.04
103	McGreal Lake	0.0910	69.20
104	Deer Lake	0.0940	69.66
105	Dunn's Lake	0.0950	69.82
106	Eagle Lake (S1)	0.0950	69.82
107	International Mine and Chemical Lake	0.0950	69.82
108	Valley Lake	0.0950	69.82
109	Countryside Lake	0.0960	69.97
110	Fish Lake	0.0960	69.97
111	Lochanora Lake	0.0960	69.97
112	Long Lake	0.0970	70.12
113	Island Lake	0.0990	70.41
114	Woodland Lake	0.0990	70.41
115	Nippersink Lake	0.1000	70.56
116	Forest Lake	0.1020	70.84
117	Longview Meadow Lake	0.1020	70.84
118	Lake Barrington	0.1050	71.26
119	Lake Forest Pond	0.1070	71.53
120	Bittersweet Golf Course #13	0.1100	71.93
121	Fox Lake	0.1100	71.93
122	Osprey Lake	0.1110	72.06
123	Bresen Lake	0.1130	72.32
124	Round Lake Marsh North	0.1130	72.32
125	Deer Lake Meadow Lake	0.1160	72.70
126	Taylor Lake	0.1180	72.94
127	Columbus Park Lake	0.1230	73.54
128	Lake Nipperink	0.1240	73.66
129	Echo Lake	0.1250	73.77
130	Grass Lake	0.1290	74.23
131	Lake Holloway	0.1320	74.56
132	Redhead Lake	0.1410	75.51
133	Antioch Lake	0.1450	75.91
134	Slocum Lake	0.1500	76.40
135	Lakewood Marsh	0.1510	76.50
136	Pond-A-Rudy	0.1510	76.50
137	Lake Matthews	0.1520	76.59
138	Buffalo Creek Reservoir	0.1550	76.88

Lake County average TSI phosphorus (TSIp) ranking 2000-2010.

RANK	LAKE NAME	TP AVE	TSIp
139	Pistakee Lake	0.1590	77.24
140	Grassy Lake	0.1610	77.42
141	Salem Lake	0.1650	77.78
142	Half Day Pit	0.1690	78.12
143	Lake Eleanor	0.1810	79.11
144	Lake Farmington	0.1850	79.43
145	Lake Louise	0.1850	79.43
146	ADID 127	0.1890	79.74
147	Patski Pond	0.1970	80.33
148	Dog Bone Lake	0.1990	80.48
149	Summerhill Estates Lake	0.1990	80.48
150	Redwing Marsh	0.2070	81.05
151	Stockholm Lake	0.2082	81.13
152	Bishop Lake	0.2160	81.66
153	Ozaukee Lake	0.2200	81.93
154	Hidden Lake	0.2240	82.19
155	McDonald Lake 2	0.2250	82.25
156	Fischer Lake	0.2280	82.44
157	Oak Hills Lake	0.2790	85.35
158	Loch Lomond	0.2950	86.16
159	Heron Pond	0.2990	86.35
160	Fairfield Marsh	0.3260	87.60
161	ADID 182	0.3280	87.69
162	Slough Lake	0.3860	90.03
163	Flint Lake Outlet	0.5000	93.76
164	Rasmussen Lake	0.5030	93.85
165	Albert Lake, Site II, outflow	1.1894	106.26

2000 - 2010 Water Quality Parameters, Statistics Summary

	ALKoxic <=3ft00-2010	
Average	**165**	
Median	**160**	
Minimum	**65**	**IMC**
Maximum	**330**	**Flint Lake**
STD	**42**	
n =	**812**	

	ALKanoxic 2000-2010	
Average	**201**	
Median	**192**	
Minimum	**103**	**Heron Pond**
Maximum	**470**	**Lake Marie**
STD	**52**	
n =	**249**	

	Condoxic <=3ft00-2010	
Average	**0.8629**	
Median	**0.7800**	
Minimum	**0.2260**	**Schreiber Lake**
Maximum	**6.8920**	**IMC**
STD	**0.5215**	
n =	**812**	

	Condanoxic 2000-2010	
Average	**1.0125**	
Median	**0.8678**	
Minimum	**0.3210**	**Lake Kathyrn, Schreiber Lake**
Maximum	**7.4080**	**IMC**
STD	**0.7821**	
n =	**248**	

	NO3-N, Nitrate+Nitrite,oxic <=3ft00-2010	
Average	**0.489**	
Median	**0.160**	
Minimum	**<0.05**	***ND**
Maximum	**9.670**	**South Churchill Lake**
STD	**1.054**	
n =	**812**	

*ND = Many lakes had non-detects (74.5%)
Only compare lakes with detectable concentrations to the statistics above
Beginning in 2006, Nitrate+Nitrite was measured.

	NH3-Nanoxic 2000-2010	
Average	**2.132**	
Median	**1.360**	
Minimum	**<0.1**	***ND**
Maximum	**18.400**	**Taylor Lake**
STD	**2.345**	
n =	**249**	

*ND = 20.1% Non-detects from 32 different lakes

	pHoxic <=3ft00-2010	
Average	**8.37**	
Median	**8.36**	
Minimum	**7.07**	**Bittersweet #13**
Maximum	**10.40**	**Summerhill Estates**
STD	**0.46**	
n =	**810**	

	pHanoxic 2000-2010	
Average	**7.33**	
Median	**7.30**	
Minimum	**6.24**	**Banana Pond**
Maximum	**9.16**	**White Lake**
STD	**0.43**	
n =	**248**	

	All Secchi 2000-2010	
Average	**4.33**	
Median	**2.95**	
Minimum	**0.25**	**McDonald Lake 2/Ozaukee Lake**
Maximum	**23.50**	**West Loon Lake**
STD	**3.66**	
n =	**758**	

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2000 - 2010 Water Quality Parameters, Statistics Summary (continued)

	TKNoxic <=3ft00-2010	
Average	**1.399**	
Median	**1.180**	
Minimum	**<0.1**	***ND**
Maximum	**10.300**	**Fairfield Marsh**
STD	**0.819**	
n =	**812**	

*ND = 3.8% Non-detects from 15 different lakes

	TKNanoxic 2000-2010	
Average	**2.866**	
Median	**2.130**	
Minimum	**<0.5**	***ND**
Maximum	**21.000**	**Taylor Lake**
STD	**2.302**	
n =	**249**	

*ND = 3.2% Non-detects from 4 different lakes

	TPoxic <=3ft00-2010	
Average	**0.099**	
Median	**0.065**	
Minimum	**<0.01**	***ND**
Maximum	**3.880**	**Albert Lake**
STD	**0.169**	
n =	**812**	

*ND = 2.2% Non-detects from 7 different lakes

	TPanoxic 2000-2010	
Average	**0.305**	
Median	**0.174**	
Minimum	**0.012**	**Independence Grove**
Maximum	**3.800**	**Taylor Lake**
STD	**0.394**	
n =	**249**	

	TSSall <=3ft00-2010	
Average	**15.6**	
Median	**8.1**	
Minimum	**<0.1**	***ND**
Maximum	**165.0**	**Fairfield Marsh**
STD	**20.8**	
n =	**812**	

*ND = 1.7% Non-detects from 10 different lakes

	TVSoxic <=3ft00-2010	
Average	**127.6**	
Median	**123.0**	
Minimum	**34.0**	**Pulaski Pond**
Maximum	**298.0**	**Fairfield Marsh**
STD	**39.7**	
n =	**767**	

No 2002 IEPA Chain Lakes

	TDSoxic <=3ft00-2004	
Average	**470**	
Median	**454**	
Minimum	**150**	**Lake Kathryn, White**
Maximum	**1340**	**IMC**
STD	**169**	
n =	**745**	

No 2002 IEPA Chain Lakes.

	CLanoxic <=3ft00-2010	
Average	**193**	
Median	**111**	
Minimum	**3.5**	**Schreiber Lake**
Maximum	**2390**	**IMC**
STD	**324**	
n =	**162**	

	CLoxic <=3ft00-2010	
Average	**181**	
Median	**142**	
Minimum	**2.7**	**Schreiber Lake**
Maximum	**2760**	**IMC**
STD	**220**	
n =	**552**	

Anoxic conditions are defined <=1 mg/l D.O.
pH Units are equal to the -Log of [H] ion activity
Conductivity units are in MilliSiemens/cm
Secchi Disk depth units are in feet
All others are in mg/L

Minimums and maximums are based on data from all lakes from 2000-2010 (n=1357).

Average, median and STD are based on data from the most recent water quality sampling year for each lake.

LCHD Environmental Services ~ 01/20/2011

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