LAKE COUNTY, ILLINOIS

2011 LAKE MILTMORE SUMMARY REPORT

PREPARED BY THE

LAKE COUNTY HEALTH DEPARTMENT

Population Health Environmental Services

Culvert draining Lake Miltmore to Fourth Lake, 2011.

Lake Miltmore is an approximately 84.4 acre glacial lake located in Lake Villa Township. The land around the lake was settled in the 1830's. Summer cottages began to colonize the landscape surrounding the lake after construction of the Wisconsin Central Railway in 1877. Development of the area began in earnest in the 1920's and continued throughout the 40's. In 1929, the Venetian Village Homeowners Association (VVHA) formed and remains active today. In 1980, the Lake Miltmore Property Owner's Association (LMPOA) formed. The LMPOA, VVHA and the Lake Villa Township all participate in the decision making process regarding management of the lake.

Historically, Lake Miltmore has had many swim bans, this was mainly due to failed septic systems from residences along Lake Miltmore. All known septic system failures occurring on lakefront properties have since been repaired. In 2011, there was only one swim ban, this occurred after a rain event and is assumed to be related to that event.

The watershed of Lake Miltmore is primarily residential. The water quality of the lake has changed very little over the past sixteen years based upon monitoring data dating back to 1995. Variations in water quality seem to be driven by wet and dry years. Conductivity is the only parameter to have consistently increased over the time period 1995 - 2011. Lake Miltmore discharges directly to Fourth Lake via a culvert.

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SPECIAL POINTS OF INTEREST:

- *Excellent Water Quality*
- *Chlorides*
- *Exotic Plant Management*

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WATERSHED

A watershed is normally defined as a high ridge in which all waters drain to either a lake, stream, or an ocean. Lake Miltmore is a glacial lake geographically located at the top of the Mill Creek watershed (a sub-watershed of the Des Plaines River). The 224.86 acre watershed of Lake Miltmore is dominated by the single family land use type. As shown below, 48.4% of the total estimated runoff comes from single family, which means that it is very important that homeowners within the watershed consider how they manage their properties, especially since the retention time is 5.17 years. Transportation only represented 14.1% of the land use, however it was estimated that it contributed almost as much runoff to the lake (48%) as the single family land use type. It is important to note that sometimes minor land uses can have profound water quality consequences due to the amount of runoff that it can produce. Practices such as lawn fertilization with phosphorus free fertilizers and proper application of chemical deicers all can help to maintain Lake Miltmore in its current condition.

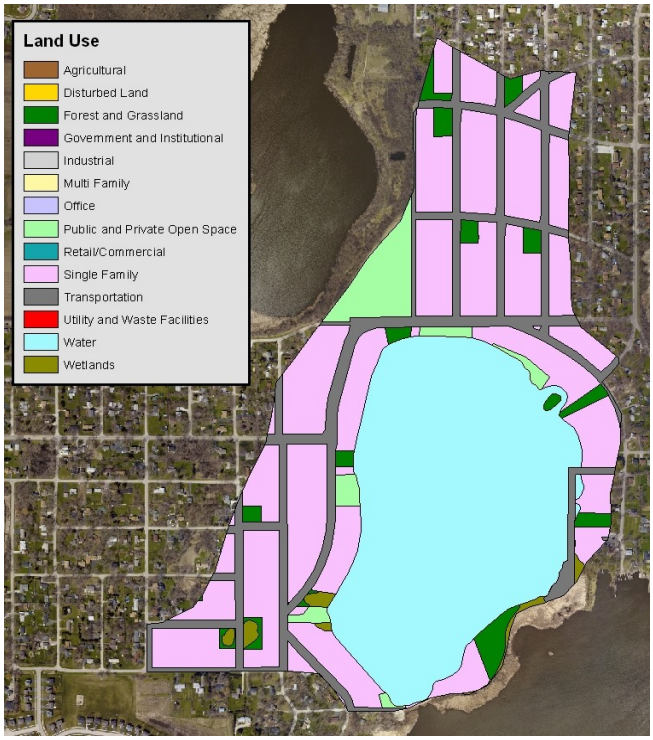


Figure 1. Estimated land use within the Lake Miltmore watershed, 2011.

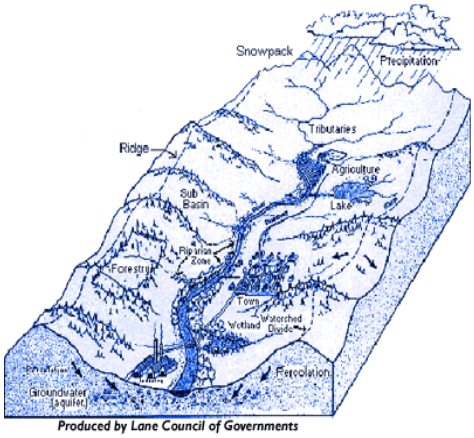


Figure 2. Watershed illustrated.

"that area of land, a bounded hydrologic system, within which all living things are inextricably linked by their common water course and where, as humans settled, simple logic demanded that they become part of a community."Wesley Powell, Scientist/ Geographer

Table 1. Land Use and breakdown of total Estimated Runoff for Lake Miltmore watershed, 2011.

Land Use	Acreage	Runoff Coeff.	Estimated Runoff, acft.	% Total of Estimated Runoff
Forest and Grassland	8.03	0.05	1.1	0.7
Public and Private Open Space	9.84	0.15	4.1	2.6
Single Family	90.60	0.30	74.7	48.4
Transportation	31.71	0.85	74.1	48.0
Water	82.71	0.00	0.0	0.0
Wetlands	1.97	0.05	0.3	0.2
TOTAL	**224.86**		**154.3**	**100.0**

Lake volume	**798.10**	**acre-feet**
Retention Time (years)= lake volume/runoff	**5.17**	**Years**
	1887.83	**Days**

WATER CLARITY

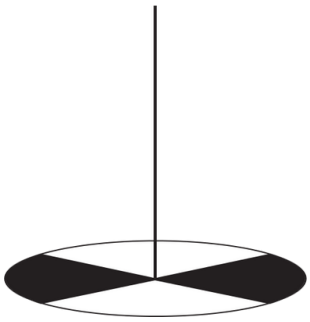
Water clarity is measured by a Secchi disk, and is often an indicator of a lakes overall water quality. It is affected by water color, which is a reflection of the amount of total suspended solids and dissolved organics in a lake. Generally, the lower the water clarity or Secchi depth, the poorer the water quality.

The water clarity of Lake Miltmore was excellent, with an average Secchi depth of 7.35 feet. This is well above the median Secchi depth recorded for lakes within the county between 2000 - 2011 of 2.95 feet. It ranked 25th out of 157 lakes in the county measured for Secchi depth during the same time period.

Since 2003, the water clarity in Lake Miltmore has improved by 51%. Back then the average Secchi depth was 4.86 feet (Appendix A, Table 1). The improvement in clarity is a result of decreases in water quality parameters such as total suspended solids which adversely affect water clarity

In 2011, the water clarity decreased within Lake Miltmore during July and August as a result of rain events that occurred within 48 hours of sampling, increasing the amount of suspended solids (algae or sediment) in the water column.

Aquatic vegetation is important if you are interested in maintaining good water clarity. Lakes with balanced plant populations will always have better water clarity than lakes with little or no plants. Therefore it is important to have a good plant management plan in place to provide a balanced aquatic plant community.



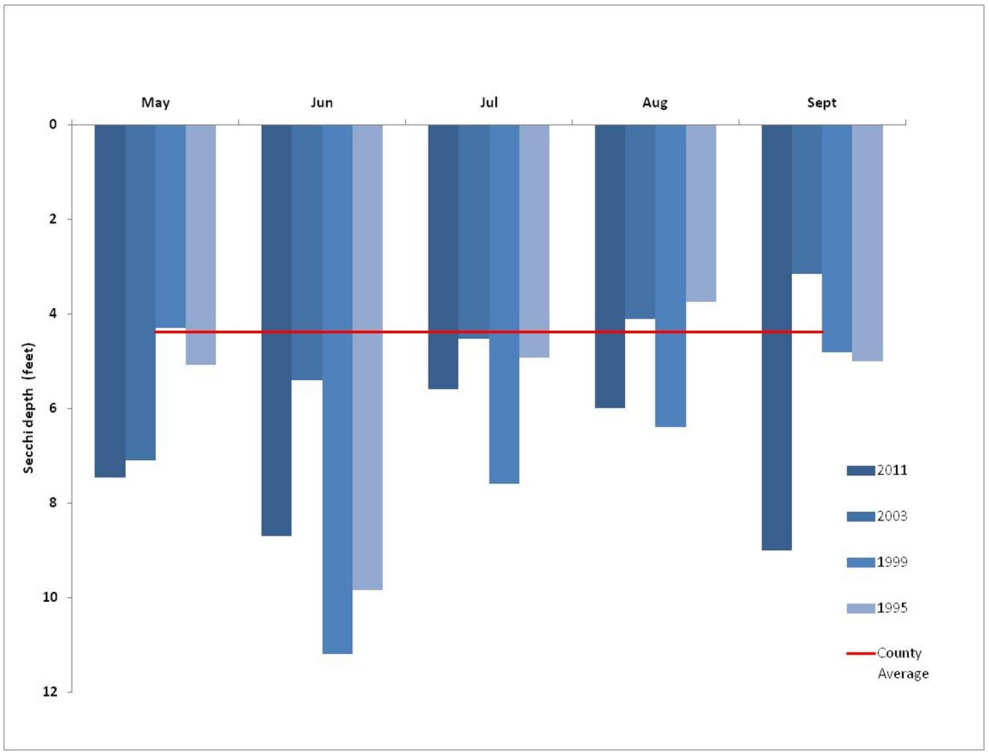


Figure 3. Secchi depths in Lake Miltmore, 1995, 1999, 2000 and 2011.

Total Suspended Solids (TSS)

Total Suspended Solids (TSS) are made up of total volatile solids (TVS), which are organic in nature and (NVSS) non-volatile suspended solids which are sediments; both affect water clarity by reducing light penetration into the photic zone. This results in reduced plant growth and competition for nutrients resulting in increased algal blooms.

Lake Miltmore had low TSS concentrations in 2011. The average epilimnetic TSS concentration in Lake Miltmore was 3.6 mg/L which was much lower than the county median TSS concentration of 8.6 mg/L. TSS concentrations have remained relatively constant in Lake Miltmore throughout all the years it was monitored by LCHD-ES. Average TSS decreased 24% from 2003, and coincides with the increased water clarity found in 2011. Much of the reduction in TSS appears to be due to a 16% decrease in average total volatile solids (TVS) from those measured in 2003. In 2011, the average TVS concentration in Lake Miltmore was 111 mg/L, this was below the county median of 122 mg/L for lakes measured between 2000 and 2011. Non-volatile suspended solids (NVSS) are made up of sediments either from the lake bottom or from those entering the lake due to eroding shorelines or other sources within the watershed. Lake Miltmore had a median NVSS concentration of 1.27 mg/L, therefore they are considered a minor component of TSS.

Nutrients

Phosphorus and nitrogen are essential, naturally occurring nutrients needed for plant growth, however when in excess they can impair water quality. High phosphorus concentrations can lead to nuisance plant and algal growth, both which can alter recreational uses.

Unlike many of the lakes within Lake County that are impaired for total phosphorus (TP) under the Illinois Environmental Protection Agency's (IEPA) standard of >0.05 mg/L, Lake Miltmore has maintained very low TP concentrations over time which is exceptional for a lake situated within a well developed watershed. In 2011, the average epilimnetic TP concentration measured in Lake Miltmore was 0.021 mg/L with concentrations ranging from 0.017 mg/L to 0.027 mg/L (Figure 4). It ranked 16th out of 171 lakes in the county monitored for TSIp concentrations between 2000-2011. The median TP concentration in the county for lakes measured during this time period was 0.066 mg/L.

A ratio between total nitrogen and total phosphorus (TN:TP) is used to determine if either nutrient is limiting in a lake. Ratios of less than 10:1 indicate a system that is limited by nitrogen, while lakes with ratios greater than 20:1 are limited by phosphorus. Introduction of the limiting nutrient will result in potential nuisance populations of either plants or algae. The TN:TP in Lake Miltmore during 2011 was 40:1 indicating that it is very much phosphorus limited; therefore any additional phosphorus introduced into the lake could result in increased algal blooms or excessive plant growth. Controlling as many factors as possible which contribute phosphorus from within the watershed should be practiced; from phosphorus free fertilizer applications to picking up dog waste. Nitrogen concentrations in Lake Miltmore have not been a problem at anytime during LCHD-ES water quality sampling years. The biologically available nitrogen (NO3 andNO2) measured in 2011 was below the detectable limits every month except May, indicating that as nitrogen becomes available it is immediately utilized by the system.

The hypolimnetic phosphorus concentrations, ranged from 0.020 mg/L to 0.048 mg/L, these concentrations are much lower than the median hypolimnetic concentration for lakes within the county of 0.181 mg/L. In July, TP concentrations in the hypolimnion increased to 0.048 mg/L. This is due to the anoxic (>1 mg/L dissolved oxygen) bottom sediments releasing phosphorus into the water. Phosphorus bound in the anoxic waters of the hypolimnion are later incorporated into the oxygenated waters of the epilimnion during fall turnover.

Carlson's Trophic State Index (TSIp) uses average phosphorus concentrations to determine the trophic state of a lake. In

NUTRIENTS

general, the higher the TSI score, the more nutrient rich is the lake. Lake Miltmore was considered a mesotrophic lake in 2011 with a TSIp score of 48. The trophic state changed from 2003, at that time it was considered eutrophic with a TSIp score of 52 (Table 2). The repair of septic systems from lakefront properties is likely responsible for the improvement in TSIp scores from 2003 until 2011.

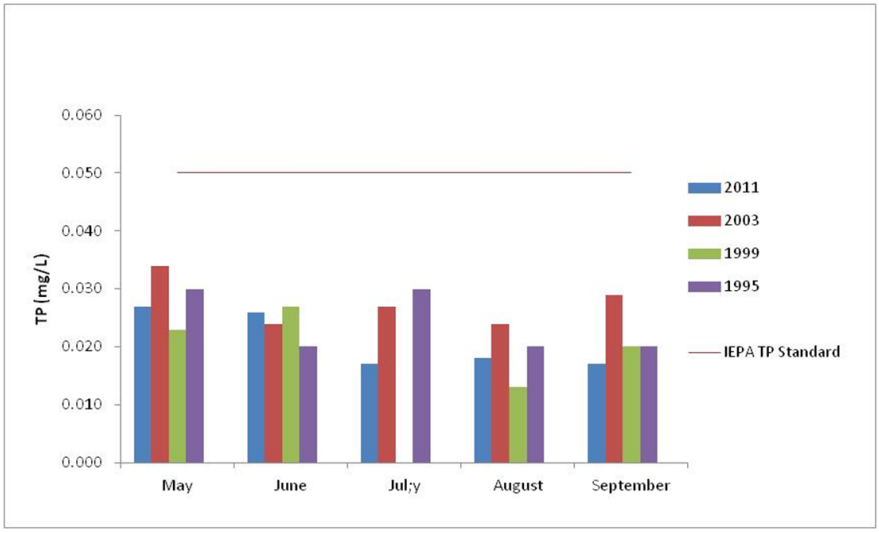


Figure 4. TP concentrations in Lake Miltmore, 1995, 1999, 2003 and 2011.

Table 2. Carlson's Trophic State Index

Trophic State	TSI score
Oligotrophic	<40
Mesotrophic	≥40<50
Eutrophic	≥50<70
Hypereutrophic	≥70

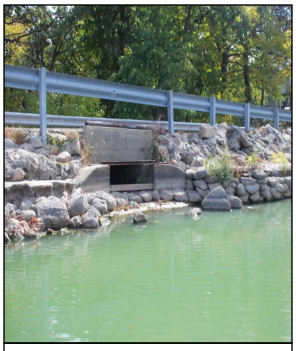
Figure 5. Trophic States Illustrated.

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 hypolimnion 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.

CONDUCTIVITY AND CHLORIDES

Conductivity measures the amount of ions contained in a waterbody. The more ions or salts that a waterbody contains the higher it's conductivity. Conductivity has been used to estimate both total dissolved solids (TDS) and chloride concentrations in Lake Miltmore as there is a strong correlation between these parameters (R^2=0.9466). Conductivity concentrations were collected during every year that Lake Miltmore was monitored by the LCHD-ES. In 1999 and 2003 total dissolved solids (TDS) were collected. In 2011, chlorides were sampled due to the strong relationship between rock salt and increased chlorides in lakes around the county.

In 2011, the conductivity of Lake Miltmore (0.9741 mS/cm) increased slightly from that measured in 2003 (0.9461 mS/cm), however, it has increased every year since 1995 (Figure 6). Since chloride and conductivity are strongly correlated, it is assumed that chloride concentration have subsequently increased in Lake Miltmore.

In 2011, the average chloride concentration in Lake Miltmore was 208 mg/L, and ranged from 204 mg/L to 212 mg/L. Although these concentrations remain below the USEPA's critical concentration of 230 mg/L, they begin to approach this critical value. Chloride concentrations maintained at or above 230 mg/L can begin to have significant impacts on aquatic life.

Chloride is a major component in most deicing or anti-icing materials and water softener salt. It has been recently discovered that water softeners can play a significant role in increasing chloride concentration in aquatic systems. It only takes 1 teaspoon of salt (chloride) to pollute 5 gallons of water (230 mg/L) and once chlorides are in water they remain there indefinitely, unless they are diluted or are treated by a reverse osmosis system, the latter which is a very expensive alternative.

If chloride concentrations were to continue to increase over time, the Lake Miltmore ecosystem could potentially be impacted due to the density of saltwater being greater than that of our freshwater lakes. As the denser saltwater accumulates at the bottom of the lake it become more difficult for it to mix with the upper layer. Overtime the inability of the waters to mix can result in a dead zone near the lake bottom.

Chlorides are also known to affect species diversity as they shift diverse species populations towards salt tolerant species such as Eurasian Water Milfoil, Cattail and blue green algae.

The LCHD-ES and Lake County Stormwater Management Commission have been holding annual training sessions targeting deicing maintenance personnel for both public and private entities. This is an attempt to educate winter road maintenance crews on the recommended application rates for applying deicers and hopefully will lead to the reduction of chloride in our environment while still maintaining safe passageways. The largest contributors of runoff in the Lake Miltmore watershed are single family and transportation land use types; therefore homeowners should be aware of proper salting practices. The "What can I do to help?" tip box provides proper deicing procedures for homeowners. Knowing the products and their limitations is crucial to the efficient use of deicers. For instance, at 10° F, rock salt is not effective in melting ice and will blow away be-

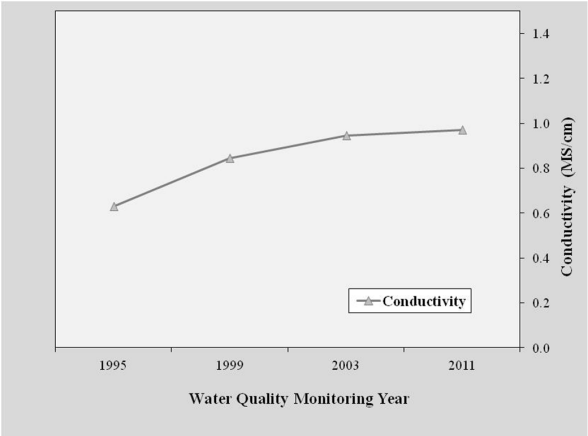


Figure 6. Conductivity concentrations in Lake Miltmore, 1995, 1999, 2003, and 2011.

What can I do to help?

- Shovel (or use a snow blower) before you use any product; never use a deicing product to melt snow.
- Read all product labels, before applying product.
- Sweep up un-dissolved product after a storm is over for reuse.
- Consider switching to a non-chloride deicer.
- Support changes in deicing policies in your municipality.
- Inform a neighbor about the impacts chlorides have on our lakes rivers and streams.

Modified from (DuPage River Salt Creek Workgroup , 2008)

BATHYMETRIC MAP

Lake Miltmore is lacking an updated bathymetric map. LCHD-ES recommends that a bathymetric map be updated every 15 years. The current map for Lake Miltmore dates back from data collected in 1987 (Figure 7).

A bathymetric map is a useful tool for lake managers as it assists in tasks such as estimating volumes for lake treatment and other decisions involved with the overall plant management plan. It also allows for calculation of anoxic water volumes which helps in managing and maintaining a fishery.

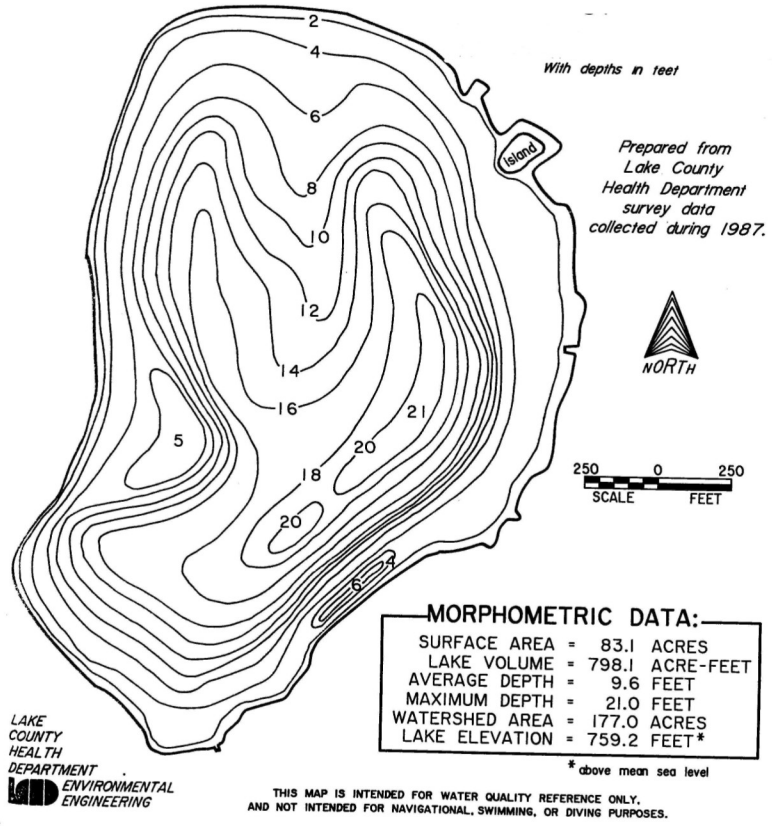


Figure 7. Bathymetric map of Lake Miltmore created by LCHD, 1987.

PERMIT REQUIREMENTS FOR APPLYING PESTICIDES IN WATERS

As of October 2010, new regulations went into effect that significantly affect how pesticides are used in Illinois waters. A National Pollutant Discharge Elimination System (NPDES) permit is now required in order 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."; therefore, the Township, VVHA, or LMPOA will have to secure a permit to apply pesticides into Lake Miltmore. Even individual homeowners wishing to treat on their property will need to get a permit. However, it is believed that the permit is primarily aimed at commercial applicators. 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 area or 20 linear miles along the water's edge. The threshold is an annual total, so for example, algaecides applied to twenty acres four times during the year, would meet this 80 acre threshold requirement. Any group planning to treat their pond or lake with pesticide after the October, 2010 date need to take into account these new requirements.

AQUATIC HERBICIDE: DMA4 IVM (2,4-D)

DMA4 IVM (2,4-D) salt is an herbicide approved for use in aquatic systems and secondarily a plant growth regulator. It is the most common herbicide used on Lake Miltmore to control Eurasian Water Milfoil (EWM). 2,4-D causes uncontrolled cell division in the targeted species. Due to it's non-selective nature it should be applied early in the season before native aquatic plant species emerge as there are native submerged and floating aquatic species sensitive to 2,4-D. DMA4 does have some toxicity to fish so care should be taken to follow label instructions for application and application rates to minimize risk.

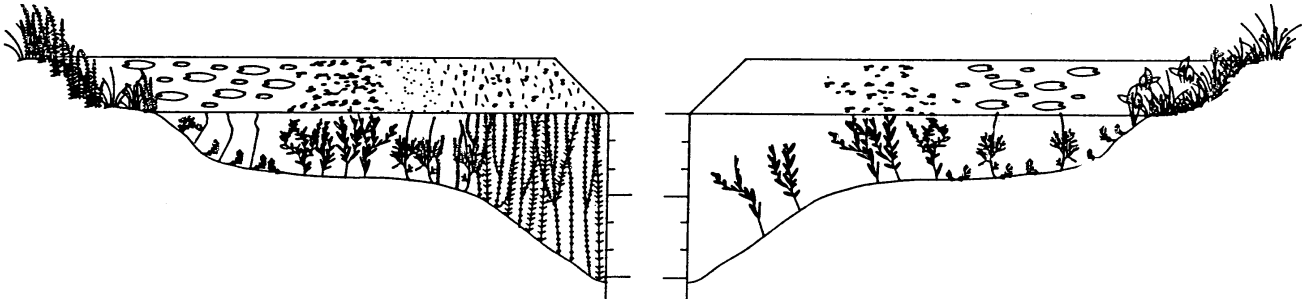
Signs should be posted following application warning of a 7 day waiting period from date and time of application before the surface waters can be diverted for drinking water, irrigation or other purposes.

The goal of plant management in Lake Miltmore is to manage invasive species such as EWM in order to provide conditions favorable for growth and spread of native plant populations. LCHD-ES recommends that the village keep detailed records of herbicide applications, including information such as application rate, method of application, pesticides used and species targeted in order to evaluate the success of the pesticide application. It appears that EWM has expanded; therefore a change of strategy may be required to reduce the abundance of EWM on Lake Miltmore.

FOR FULL DETAILS OF THE RULE SEE:

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

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



AQUATIC PLANTS

Aquatic plants are crucial for maintaining good water quality as they compete against algae for nutrients, minimize algal blooms, trap and hold sediments in place and provide habitat for aquatic organisms.

An aquatic vegetation survey was conducted in July, 2011. A 60-meter grid was randomly overlaid on an aerial photo of Lake Miltmore. Ninety-one grid points fell within the lake area and were assessed, 50% of the points sampled were vegetated (Figure 8). The average density of plants on Lake Miltmore was 39%. Ten aquatic plant species including Chara (a macro algae) were detected during the aquatic plant survey conducted in Lake Miltmore (Table 3). Two of those species were non-native invasive plant species, Curly-leaf Pondweed (*Potamogeton crispus*) and EWM (*Myriophyllum spicata*). All aquatic submerged and floating plant species detected in Lake Miltmore were recorded and a floristic quality index (FQI) was calculated. Lake Miltmore had an FQI of 16.8, ranking it 42nd of 158 lakes in the county evaluated for FQI between 2000 - 2011. Floristic quality assessments allow for assessment of natural areas and site comparison. A FQI score of 35 is considered of marginal quality. Most lands in the Chicago region score an FQI of 20 or below which is insignificant in terms of natural area quality (Swink and Wilhelm, 1997).

EWM was the dominant plant species detected at 37.4% of the sampling points with an average density of 19%. It is recommended that Lake Miltmore continue to manage the EWM population managed as it appears to have spread since 2003.

Curlyleaf Pondweed (CLP) was detected at an average density of <1% during 2011. When detected it was found mainly near shore. Since the lake was sampled in July it could be that we missed the peak growth of CLP due to the seasonality of this species or it could be that the diverse aquatic plant community is keeping this species in check. Based upon the results of the 2011 aquatic plant survey, management of CLP is not a high priority at this time.

Table 3. Plant species detected during the 2013 quantitative survey of Lake Miltmore.

Common Name	Scientific Name
Chara (macro-algae)	Chara spp.
Coontail	Ceratophyllum demeserum
Curlyleaf Pondweed	Potamogeton crispus
Eurasian water milfoil	Myriophyllum spicata
Illinois Pondweed	Potamogeton illinoensis
Sago Pondweed	Potamogeton pectinatus
Slender Naiad	Najas flexilis
Spatterdock	Nuphar variegata
Valisneria	Valisneria americana
Water Crowfoot	Ranunculus longirostris
White Water Lily	Nymphae tuberosa

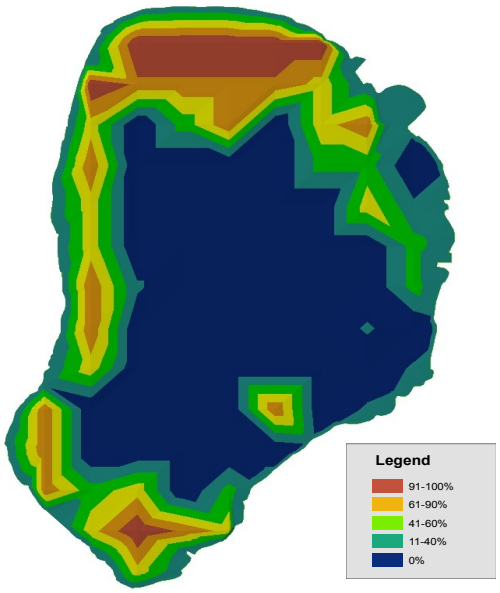


Figure 8. Rake density of aquatic vegetation in Lake Miltmore during July, 2011.

Eurasian Water Milfoil (EWM)

EWM is a non native, invasive submerged aquatic weed whose origins are in Europe, Asia, and North Africa. Since its introduction, which was documented as early as the 1880's, EWM has been a successful invader of shallow areas within lakes and streams throughout North America (see below), usually forming dense mats which outcompete and displace native vegetation.

Recently it has been discovered that EWM hybridizes with our native northern water milfoil. The hybrid appears to be much more aggressive as well as more difficult to manage. This has implications for management of this plant and may require different strategies.

In 2011, EWM was the dominant plant species detected at 37.4% of the sampling points and an average density of 19%. The map on the right indicates the approximate locations and densities in which EWM was found during our study.

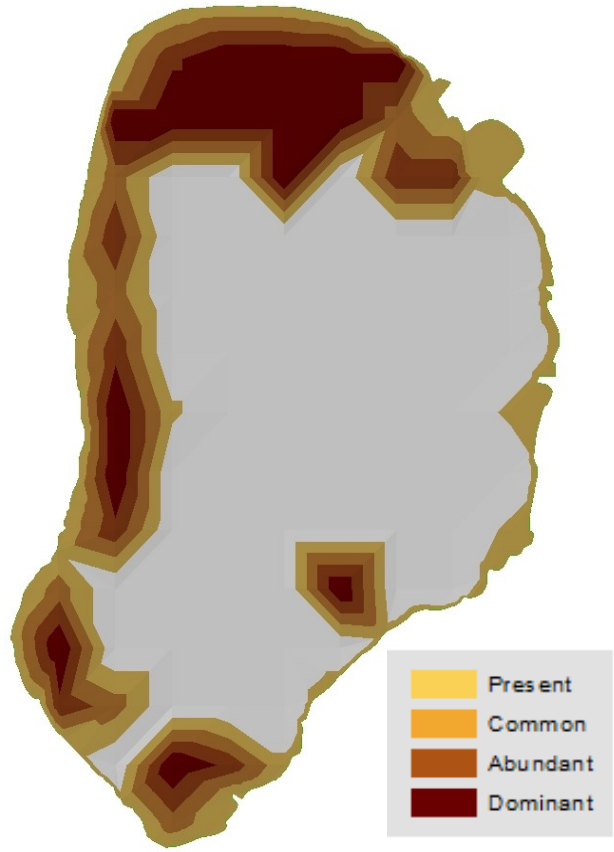
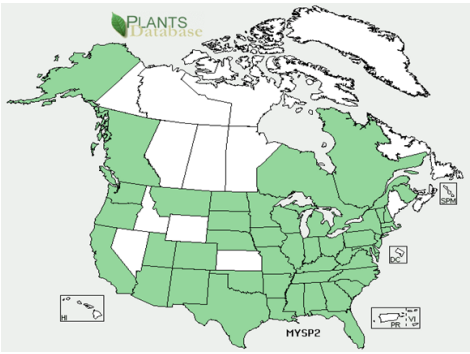


Figure 9. Estimated density and location of EWM, from 2011 vegetation survey.



Distribution map of EWM invasions.

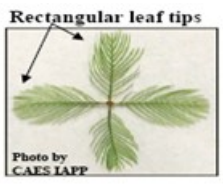
Key Characteristics

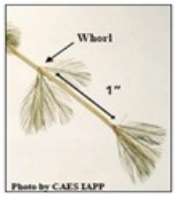
Common Names:
Eurasian watermilfoil

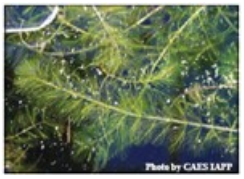
Origin: EXOTIC
Europe and Asia. Found throughout Lake County and Illinois

Importance:
This invasive plant spreads rapidly, crowding out native species, clogging waterways, and blocking sunlight and oxygen from underlying waters.

Look alikes:
Northern watermilfoil
Which has fewer than 12 leaflet pairs per leaf, and generally has stouter stems.







Key Features:

Stem: Long, often abundantly branced stems form a reddish or olive-green surface mat in summer.

Leaf: Leaves are rectangular with ≥12 pairs of leaflets per leaf and are dissected giving a feathery appearance, arranged in a whorl, whorls are 1 inch apart.

Flower: Small pinkish male flowers that occur on reddish spikes, female flowers lack petals and sepals and 4 lobed pistil.

Shoreline Erosion

Shoreline erosion contributes to poor water quality by reducing water clarity and increasing both the total suspended solids and phosphorus concentrations in a lake with either one of two outcomes, a very weedy lake due to the increase of a limiting nutrient (phosphorus) or a lake with few weeds due to decreased water clarity from either sediment or algae being disbursed throughout the water column. Sedimentation can potentially destroy habitat for fish and other macroinvertebrates through deposition on nests and plants.

Fifty-two percent of the shoreline along Lake Miltmore exhibited some degree of erosion (Figure 10, Table 4). Slight erosion occurred on 44% of the shoreline, this degree of erosion is most easily remedied. Seven percent was noted as having moderate erosion problems and one case of severe erosion was documented. Many of the erosion problems found on Miltmore were due to poor material selection (i.e. patio blocks, cinder blocks, railroad ties) for erosion control, or from failing seawalls. There are a variety of methods for repairing erosion, such as installing native vegetation either alone or in combination with rock or rip rap. If done properly, either of these methods would provide long-term erosion solutions. As discussed previously under the nutrient section, Lake Miltmore is a phosphorus limited system and therefore any addition of phosphorus can cause excessive plant and/or algal growth in the future. It is recommended that all eroding shorelines be remediated as soon as possible to prevent additional expense and future management problems.

Figure 10. Results of shoreline erosion assessment, 2011.

Table 4. Results of shoreline erosion assessment on Lake Miltmore, 2011.

Degree of Erosion	Miles	%
No Erosion	0.78	48%
Slight	0.71	44%
Moderate	0.11	7%
Severe	0.02	1%
Total Shoreline	1.62	100%

Figure 11. Poor management practice for eroding shorelines.

Figure 12. A preferred option of native plantings.

FISH

A management goal of Lake Miltmore is to maintain a healthy fishery. LCHD-ES recommends that a fish survey be completed by the Illinois Department of Natural Resources (IDNR) fishery biologists before a stocking program is initiated; it has been eleven years (1995) since the fishery was last surveyed. This allows the biologist to assess the current fish population and make recommendations on improving the fishery based upon their findings. In 1995, the IDNR reported that they sampled by electro fishing for 90 minutes as well as set two gill nets and a trap net overnight. They collected 155 fish representing 14 species. In 2003, the LCHD-ES seined seven sites within Lake Miltmore in search of Threatened and Endangered species. The LCH-ES collected thirteen species (*), none of these were threatened or endangered. A comprehensive list of species found in IDNR and LCHD-ES surveys is presented to the right.

Common Name
Black Crappie
Bluegill*
Bluntnose Minnow*
Bowfin
Brook Silverside
Carp
Channel Catfish
Golden Shiner*
Green Sunfish
Johnny Darter*
Largemouth Bass*
Lake Chubsucker*
Northern Pike
Pumpkinseed*
Pugnose Minnow
Redear Sunfish*
Striped Bass*
Quillback
Walleye
Warmouth*
Yellow Bass
Yellow Perch*

BEACHES

Lake Miltmore has two licensed beaches; Fourth Lake Resort Beach and West Township Beach. The LCHD-ES monitors the beaches every other week for E-coli from Memorial Day through Labor Day. On July 11, 2011 a swim ban occurred at Fourth Lake Resort Beach due to elevated E-coli concentrations (235 colonies/100 ml). One other swim ban occurred since the last water quality monitoring year. In 2004, a swim ban occurred at West Township Beach. Both swim bans were likely due to rain events taking place following long dry periods during the summer.

On August 19, 2011, the Port-A-Potty at West Township Beach was tipped over. It did not appear to cause water quality problems or an issuance of a swim ban; however, when events such as this occur they should be remedied immediately to prevent any health threats.

VOLUNTEER LAKE MONITOR PROGRAM

Lake Miltmore has lacked a volunteer lake monitor since 1985. A volunteer lake monitor for a lake of exceptional quality as is Lake Miltmore is crucial to track water quality changes through parameters such as water clarity (Secchi disk) and dissolved oxygen concentrations. The LCHD-ES is pleased to announce that there will be a volunteer lake monitor in 2012.

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

Overall the water quality of Lake Miltmore is excellent, LCHD-ES does recommend the following actions for maintaining the great water quality found in Lake Miltmore:

- Conduct practices in the watershed that minimize nutrients from entering into the lake from stormwater, such as picking up pet wastes, not burning yard wastes near lake shorelines and using phosphorus free fertilizers.
- During winter months when using deicers, do so in a responsible way; following package directions for application rates and make sure that the deicer will be effective for the given conditions. Always remove snow before applying material.
- The township should maintain detailed records of herbicide application including the rate and method of application, material used, application date and targeted species. This will assist in assessing the success of application. EWM has expanded since 2003; therefore it is recommended to re-evaluate the current aquatic plant management plan.
- In order to maintain a healthy fish population, an IDNR fish survey is recommended before a stocking program is implemented.
- Eroded shorelines should be repaired to minimize sediments from entering into lake. There are many options available to secure shorelines; naturalizing the shoreline with native plants does provide a buffer for nutrient inputs and can be an attractive viewscape if implemented properly.
- Updating the bathymetric map will assist decision makers on chemical treatments for plant and algae control, fish stocking and other management activities on the lake.

STOP AQUATIC HITCHHIKERS!™

Prevent the transport of nuisance species.
Clean all recreational equipment.
www.ProtectYourWaters.net

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.

APPENDIX A

FIGURES AND TABLES
LAKE MILTMORE
2011

Figure 1. Sampling point on Lake Miltmore, 2011.

Table 1. Water quality summary for Lake Miltmore, 1995, 1999. 2003 and 2011.

2011	Epilimnion															
DATE	DEPTH	ALK	TKN	NH_3-N	NO_2 + NO_3-N	TP	SRP	TDS**	Cl^-	TSS	TS	TVS	SECCHI	COND	pH	DO
11-May	3	160	0.89	<0.1	0.121	0.027	<0.005	551	207	2.6	561	87	7.46	1.0020	9.37	10.21
15-Jun	3	144	0.84	<0.1	<0.050	0.026	<0.005	520	206	2.6	578	119	8.69	0.9400	8.51	8.94
13-Jul	3	135	0.83	<0.1	<0.050	0.017	<0.005	517	210	5.0	599	138	5.60	0.9346	8.78	9.17
10-Aug	3	122	0.78	<0.1	<0.050	0.018	<0.005	501	204	4.0	536	98	6.00	0.9014	8.77	8.10
14-Sep	3	123	0.75	<0.1	<0.050	0.017	<0.005	590	212	3.9	563	115	9.01	1.0790	8.72	9.12
	Average	137	0.82	<0.1[k]	0.064[k]	0.021	<0.005[k]	536	208	3.6	567	111	7.35	0.9714	8.83	9.11

2003	Epilimnion															
DATE	DEPTH	ALK	TKN	NH_3-N	NO_2+ NO_3-N	TP	SRP	TDS	Cl^-	TSS	TS	TVS	SECCHI	COND	pH	DO
19-May	3	161	1.26	<0.1	<0.050	0.034	<0.005	546	NA	2.4	553	108	7.09	0.9621	8.64	9.67
17-Jun	3	138	1.80	<0.1	<0.050	0.024	<0.005	562	NA	3.8	552	136	5.41	0.9780	8.89	9.19
22-Jul	3	123	1.10	<0.1	<0.050	0.027	<0.005	542	NA	5.0	580	132	4.53	0.9049	8.93	8.18
19-Aug	3	124	1.11	<0.1	<0.050	0.024	<0.005	540	NA	6.1	572	154	4.10	0.9234	8.99	8.06
23-Sep	3	132	1.17	<0.1	<0.050	0.029	<0.005	504	NA	6.4	551	133	3.15	0.9623	8.79	7.86
	Average	136	1.288	<0.1[k]	<0.05[k]	0.028	<0.005[k]	539	NA	4.7	562	133	4.86	0.9461	8.85	8.59

1999	Epilimnion															
DATE	DEPTH	ALK	TKN	NH_3-N	NO_3-N*	TP	SRP	TDS	Cl^-	TSS	TS	TVS	SECCHI	COND	pH	DO
4-May	3	159	0.94	<0.1	<0.050	0.023	<0.005	493	NA	3.3	533	155	4.30	0.839	8.61	12.14
8-Jun	3	137	0.83	<0.1	0.056	0.027	<0.005	505	NA	2.0	518	160	11.20	0.8470	8.69	9.76
7-Jul	3	120	1.01	<0.1	<0.050	<0.010	<0.005	496	NA	3.2	493	140	7.60	0.8390	8.82	8.41
10-Aug	3	118	1.24	<0.1	<0.050	0.013	<0.005	522	NA	4.1	525	160	6.40	0.8560	8.54	7.20
7-Sep	3	120	1.03	<0.1	0.052	0.020	<0.005	470	NA	4.0	506	129	4.82	0.8360	8.86	9.10
	Average	131	1.01	<0.1[k]	0.054[k]	0.017[k]	<0.005[k]	497	NA	3.3	515	149	6.86	0.8434	8.70	9.32

1995	Epilimnion															
DATE	DEPTH	ALK	TKN	NH_3-N	NO_3-N*	TP	SRP	TDS	Cl^-	TSS	TS	TVS	SECCHI	COND	pH	DO
10-May	3	154	0.84	<0.1	0.05	0.030	<0.005	NA	NA	2.2	469	127	5.08	NA	8.6	10.52
6-Jun	3	140	0.97	<0.1	<0.05	0.020	<0.005	NA	NA	1.0	453	132	9.83	0.6270	8.5	10.08
11-Jul	3	137	2.18	<0.1	0.06	0.030	<0.005	NA	NA	4.2	492	165	4.92	0.6370	8.6	9.93
7-Aug	3	127	1.00	<0.1	<0.05	0.020	<0.005	NA	NA	6.0	482	155	3.75	0.6250	8.7	8.31
6-Sep	3	124	1.50	<0.1	0.06	0.020	<0.005	NA	NA	7.6	462	182	5.00	0.6330	8.6	9.38
	Average	136	1	<0.1[k]	0.054[k]	0.02	<0.005[k]	NA	NA	4.0	472	152	5.72	0.6305	8.60	9.64

2011	Hypolimnion															
DATE	DEPTH	ALK	TKN	NH_3-N	NO_2+ NO_3-N	TP	SRP	TDS**	Cl^-	TSS	TS	TVS	SECCHI	COND	pH	DO
11-May	16	163	0.87	0.122	0.10	0.030	<0.005	550	205	2.9	576	96	NA	0.9995	8.08	5.82
15-Jun	17	166	0.98	0.116	<0.05	0.029	<0.005	532	206	2.9	611	128	NA	0.9641	7.86	4.19
13-Jul	16	169	1.10	<0.100	<0.05	0.048	<0.005	526	202	11.0	619	129	NA	0.9517	7.61	0.58
10-Aug	16	122	0.82	<0.100	<0.05	0.020	<0.005	503	204	4.8	540	105	NA	0.9055	8.63	7.42
14-Sep	16	125	0.77	<0.100	<0.05	0.022	<0.005	592	211	4.3	548	100	NA	1.0820	8.70	8.77
	Average	149	0.91	0.1076[k]	0.06[k]	0.030	0.005[k]	541	206	5.2	579	112	NA	0.9806	8.18	5.36

2003	Hypolimnion															
DATE	DEPTH	ALK	TKN	NH_3-N	NO_2+ NO_3-N	TP	SRP	TDS	Cl^-	TSS	TS	TVS	SECCHI	COND	pH	DO
19-May	17	163	1.20	<0.100	<0.050	0.038	0.005	538	NA	3.7	553	112	NA	0.9630	8.24	6.37
17-Jun	17	161	1.66	<0.100	<0.050	0.054	<0.005	568	NA	8.8	583	157	NA	1.0010	7.63	0.63
22-Jul	17	152	1.92	0.530	<0.050	0.061	<0.005	548	NA	8.8	578	134	NA	0.9903	7.36	0.24
19-Aug	17	171	3.47	1.690	<0.050	0.085	<0.005	520	NA	8.4	626	185	NA	0.9965	7.30	0.09
23-Sep	16	131	1.12	<0.100	<0.050	0.031	<0.005	497	NA	6.3	550	138	NA	0.9621	8.78	7.67
	Average	156	1.87	1.110[k]	<0.050[k]	0.054	0.005[k]	534.2	NA	7.2	578	145	NA	0.9826	7.86	3.00

1999	Hypolimnion															
DATE	DEPTH	ALK	TKN	NH_3-N	NO_3-N*	TP	SRP	TDS	Cl^-	TSS	TS	TVS	SECCHI	COND	pH	DO
4-May	17	161	1.24	0.218	0.053	0.045	<0.005	506	NA	4.3	522	121	NA	0.8300	8.14	5.83
8-Jun	16.5	150	1.07	0.198	0.050	0.046	0.006	500	NA	2.0	531	166	NA	0.8320	7.92	0.21
7-Jul	15.5	149	1.24	<0.100	<0.050	0.030	<0.005	528	NA	6.0	509	142	NA	0.8550	7.93	0.95
10-Aug	15	119	1.52	0.106	<0.050	0.020	<0.005	501	NA	5.0	530	155	NA	0.8550	8.57	6.05
7-Sep	15	124	1.45	0.168	0.054	0.038	<0.005	466	NA	7.2	505	139	NA	0.8420	8.04	0.55
	Average	141	1.30	0.173[k]	0.052[k]	0.036	0.006[k]	500	NA	4.9	519	145	NA	0.8428	8.12	2.72

1995	Hypolimnion															
DATE	DEPTH	ALK	TKN	NH_3-N	NO_3-N*	TP	SRP	TDS	Cl^-	TSS	TS	TVS	SECCHI	COND	pH	DO
10-May	18	160	1.06	0.053	<0.050	0.041	<0.005	NA	NA	3.9	491	144	NA	NA	8.20	6.50
6-Jun	18	156	1.45	<0.100	0.202	0.053	<0.005	NA	NA	2.0	479	165	NA	0.6440	7.53	0.78
11-Jul	17	140	1.44	0.060	0.172	0.042	<0.005	NA	NA	6.0	515	155	NA	0.6570	7.30	0.35
7-Aug	15	131	1.15	<0.100	<0.050	0.034	0.008	NA	NA	9.3	508	182	NA	0.6670	7.31	0.07
6-Sep	15	128	1.60	0.058	0.129	0.026	<0.005	NA	NA	5.2	465	142	NA	0.6430	7.77	1.99
	Average	143	1.00	0.057[k]	0.153[k]	0.039	0.008[k]	500	NA	5.3	492	158	NA	0.6528	7.62	1.94

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

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
** = Estimated from Conductivity

Table 2. Lake Miltmore, multiparameter data, 2011.

Date MMDDYY	Text Depth feet	Dep25 feet	Temp øC	DO mg/l	DO% Sat	SpCond mS/cm	pH Units	PAR æE/s/mý
51111	0.25	0.32	17.00	10.06	108.0	1.002	8.36	2777
51111	1	1.19	16.94	10.18	109.1	1.002	8.38	540
51111	2	2.05	16.93	10.18	109.1	1.002	8.37	428
51111	3	3.09	16.92	10.21	109.4	1.002	8.37	331
51111	4	4.09	16.80	10.19	108.9	1.002	8.37	229
51111	6	5.98	16.57	10.07	107.0	1.001	8.35	177
51111	8	7.97	15.34	10.15	105.2	1.003	8.35	231
51111	10	10.03	14.73	10.22	104.4	0.998	8.32	170
51111	12	12.09	14.38	9.84	99.8	1.000	8.29	102
51111	14	14.24	14.12	9.65	97.4	0.999	8.23	74
51111	16	16.09	13.57	8.22	81.9	1.000	8.08	53
51111	18	17.97	13.04	6.70	66.0	1.003	7.90	35
51111	20	18.97	13.00	6.11	59.7	0.998	7.82	28

Date MMDDYY	Text Depth feet	Dep25 feet	Temp øC	DO mg/l	DO% Sat	SpCond mS/cm	pH Units	PAR æE/s/mý
61511	0.25	0.31	20.60	8.93	103.6	0.940	8.42	1102
61511	1	1.10	20.64	8.93	103.6	0.940	8.47	703
61511	2	2.13	20.65	8.94	103.8	0.940	8.50	279
61511	3	2.93	20.65	8.94	103.8	0.940	8.51	131
61511	4	4.09	20.65	8.95	103.9	0.940	8.51	122
61511	6	6.06	20.64	8.93	103.7	0.940	8.51	94
61511	8	8.07	20.65	8.92	103.6	0.940	8.51	89
61511	10	9.95	20.65	8.92	103.6	0.940	8.51	69
61511	12	12.02	20.64	8.88	103.1	0.940	8.51	52
61511	14	14.03	20.58	8.86	102.7	0.936	8.38	37
61511	16	16.01	17.92	5.82	64.0	0.960	7.98	23
61511	18	17.87	16.92	2.55	27.5	0.968	7.73	16
61511	20	19.90	16.39	0.97	10.4	0.975	7.60	11

Date MMDDYY	Text Depth feet	Dep25 feet	Temp øC	DO mg/l	DO% Sat	SpCond mS/cm	pH Units	PAR æE/s/mý
7122011	0.25	0.25	25.62	9.61	120.8	0.965	8.75	3986
7122011	1	0.98	27.32	9.20	119.2	0.935	8.78	4897
7122011	2	2.06	27.38	9.17	119.1	0.936	8.78	1607
7122011	3	3.04	27.38	9.17	119.0	0.935	8.78	888
7122011	4	4.03	27.34	9.19	119.3	0.935	8.79	941
7122011	6	5.97	27.38	9.18	119.2	0.935	8.79	616
7122011	8	7.99	27.04	8.56	110.4	0.936	8.70	426
7122011	10	10.01	26.58	8.30	106.2	0.935	8.62	96

Table 2. Lake Miltmore, multiparameter data, 2011.

Date MMDDYY	Text Depth feet	Dep25 feet	Temp øC	DO mg/l	DO% Sat	SpCond mS/cm	pH Units	PAR æE/s/mý
7122011	12	11.95	24.40	5.55	68.3	0.942	8.25	45
7122011	14	14.02	22.54	1.60	19.0	0.944	7.76	29
7122011	16	15.98	20.98	0.58	6.7	0.952	7.61	19
7122011	18	18.00	19.22	0.25	2.8	0.965	7.43	6

Date MMDDYY	Text Depth feet	Dep25 feet	Temp øC	DO mg/l	DO% Sat	SpCond mS/cm	pH Units	PAR æE/s/mý
81011	0.25	0.60	26.68	8.20	106.0	0.895	8.63	3607
81011	1	1.16	26.66	8.10	104.7	0.901	8.74	3148
81011	2	2.00	26.70	8.10	104.7	0.901	8.76	155
81011	3	2.99	26.70	8.10	104.7	0.901	8.77	94
81011	4	4.04	26.70	8.08	104.5	0.901	8.77	166
81011	6	6.00	26.71	8.06	104.3	0.901	8.76	108
81011	8	8.03	26.69	8.01	103.6	0.902	8.74	130
81011	10	10.04	26.67	7.72	99.8	0.903	8.71	127
81011	12	11.98	26.63	7.52	97.1	0.902	8.70	78
81011	14	14.04	26.25	7.53	96.6	0.902	8.69	53
81011	16	15.92	25.93	7.42	94.6	0.906	8.63	38
81011	18	18.01	22.52	0.47	5.7	0.998	7.26	23
81011	20	19.67	21.91	0.33	3.9	1.044	7.04	3

Date MMDDYY	Text Depth feet	Dep25 feet	Temp øC	DO mg/l	DO% Sat	SpCond mS/cm	pH Units	PAR æE/s/mý
91411	0.25	0.49	21.61	9.11	106.4	1.079	8.63	175
91411	1	1.13	21.67	9.12	106.7	1.079	8.67	204
91411	2	2.18	21.66	9.12	106.6	1.079	8.71	77
91411	3	2.92	21.67	9.12	106.6	1.079	8.72	72
91411	4	3.94	21.67	9.12	106.6	1.079	8.73	66
91411	6	6.04	21.68	9.10	106.5	1.079	8.73	36
91411	8	7.95	21.67	9.10	106.4	1.079	8.73	31
91411	10	9.98	21.67	9.07	106.1	1.079	8.73	22
91411	12	12.23	21.67	9.06	106.0	1.079	8.73	14
91411	14	13.98	21.65	9.02	105.4	1.079	8.74	12
91411	16	16.14	21.36	8.77	101.9	1.080	8.71	8
91411	18	18.02	21.23	6.81	78.9	1.087	8.44	6
91411	20	19.39	21.15	5.02	58.2	1.111	8.10	5

Figure 2. Secchi depth (water clarity) in Lake Miltmore during 1995, 1999, 2003 and 2011.

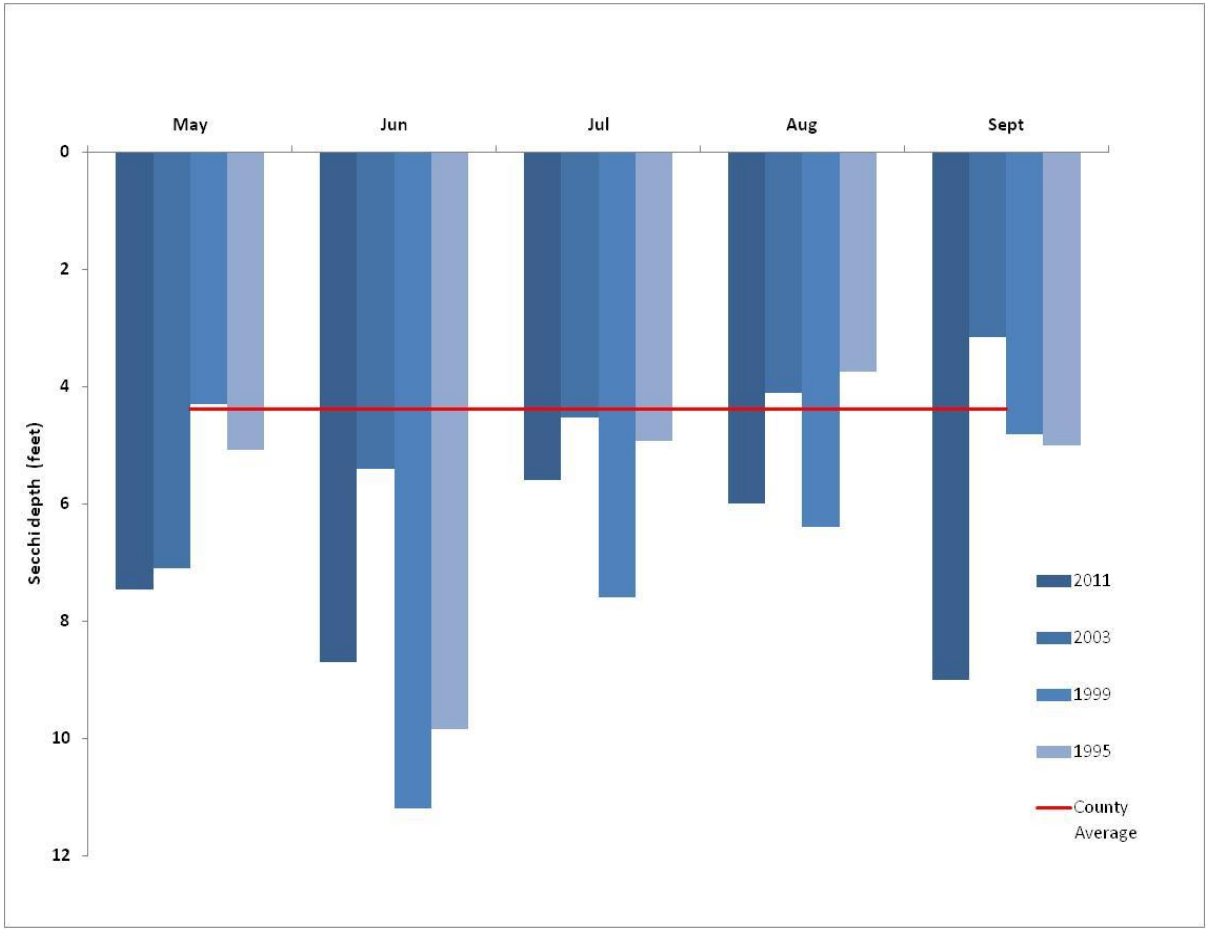


Figure 3. Approximate watershed of Lake Miltmore, 2011.

Figure 4. Land use of Lake Miltmore, 2011 (based upon 2010 imagery)

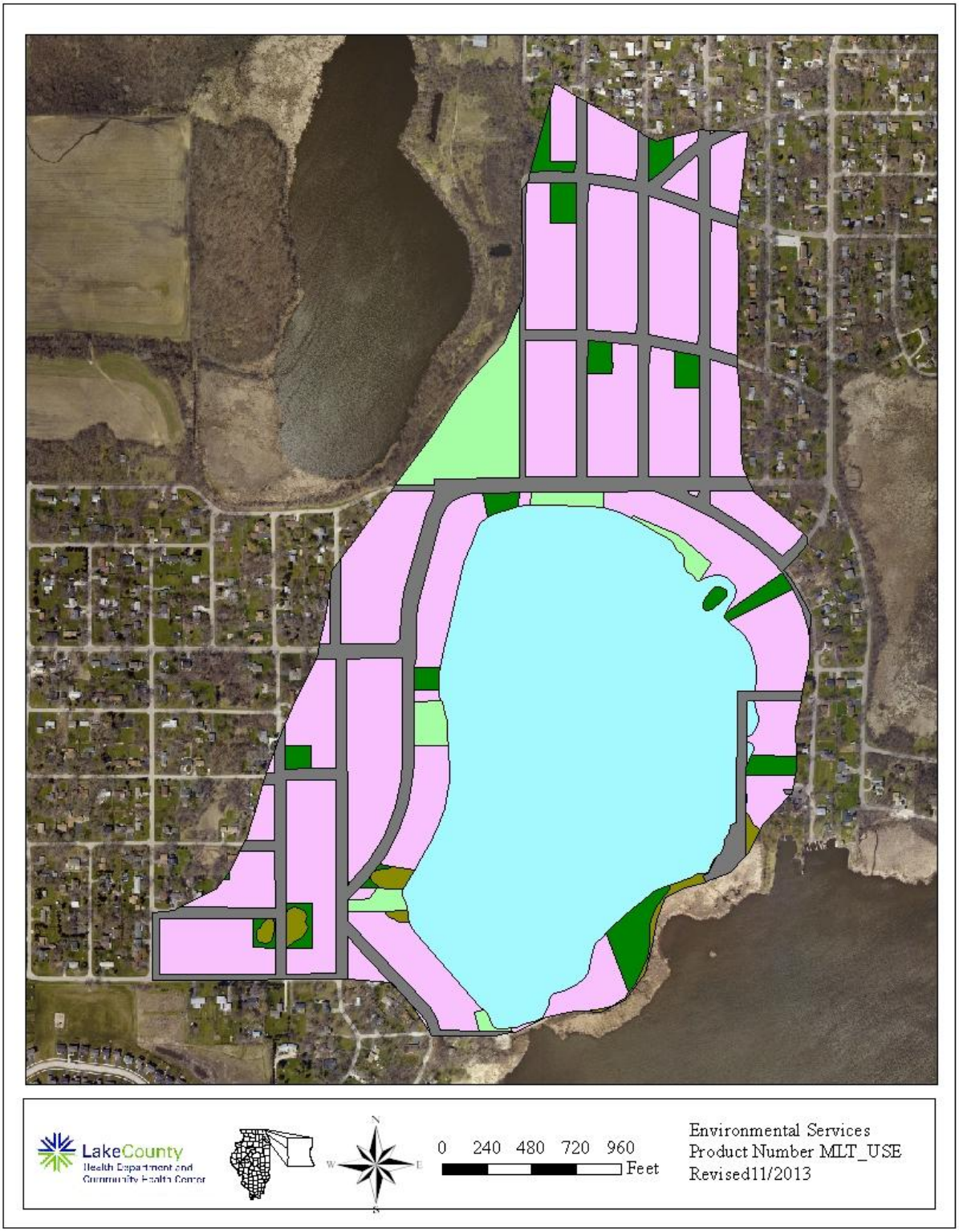


Table 3. Estimated land use and total percent runoff to Lake Miltmore, 2011.

Land Use	Acreage	% of Total
Forest and Grassland	8.03	3.6%
Public and Private Open Space	9.84	4.4%
Single Family	90.60	40.3%
Transportation	31.71	14.1%
Water	82.71	36.8%
Wetlands	1.97	0.9%
Total Acres	**224.86**	**100.0%**

Land Use	Acreage	Runoff Coeff.	Estimated Runoff, acft.	% Total of Estimated Runoff
Forest and Grassland	8.03	0.05	1.1	0.7
Public and Private Open Space	9.84	0.15	4.1	2.6
Single Family	90.60	0.30	74.7	48.4
Transportation	31.71	0.85	74.1	48.0
Water	82.71	0.00	0.0	0.0
Wetlands	1.97	0.05	0.3	0.2
TOTAL	**224.86**		**154.3**	**100.0**

Lake volume	**798.10**	**acre-feet**
Retention Time (years)= lake volume/runoff	**5.17**	**years**
	1887.83	**days**

Table 4. Lake County average TSI phosphorus (TSIp) 2000 – 2011.

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	Druce Lake	0.0140	42.00
6	West Loon	0.0152	43.00
7	Windward Lake	0.0160	44.13
8	Sand Pond (IDNR)	0.0165	44.57
9	Cedar Lake	0.0170	45.00
10	Pulaski Pond	0.0180	45.83
11	Gages Lake	0.0200	47.00
12	Banana Pond	0.0200	47.35
13	Lake Kathryn	0.0200	47.35
14	Lake Minear	0.0200	47.35
15	Highland Lake	0.0202	47.49
16	Lake Miltmore	0.0210	48.00
17	Timber Lake (North)	0.0210	48.05
18	Cross Lake	0.0220	48.72
19	Dog Training Pond	0.0220	48.72
20	Sun Lake	0.0220	48.72
21	Cranberry Lake	0.0230	49.00
22	Deep Lake	0.0230	49.36
23	Lake of the Hollow	0.0230	49.36
24	Round Lake	0.0230	49.36
25	Stone Quarry Lake	0.0230	49.36
26	Little Silver Lake	0.0250	50.57
27	Bangs Lake	0.0260	51.00
28	Lake Leo	0.0260	51.13
29	Dugdale Lake	0.0270	51.68
30	Peterson Pond	0.0270	51.68
31	Fourth Lake	0.0360	53.00
32	Lake Fairfield	0.0300	53.20
33	Third Lake	0.0300	53.33
34	Lake Catherine	0.0310	53.67
35	Lambs Farm Lake	0.0310	53.67
36	Old School Lake	0.0310	53.67
37	Grays Lake	0.0310	54.00
38	Hendrick Lake	0.0340	55.00
39	Honey Lake	0.0340	55.00
40	Sand Lake	0.0380	56.00
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	East Loon	0.0400	57.00
46	Schreiber Lake	0.0400	57.34

Table 4. Lake County average TSI phosphorus (TSIp) 2000 – 2011.

RANK	LAKE NAME	TP AVE	TSIp
47	Waterford Lake	0.0400	57.34
48	Hook Lake	0.0410	57.70
49	Duck Lake	0.0430	58.39
50	Nielsen Pond	0.0450	59.04
51	Seven Acre Lake	0.0460	59.36
52	Turner Lake	0.0460	59.36
53	Willow Lake	0.0460	59.36
54	East Meadow Lake	0.0480	59.97
55	Lucky Lake	0.0480	59.97
56	Old Oak Lake	0.0490	60.27
57	College Trail Lake	0.0500	60.56
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	Briarcrest Pond	0.0580	63.00
70	Lake Naomi	0.0620	63.66
71	Lake Tranquility (S1)	0.0620	63.66
72	Liberty Lake	0.0630	63.89
73	Werhane Lake	0.0630	63.89
74	Countryside Glen Lake	0.0640	64.12
75	Davis Lake	0.0650	64.34
76	Lake Fairview	0.0650	64.34
77	Leisure 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	Wooster Lake	0.0690	65.00
82	Crooked Lake	0.0700	65.41
83	Lake Helen	0.0720	65.82
84	Grandwood Park Lake	0.0720	66.00
85	ADID 203	0.0730	66.02
86	Bluff Lake	0.0730	66.02
87	Spring Lake	0.0730	66.02
88	Harvey Lake	0.0770	66.79
89	Broberg Marsh	0.0780	66.97
90	Countryside Lake	0.0780	67.00
91	Sylvan Lake	0.0790	67.16
92	Big Bear Lake	0.0810	67.52

Table 4. Lake County average TSI phosphorus (TSIp) 2000 – 2011.

RANK	LAKE NAME	TP AVE	TSIp
93	Redwing Slough	0.0822	67.73
94	Petite Lake	0.0830	67.87
95	Forest Lake	0.0820	68.00
96	Lake Marie	0.0850	68.21
97	Potomac Lake	0.0850	68.21
98	Timber Lake (South)	0.0850	68.21
99	White Lake	0.0862	68.42
100	Grand Ave Marsh	0.0870	68.55
101	North Churchill Lake	0.0870	68.55
102	McDonald Lake 1	0.0880	68.71
103	North Tower Lake	0.0880	68.71
104	Long Lake	0.0850	69.00
105	Rivershire Pond 2	0.0900	69.04
106	South Churchill Lake	0.0900	69.04
107	McGreal Lake	0.0910	69.20
108	Deer Lake	0.0940	69.66
109	Dunn's Lake	0.0950	69.82
110	Eagle Lake (S1)	0.0950	69.82
111	International Mine and Chemical Lake	0.0950	69.82
112	Valley Lake	0.0950	69.82
113	Fish Lake	0.0960	69.97
114	Lochanora Lake	0.0960	69.97
115	Island Lake	0.0990	70.41
116	Woodland Lake	0.0990	70.41
117	Nippersink Lake	0.1000	70.56
118	Longview Meadow Lake	0.1020	70.84
119	Lake Barrington	0.1050	71.26
120	Lake Forest Pond	0.1070	71.53
121	Bittersweet Golf Course #13	0.1100	71.93
122	Fox Lake	0.1100	71.93
123	Middlefork Savannah Outlet 1	0.1120	72.00
124	Osprey Lake	0.1110	72.06
125	Bresen Lake	0.1130	72.32
126	Round Lake Marsh North	0.1130	72.32
127	Deer Lake Meadow Lake	0.1160	72.70
128	Taylor Lake	0.1180	72.94
129	Columbus Park Lake	0.1230	73.54
130	Lake Nipperink	0.1240	73.66
131	Echo Lake	0.1250	73.77
132	Grass Lake	0.1290	74.23
133	Lake Holloway	0.1320	74.56
134	Redhead Lake	0.1410	75.51
135	Antioch Lake	0.1450	75.91
136	Slocum Lake	0.1500	76.40
137	Lakewood Marsh	0.1510	76.50
138	Pond-A-Rudy	0.1510	76.50

Table 4. Lake County average TSI phosphorus (TSIp) 2000 – 2011.

RANK	LAKE NAME	TP AVE	TSIp
139	Lake Matthews	0.1520	76.59
140	Buffalo Creek Reservoir	0.1550	76.88
141	Middlefork Savannah Outlet 2	0.1590	77.00
142	Pistakee Lake	0.1590	77.24
143	Grassy Lake	0.1610	77.42
144	Salem Lake	0.1650	77.78
145	Half Day Pit	0.1690	78.12
146	Lake Eleanor	0.1810	79.11
147	Lake Farmington	0.1850	79.43
148	Lake Louise	0.1850	79.43
149	ADID 127	0.1890	79.74
150	Patski Pond	0.1970	80.33
151	Dog Bone Lake	0.1990	80.48
152	Summerhill Estates Lake	0.1990	80.48
153	Redwing Marsh	0.2070	81.05
154	Stockholm Lake	0.2082	81.13
155	Bishop Lake	0.2160	81.66
156	Ozaukee Lake	0.2200	81.93
157	Hidden Lake	0.2240	82.19
158	McDonald Lake 2	0.2250	82.28
159	Fischer Lake	0.2280	82.44
160	Oak Hills Lake	0.2790	85.35
161	Loch Lomond	0.2950	86.16
162	Heron Pond	0.2990	86.35
163	Rollins Savannah 1	0.3070	87.00
164	Fairfield Marsh	0.3260	87.60
165	ADID 182	0.3280	87.69
166	Slough Lake	0.3860	90.03
167	Flint Lake Outlet	0.5000	93.76
168	Rasmussen Lake	0.5030	93.85
169	Rollins Savannah 2	0.5870	96.00
170	Albert Lake, Site II, outflow	1.1894	106.26
171	Almond Marsh	1.9510	113.00

Figure 4. Conductivity concentrations measured in Lake Miltmore, 1995, 1999, 2003, 2011.

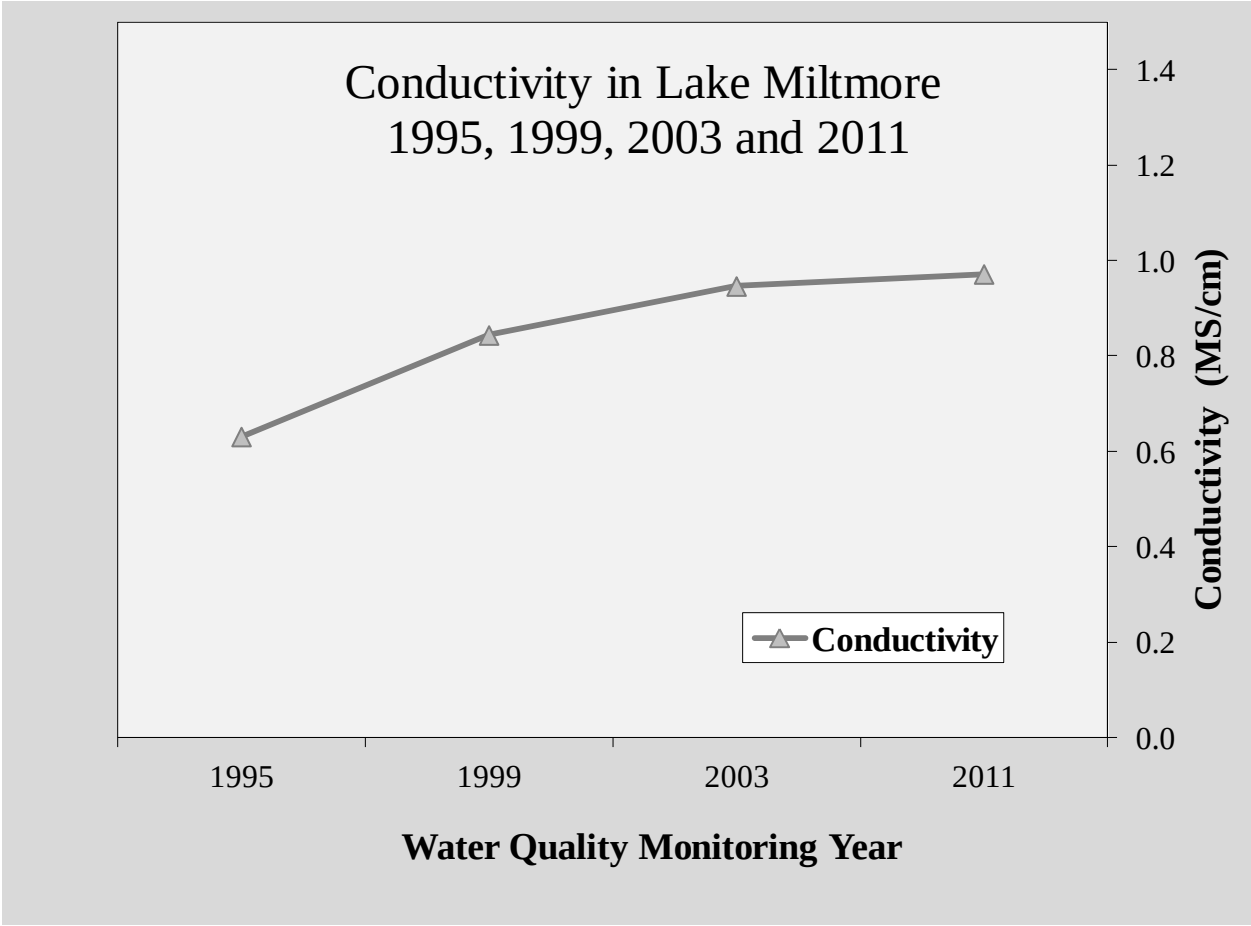


Figure 5. Randomized plant grid, Lake Miltmore, 2011.

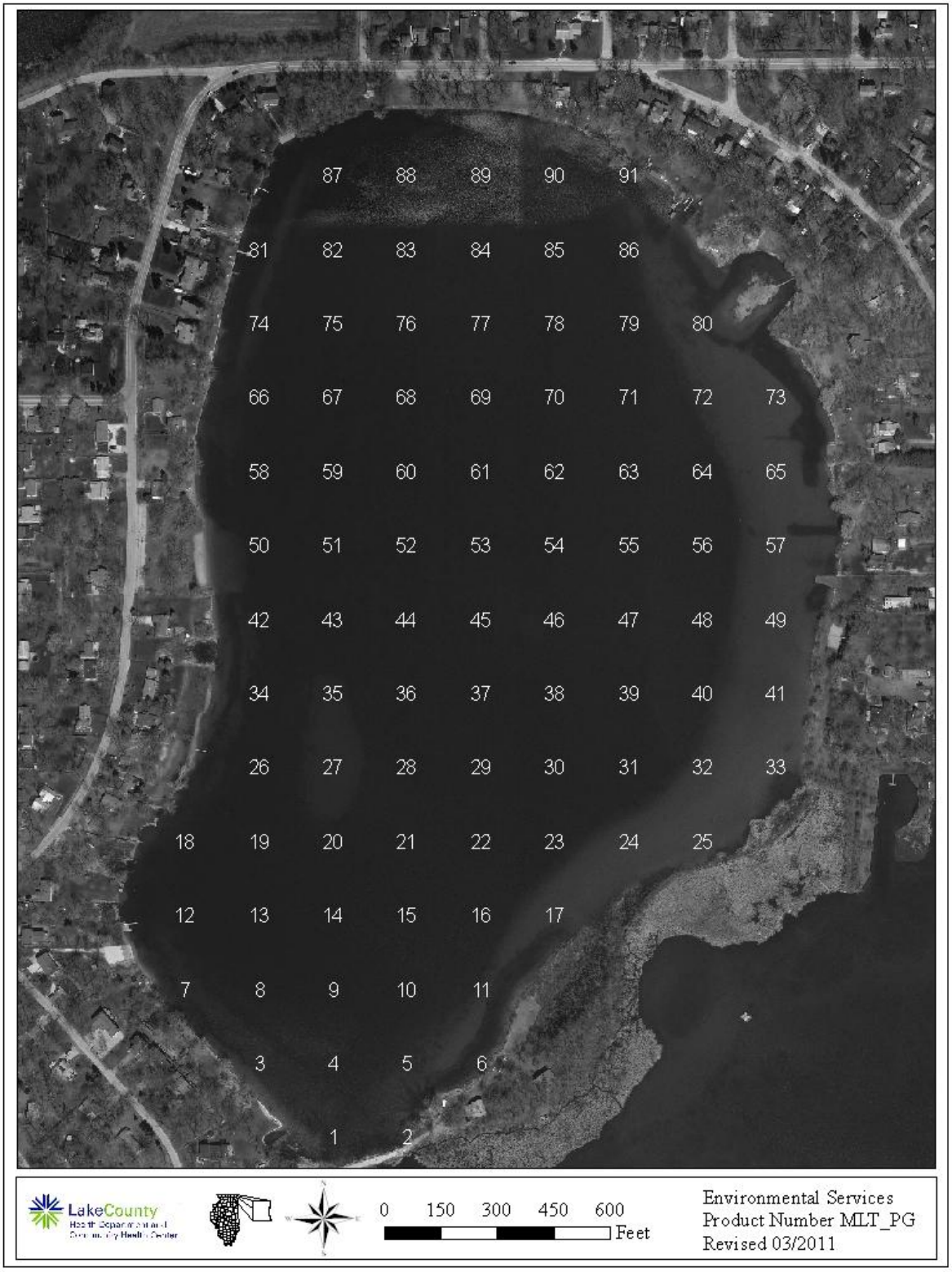


Figure 6. Location of plants and densities found in Lake Miltmore, 2011.

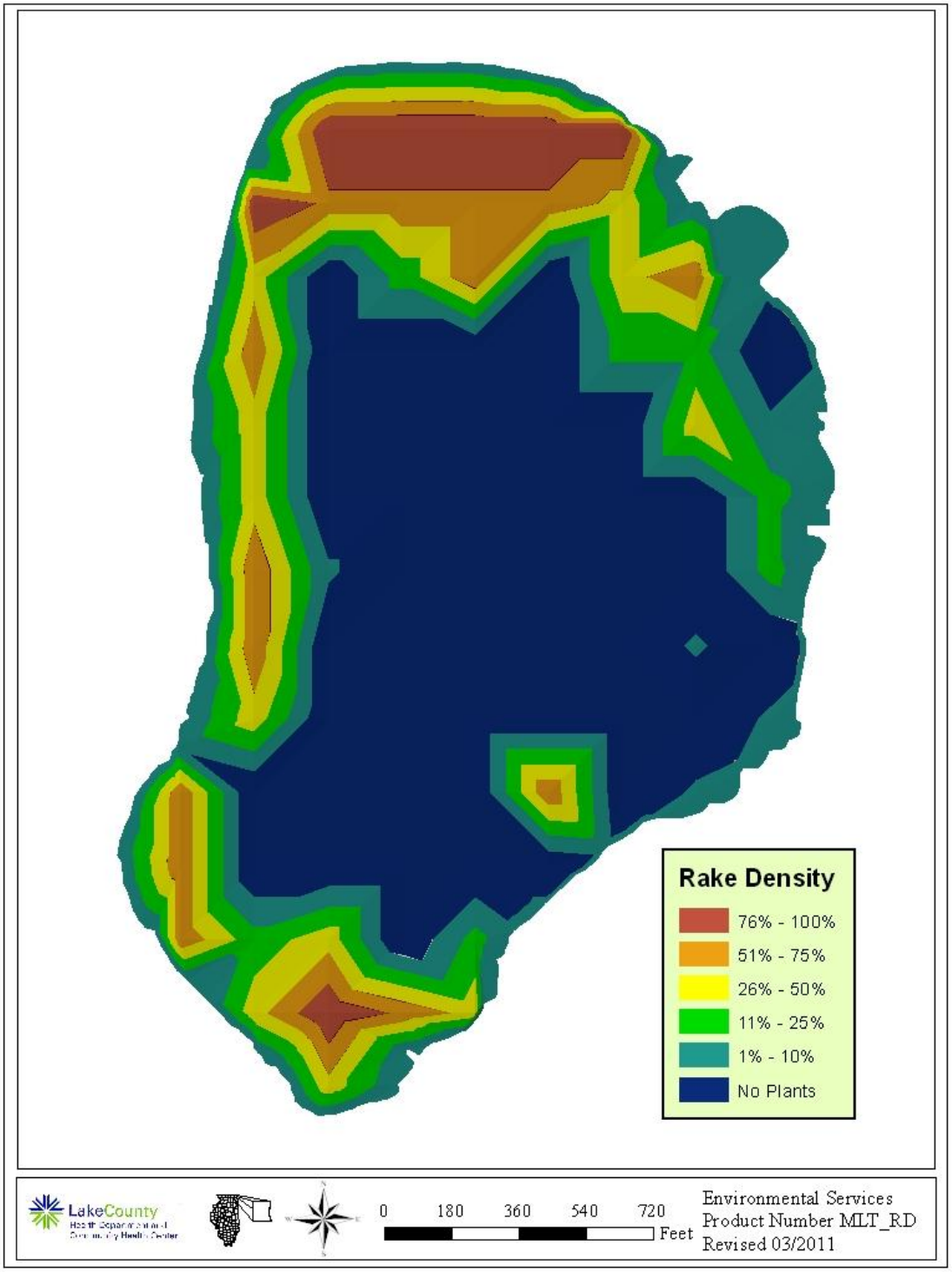


Figure 7. Location and estimated densities of EWM, Lake Miltmore, 2011.

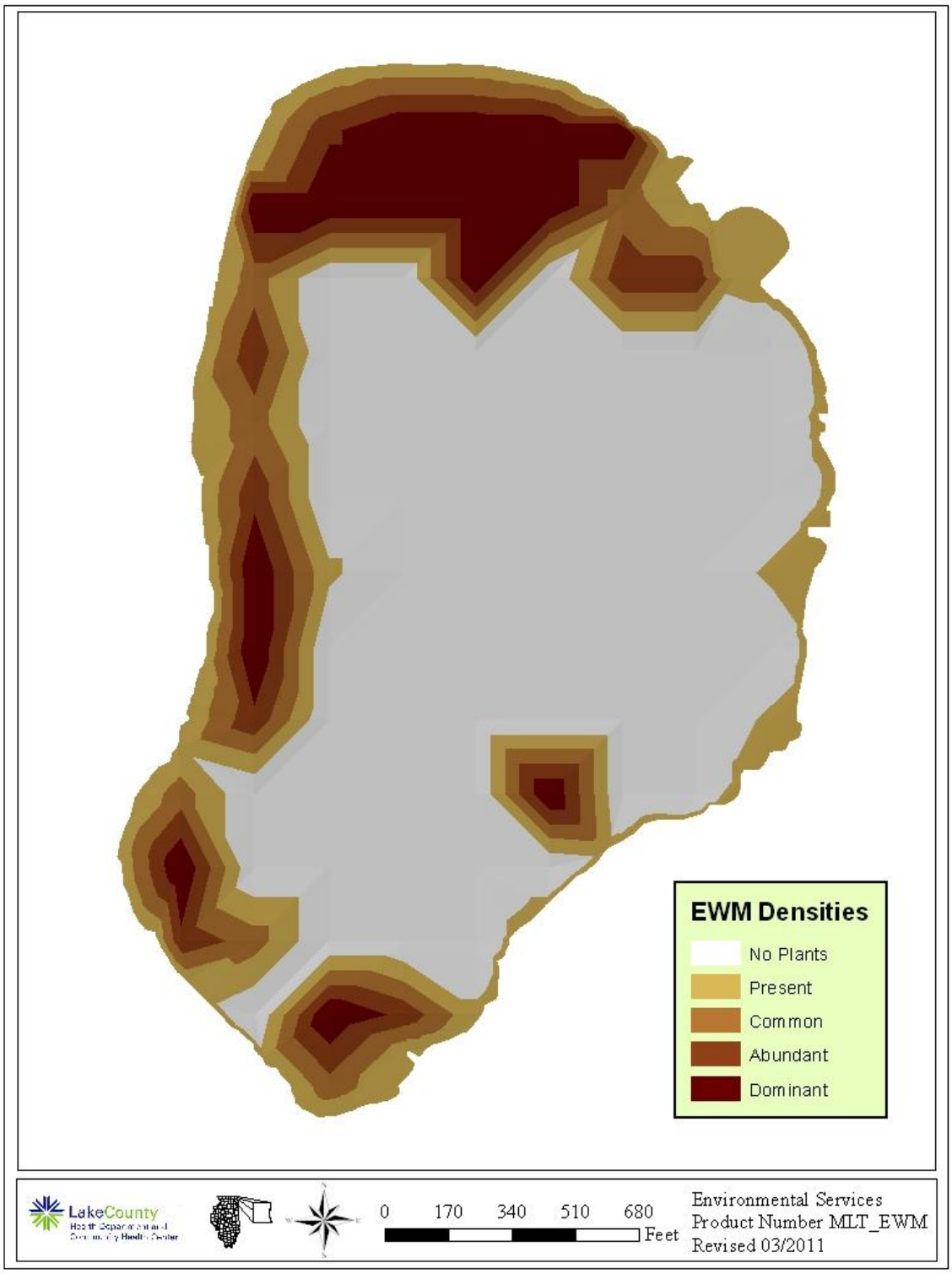


Table 5a. Aquatic vegetation species found at the 91 sampling sites on Lake Miltmore, July 2011. Maximum depth that plants were found was 12.2 feet.

Plant Density	Chara	Coontail	Curlyleaf	Eurasian Watermilfoil	Illinois Pondweed	Sago Pondweed	Slender Naiad	Spatterdock	Vallisneria	White Crowfoot	White Water Lily	Unknown
Absent	58	55	67	35	52	60	68	67	66	66	58	68
Present	3	4	2	4	5	3	0	0	0	1	3	0
Common	7	6	0	6	10	5	1	0	3	0	6	1
Abundant	1	4	0	9	2	1	0	2	0	2	2	0
Dominant	0	0	0	15	0	0	0	0	0	0	0	0
% Plant Occurrence	12.1%	15.4%	2.2%	37.4%	18.7%	9.9%	1.1%	2.2%	3.3%	3.3%	12.1%	1.1%

Table 5b. Distribution of rake density across all sampling sites.

Rake Density (Coverage)	# of Sites	%
No plants	24	26.4
>0 to 10%	5	5.5
>10 to 40%	7	7.7
>40 to 60%	11	12.1
>60 to 90%	15	16.5
>90%	7	7.7
Total Sites with Plants	45	49.5
Total # of Sites	91	100.0

Figure 8. Shoreline erosion assessed on Lake Miltmore, 2011.