Lake County, Illinois

2011 Grays Lake Summary Report

Prepared by the

LAKE COUNTY HEALTH DEPARTMENT

Population Health Environmental Services

History and photo provided by: Dave Oberg, Grayslake Heritage Center

Pioneer William M. Gray traveled from Allegany County, New York, to the wilds of Illinois in the mid-1830s. He purchased land in this area that included part of an unnamed lake. Though he would soon pull up stakes, the lake to this day bears the name "Grays Lake."

From the beginning, residents have used Grays Lake for food, transportation and recreation. Locals prized the lake for its beauty and settled along its banks.

With the creation of the Village of Grayslake in 1895, local government and private citizens have worked to enhance the lake while maintaining its charm and delicate ecosystem.

In June of 1905, the Village of Grayslake proposed construction of a public pier to increase access to Grays Lake. The editor of The Grayslake Times noted, "Right here, let me say that the boys, when out of school, could render lots of help in the construction….Boys, just imagine yourselves lining up on the pier on the morning of July the Fourth and firing off such a salute that even Hainesville will wake up and inquire, 'which fleet is in the sea?'"

Combating weeds and cleaning up the lake soon

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HISTORY

became a perennial effort. Village of Grayslake President F. D. Battershall posted notice in 1916 that locals using the south end of the lake for dumping trash would be arrested and prosecuted. Stocking the body of water for eager anglers soon also became a regular tradition. A century ago, volunteers stocked the lake, catching pickerel on their annual migration from Third Lake. By the 1920s, more formal efforts kept fishermen happy. Reports of seven pound bass and fifteen pound pickerel appeared regularly in the paper.

Residents also took advantage of the lake for boating and swimming in the summer and ice skating and even ice boating in the winter months. A couple of local boys had a close scrape in the winter months when they took their ice boat too far out on the lake. Cliff Frazier and Walter Hansen built their own ice boat with Fay Brandstetter. Frazier and Hansen put the craft through its paces along the edge of the lake, but got into trouble when they headed into deeper water. The craft went through the ice and the boys were lucky they were able to scramble to safety.

With heavier use, occasionally, friction developed. The Grayslake Times noted in August of 1921 that locals complained of swimmers who waited until they reached the beach to change into their bathing suits, a rather scandalous practice. Builders and homeowners occasionally ignored local ordinances, adding fill to their property to gain a little more space. A local grade schooler protested one such effort, picketing with a sign that read, "He is trying to take the lake out of Grayslake."

In 1965, the Grayslake Park District purchased Jones Island from Mrs. Milton Jones. This island has served as the only public access point to Grays Lake, ideal for boaters, anglers, picnickers and ice skaters. Today, residents and local governments work together to keep Grays Lake a clean and welcoming attraction, as it was for our ancestors, generations ago.

Above:

HEAD OF 21 POUND PICKEREL CAUGHT IN GRAYS LAKE, ILL.

Right:

ICE BOATING ON GRAY LAKE

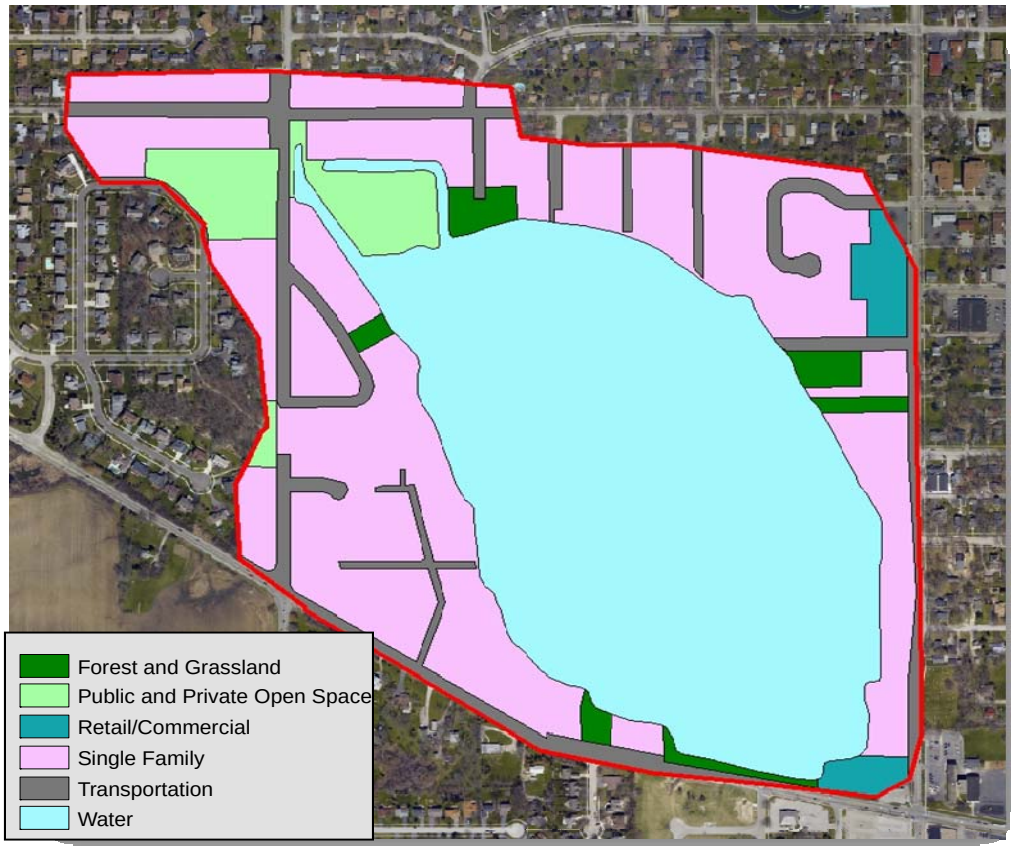
Photo Credit: Grayslake Heritage Center

WATERSHED

The source of a lake's water supply is very important in determining its water quality and choosing management practices to protect the lake. A watershed is an area of land where surface water from rain and melting snow meet at a point, such as a lake or stream. The watershed of Grays Lake encompasses approximately 175.40 acres, draining residential areas to the north, east, and west of the lake. The size of the watershed feeding the lake relative to the lakes size is also an important factor in determining the amount of pollutants in the lake. The watershed to lake surface area ratio of 2:1 is very small. This is positive in that it may help prevent serious water quality problems that often accompany a larger watershed to lake ratios. There is a spillway on the west side of the lake, which controls the drainage from Gray's Lake into Mill Creek. Flow continues northward to Third Lake and eventually into the Des Plaines River. Retention time, the amount of time it takes for water entering a lake to flow out of it again, was calculated to be approximately 3.35 years. Based on the 2011 data, the current external sources affecting Grays Lake were from the following land uses: single family homes (37%). Based on the amount of impervious surfaces each land use contributes varied amounts of runoff. Because impervious surfaces (parking lots, roads, buildings, compacted soil) do not allow rain to infiltrate into the ground, more runoff is generated than in the undeveloped condition. The major sources of runoff for Grays Lake were single family homes (52%), and transportation (37%). The lack of wetland, forest, and grassland areas around the lake increases pollution as runoff and nutrients don't have a chance to be absorbed before entering the lake. Controlling water that runs from the land's surface into the lake is important for drainage lakes.

KETTLE LAKE:

KETTLES ARE DEPRESSIONS LEFT BEHIND AFTER PARTIALLY-BURIED ICE BLOCKS MELT. MANY ARE FILLED WITH WATER, AND ARE THEN CALLED "KETTLE LAKES"



LAND USE IN THE GRAYS LAKE WATERSHED

LAKE FACTS

Major Watershed:
Des Plaines

Sub-Watershed:
Mill Creek

Surface Area:
79.87 acres

Shoreline Length:
2.00 miles

Maximum Depth:
17.3 feet

Average Depth:
4.3 feet

Lake Volume:
344.20 acre-feet

Watershed Area:
175.65 acres

Lake Type:
Glacial

Management Entity:
Gray's Lake, Lake Management Committee and the Grayslake Park District

Current Uses:
swimming, fishing, non powered boating

VOLUNTEER LAKE MONITORING PROGRAM (VLMP)

The VLMP was established in 1981 to gather information on Illinois inland lakes, and to provide an educational program for citizens. The primary measurement by volunteers is the Secchi depth (water clarity). Other observations such as water color, suspended algae and sediment, aquatic plants and odor are also recorded. The sampling season is May through October with measurements taken twice a month. In 2011, there were **42 lakes** that participated in Lake County.

For more information visit: www.epa.state.il.us/water/vlmp/index.html

WATER CLARITY

Water clarity is an indicator of water quality related to chemical and physical properties.

Measurements taken with a Secchi disk indicate the light penetration into a body of water. Algae, microscopic animals, water color, eroded soil, and resuspended bottom sediment are factors that interfere with light penetration and reduce water transparency.

The 2011 average water clarity in Grays Lake was 4.08 feet; this was similar to the 1996 average (4.40 feet) and less than half the lake's 2003 average transparency of 8.46 feet. However the 2002 average was influenced by an unusual Secchi depth in June of 15.10 feet. This deeper Secchi depth might have been caused by the low concentrations of suspended solids, such as planktonic algae and sediment due to the extensive growth of curly leaf pondweed throughout the lake in May and June of that year. Overall, the better than average Secchi depth was due to a variety of reasons including the lakes deep morphology, good aquatic plant densities, low nutrient concentrations, and the "no motor" policy. Overall Grays Lake average water clarity has remained above the county median of 2.95 feet since 1996.

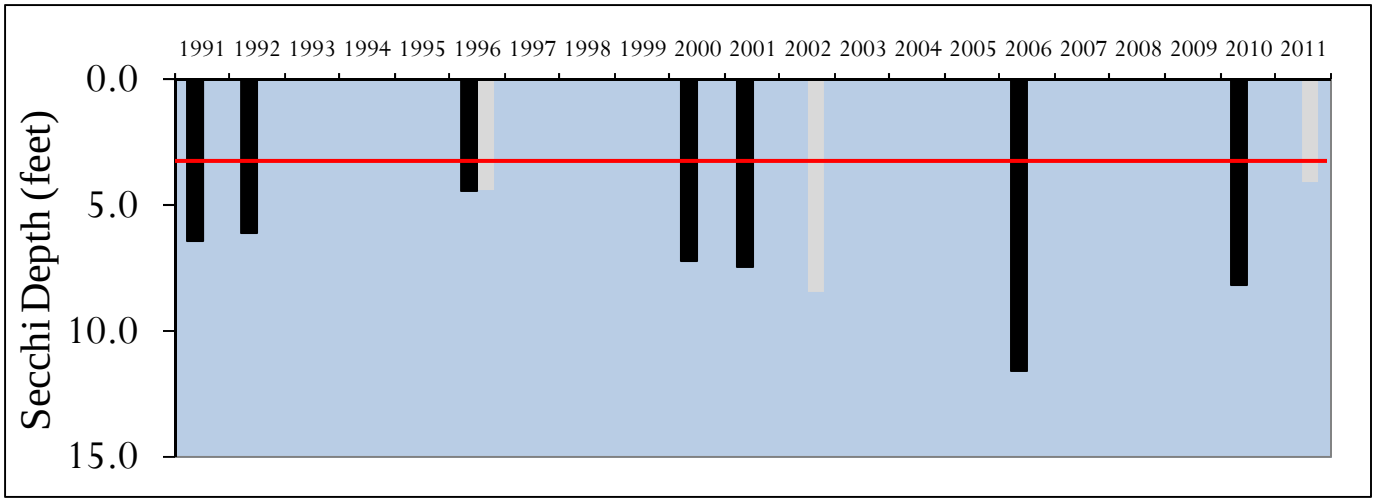
A Secchi disk is an eight-inch diameter weighted metal plate painted black and white in alternating quadrants. A calibrated rope is used to lower the disc into the water and measure the depth to which it is visible.

WATER CLARITY-VOLUNTEER LAKE MONITOR PROGRAM

Additional water clarity measurements were taken in Grays Lake through participation in the Illinois Environmental Protection Agency's (IEPA) Volunteer Lake Monitoring Program (VLMP). Grays Lake residents Bill Soucie and family participated in the program since 2000 and will continue to monitor in 2012. Grays Lake also had historical VLMP data from 1991, 1992, and 1996. Participation in the VLMP program has provided Grays Lake with baseline data that can be used to determine long-term water quality trends and support current lake management decision making. The average VLMP Secchi disk depth from 2010 was 8.21 feet. Monthly VLMP readings have varied from 4.00 feet in May 2006 to 14.00 feet in June 2004. The volunteers on Grays Lake have provided data that is vital for the continued monitoring and management of this lake. The LCHD-ES would like to thank them for their efforts and recommend continued involvement in the future.

SECCHI DISK AVERAGES FROM VLMP AND LCHD RECORDS FOR GRAYS LAKE 1996—2011.

- VLMP
- LCHD
- LAKE COUNTY 2011 MEDIAN 2.95 FEET



TOTAL SUSPENDED SOLIDS

Another measure of water clarity is turbidity, which is caused by particles of matter rather than dissolved organic compounds. Suspended particles dissipate light, which affects the depth at which plants can grow. The total suspended solid (TSS) parameter (turbidity) is composed of nonvolatile suspended solids (NVSS), non-organic clay or sediment materials, and volatile suspended solids (TVS) (algae and other organic matter).

2011 TSS concentrations averaged 6.2 mg/L which was below the county median of 8.6 mg/L and a 53% increase from the 2002 average concentration of 2.9 mg/L. High TSS values are typically correlated with poor water clarity (Secchi disk depth) and can be detrimental to many aspects of the lake ecosystem including the plant and fish communities.

Calculated nonvolatile suspended solids (NVSS) was 1.5 mg/L. This means that 76% of the TSS concentration in 2011 can be attributed to organic particles, such as algae and 24% can be attributed to non-organic particles such as sediment. Turbidity caused primarily by algae reduced the water clarity in Grays Lake. The highest TSS concentration occurred in September this corresponded with the lowest Secchi depth of the sampling season of 2.2 feet.

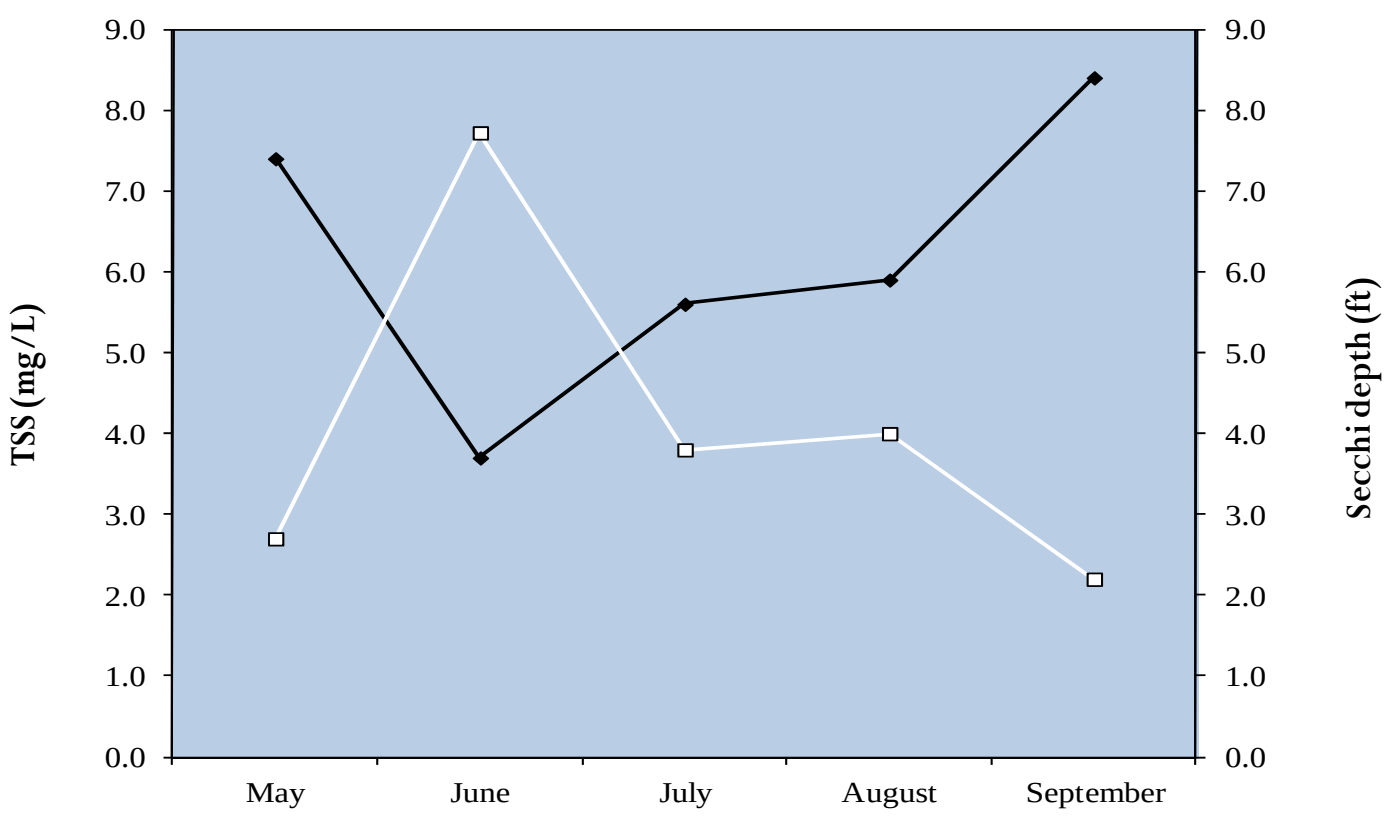
Algae blooms were documented throughout the season in 2011. These were mostly noted as being planktonic, algae that float or drift, in nature. However these blooms consisted mostly of Blue-green algae, while Blue-greens are naturally occur in lakes increased populations can pose a health risk. In 2011 the most dense Blue-green algae populations were documented on the north side of the lake near Jones Island.

DATE	TSS	SECCHI
May	7.4	2.70
June	3.7	7.72
July	5.6	3.80
August	5.9	4.00
September	8.4	2.20

Monthly Total Suspended Solid Concentrations and Secchi Depth in Grays Lake, 2011.

***2011 Lake County median TSS = 8.6 mg/L**

Monthly Total Suspended Solid Concentrations and Secchi Depth in Grays Lake, 2011.



NUTRIENTS

WHAT HAS BEEN DONE TO REDUCE PHOSPHORUS LEVELS IN ILLINOIS

July 2010- The state of Illinois passed a law to reduce the amount of phosphorus content in dishwashing and laundry detergents.

July 2010- The state of Illinois passed another law restricting the use of lawn fertilizers containing phosphorus by commercial applicators.

YEAR	TP
2011	0.031
2003	0.030
1996	0.023

Phosphorus Concentrations for Grays Lake 1996-2011

WHAT YOU CAN DO TO HELP LOWER PHOSPHORUS LEVELS IN GAGES LAKE

*Do not throw leaves, grass clippings, pet waste, other organic debris into the street or driveway. Runoff carries these through storm sewers, directly to Waterford Lake

*Build a rain garden to filter run-off from roofs, driveways, streets. This allows the phosphorus to be bound to the soil so it does not reach surface waters.

*Sweep up fertilizer that is spilled or inadvertently applied to hard surface areas, do not hose it away.

Organisms take nutrients in from their environment. In a lake, the primary nutrients needed for aquatic plant and algal growth are phosphorus and nitrogen. In most lakes, phosphorus is the limiting nutrient, which means everything that plants and algae need to grow is available in excess: sunlight, warmth, and nitrogen. In Gages Lake, the limiting nutrient was phosphorus, phosphorus has a direct effect on how much aquatic plants and algae can grow in lakes

The 2011 average total phosphorus concentration in Grays Lake was 0.031 mg/L this was a increase from the 2002 concentration (0.030 mg/L) and below the 2011 county median of 0.066 mg/L. Lakes with concentrations exceeding 0.050 mg/L can support high densities of algae and aquatic plants, which can reduce water clarity and dissolved oxygen levels and are considered impaired by the IEPA.

Phosphorus originates from a variety of sources, many of which are related to human activities which include: human and animal waste, soil erosion, detergents, septic systems, common carp, and runoff from farmland and lawns.

Nitrogen is the other nutrient critical for algal growth. Total Kjeldahl nitrogen (TKN) is a measure of organic nitrogen, and is typically bound up in algal and plant cells. The average 2011 TKN for Grays Lake was 0.886 mg/L, which was also lower than the county median of 1.18 mg/L.

TROPHIC STATE INDEX

Another way to look at phosphorus levels and how they affect lake productivity is to use a Trophic State Index (TSI) based on phosphorus (TSIp). TSIp values are commonly used to classify and compare lake productivity levels (trophic state). A lakes response to additional phosphorus is an accelerated rate of eutrophication. Eutrophication is a natural process where lakes become increasingly enriched with nutrients. Lakes start out with clear water and few aquatic plants and over time become more enriched with nutrients and vegetation, until the lake becomes a wetland. This process takes thousands of years. However, human activities that supply lakes with additional phosphorus that drives eutrophication is speeding up this process significantly. The TSIp 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). In 2011, Grays Lake was eutophic with a TSIp value of 53.7. Based on the TSIp, Grays Lake ranked 65th out of 171 lakes studied by the LCHD-ES from 2000-2011.

OLIGOTROPHIC:

Lakes are generally clear, deep and free of weeds or large algae blooms. Though beautiful, they are low in nutrients and do not support large fish populations.

MESOTROPHIC:

Lakes lie between the oligotrophic and eutrophic stages. Devoid of oxygen in late summer, their hypolimnions limit cold water fish and cause phosphorus cycling from sediments.

EUTROPHIC:

Lakes are high in nutrients, they are usually either weedy or subject to frequent algae blooms, or both. Eutrophic lakes often support large fish populations, but are also susceptible to oxygen depletion.

New Permit Requirements for Applying Pesticides in Waters

New regulations are now in effect that will significantly affect how pesticides are used in Illinois waters. A National Pollutant Discharge Elimination System (NPDES) permit will now be required to apply any type of pesticides over or into waters of the State. In Illinois, the permitting process will be administrated through the Illinois Environmental Protection Agency (IEPA).

Who has to get a permit? According to the language in the permit, anyone who qualifies as an "operator", which is defined as: "any person, persons, group, or entity in control over the financing for, or over the decision to perform pest control activities, or applying pesticides that will result in a discharge to waters of the State". Homeowner associations or even individuals may need to get a permit. Regardless of the size of treatment, a permit will be needed. If the treatment area or total annual area exceeds certain thresholds then additional requirements will be required such as a Pesticide Discharge Management Plan and an annual report. The thresholds vary depending on type of treatment. For weed and algae control, the threshold is 80 acres of treatment or 80 linear miles along the water's edge. The threshold is an annual total, so for example, algaecides applied to five acres four times during the year, would meet this 80 acre threshold requirement.

Anyone or any group planning to treat their pond or lake with pesticide this year should take into account these new requirements.

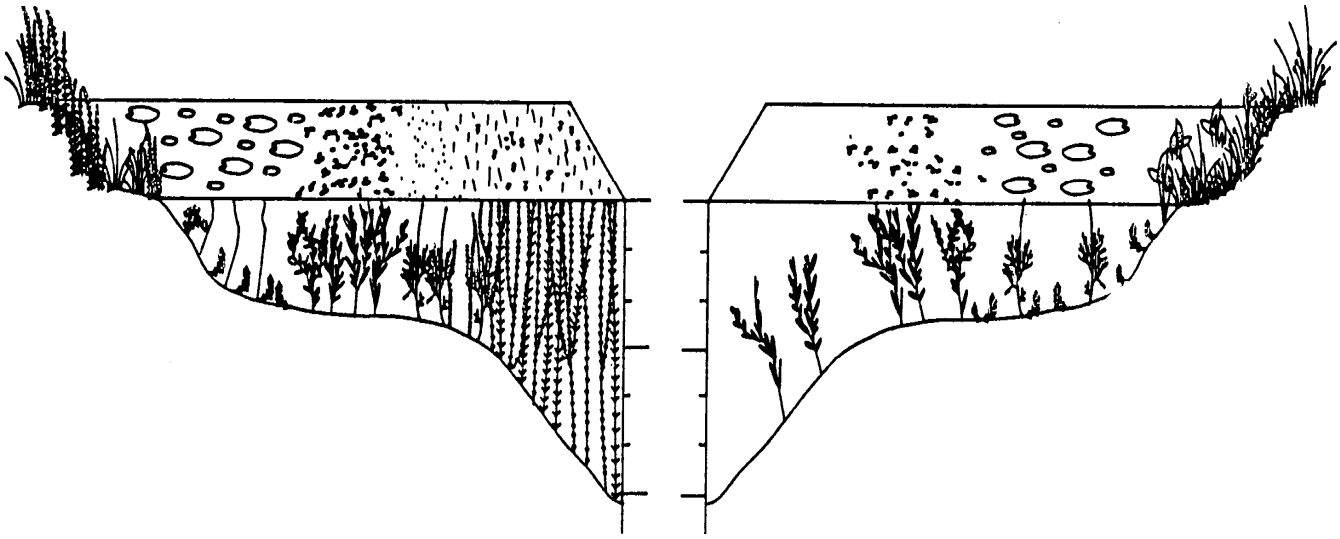
For full details of the rule see:

HTTP://WWW.EPA.STATE.IL.US/WATER/PERMITS/PESTICIDE/INDEX.HTML

Aquatic Herbicides-Floridone (Whitecap)

Whitecap is a broad spectrum herbicide used to reduce the populations of a variety of submerged, emergent, and floating plants, and shoreline plants. Whitecap is absorbed through the leaves and shoots and from the soil through the roots. Whitecap is a photosynthetic inhibitor, the application blocks the light reactions of photosynthesis where plants convert the energy from sunlight into food. Depending on conditions symptoms of the treatment can be observed 7-10 days after treatment. Leaves will appear pale green, yellow, or yellow-white in color. Marine Biochemists applied Whitecap in Grays Lake May 2011at 8ppm to reduce Curlyleaf Pondweed (exotic and invasive) and Eurasian Watermilfoil populations. For 2012, the aquatic plant population will be monitored and chemical applications will only be used if nuisance conditions arise.

A KEY TO A HEALTHY LAKE IS A WELL-BALANCED AQUATIC PLANT POPULATION



TIPS

1. De-icers melt snow and ice. They provide no traction on top of snow and ice.
2. Anti-icing prevents the bond from forming between pavement and ice.
3. De-icing works best if you plow/shovel before applying material.
4. Pick the right material for the pavement temperatures.
5. Sand only works on top of snow as traction. It provides no melting.
6. Anti-icing chemicals must be applied prior to snow fall.

CONDUCTIVITY AND CHLORIDES

Another parameter measured during 2011 that is important in comparing data from year to year is conductivity. Conductivity is the measure of different chemical ions in solution. As the concentration of these ions increases, conductivity increases. The conductivity of a lake is dependent on the lake and watershed geology, the size of the watershed flowing into the lake, the land uses within that watershed, and evaporation and bacterial activity. Conductivity has been shown to be highly correlated (in urban areas) with chloride ions found in road salt mixtures. Water bodies most subject to the impacts of road salts are streams, wetlands or lakes draining major roadways.

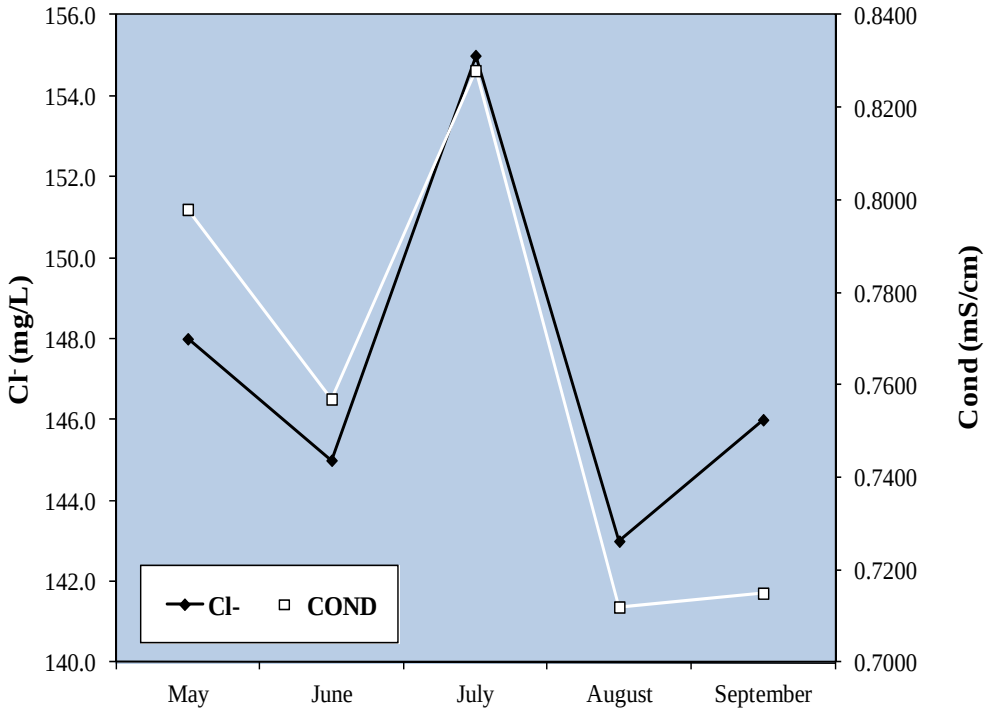
In 2011, Grays Lake average conductivity was 0.7620 mS/cm. This parameter was below the county median of 0.7821 mS/cm and 13% decrease from the 2002 value 0.8738 mS/cm. One of the most common dissolved solids is road salt used in winter road deicing. Most road salt is sodium chloride, calcium chloride, potassium chloride, magnesium chloride or ferrocyanide salts. Grays Lake 2011 average chloride concentration was 147 mg/L. Conductivity and Chloride concentrations were the only parameters in 2011 that exceeded county medians. These values are influenced by the winter road maintenance of Route 120. However a key factor in Grays Lake lower chloride concentrations is the lake's small watershed. The United States Environmental Protection Agency has determined that chloride concentrations higher than 230 mg/L can disrupt aquatic systems and prolonged exposure can harm 10% of aquatic species. Chlorides tend to accumulate within a watershed as these ions do not break down and are not utilized by plants or animals. High chloride concentrations may make it difficult for many of our native species to survive. However, many of our invasive species, such as Eurasian Watermilfoil, Cattail and Common Reed, are tolerant to high chloride concentrations.

THE CRITICAL VALUE FOR CHLORIDES IN AQUATIC SYSTEMS IS 230 MG/L.

230 mg/L = 1 teaspoon of salt added to 5 gallons of water.

DATE	COND	Cl^-
May	0.7980	148
June	0.7570	145
July	0.8280	155
August	0.7120	143
September	0.7150	145

MONTHLY CHLORIDE CONCENTRATIONS (CL-) AND CONDUCTIVIY FOR GRAYS LAKE, 2011.



Average Conductivity (mS/cm) and Chloride Concentrations in Grays Lake May through September, 2011.

Chlorides:

Village of Grays Lake Public Works:

Uses an environmentally friendly alternative to salt a liquid by-product consisting of salt brine mix (70%), beet juice (20%) (beet by-product) and calcium chloride (10%). This product will be mixed with the salt on the trucks to create an oatmeal like substance, and then applied to the streets.

This liquid has several advantages.

1. Beet juice adds moisture to help salt work better.
2. Lowers the working temperature of salt to around 20 degrees below zero.
3. Creates a composition that sticks to the pavement versus dry salt that can bounce off of the pavement.
4. Reduces salt use by 20%.
5. Environmentally friendly product.

Pavement temperature greatly influences the efficiency of salt to melt ice.

Pavement Temp. °F	One Pound of Salt (NaCl) melts	Melt Times
30°	46.3 lbs of ice	5 min.
25°	14.4 lbs of ice	10 min.
20°	8.6 lbs of ice	20 min
15°	6.3 lbs of ice	1 hour
10°	4.9 lbs of ice	**Ineffective**

NaCl (Road Salt) does not work on cold days, less than 15° F.

Practicing common sense and good hygiene will go a long way in preventing illness from swimming beaches.

- If you are sick, do NOT swim.
- Do NOT drink the water while swimming.
- Avoid swimming during heavy algae blooms.
- Keep geese off the beach.
- Children who are not toilet trained should wear tight-fitting rubber or plastic pants.
- Take a shower before entering the water, and have kids take frequent bathroom breaks.
- Wash your hands after exiting the lake.

Swimming Beach Monitoring

There is one state licensed swimming beach on Grays Lake at Jones Island. The beach was sampled for the bacteria Eschericia coli (E. coli) levels every two weeks, from mid May to the end of August, by the LCHD-ES in 2011. The water samples are tested for E. coli bacteria, which are found in the intestines of warm-blooded animals. While not all strains of E. coli are the same, certain strains can make humans sick if ingested in high enough concentrations. If water samples come back high for E. coli (>235 E. coli/100 ml), the management body for the bathing beach is notified and a sign is posted indicating the swim ban. E. coli is used as an indicator organism, meaning that high concentrations of E. coli might suggest the presence of harmful pathogens such as, Salmonella, Giardia, etc.

There are many ways E.coli can end up in a swimming beach. Heavy rainfall and strong wind associated with storms can cause the water to become cloudy with sediment from the lake bottom. Stormwater from rain can also wash in other particles from lawns, streets, and buildings. This sediment and stormwater may contain high concentrations of E. coli. Another source of E. coli contamination is the feces of gulls, geese, and other wildlife.

From 2003 through 2011 there were a total of 7 beach closures at Jones Island. Three closures occurred in 2010, two in 2007 and one each in 2005 and 2011.

Kerry McCaughey LCHD Lab staff uses black light technology to report E. coli

Swim Bans on Jones Island, Grays Lake from 2003 - 2011.

2011	2010	2009	2008	2007	2006	2005	2004	2003
1	3	0	0	2	0	1	0	0

AQUATIC PLANT POPULATION

SKUNKWEED, MUSKGRASS
CHARA SPP.
Is native and common in Lake County and Illinois.

Although these common lake inhabitants look similar to many underwater plants, there are actually ALGAE!

Plants growing in our lakes, ponds, and streams are called macrophytes. These aquatic plants appear in many shapes and sizes. Some have leaves that float on the water surface, while others grow completely underwater. In moderation, aquatic plants are aesthetically pleasing and desirable environmentally. Their presence is natural and normal in lakes.

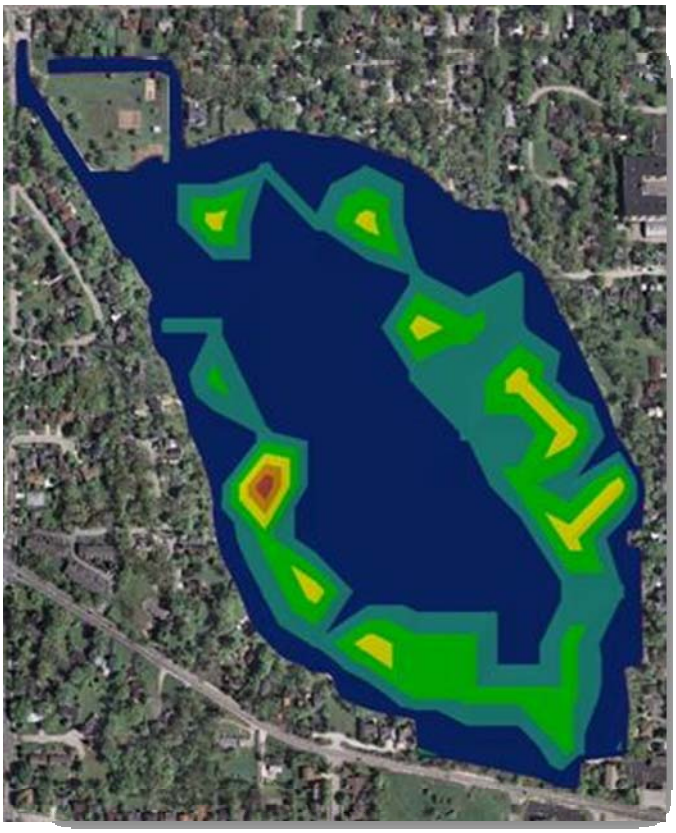
Aquatic plant sampling was conducted on Grays Lake in July 2011. There were 91 points generated based on a computer grid system with points 60 meters apart. Aquatic plants occurred at 43 of the sites (47% total lake coverage) that included 5 aquatic plant species, and one macro-algae, Chara. There was a decrease in species diversity from 2002 with the absence of four native species including Coontail, Watershield, Spiny Naiad, and Sago Pondweed from the aquatic plant community. Watershield is a desirable aquatic plant species there are only two lakes in the county were populations still exist. There was also significant reduction in the Sago Pondweed population; this is a contributing factor for the increase in total suspended solids. Another reduction from 2002 was the absence of two exotic aquatic plants: Curlyleaf Pondweed and Eurasian Watermilfoil. Removal of exotic species is essential in maintaining a balanced aquatic plant community; exotic species displace and outcompete natives. In 2011 the most common species was Chara at 25% of the sampled sites, while Waterstar Grass (21%) and Illinois Pondweed (11%) were the next most abundant species. The overall aquatic plant density has changed significantly since 2002.

In 2002 the most abundant species was Curlyleaf Pondweed found at 67% of the sites sampled in June. In 2011 the Chara population slightly decreased from the 2002, when the average lake occurrence was 30%. Chara often has a "grainy" or "crunchy" texture and is often called Skunkweed or Muskgrass because of it foul, musty almost garlic odor. Chara will not extend above the water's surface and provides protection for invertebrates and young fish, and is a food source for waterfowl.

The diversity and extent of plant populations can be influenced by a variety of factors. Water clarity and depth are the major limiting factors in determining the maximum depth at which aquatic plants can be found. When the light level in the water column falls below 1% of the surface light level, plants can no longer grow. The 1% light level in Grays Lake ranged from 14-16 ft. during the sampling season. Plants were found at a maximum depth of 5.7 feet. A healthy aquatic plant population is critical to good lake health. Aquatic vegetation provides important wildlife habitat and food sources. Additionally, aquatic plants provide many water quality benefits such as sediment stabilization and competition with algae for available resources.

AQUATIC PLANT DENSITY AT 91 SITES ON GRAYS LAKE JULY, 2011 , MAXIMUM DEPTH THAT PLANTS WERE FOUND WAS 5.7 FEET.

Rake Density (Coverage)	# of Sites	%
No plants	46	50.5
>0 to 10%	20	22.0
>10 to 40%	12	13.2
>40 to 60%	10	11.0
>60 to 90%	0	0.0
>90%	1	1.1
Total Sites with Plants	43	47.3
Total # of Sites	91	100.0



0%
1-10%
11-41%
41-60%
61-90%
91-100%

RAKE DENSITY ACROSS ALL SAMPLES SITES JULY, 2011

FLORISTIC QUALITY INDEX

Floristic quality index (FQI) is an assessment tool designed to evaluate the closeness 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. An FQI is calculated by multiplying the average of these numbers by the square root of the number of these plant species found in the lake. A high FQI number indicates that a large number of sensitive, high quality plant species present in the lake. Non-native species were also included in the FQI calculations for Lake County lakes. The median FQI for Lake County lakes from 2000-2011 was 14.3. Grays Lake had an FQI of 16.1 ranking 64th out of 158.

Lake County Average

FQI = 14.3

AQUATIC PLANTS: WHERE DO THEY GROW?

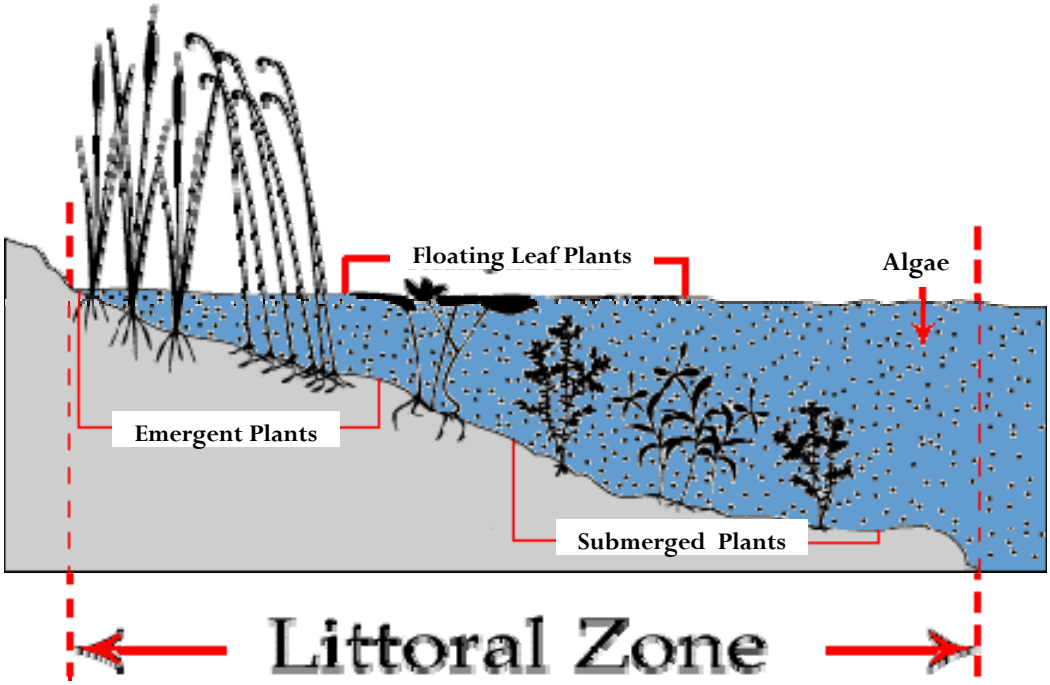
Littoral Zone– the area that aquatic plants grow in a lake.

Algae– have no true roots, stems, or leaves and range in size from tiny, one-celled organisms to large, multicelled plant-like organisms.

Submerged Plants– have stems and leaves that grow entirely underwater, although some may also have floating leaves.

Floating-leaf Plants– are often rooted in the lake bottom, but their leaves and flowers flat on the water surface.

Emergent Plants– are rooted in the lake bottom, but their leaves and stems extend out of the water.



Source: Minnesota Department of Natural Resources

IN MANY LAKES MACROPHYTES CONTRIBUTE TO THE AESTHETICALLY PLEASING APPEARANCE OF THE SETTING AND ARE ENJOYABLE IN THEIR OWN RIGHT. BUT EVEN MORE IMPORTANT, THEY ARE AN ESSENTIAL ELEMENT IN THE LIFE SYSTEMS OF MOST LAKES.

- Macrophyte leaves and stems provide a habitat or home for small attached plants and animals. Some are microscopic in size and some are larger. These attached organisms are valuable as food for animals higher in the food chain, such as fish and birds.
- Many types of small organisms live in the sediment. There are insects that spend the immature stages of life in the sediments, leaving when they become adults. Decomposing plant life provides part of the food supply for these sediment-dwelling organisms and the emerging insects, in turn, are food for fish.
- The submerged portions of macrophytes provide shelter and cover for small or young fish from larger fish that would feed on them.
- Types of plants that extend above the water can provide cover for waterfowl and their young, and many plants can serve directly as food for certain types of waterfowl.
- Aquatic plants provide many water quality benefits such as sediment stabilization and competition with algae for available nutrients.

Excerpt: Department of Ecology, Washington state

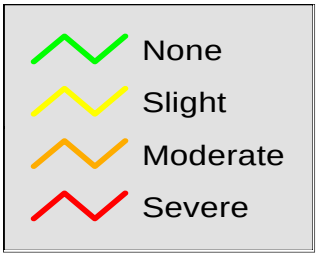
SHORELINE EROSION

EXAMPLE OF A PERMANENT STAFF

Erosion is the natural process of weathering and transport of solids (sediment, soil, rock and other particles) in the natural environment. It usually occurs due to transport by wind, water, or ice; by down-slope creep of soil and other material under the force of gravity; or by living organisms, such as burrowing animals. However this process has been increased dramatically by human land use, especially industrial agriculture, deforestation, and urban sprawl.

The shoreline was reassessed in 2011 for significant changes in erosion since 2002. Based on the 2011 assessment, there was a slight increase in shoreline erosion with approximately 19% of the shoreline having some degree of erosion. Overall, 81% of the shoreline had no erosion, 6% had slight erosion,6% had moderate, and 7% had severe erosion. In the past shoreline erosion on Grays Lake has been minimal; in 2002 none of the shoreline was exhibiting signs of severe erosion. The areas of moderate and severe erosion were mostly located on the southern end of the lake, along the shoreline near route 120. Moderate erosion was also occurring on the northern portion of the lake, on the east channel around Jones Island. These areas should be addressed soon; it is much easier and less costly to mitigate slightly eroding shorelines than those with more severe erosion. Very few homeowners have installed buffer strips of emergent vegetation along their shorelines. Buffers are excellent features for providing erosion control and wildlife habitat and for reducing sediment and nutrient load to the lake. It is recommended that these emergent types of buffer strips, as well as upland buffer strips, be installed along as many shorelines as possible. Upland buffers can even be installed above rip rap or seawalled shorelines to help filter non-point runoff before it enters the lake.

SHORELINE EROSION ON GRAYS LAKE, 2011



SHORELINE EROSION ON GRAYS LAKE, 2011 AND 2002

Erosion	2011%	2002%
Severe	7	0
Moderate	6	11
Slight	6	12
None	81	77
	100	100

2006 FISH SURVEY: ILLINOIS DIVISION OF NATURAL RESOURCES

In May of 2006 the Illinois Department of Natural Resources (IDNR) conducted a 60 minute daytime electrofishing survey, and overnight net sets including two trapnets and one 250' experimental mesh gill net. The survey was undertaken to assess the current fish population. The IDNR collected 783 fish representing 16 species. Two seine hauls collected another 27 fish (3 pumpkinseed, 19 bluegill, and 5 bluntnose minnows) mostly less than 2" long but important for indicating successful reproduction in the sunfish and as attempt at collecting any Endangered or Threatened fish that may be present but were missed other gear types and/or absent from previous surveys. No E and T fishes were collected this survey. The last reported Blackchin shiner was from 1989.

Bluegill was the most abundant fish species collected at 59% of the catch (462 individuals) ranging in length from 1.8 to 7.3 inches. The majority of these fish were found near rocky shorelines and downed trees. Data from the last two surveys suggests the bluegill population is stable with consistent replacement and reproduction. Fisheries Biologist Frank Jakubicek noted "It would have been nice to catch larger fish, so fishermen would have better bluegill fishing, but this should come as the population matures". This is most likely influenced by two scenarios: 1) that larger fish are being caught and harvested by fishermen or 2) the bluegill population is showing signs of stunting because too few people harvest fish and there isn't enough predation in the lake to control their prolific reproduction. Predation appears to be building, as indicated by the increased catch rates and size of the bass sample. This should break any cycle of stunting and if that's the reason for so few large size bluegill. If fishermen are harvesting fish then they must be happy catching the larger fish in lake and the trend will continue. Largemouth bass was the second most abundant fish species collected representing 18% of the catch. Largemouth bass were collected at a rate of 2.1 fish per minute. This rate is above the general management objective of 1.0 fish per minute. The IDNR used an index called the Proportional Stock Density (PSD) to evaluate adult abundance of Largemouth Bass in the sample. The index compares the number of fish longer than 12" (Quality size) to the number of bass longer than 8" (Stock size) and produces a value that can be used to compare samples from different years or different lakes. The PSD value basically produces a number that represents the percent of sexually mature fish in the sample to fish that survived their first winter (roughly 8" long) and are likely to survive to maturity. A balanced population has a PSD value between 40% and 60%. The PSD for Grays Lake was 61, this means that 61% of the sample was over 12 inches long. Indicating bass fishing can be really good for the next few years then older, larger fish will begin to die from either natural causes or hooking mortality (because fishing is so good) and a decline may be noticed. If reproduction is consistent and significant younger fish will be present to replace fish that have died. Ten northern pike and a tiger muskie were collected during the survey. Both fish are good predators for our area though successful tiger muskie fisheries are less common than northern pike fisheries. This is attributed to the aggressiveness of the tiger musky as they tend to have higher hook and handling mortality rates at smaller sizes. Another good predator for shallow warm water lakes represented in the sample was channel catfish. Like walleye these fish don't tend to successfully reproduce and need to be stocked to maintain their presence. Ten northern pike were collected, pike ranged in size from 16.7" to 26.7". Grayslake is stocked annually with northern pike fingerlings to maintain their presence and provide additional predatory pressure on forage species. They appear to be doing well and survive past legal size (24"). Black crappie were commonly collected in this survey (37 individuals), fish ranged from 4.9" to 12.5" indicating multiple year class's present and relatively consistent reproduction. Most of the crappie, were collected in trapnets and ranged 8" to 10" long. Fishermen will harvest crappies that are 9" long so there appears to be a nice, catch able size crappie population in the lake.

IDNR 2006 RECOMMENDATIONS

1. Inspect inlets and outlets and install weirs so fish movement is restricted
2. Promote natural shorelines, sheet-piling does not provide habitat for aquatic species
3. Conduct a standardized fish population survey in 2010
4. The State will provide 237 8 inch northern pike fingerlings annually (number may vary with production levels)
5. Maintain vegetation in the lake equivalent to at least 20% surface area, promoting native plant species
6. Check signs to verify current regulations are posted and located at each public access area
7. Include information on largemouth bass length and creel limits in newsletters sent to local lake users
8. Carp removal should be promoted to reduce their abundance and further expansion

Blue-green Algae the facts

Blue-green algae, also known as cyanobacteria, are not a true algae but are in fact closely related to bacteria. Similar to bacteria in structure, these simple organisms are credited for first using chlorophyll to make food from sunlight and for boosting oxygen in the Earth's early atmosphere. Today this organism forms an important role at the base of the food chain in our lakes; however they also pose a potential harmful health effect as they reach nuisance and noxious populations due to the high nutrient loads in our lakes.

Blue-green algae are naturally present in lakes and streams in low numbers. Blue-green algae can become abundant in warm, shallow, undisturbed surface water that receives ample sunlight. Under some conditions the algae becomes so abundant that they can form floating rafts or scums on the surface of the water. Both true algae and blue-green have similar growth requirements including sunlight, warmth, and nutrients (phosphorus and nitrogen). However, an oversupply of nutrients, especially phosphorus, will often result in excessive growth of blue-green algae because they possess certain adaptations that enable them to out compete true algae. One of these adaptations is positive buoyancy; blue-greens contain gas vesicles that allow them to rise to the lake surface during calm conditions to take advantage of sunlight. The second adaptation of some blue-green algae is the ability to fix nitrogen from the atmosphere when nitrogen supplies are low. This is especially useful in Lake County where 62% of the lakes have high levels of phosphorus. This means that in lakes with high phosphorus there is not enough nitrogen, thus the need for this adaptation.

In addition to having unique adaptations, some blue-green algae can also produce toxins, these are known collectively as cyanotoxins. Not all blue-green algae produce harmful conditions. The three primary genera in our area that are responsible are *Anabaena, Aphanizomenon, and Microcystis*.

Algal toxins could pose a health risk to people and animals when they are exposed to the toxins in large quantities. Health effects could occur when surface scums or water containing high levels of blue-green algal toxins are swallowed, come in contact with the skin or when airborne droplets containing toxins are inhaled while swimming, bathing, or showering. Lake County residents get their drinking water from Lake Michigan and ground water; both of which have minimal levels of nutrients and algae cells, unlike our inland lakes. Direct contact or breathing airborne droplets containing high levels of blue-green algal toxins during swimming or showering can cause irritation of the skin, eyes, nose and throat and inflammation in the respiratory tract. To protect yourself against exposure do not swim, boat, etc. in water that looks like "pea soup," green or blue paint, or that has a scum layer or puffy blobs floating on the surface.

There is no quick or easy way to control blue-green algae. Chemical treatments can control blue-green algae temporarily, but repeated applications are often necessary. It is best to treat blue-green algae when populations are low. Treating large populations can cause large amounts of toxins to be released at once. Reducing the amount of nutrients in the lake or pond will eventually reduce the frequency and intensity of the blooms. It is not understood when or why blue-green algae release toxins. If you suspect that you are experiencing symptoms related to exposure to blue-green algae such as stomach cramps, diarrhea, vomiting, headache, fever, muscle weakness, or difficulty breathing contact your doctor or the poison control center. For more information or to report a blue-green algae bloom, contact the Lake County Health Department Environmental Services (847) 377-8030.

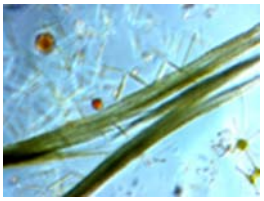
For more information on Blue-green algae.

http://dnr.wi.gov/lakes/bluegreenalgae/

http://www.health.state.ny.us/environmental/water/drinking/bluegreenalgae.pdf

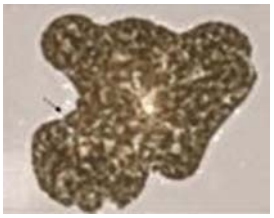
To report a blue-green algae bloom:

Lake County Health Department
Environmental Services
(8470 377-8030



Aphanizomenon ***Sp.***

Anabaena ***Sp.***



Microcystis ***Sp.***

BATHYMETRIC MAP

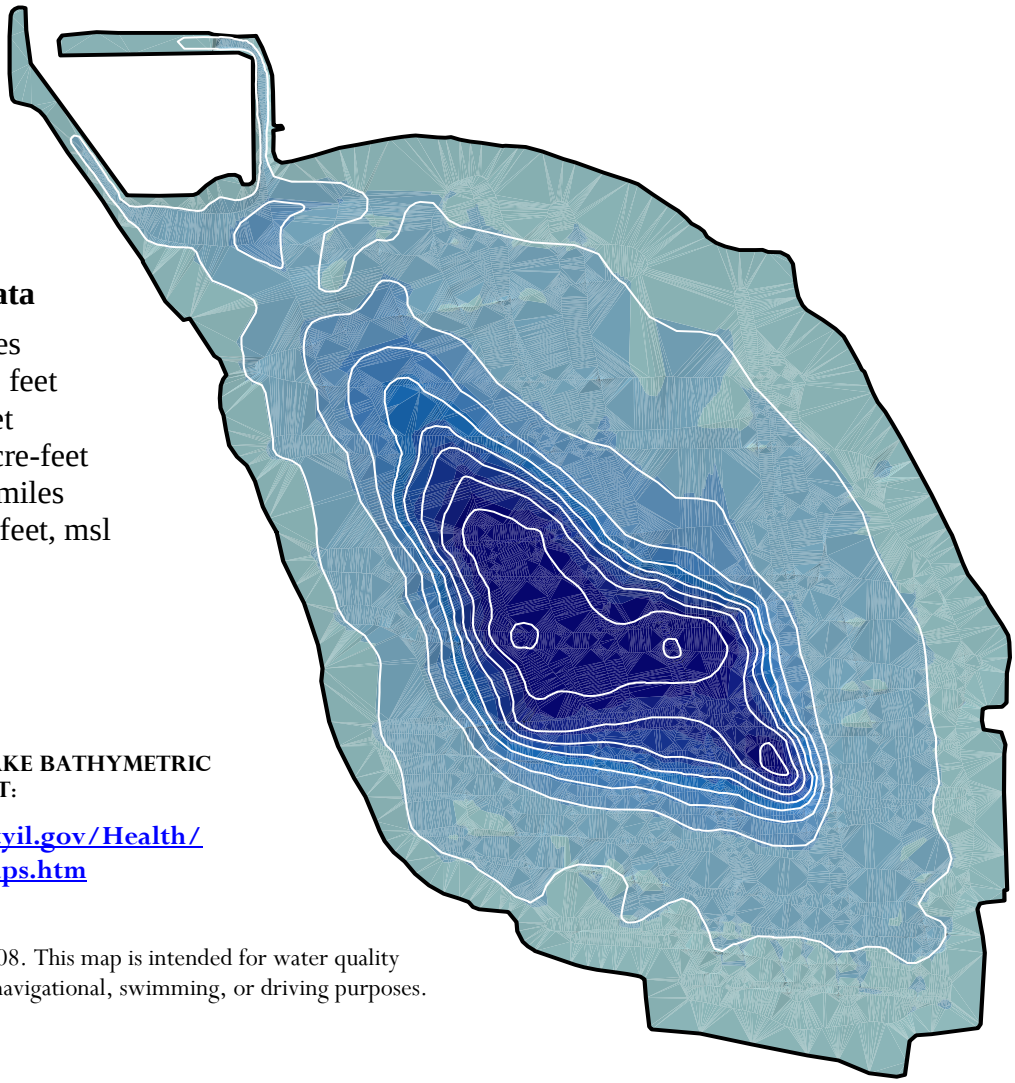
GRAYS LAKE MORPHOLOGICAL FEATURES

Elevation

- -1.914 - 0
- -3.828 - -1.914
- -5.741 - -3.828
- -7.655 - -5.741
- -9.569 - -7.655
- -11.483 - -9.569
- -13.397 - -11.483
- -15.311 - -13.397
- -17.224 - -15.311

A bathymetric (depth contour) map is an essential tool for effective lake management since it provides critical information about the physical features of the lake such as depth, surface area, and volume. This information is particularly important when intensive management techniques such as chemical treatments for plant or algae control, dredging, fish stocking or habitat enhancement are part of the lake's overall management plan.

In August 2008 the LCHD-ES collected the field data to replace the bathymetric map created by the LCHD-ES in 1989. Field data was collected using Biosonics equipment along with a Trimble GPS unit with sub-foot accuracy. Once collected, the data was analyzed and imported into ArcGis for further analysis. In ArcGis, the contours were drawn and the volume was calculated.



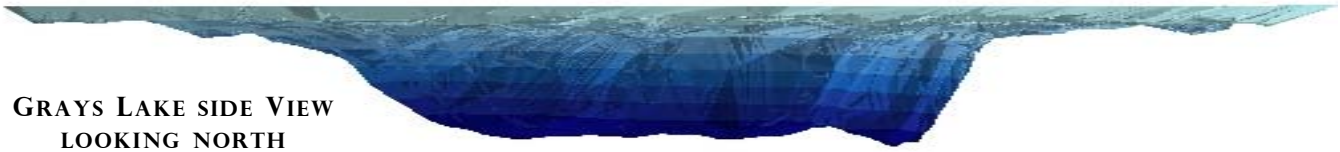
Morphometric Data

Surface Area: 79.87 acres
Maximum Depth: 17.29 feet
Average Depth: 4.31 feet
Lake Volume: 344.20 acre-feet
Shoreline Length: 2.00 miles
Lake Elevation: 787.74 feet, msl

FOR A COPY OF GRAYS LAKE BATHYMETRIC MAP VISIT:

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

Survey Data Collected August 2008. This map is intended for water quality reference only, not intended for navigational, swimming, or driving purposes.



GRAYS LAKE SIDE VIEW LOOKING NORTH

LakeCounty
Health Department and
Community Health Center

ENVIRONMENTAL SERVICES

Senior Biologist: Mike Adam
madam@lakecountyil.gov

Population Health Services
500 W. Winchester Road
Libertyville, Illinois 60048-1331

Phone: 847-377-8030
Fax: 847-984-5622

For more information visit us at:

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

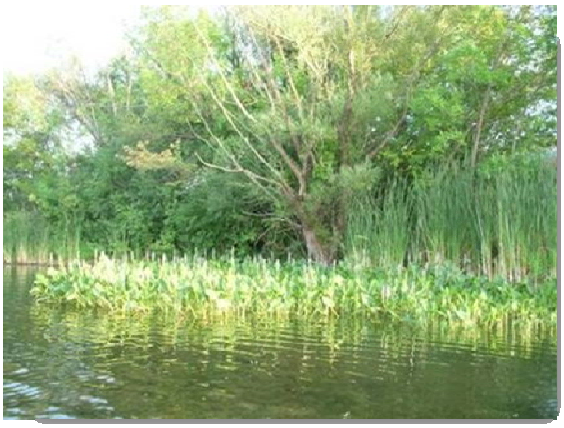
Services provided are either of a technical or educational nature and are provided by a professional staff of scientists to government agencies (county, township and municipal), lake property owners' associations and private individuals on all bodies of water within Lake County.

LAKE RECOMMENDATIONS

Grays Lake provides a variety recreational opportunity to its residents. Overall water quality decreased since 2002 specifically the substantial decrease in water clarity; however many water quality parameters remained above the county medians. The aquatic plant density has significantly expanded with the removal of exotic species but diversity remains low.

Grays Lake, lake's management is administered by The Grayslake Park District along with the Gray's Lake Lake Management Committee. To improve the overall quality of Grays Lake, the ES (Environmental Services) has the following recommendations:

- **Assess current fish population**
- **Assess need for herbicide applications annually, based on need for exotic species control**
- **Develop a long-term stocking program**
- **Continue participate Volunteer Lake Monitoring Program**
- **Mitigate shoreline exhibiting erosion**
- **Encourage homeowners to incorporate native plants in their landscaping through rain gardens or shoreline filter strips**
- **Install a staff gauge to monitor lake level fluctuations**
- **Use salt alternatives and proper application procedures.**
- **Remove all carp**



NATURALIZED SHORELINE ON GRAYS LAKE