LAKE COUNTY, ILLINOIS

2010 WHITE LAKE SUMMARY REPORT

PREPARED BY THE LAKE COUNTY HEALTH DEPARTMENT

POPULATON HELATH ENVIRONMENTAL SERVICES

Figure 1. Chinese Mantid (*Tenodera aridifolia*) on Grass leaved goldenrod (*Solidago graminifolia*) September

White Lake is a 42 acre impounded wetland situated in the recently constructed Clublands of Antioch subdivision (2003 to present). The builder of the subdivision filed bankruptcy in 2005 and at this time the expansion of home sites has slowed.

White Lake itself was constructed in 1964, historically it was stocked by the owner (IDOC, 1972).

Today the lake is used for non-motorized boating, fishing and aesthetics. In 2009 the Illinois Department of Natural Resources inspected the lake for fish species and found five species in the lake. The assessment of the lake was in response to a fish kill that occurred on White Lake as well as reduced success being reported by fishermen using the lake.

The water quality of White Lake is poor. It is listed as an impaired lake due to excess phosphorus and high pH by the Illinois Environmental Protection Agency.

Water clarity has declined since 2000 when the LCHD first monitored White Lake. The total suspended solids concentration increased during the same time period. This does not appear to be due to sediment but is more due to nutrients and algae blooms.

ENVIRONMENTAL SERVICES WATER QUALITY SPECIALISTS

Kelly Deem

kdeem@lakecountyil.gov

Kathy Paap

kpaap@lakecountyil.gov

SPECIAL POINTS OF INTEREST:

- *Nutrients*
- *Chlorides*
- *Dissolved Oxygen*
- *Algae*
- *Bathymetric Map*
- *Volunteer Lakes Monitoring Program*

INSIDE THIS ISSUE:

LAKE FACTS

HISTORICAL NAME:
HOMER WHITE LAKE

LOCATION:
T46N, R21E,
SECTIONS 22, 23

ELEVATION 782.0 MSL

WATERSHED
DES PLAINES RIVER

SUB WATERSHED
NORTH MILL CREEK

SURFACE AREA
41.6 ACRES

SHORELINE LENGTH
1.6 MILES

MAXIMUM DEPTH
9.9 FEET

AVERAGE DEPTH
4.48 FEET

LAKE VOLUME (EST.)
187.67 ACRE-FT

LAKE TYPE
IMPOUNDMENT

WATERSHED AREA
183.63 ACRES

MAJOR LANDUSES
AGRICULTURE, WATER

BOTTOM OWNERSHIP
PRIVATE

MANAGEMENT ENTITIES
PRIVATE

CURRENT USES
NON MOTORBOAT,
FISHING AND
AESTHETICS

HISTORICAL USES
FISHING

SUMMARY (CONTINUED)

Dissolved oxygen concentrations were low at times when aerators were not functioning well. Chloride concentrations increased between 2006 and 2010. This is likely due to increased transportation corridors being maintained by winter maintenance crews. Road salt contains 60% chloride and 40% sodium ions. It has been pinpointed as a major source of chlorides in our lakes.

WATERSHED

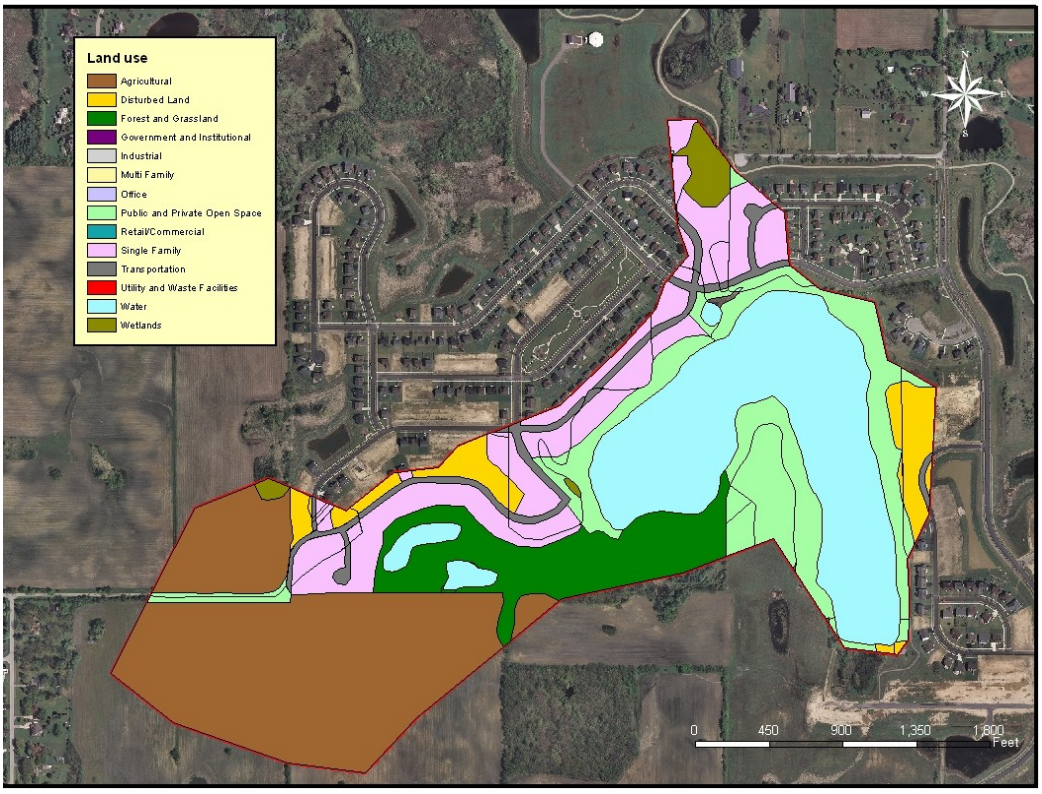


Figure 2. Approximate watershed and land use of White Lake, 2010.

White Lake whose surface area is 41.6 acres represents only about one quarter of its watershed which is estimated to be 183.63 acres.

The main land uses are Agriculture and Water representing 28.8 and 23.8 percent of the watershed, respectively (Figure 1). However, these two land use categories do not contribute the greatest percentage of runoff to White Lake. Single Family which represented only 16.3% of the watershed dominated the estimated total percent runoff entering White Lake at 40.3%. It was followed up by Public and Private Open Space and Transportation contributing 21.0% and 16.9% of the estimated runoff respectively. Since Single Family land use contributes such a good deal of runoff to a lake, it becomes even more important that homeowners are paying attention to management activities that they implement on their properties as they can have large impacts to the lake.

WATER CLARITY AND TOTAL SUSPENDED SOLIDS

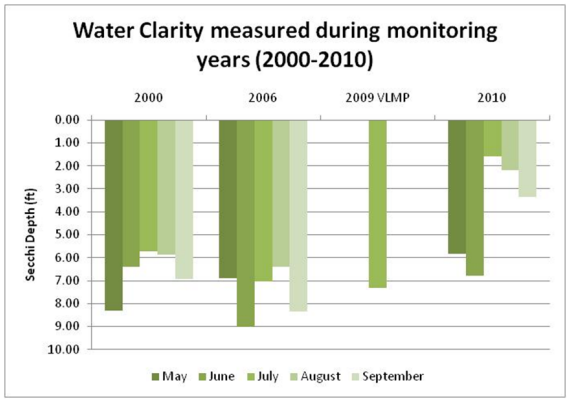


Figure 3. Water clarity of White Lake during 2000, 2006, 2009 (VLMP) and 2010.

The Secchi depth for White Lake ranged from 6.80 feet in June to a low of 1.60 feet in July. The median Secchi depth measured from 2000 to 2010 from 758 samples taken in lakes in the county was 2.95 feet. The median Secchi depth for White Lake was 3.96 feet. The average water clarity was better than what is found in lakes in the county, however, in July and August of 2010, measures fell below the county median. The cause of this is likely that the aerators in the lake were not functioning well. It was noted during our July visit that the lake had turned green (algae) within a weeks time.

Figure 4. Example of impairment of Secchi depth by algae.

Total suspended solids (TSS), a culmination of total volatile and non-volatile solids inversely correlated to water clarity, showed significant increases in July and August at 17.0 mg/L and 8.0 mg/L, respectively. The average TSS concentration in White Lake in 2010 was 7.3 mg/L, which is below the county median of 8.1 mg/L. Both water clarity and TSS have declined over time and are poorer than measurements in 2000 and 2006 for White Lake. This can be attributed to sediments entering the lake from erosion, storm events or algal blooms.

Figure 2 depicts the changes in water clarity over time. The June, 2009 value is the only sample date recorded during the 2009 monitoring year. It is recommended that White Lake rejoin the VLMP program, it will help to fill in gaps of time where LCHD-ES is not monitoring the lake.

An algal bloom occurring in the lake during July is likely the cause for the abrupt diminished water clarity occurring in 2010. It should be noted, however that there was a slight increase in the amount of non-volatile suspended solids (sediments) measured in White lake during July, we also had an large rain event (2.98 inches) occurring during our July water quality sampling event.

In September, while looking at shoreline vegetation, it was noted that runoff was entering the lake from the western edge and that the source of the water was coming from the direction of the detention pond to the immediate west from White Lake. It appears from the 2008 aerial photo that there may be some underlying problems that need to be further investigated in order to improve water quality conditions in White Lake. In this area there were large gully formation towards White Lake. Phosphorus binds to eroding sediments and this can further be a source of nutrients entering into the lake.

NUTRIENTS

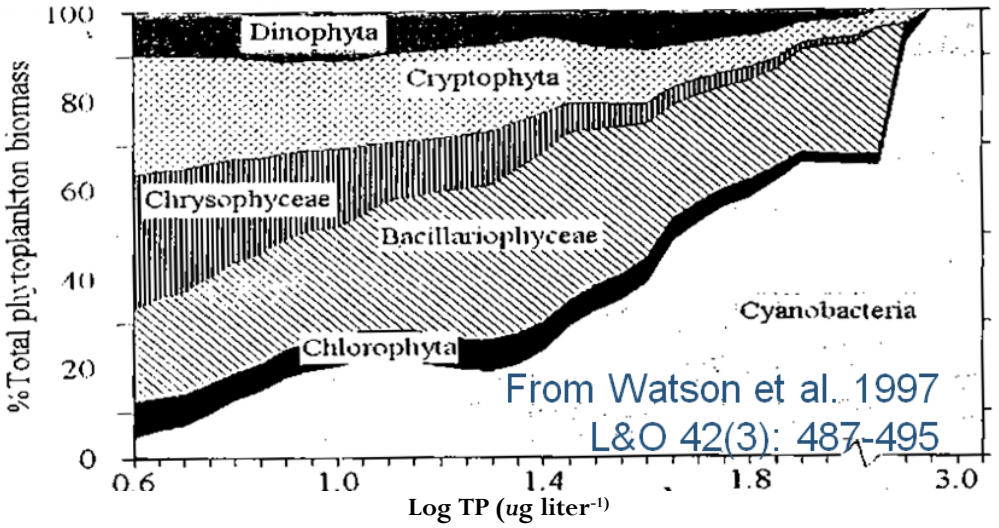


Figure 5. Graphic demonstrating shift from algae to cyanobacteria with increasing phosphorus concentration.

Figure 5. Planktothrix, a filamentous cyanobacteria collected in September, 2010.

White Lake is listed as an impaired water by the IEPA for total phosphorus (TP). Phosphorus is normally a limiting nutrient in our landscapes, however, there is a trend of increasing phosphorus levels to the point of impairment on many of the lakes in Lake County. The IEPA determines whether a lake is impaired for phosphorus based on a critical value of 0.05 mg/L occurring at least once during the monitoring season for lakes at least 20 acres in surface area. White Lake exceeded this value from June through September with values ranging from 0.062 mg/L which occurred in September to a high of 0.133 mg/L in July. It is ranked 95th out of 165 lakes measured between 2000 through 2010.

White Lake average TP calculated at 0.086 mg/L was slightly worse than the county median of 0.065 mg/L for 812 samples collected during the same period 2000 to 2010.

Another measure that supports the phosphorus impairment is the TN:TP ratio. A ratio of 10 or below indicates that nitrogen is limiting in that system, a ratio of 15 or greater indicates phosphorus is limiting, and anything in between indicates that both nutrients are limiting. If there is additional inputs of any of the limiting nutrient into the lake excessive plant or algal growth are expected.

White Lake has a TN:TP ratio of 17 indicating that phosphorus was limiting, as there were abundant plant and algae populations present during 2010.

TP concentrations can determine what algae families are present, in general lower TP supports a more diverse algal population, as TP increases there is a shift to cyanobacteria. Some species of cyanobacteria (blue-green algae) have been linked to adverse health issues in humans.

Although White Lake is not listed as impaired for nitrogen, increases in nitrogen have been measured over the past decade. Between nitrogen and phosphorus, nitrogen is the most difficult to manage because of the variety of atmospheric and anthropogenic inputs.

Phosphorus is much easier to manage by limiting the amount of phosphorus that is input into the watershed by using practices such as phosphorus free fertilizers, although recently constructed homes may have initially needed additional phosphorus to establish lawn, likely no

NUTRIENTS (CONTINUED)

longer need a fertilizer with phosphorus. In Illinois a recent Act passed requires commercial applicators to perform a soil sample to determine if there is a phosphorus deficiency in order for it to be legal to apply fertilizer containing phosphorus. This should strengthen the already in place Village of Antioch ordinance banning the use of fertilizers containing phosphorus.

ALGAE

In 2010, White Lake was sampled for it's planktonic population. The results of the plankton tow (Figure 6) showed the copepod, *Macrocyclops albidus* and *Ceratium* as the dominant species. *Anabaena* spp. was also somewhat common, and *Fragilaria* spp. was detected. *Macrocyclops albidus* feeds on mosquito larvae and are food for some fish species such as largemouth bass, darters, shiners etc.

In September during a site visit, a grab sample collected near the outlet of White Lake of filamentous algae, turned out to be *Planktothrix* (Figure 5), a cyanobacteria. It is unclear if this particular species found in White Lake carries toxic compounds.

Given the numbers of microinvertebrates found in the plankton tow sample in July it is likely that if the dissolved oxygen (DO) in the lake could be stabilized that a fish population could be established. However, dissolved in August of 2010 White Lake had DO concentrations at 3.9 mg/L at a three foot depth, so conditions would have to improve to accommodate a healthy fishery.

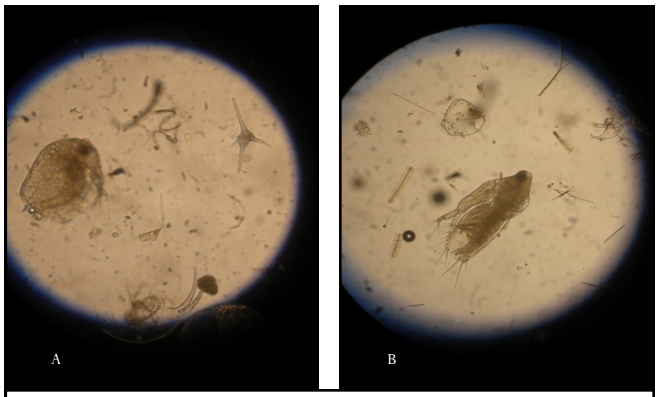


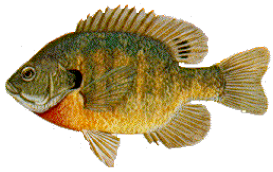
Figure 6. A.) Daphnia, Anabaena and Ceratium spp. Ceratium was the dominant algae and B.) Macrocyclops albidiens, the dominant microinvertebrate all observed in plankton tow sample collected in July, 2010.

DISSOLVED OXYGEN

White Lake is a shallow well mixed lake. White Lake became thermally stratified in July, at that time it was noted that the aerators were not fully functional. Simultaneously, an algal bloom occurred causing a spike in DO at the surface in July. Due to stratification, DO concentrations declined to <0.1 mg/L near the bottom. By August, there was less algae and the DO concentration ranged from 5.8 mg/L at the surface and became anoxic (<1.0 mg/L DO) at between five and six feet depth.

White Lake has been managed in past years for fish. If it is a management goal to continue to maintain a healthy fishery on White Lake, it is important that the aerators be maintained to prevent the DO from dipping to 5.0 mg/L or lower as fish become stressed and can lead to fish kills occurring on the lake. As recently as 2009 White Lake reported a fish kill which affected approximately 200 fish, it is not clear whether the kill was related to low DO concentrations or not. Excessive aquatic plant densities can also cause fluctuations in DO. A balanced aquatic plant management plan may also need to be considered if a healthy fishery is desired.

FISH



In 2009 , the Illinois Department of Natural Resources conducted a survey of White Lake. Six species were found inhabiting the lake. These were Bluegill, Black Crappie, Hybrid Bluegill, Sunfish and Pumpkinseed. There were no predator species sampled or observed. on the day sampled. As eluded to previously it is recommended ensuring that the aerators installed in the lake are functioning properly prior to stocking predator species in to the lake due to the DO dropping low enough to cause stress and even a fish kill at times during the summer months.

CHLORIDES

Chlorides are not currently a threat to White Lake. However, average chloride levels found in White Lake increased from 2006 to 2010 from 32 mg/L to 37 mg/L. The seasonal average chloride concentration of 37 mg/L in 2010 for White Lake is well below the county median of 142 mg/L from a sample of 552 lakes measured between 2000 and 2010. Although, increased chloride levels in White Lake is not a concern at this time, concentrations have increased slightly from 2006 to 2010, and could pose a threat as the subdivision is completed.

ONE TEASPOON OF SALT CAN CONTAMINATE FIVE GALLONS OF WATER

This is expected as the transportation corridors of White Lakes watershed have increased. Road salt which is comprised of 60% chloride and 40% sodium ions, has been determined to be a large contributor to chloride in lakes not only in Lake County but in many urbanized areas throughout the snowbelt.

Recently many public and private firms have been trained on methods to reduce the amount of road salt being applied while providing safe passageways.

The United States Environmental Protection Agency (USEPA, 1988) determined that 230 mg/L is the critical chloride concentration where impacts begin to occur. However, other studies have found that chloride levels as low as 12 mg/L have impacted certain algal species, changing the composition of the algal community. Salt water which is denser than fresh water sinks to the bottom of a lake and does not mix, when this happens it can have a profound affect on an entire lake ecosystem.

SUBMERSED AQUATIC VEGETATION

Plants Common name	Average Cover	Frequency
Coontail	46.56	93.75
Flatstem Pondweed	9.67	47.92
Elodea	8.28	25.00
Slender naiad	7.14	20.83
Sago Pondweed	2.20	16.67
Chara	4.19	8.33
Curlyleaf Pondweed	0.10	2.08
Duckweed	0.10	2.08
Vallisneria	0.10	2.08
Watermeal	0.10	2.08
Total Average Cover	78.45	

Table 1. List of plant species found in 2010 and their abundance

SUBMERSED AQUATIC VEGETATION (CONTINUED)

The submerged vegetation was assessed in early July, 2010. Nine aquatic species were found plus Chara, which is a macroalgae. There was only one non-native species, Curlyleaf Pondweed, detected at the time of survey.

The total average cover of the lake was estimated at 78.45%. Coontail was the dominant species found at 94 percent of the sites. Flatstem Pondweed, Elodea, Slender Naiad, and Sago Pondweed as well as Chara appear to be balanced rather evenly throughout the lake. The Floristic Quality Index (FQI) of White Lake is 16.0 and ranked 61st of 154 lakes measured for floristic quality between 2000 and 2010. White Lake was slightly above the median FQI of 14.3 for that same set of lakes.

The abundance of plants measured in the lake is excessive in terms of managing the lake for a sport fishery. LCHD-ES recommends plant densities at approximately 30 - 40% when managing a lake to support a sport fishery. Careful consideration of a plant management plan should be implemented to reduce vegetation. LCHD can make recommendations on options to accomplish this if it is the direction of the lake management group.

SHORELINE EROSION

During the evaluation of White Lake's shoreline only 6% of the shoreline exhibited any degree of erosion. It was documented that 5% had slight erosion occurring and another 1% was an area of moderate erosion. These areas are depicted on the figure to the right.

However, upon evaluating shoreline vegetation it was noted that the west end of White Lake had erosion occurring along the slope leading to the lake, and the 2008 aerial shows some sediment entering the lake. This should be evaluated further and corrective measures implemented if the area has not already been stabilized.

Correcting erosion problems when they are slight is easier to accomplish then when they become bigger issues. The area of moderate erosion should be remediated as soon as possible. White Lake does not have a large sediment problem, however, it does have an impairment for TP and phosphorus does bind to sediments.

The LCHD-ES recommends stabilizing shorelines by implementing shoreline plantings with native species. Native plants have extensive root systems that can efficiently anchor soils.

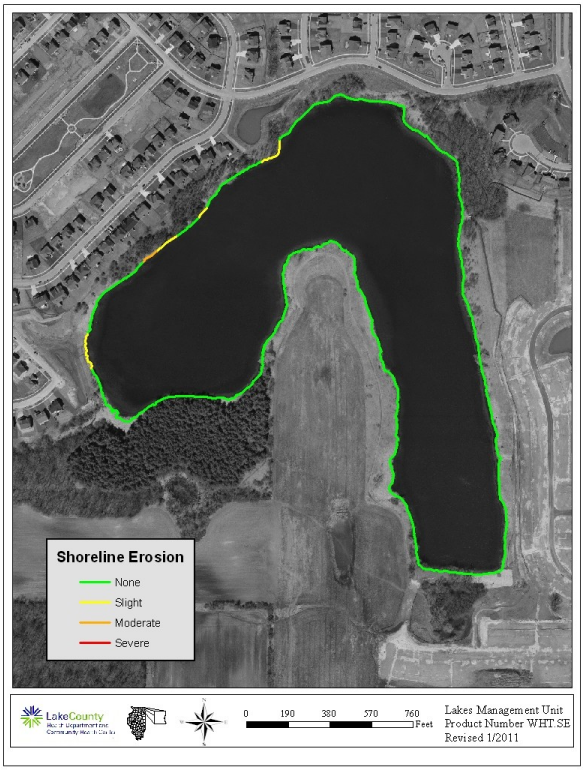


Figure 7. Shoreline erosion found on White Lake, 2010.

SHORELINE VEGETATION

Figure 8. Cattail and Reed Canary grass dominated shoreline.

In September, 2010 the shoreline and wetland vegetation surrounding the lake was assessed. There were over 64 species during meander searches conducted along the lakeshore areas. Reed canary grass (*Phalaris arundinacea*), a non native invasive grass dominated the undeveloped shoreline areas. Cattail, also an invasive, dominated the wetland area on the north side adjacent to the lake. Oriental Bittersweet, is a new invader to the area, and was detected in the woodlands along the south shoreline. A FQI was calculated for all shoreline vegetation identified to species, the FQI was 17.0, This value is similar to the FQI calculated for the submersed vegetation on White Lake of 16.0. It should be noted that the FQI for the submersed vegetation was representative of nine species versus the sixty-four species generating the shoreline and wetland areas. The species within the lake were mainly natives with one non-native being present, whereas the shoreline had many non-native species present.

LCHD-ES recommends that when possible the homeowners association or lake management association manage invasive species and replace with native vegetation and are willing to provide options to the association.

WILDLIFE NOTED

Waterfowl such as Canada goose and mallards were noted on the lake. Great blue herons, egrets and cormorants were found fishing in the lake and kingfishers were found perched along the shoreline hunting for their next meal. In the spring, blue gill nests were noted at the boat launch. Over the monitoring season, there were green and bull frogs observed and butterflies were seen flittering across the lake. Much of the shoreline area is left "natural" and even in areas of development the lake has a large area of buffer. Even the Chinese Mantid shown on the report cover was found perched in a goldenrod awaiting prey.

BATHYMETRIC MAP

In 2010 a bathymetric map was generated utilizing gps data collected during the July plant sampling visit. Bathymetric maps and their morphometric tables are useful tools helping with management decisions in regard to fish, plant management and even electrofishing in order to estimate species and species abundance in a lake as what was completed by the IDNR on White Lake back in 2009. Anglers also can use the maps when determining where on a lake they may want to fish on any given day.

For a larger version of the bathymetric map, you can visit our website at http://www.lakecountyil.gov/Health/want/LakeMaps.htm

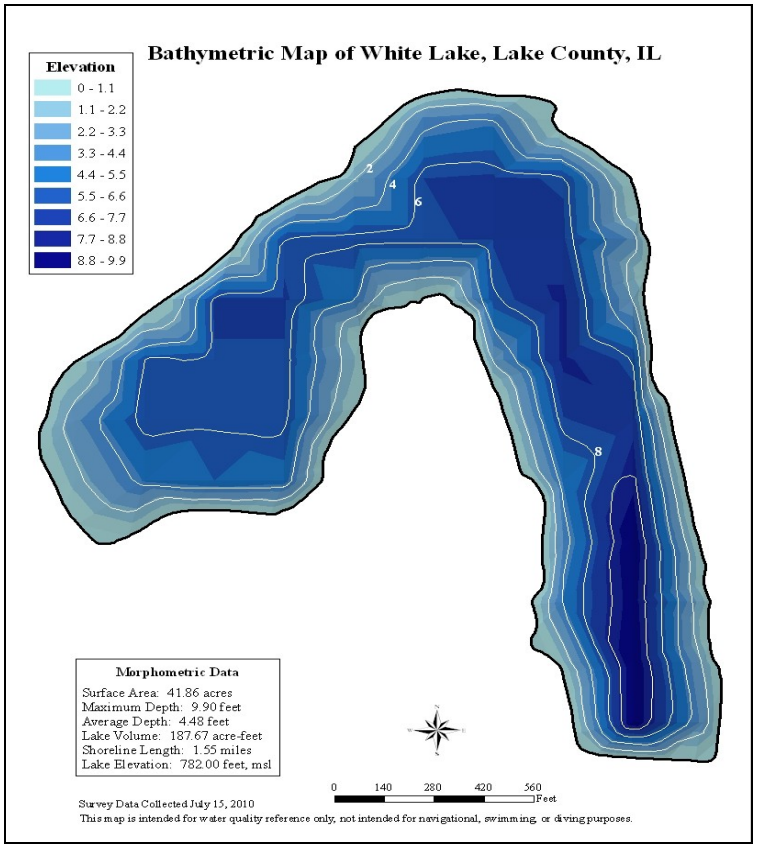


Figure 9. Bathymetric Map (estimated) of White Lake, 2010

Table 2. Morphometric Table (Estimated) for White Lake, 2010

Morphometric Features of White Lake ~
Data From the July 2010 Aquatic Plant Survey, LCHD Environmental Services

Contour (feet)	Area enclosed (acres)	Percent of total acres	Volume (acre-feet)	Depth zone (feet)	Area (acres)	Percent (depth zone to total acres)	Percent (acre-feet to total volume)
0	41.86	100%	39.88	0 - 1	3.92	9.4%	21.3%
1	37.94	91%	35.88	1 - 2	4.08	9.8%	19.1%
2	33.86	81%	31.71	2 - 3	4.24	10.1%	16.9%
3	29.62	71%	27.36	3 - 4	4.45	10.6%	14.6%
4	25.16	60%	22.69	4 - 5	4.87	11.6%	12.1%
5	20.30	48%	16.91	5 - 6	6.56	15.7%	9.0%
6	13.73	33%	8.70	6 - 7	9.23	22.0%	4.6%
7	4.51	11%	2.97	7 - 8	2.85	6.8%	1.6%
8	1.66	4%	1.10	8 - 9	1.04	2.5%	0.6%
9	0.62	1.5%	0.47	9+	0.62	1.5%	0.3%
			187.67		41.86	100%	100%

Maximum Depth of Lake: 9.90 feet
Average Depth of Lake: 4.48 feet
Volume of Lake: 187.67 acre-feet
Area of Lake: 41.86 acres
Shoreline Length: 1.55 miles
Water Elevation at 782.00 feet above mean sea level

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.

Recommendations

LCHD-ES recommends that :

- Use phosphorus free fertilizer unless a soil test indicates otherwise.
- Areas that show signs of shoreline erosion be remediated to secure sediments and prevent them entering the lake. The western shoreline should be evaluated and the land sloping towards the lake should be stabilized.
- The homeowners association or whomever is responsible for maintaining the aerators make sure that they are functioning especially during the growing season May through September.
- When homeowners apply deicing material that they shovel snow from their walks and driveways before applying the material as deicers are not meant to melt snow but to prevent or remove ice from passageways. Always follow manufacturer's instructions when applying any materials, deicers or fertilizers.
- Getting involved with the Volunteer Lakes Monitoring Program, for more information contact us at (847) 377-8030.