LAKE COUNTY, ILLINOIS

# 2012 HARVEY LAKE SUMMARY REPORT

## PREPARED BY THE ENVIRONMENTAL SERVICES
## LAKE COUNTY HEALTH DEPARTMENT

**Harvey Lake**

Harvey Lake is a man-made lake located within the Village of Vernon Hills. The lake has a surface area of 14.5 acres and a 2012 maximum depth of 12.0 feet. The Village of Vernon Hills actively manages the lake for non-motorized boating, fishing, and aesthetics.

Harvey Lake is listed as an ADID (advanced identification) wetland by the U.S. Environmental Protection Agency. This indicates that the lake and surrounding natural environments have potential to high quality aquatic resources based on water quality and hydrology values.

Harvey Lake receives water from its approximate 50.6 acre watershed The primary land uses within the Harvey Lake watershed were: public and private open space, water and multifamily homes.

Many water quality parameters have significantly improved since the 2000 lake study. Total phosphorus concentrations in Harvey Lake averaged 0.032 mg/L in 2012 which is a 59% decrease from the 2000 concentration of 0.078 mg/L. The total phosphorus levels in 2000 exceeded the Illinois Environmental Protection


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### *SPECIAL POINTS OF INTEREST*

- *Improved water quality*
- *Shoreline restoration*
- *Increase in exotic species Eurasian Watermilfoil*

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**LAKE FACTS**

**Major Watershed:**
Des Plaines

**Sub-Watershed:**
Indian Creek

**Surface Area:**
14.54 acres

**Shoreline Length:**
1.00 miles

**Maximum Depth**:
13.8 feet

**Average Depth:**
6.9 feet

**Lake Volume:**
100.3 acre-feet

**Watershed Area:**
50.6 acres

**Lake Type:**
Impoundment

**Management Entity:**
Village of Vernon Hills

**Current Uses:**
swimming, fishing, non-motor boating, aesthetics

# LAKE SUMMARY (CONTINUED)

Agency's (IEPA) impairment level of 0.050 mg/L. Nitrogen is the other nutrient critical for algal growth. The average Total Kjeldahl nitrogen concentration for Harvey Lake was 0.80 mg/L which was lower than the 2000 value by 42% (1.37 mg/L). A total nitrogen to total phosphorus (TN:TP) ratio of 27:1 indicates phosphorus was limiting. Also using phosphorus as an indicator, the trophic state index (TSIp) ranked Harvey Lake as eutrophic with a TSIp value of 53.7.

The 2012 average total suspended solids (TSS) concentration for Harvey Lake (1.9 mg/L) was less than the 2012 county median (7.9 mg/L) and a significant reduction from the 2000 value of 19.8 mg/L. Another violation of the IEPA water quality standards that occurred in 2000 was nonvolatile suspended solids (NVSS) concentrations for exceeding 12 mg/L. In 2012 NVSS concentrations averaged well below the impairment level of 1.18 mg/L. The water clarity measured by Secchi depth, ranged from 6.67 feet in July to 12.00 feet in September. The average Secchi depth for the season was 9.47 feet which well above the county median (2.99 feet) and more than four times deeper than 2000 (2.03 feet).

Conductivity concentrations, are correlated with chloride concentrations, the average conductivity reading for Harvey Lake was 0.8128 mS/cm, which was slightly above the county median (0.8020 mS/cm) and the only water quality parameter that did not improve since 2000 (0.8094 mS/cm). The chloride concentration in Harvey Lake in 2012 was 152 mg/L which is slightly below the county median of 153 mg/L.

Aquatic plant sampling was conducted on Harvey Lake in July. Only three species of plants were present covering 100% of the lake. Coontail was dominant found at all the sampling sites and Eurasian Watermilfoil (EWM) was also abundant occupying 82% of the lake. EWM is an exotic and invasive species that tend to crowd out native species when left unmanaged. Current EWM populations are impairing the recreational uses of the lake.

Many water quality parameters had notable improvements from the 2000 lake survey; this is most likely influenced by the extensive increase in aquatic plant population and shoreline restoration.

# WATERSHED

Everyone lives in a watershed! 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.

**Which watershed do you live in?**

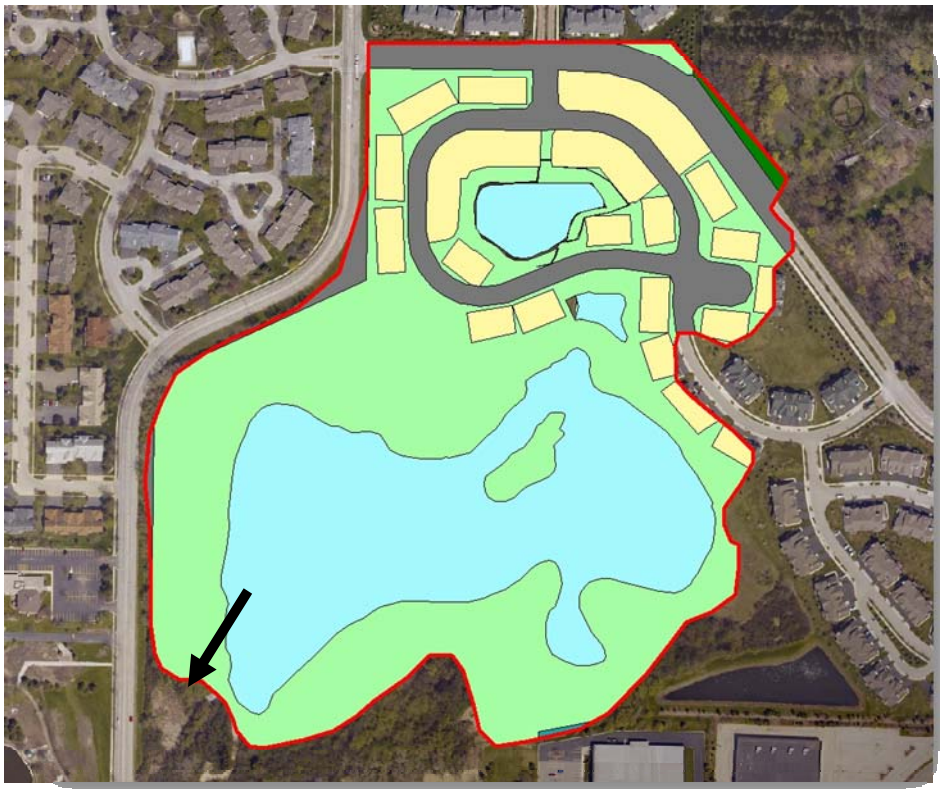
The source of a lake's water supply is very important in determining its water quality and choosing management practices to protect the lake. A watershed is an area of land where surface water from rain and melting snow meet at a point, such as a lake or stream. The watershed of Harvey Lake encompasses approximately 50.6 acres, draining large residential areas to the south and north 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 3:1 is small. This is positive in that it may help lessen serious water quality problems that often accompany lakes with a higher ratio. The outlet of Harvey Lake is located on the southwest side of the lake. Water exits Harvey Lake to a small low area, which is an intermittently flooded wetland, before eventually entering Indian Creek and then 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 3.93 years. Based on the 2012 data, the current external sources

# Harvey Lake Watershed (continued)

affecting Harvey Lake were from the following land uses: public and private open space (45%), water (31%), and multifamily homes (13%). 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 Harvey Lake were transportation (53%), multifamily homes (34%) and public and private open space (12%). Controlling water that runs from the land's surface into the lake is important for drainage lakes. Due to the large amount of residential area in the Harvey Lake, watershed, residents should be mindful of their impacts to the lake.

2012 Land Use in the Harvey Lake Watershed

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

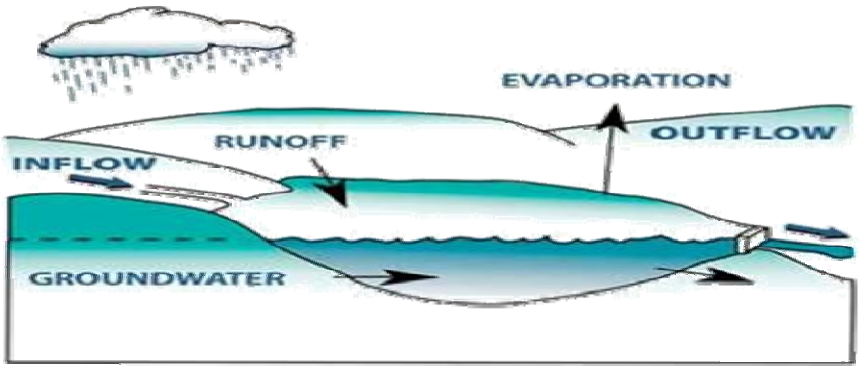


**IMPOUNDMENT**

A manmade lake created by damming a stream. An impoundment is also drained by a stream.

**Direction of watershed:**

Water drains into Harvey Lake from the delineated land. Water exits Harvey Lake to a small low area, which is an intermittently flooded wetland, before eventually entering Indian Creek and then the Des Plaines River.



## VOLUNTEER LAKE MONITORING PROGRAM

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 2012 there were **50 lakes** participating in Lake County.

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

**PLEASE CONSIDER PARTICIPATING IN THE VOLUNTEER LAKE MONITORING PROGRAM ON HARVEY LAKE**

# 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.

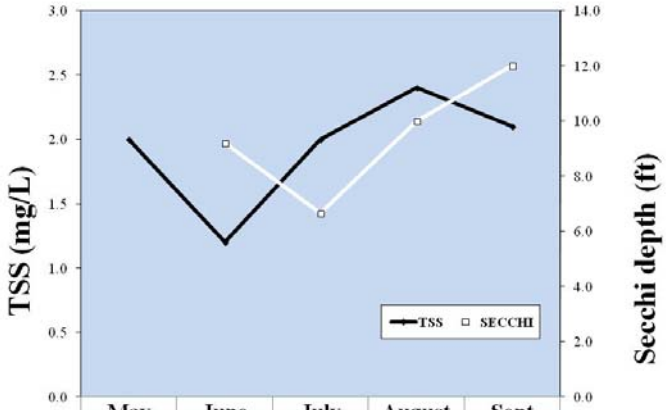
The 2012 average water clarity in Harvey Lake was 9.47 feet; this was a 467% increase in the lake's transparency since 2000 (2.03 feet) and the water clarity was above the county median of 2.99 feet.

This parameter is correlated with the aquatic plant community (pg 8) and shoreline erosion (pg 11).

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.

# 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). 2012 TSS concentrations in Harvey Lake averaged 1.9 mg/L which was below the county median of 8.2 mg/L, and more than 10 times lower than the 2000 average concentration of 19.8 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. The lowest




| | May | June | July | August | Sept |
|---|---|---|---|---|---|
| TSS | 2.0 | 1.2 | 2.0 | 2.4 | 2.1 |
| SECCHI | | 9.2 | 6.67 | 10 | 12.00 |

Secchi depth recorded in 2012 occurred in July (6.67 feet) corresponding with the highest 2012 TVS concentration (137 mg/L). Calculated nonvolatile suspended solids (NVSS) was 1.18 mg/L. This means that slightly more than half of the TSS concentration in 2012 can be attributed to organic particles, such as algae. Turbidity caused by algae can reduce the water clarity in Harvey Lake. Algae blooms were documented June through August, primarily consisting of filamentous algae that covered up to 70 % of the lake surface attached to topped out aquatic plants (Eurasian Watermilfoil pg ?). As summer progressed planktonic algae (free-floating) blooms increased primarily consisting of blue-green algae. June through August TVS concentrations were above the county median of 122 mg/L.

# NUTRIENTS

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 Harvey Lake, the limiting nutrient was phosphorus, which has a direct effect on how much aquatic plants and algae can grow in lakes.

The 2012 average total phosphorus concentration in Sand Lake was 0.032 mg/L this was a 59% decrease from the 2000 concentration (0.078 mg/L) and below the 2012 county median of 0.067 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 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 2012 TKN for Harvey Lake was 0.80 mg/L, which was below the county median of 1.16 mg/L and a 42% decrease from the 2000 concentration (1.37 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 lake's 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 2012, Harvey Lake was eutrophic with a TSIp value of 54.5. Based on the TSIp, Harvey Lake ranked 38$^{h}$ out of 174 lakes studied by the LCHD-ES from 2000-2012.

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.

### WHAT HAS BEEN DONE TO REDUCE PHOSPHORUS LEVELS IN HARVEY LAKE

**December 2008–** Vernon Hills passed an ordinance prohibiting the use of lawn fertilizers containing phosphorus

**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.

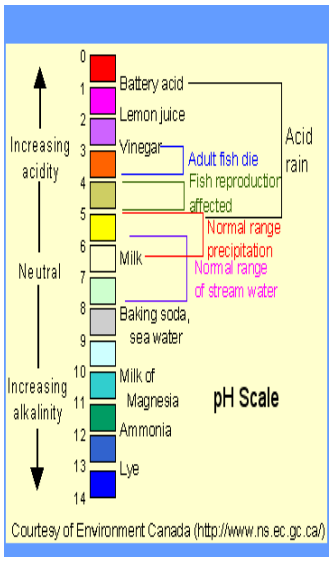
### WHAT YOU CAN DO TO HELP LOWER PHOSPHORUS LEVELS IN HARVEYLAKE

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

# ALKALINITY AND pH

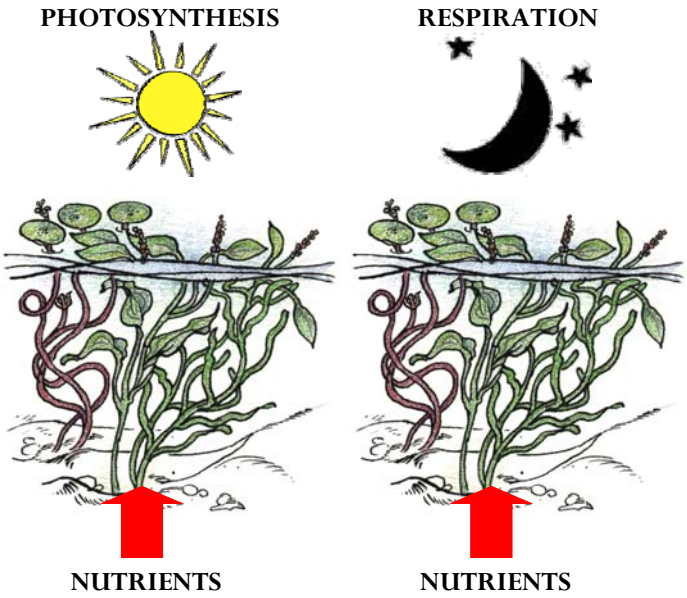



**The pH scale ranges from 0 to 14. A pH of 7 is considered to be neutral. Substances with pH of less than 7 are acidic; substances with a pH greater than 7 are basic. The chart above illustrates the pH of some common substances.**

| U.S. E.P.A Category | Concentration of $CaCO_3$ (mg/L) |
|---|---|
| Acidified | <1 and pH <5 |
| Critical | <2 |
| Endangered | 2-5 |
| Highly Sensitive | 5-10 |
| Sensitive | 10-20 |
| Not Sensitive | >20 |

**U.S. E.P.A classification of lakes and ponds based on alkalinity as measured in concentration of calcium carbonate ($CaCO_3$)**

Alkalinity is the buffering capacity of a water body. It measures the ability of water bodies to neutralize acids and bases to maintain a stable pH. In a lake alkalinity acts to buffer lakes from the effects of acid rain because bicarbonate ($HCO_3$-) and carbonate ($CO_3$) neutralize hydrogen ions from acid inputs. Buffering occurs when excess hydrogen ions (H+) are removed from the water. pH is a measure of the hydrogen ion concentration of water. As the hydrogen ions are removed, pH goes up or halts its decline. Alkalinity comes from rocks, soils, salts, and certain plant activities. If a lakes watershed contains large quantities of calcium carbonate ($CaCO_3$, limestone), water bodies tend to be more alkaline; while granite bedrock is deficient in alkaline materials to buffer acidic inputs. A well buffered lake also means that daily fluctuations of $CO_2$ concentrations result in only minor changes in pH throughout the day. Aquatic organisms benefit from a stable pH within their water body for optimal growth and survival. Although each organism has an ideal pH, most aquatic organisms prefer pH of 6.5 – 8.0. Outside of this range, organisms become physiologically stressed. Reproduction can be impacted by out-of-range pH, and organisms may even die if the pH gets too far from their optimal range. In 2012 the average alkalinity ($CaCO_3$) concentrations in Harvey Lake were 101 mg/L which is below the county median of 161 mg/L. The USEPA considers lakes with a $CaCO_3$ concentrations greater than 20 mg/L to not be sensitive to acidification. The lowest concentration occurred in June with a concentration of 70 mg/L and correlated with the highest pH value of 9.36. As buffering occurs excess hydrogen ions (H+) are removed pH values increase. This was influenced by the large aquatic plant and algae populations. As aquatic plants/algae under go photosynthesis pH is raised because the process consumes protons (H+). Photosynthesis uses up dissolved carbon dioxide ($CO_2$). $CO_2$ in effect, reduces the acidity of the water and so pH increases. In contrast, respiration of aquatic plants/algae produces $CO_2$ , which lowers pH. pH may be higher during daylight hours and during the growing season when photosynthesis is at a maximum. Harvey Lake average pH is 8.41 which is slightly above the county median of 8.34.



# CONDUCTIVITY AND CHLORIDE

**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.**

Another parameter measured during 2012 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 2012, Harvey Lake average conductivity was 0.8128 mS/cm. This was the only parameter to exceed Lake County medians, since 2000 (0.8020 mS/cm, 0.8094 mS/cm, respectively). 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. Harvey Lake 2012 average chloride concentration was 152 mg/L. These values are influenced by the winter road maintenance of Museum Boulevard and Lakeview Parkway. The United States Environmental Protection Agency has determined that chloride concentrations higher than 230 mg/L can disrupt aquatic systems. 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.

## ICE FACTS

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

## WHAT HAS BEEN DONE TO REDUCE CHLORIDE LEVELS IN HARVEY LAKE

**Village of Vernon Hills Public Works:**

Uses a 300-gallon tank on a pickup truck and an environmentally friendly alternative to salt, a liquid by-product consisting of salt, calcium chloride, and beet juice that adheres to pavement for up to 5 days. The department has halved salt consumption – from 600 to 300 pounds per lane mile, or 1,600 tons a year .

**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.

**Lake County Division of Transportation:**

Is enhancing efficiency of snow removal, and going green through innovation and technology. Global positioning systems (GPS) on snow plows are providing real-time tracking of these vehicles, as well as the application of salt and de-ice materials. The data is then used to better coordinate and target services, saving on salt and gas.

**Effectiveness of Salt as a Deicing Agent Based on Pavement Temperature °F**

| 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 | Dry salt is ineffective and will blow away before it melts the ice |

# AQUATIC PLANTS

**The tips of the braches are crowded with leaves giving it a "Coontail" resemblance.**

**COONTAIL**
*CERATOPHYLLUM DEMERSUM*
**OVERWINTERS AS A EVERGREEN PLANT, IT PROVIDES IMPORTANT HABITAT TO MANY INVERTEBRATES OVERWINTERS AS AN EVERGREEN AND PROVIDES FISH WITH YEAR ROUND HABITAT.**

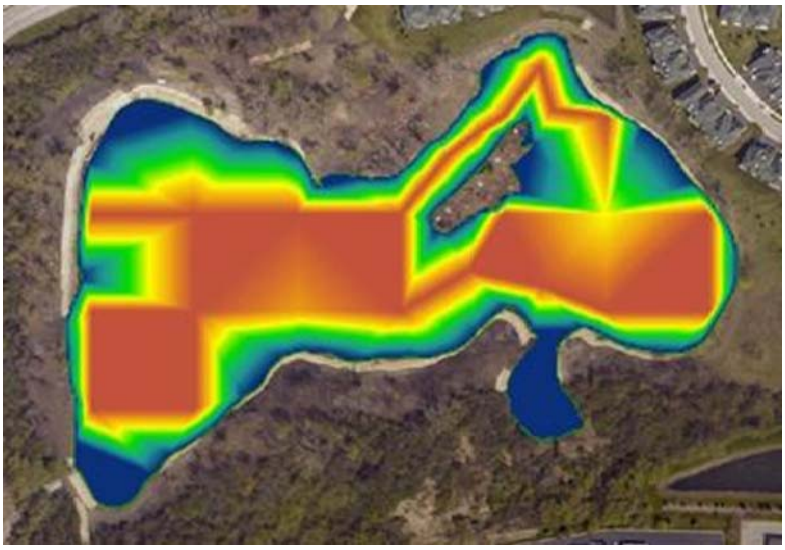
Plants growing in our lakes, ponds, and streams are called macrophytes. These aquatic plants appear in many shapes and sizes. Some have leaves that float on the water surface, while others grow completely underwater. In moderation, aquatic plants are aesthetically pleasing and desirable environmentally.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

Aquatic plant sampling was conducted on Harvey Lake in July 2012. There were 17 points generated based on a computer grid system with points 60 meters apart. Aquatic plants occurred at all 17 of the sites (100 % total lake coverage) that included 3 aquatic plant species, including one exotic invasive species; Eurasian Watermilfoil. Species diversity decreased from 2000 with the loss of Leafy Pondweed, Northern Watermilfoil, and Duckweed in the aquatic plant community. In 2012 the most common species was Coontail and Eurasian Watermilfoil at 100% and 82% of the sampled sites, respectively while Sago Pondweed was common at 12% of the sampled sites. The overall aquatic plant density has changed since 2000. This is mostly contributed to the significant increase in the Coontail population. In 2000 Eurasian Coontail was only found at 6% of the samples sites in July. Coontail is a submersed aquatic plant with coarse, bushy stems and no roots. Lacking true roots, the plants may drift between a variety of depths during the growing season. Coontail overwinters as an evergreen plant, providing habitat to invertebrates and fish year round.

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 will grow. 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 Harvey Lake ranged from 10-12 feet during the sampling season. Plants were found at a maximum depth of 12.0 feet. A healthy aquatic plant population is critical to good lake health. Aquatic vegetation provides important wildlife habitat and food sources. 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. Empirically this can be seen in Harvey Lake by the reduction in TSS, NVSS, TP, and Secchi depth from 2000 to 2012.

## DISTRIBUTION OF RAKE DENSITY ACROSS ALL SAMPLES SITES IN 2012

| Rake Density (Coverage) | # of Sites | % |
|---|---|---|
| No plants | 0 | 0.0 |
| >0 to 10% | 0 | 0.0 |
| >10 to 40% | 0 | 0.0 |
| >40 to 60% | 1 | 5.9 |
| >60 to 90% | 1 | 5.9 |
| >90% | 15 | 88.2 |
| Total Sites with Plants | 17 | 100.0 |
| Total # of Sites | 17 | 100.0 |



# 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 -2012 was 12.7. Harvey Lake had an FQI of 3.3 ranking 150th out of 160.

**Lake County Median**

**FQI = 12.7**

**AQUATIC PLANTS: WHERE DO THEY GROW?**

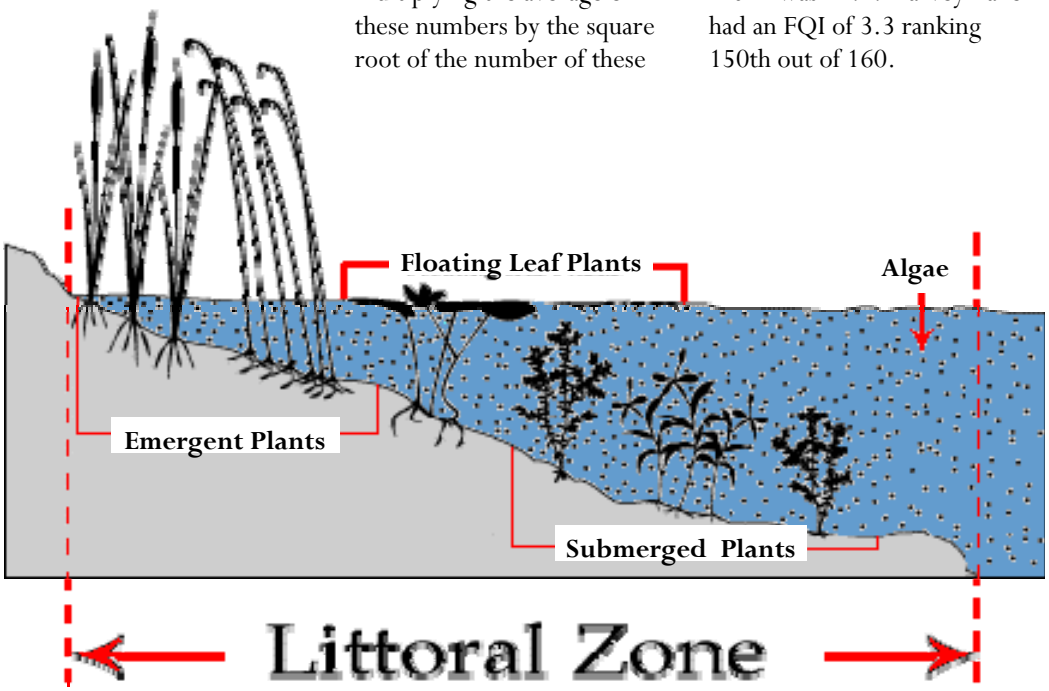
**Littoral Zone–** the area that aquatic plants grow in a lake.

**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

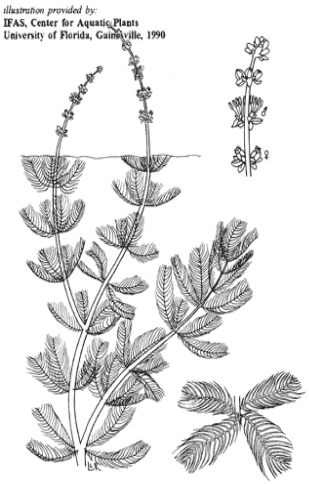
IN MANY LAKES MACROPHYTES CONTRIBUTE TO THE AESTHETICALLY PLEASING APPEARANCE OF THE SETTING AND ARE ENJOYABLE IN THEIR OWN RIGHT. BUT EVEN MORE IMPORTANT, THEY ARE AN ESSENTIAL ELEMENT IN THE LIFE SYSTEMS OF MOST LAKES.

- 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**

# Eurasian Watermilfoil

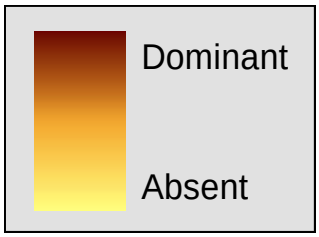
**Illustration of Eurasian Watermilfoil**

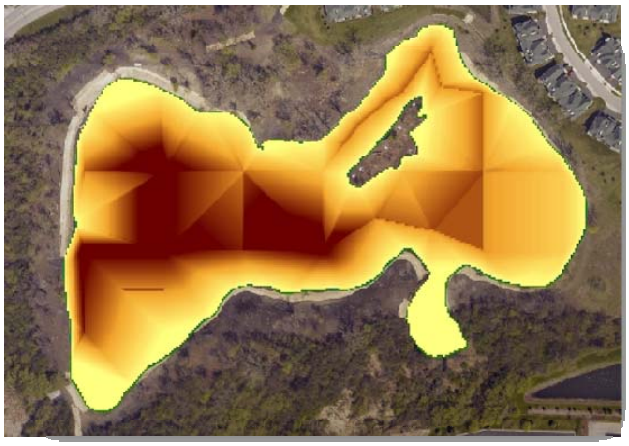



Eurasian Watermilfoil (EWM) is a feathery submerged aquatic plant that can quickly form thick mats in shallow areas of lakes and rivers in North America. These mats can interfere with swimming and entangle propellers, which hinders boating fishing, and waterfowl hunting. Matted milfoil can displace native aquatic plants, impacting fish and wildlife. Since it was discovered in North America in the 1940's, EWM has invaded nearly every US state and at least three Canadian Provinces. Milfoil spreads when plant pieces break off and float on water currents. It can cross land to new waters by clinging to sailboats, personal watercraft, powerboats, motors, trailers, and fishing gear.

The abundance of EWM in Harvey Lake has increased by 42% since 2000. EWM was absent at only three sample sites, and populations were most dense in the western portion of the lake at depths around 5 feet. In 2012 topped out EWM populations negatively influenced recreational and aesthetic uses of the lake. An aquatic plant management plan is critical to maintaining the health of the lake and a balanced aquatic plant community. The plan should be based on the management goals of the lake and involve usage issues, habitat maintenance/ restoration, and limitations of the lake. The primary focus of the plan must include the control of exotic aquatic species including EWM. Follow up is critical to achieve long-term success. A good aquatic plant management plan considers both the short and long-term needs of the lake.

**Erasian watermilfoil density at 17 sites on Harvey lake in July, 2012, Maximum depth that plants were found was 8.0 feet.**



**Distribution of eurasion watermilfoil**

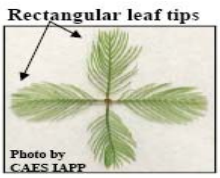
## *Myriophyllum*

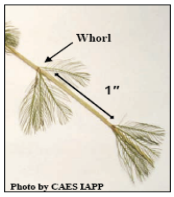
**Common Names:**
Eurasian watermilfoil

**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

**WANTED DEAD, NOT ALIVE**
**INVADING SPECIES**

**INVASIVE EXOTIC PLANT SPECIES AROUND HARVEY LAKE, THESE PLANTS EXCLUDE NATIVE PLANTS AND PROVIDE POOR SHORELINE STABILIZATION.**

**COMMON BUCKTHORN:**
*Rhamnus catharita*
**GLOSSY BUCKTHORN**
*Rhamnus frangula*

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 2012 for significant changes in erosion since 2000; there was noteworthy improvement in shoreline erosion since 2000 when 100% of the shoreline had some degree of erosion. In 2000 the entire shoreline was classified as undeveloped and most of the shoreline exhibited serve erosion. Several factors were influencing the degree of erosion on Harvey Lake: fluctuating water level, bare erodible soils under an invasive exotic shrub (Buckthorn), and the composition of the soil, a loose hydric peaty soil. In 2007 the Village with grant assistance from the North Cook County Soil and Water Conservation District, conducted a comprehensive shoreline restoration project. Over 9.4 acres of buckthorn was cleared to create a native riparian area around the lake, the lake was pumped down over 3 feet in depth to provide an area to install deep water stabilization techniques such as "off shore rock berms.", the slopes were reshaped and seeded with native seed mixes and erosion control blankets were installed, in late spring native shrub live stakes were installed near normal water level, and in early summer, over 32,000 native plant plugs were installed from deep water and shallow water emergents to middle upper bank plants. This restoration project improved the health of Harvey Lake in a variety of way. The new aquatic and terrestrial native plants help to stabilize the shoreline to prevent future erosion, add habitat for wildlife to a shoreline that was otherwise limited in habitat and filter pollutants and nutrients from the near shore areas before they enter the lake.

A successful restoration project includes a long-term plan that factors in maintenance and interaction with community.

## 2007 COMPREHENSIVE SHORELINE RESTORATION

**OVER 9.4 ACRES OF BUCKTHORN WAS CLEARED TO CREATE A NATIVE RIPARIAN AREA AROUND THE LAKE.**

**SLOPES WERE RESHAPED AND SEEDED WITH NATIVE SEED MIXES AND EROSION CONTROL BLANKETS WERE INSTALLED.**

**OVER 32,000 NATIVE PLANT PLUGS WERE INSTALLED FROM DEEP WATER AND SHALLOW WATER EMERGENTS TO MIDDLE UPPER BANK PLANTS.**

# SHORELINE PLANT SURVEY

**WANTED DEAD, NOT ALIVE**
**INVADING SPECIES**

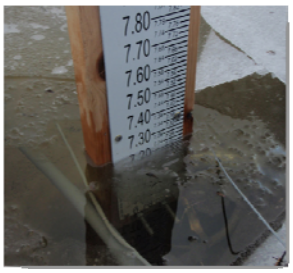
**INVASIVE EXOTIC PLANT SPECIES AROUND HARVEY LAKE, AS IT ESTABLISHES AND EXPANDS, IT OUTCOMPETES AND REPLACES NATIVE GRASSES, SEDGES, AND OTHER FLOWERING PLANTS THAT PROVIDE A HIGHER QUALITY SOURCE OF NUTRITION FOR WILDLIFE.**

**PURPLE LOOSESTRIFE:**
*Lythrum salicaria*

In July 2012, a shoreline vegetation survey was conducted at eleven sites, ten sites were evenly spaced around the perimeter of the lake and one site was located on the island. The species encountered were documented, and quantified only as present or absent. Eighty-five species were present, and 19 were exotic. The most common species documented was Pickerel Weed and Cattail observed at seven sample locations. These species occupied similar niches around Harvey Lake often occurring together. Other common species included Purple Coneflower, Purple Loosestrife, Swamp Milkweed, and Tule. Purple Loosestrife is an invasive exotic species, when left unmanaged populations can result in the suppression of the native plant community creating a monoculture that disrupts food sources and cover for wildlife. Another exotic Common Buckthorn was present at four sample locations (sample sites 1, 2, 5, and 10) primarily on the northeastern portion of the lake; Glossy Buckthorn was also present at sample site 10. The northeastern portion of the lake had the most shoreline plant diversity with 31 species present, while sample site 11 on the island had the least with 8 species present.

**ELEVEN SHORELINE PLANT SAMPLE SITES ON HARVEY LAKE, 2012.**

# LAKE LEVEL




**EXAMPLE OF A PERMANENT STAFF GAGE**

Lakes with stable water levels potentially have less shoreline erosion problems. A fluctuation in lake levels was observed during the sampling season. Data from the Stormwater Management Commission's Lake Zurich rain gauge was correlated to rain events and lake levels increases. Over the sample period May to September the lake level decreased 19.65 inches. Harvey Lake appears to be greatly influenced by rain events, the lake receives storm water from its watershed and storm drains. The highest lake level occurred in May after the addition of 4.21 inches of rain. The driest weather during the sampling period occurred in July (0.53 inches of rain) along with the lowest lake level and the greatest monthly change in lake level with a decrease of 20.71 inches from June to July. The 2000 report also documented fluctuating lake levels. According to the National Climatic Data Center administered by the National Oceanic and Atmospheric Administration, the weather in Illinois from May to September in 2012 was unusually dry and warm. The 2012 nine month average temperatures were the second highest recorded on record since 1895. Only 1921 had higher average temperatures, resulting in lake levels to be considerably lower than average.

LakeCounty
Health Department and
Community Health Center

ENVIRONMENTAL SERVICES

Senior Biologist: Mike Adam

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Libertyville, Illinois 60048-1331

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**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

Harvey Lake's water quality had notable decreases in most parameters since the last survey in 2000. This was largely influenced by the shoreline restoration project occurring in 2007; that stabilized shorelines reducing TSS and TP into the lake. The aquatic plant community response to increased water clarity was 100% lake coverage; however a significant increase in EWM population and a decrease in aquatic plant diversity present in the lake also occurred .

Harvey Lake's, management is administered by the Village of Vernon Hills. To improve the overall quality of Harvey Lake, the ES (Environmental

- **Develop an aquatic plant management plan that targets the reduction of Eurasian Watermilfoil and increases species diversity**
- **Bathymetric map created**
- **Update shoreline management plan to continue removal of Buckthorn species and the addition of Purple Loosestrife**
- **Reduce chlorides entering the lake**
- **Participate in Volunteer Lake Monitoring Program**
- **Install a staff gage to monitor lake level fluctuations**
- **Assess current fish population**

**TOPPED OUT EURASIAN WATERMILFOIL HARVEY LAKE, 2012**