



*Aerial view of Forest Lake from the South, year unknown*

## **Forest Lake Improvement Committee**

**2010 Lake Management Summary  
2011 Lake Management Plan**

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# Forest Lake Improvement Committee

## 2010 Lake Management Summary

### Note from the Committee

This year the Forest Lake Improvement Committee (FLIC) saw a change in management, as Lou DiNicola resigned from the FLCA Board and newly appointed Board member Nick Leonard assumed responsibilities as Chairman of the Lake Committee. Lou did an outstanding job during his time as Chairman, and deserves our greatest gratitude. Lou has decided to remain a member of the committee, contributing his experience with Forest Lake and its fishery.

### Water Quality Monitoring

Year	TP (mg/L)	TSS (mg/L)	SECCHI (feet)	COND (mS/cm)	DO (mg/L)	TSI	LC Ranking
1985	0.144	18.6	2.10	N/A	N/A	N/A	N/A
2000	0.087	15.6	2.48	0.8450	6.85	68.7	60/86
2003	0.167	16.8	2.23	1.0776	8.24	78.0	113/130
2004	0.105	10.6	3.35	0.9767	8.37	71.0	113/161
2005	0.147	14.0	2.37	1.5816	9.11	76.1	130/162
2006	0.142	15.3	2.84	1.2298	6.55	75.3	130/162
2010	0.102	12.0	2.49	1.0390	8.42	70.0	116/165
Desired Level	<0.050	N/A	N/A	<1.0000	>5.00	50-70	N/A
Lake County Median	0.063	7.9	3.15	0.7910	N/A	N/A	N/A
Forest Lake Avg '85-'06	0.132	15.2	2.56	1.1420	7.82	73.8	N/A

TP - Total Phosphorous, TSS - Total Suspended Solids, Secchi - visibility, COND - conductivity  
DO - Dissolved Oxygen, TSI - Trophic State Index

This year the FLIC participated in Lake County's Volunteer Lake Management Program (VLMP) for the first time since 1985. Monthly VLMP testing was conducted at three locations throughout the season (May-Sept) for Secchi depth, dissolved oxygen, and temperature. Results were submitted to Lake County Environmental Health Services (LCEHS) for analysis, and were used to complete the LCEHS annual report for Forest Lake.

From a water quality standpoint, 2010 was a very good year for Forest Lake. The FLIC contracts water testing services from LCEHS, and the data accumulated from 1985 through 2010 is displayed in the table above. Historically, Forest Lake contains high levels of phosphorus: a trend that continued in 2010. High levels of phosphorus contribute to excessive aquatic plant growth and algae blooms. While the average total phosphorus (TP) of 0.102 mg/L was the second lowest on record, it's approximately twice the county average and recommended level. Also, a dramatic rise in TP has been observed between June and July of almost every year on record. Because of high phosphorous levels, Forest Lake continues to hold a place on the IEPA's "Impaired Lakes" list.

The conductivity of the lake is measured to determine the concentration of ions in the water, which can be correlated to the amount of chloride (Cl-) present. Chloride, which is introduced to the lake through the use of road salts in the winter, can affect fish and aquatic macrophyte (plant) populations. In 2010, the conductivity of Forest Lake was lower than the 1985-2006 average, but still higher than the Lake County average and the desired level. Since 2005, the percentage of transportation and industrial land uses in the watershed (the area that drains into the lake) has increased 130% and 170%, respectively. These types of land use can be significant sources of chloride, and may become problematic in the future.

Tropic State Index (TSI) is a rating used to determine the trophic state of a lake, and is calculated from various water quality parameters. There are four trophic states, oligotrophic (TSI <40), mesotrophic (40-50), eutrophic (50-70), and hypereutrophic (>70). These states represent the natural aging process of glacial lakes, as they slowly fill with sediment and other materials from the surrounding watershed over thousands of years. Oligotrophic lakes are nutrient-poor and biologically unproductive, mesotrophic lakes have intermediate nutrient availability and biological productivity, eutrophic lakes are nutrient-rich and highly productive, and hypereutrophic lakes are extremely nutrient-rich and biologically productive. Due to land development (soil erosion) and fertilization (phosphorus inputs), most lakes in the county are eutrophic or hypereutrophic, and Forest Lake has walked the border of these two states throughout its recorded history. All of the lakes monitored by LCEHS are ranked according to TSI, and Forest Lake has historically ranked in the bottom 30%. However, between 2006 and 2010, Forest Lake dropped 5.3 index points and gained 14 spots on the list.

### **The State of the Aerators**

Aerators are used to provide oxygenation, water movement, and to limit the summer stratification of lakes. Stratification, where the water column forms two thermally separated layers that do not mix, can cause anoxic (oxygen depleted) conditions in the hypolimnion (lower layer). Oxygen depletion can cause numerous problems for a lake, including summer fish kills and fall algae blooms. In the annual lake reports of 2000, 2005, and 2006, LCEHS determined that Forest Lake did not stratify in the summer months. During these years, however, the aerators were in operation, so a mixed water column would be expected. Since stratification usually requires water greater than 20 feet deep, it is likely that Forest Lake would not stratify even if the aerators were not in operation.

By suggestion of LCEHS, the aerators were not in operation for the entire duration of 2010. Dissolved oxygen monitoring ruled out any significant oxygen depletion at the lake bottom. Although a thermocline (temperature difference) can be felt in the summer months, the testing data concludes that Forest Lake did not stratify in 2010 when the aerators were not in operation. It appears that the shallow morphology of the lake and sufficient wave action due to wind sustain a mixed water column throughout the summer season.

As suggested by LCEHS in their 2000 report, it was believed that the aerators may be agitating the lake bed, causing sediment to be suspended in the water column. Inspection of the aerator diagrams by the FLIC and discussions with the installers provided support for this theory. The aerators were installed in ~13' deep pits that were dug as in-lake sediment traps during the 1994 dredging. It is possible that over time, sediment has collected in these pits (as designed), covering the aerator tubing that is coiled at the bottom. Operation of the aerators could disrupt this sediment, and result in increased Total Suspended Sediment (TSS) levels and decreased visibility (Secchi depth). The average TSS level for 2010 was the second lowest on record, supporting a correlation between aerator operation and high TSS levels. Secchi depth, however, did not follow

suit and remained at the historical average. However, Secchi depth measurements can be impacted by algae blooms, and the FLIC recorded unofficial Secchi depths in early November of an unprecedented 7-8 feet. The impact of the aerators on Secchi depth is inconclusive and requires further study.

Since no other phosphorous controls were enacted in 2010, it's possible that the aerators have an effect on phosphorus levels as well. Agitation of the lake bottom sediment can release phosphorus, so it's possible that the absence of aeration contributed to the lower than average TP levels observed in 2010. This theory cannot be confirmed at this time, and further studies are necessary.

### **Aquatic Macrophyte Management**

Planktonic algae and other undesirable algae dominated Forest Lake throughout the 2010 season. Planktonic algae (blue-green algae) are free floating, single celled organisms that give water a "pea soup" appearance. Planktonic algae blooms have occurred in Forest Lake throughout its recorded history, and in 2010, were observed intermittently from July through September. Blue-green algae, also referred to as cyanobacteria, are known to produce toxins that, at high concentrations, can harm aquatic life and humans. LCEHS determined that the three types of blue-green algae that are known to produce toxins were present in Forest Lake in 2010. It is recommended that residents avoid swimming during significant blue-green algae blooms. Typical symptoms of interaction include irritation of the eyes, nose, and throat.

A *Hydrodictyon* filamentous algae outbreak also occurred this year, beginning the first week in September on north shore and spreading to most of the northwestern shoreline by the end of the month. *Hydrodictyon* usually attaches to lake bed debris and does not occur in more than four feet of water. It is known to multiply rapidly and form dense green mats that resemble nylon netting. This year's outbreak lasted approximately six weeks, and subsided as the water temperature decreased in late October.

Desirable aquatic macrophytes (plants) had a surprisingly successful year in Forest Lake. LCEHS conducted a grid-style plant survey, and although aquatic macrophytes were found at only six of the 41 sites surveyed, 10 different species were observed and 14% of the surface was determined to have plant coverage. Only one invasive species (curly leaf pond weed) was found, and the most abundant macrophytes were large colonies of American pondweed along the western and southwestern shoreline. The aquatic macrophyte population of Forest Lake has vastly improved since the 2000 survey, which found only two species of aquatic macrophytes. It is very likely that the decreased TSS levels observed in 2010 were a major contributor to the success of the aquatic plant population.

Although the aquatic macrophyte population on Forest Lake has increased, there is still much room for improvement. LCEHS suggests that 30-40% of the lake surface have plant coverage. An established, healthy aquatic plant population is imperative for a healthy lake, providing lake bed stabilization, habitat and food for wildlife, and reduced algae blooms: all of which will contribute to clear water and an improved fishery. While it is common to have a negative view of these "weeds", a lake with clear water and an established plant population is much more desirable than a turbid, "pea soup" colored body of water.

## **Shoreline Management**

In 2010, LCEHS conducted the first shoreline erosion survey since 2000. The entire 1.6 miles of Forest Lake shoreline was visually inspected and categorized as having no erosion, slight erosion, moderate erosion, or severe erosion. It was determined that 41% of the shoreline exhibited some form of erosion, with 20% being slight, 12% moderate, and 9% severe. This is a significant increase from 2000, when 28% of the shoreline was considered to have slight/moderate erosion and none determined to be severe.

Shoreline erosion can result in decreased water clarity and will cause the lake to slowly fill in over time. The shoreline of Forest Lake is almost completely developed and most yards have turf grasses which run to the shoreline. Turf grasses have very shallow root systems (2–4”) and don’t provide sufficient protection from erosion. Rocks and boulders (rip-rap) can be installed to slow erosion, but over time the unstabilized soil behind the rocks will be washed away. The best method to limit erosion, and the suggestion of LCEHS, is the installation of shoreline buffer strips. Simply stated, the installation of a buffer strip involves the replacement of shoreline turf grasses with native plants. Native plants have incredibly deep root systems (some up to 15 feet) that are ideal for stabilizing the shoreline and limiting erosion. Proper rehabilitation of our shorelines will have a dramatic effect on the water quality and wildlife populations of Forest Lake.

## **Fishery Management**

In the spring of 2010, the lake was stocked with 25 lbs. of fathead minnows, 25 lbs. of golden shiners, 160 5-8” largemouth bass, 160 5-7” smallmouth bass, and 174 5-7” walleye pike. The juvenile largemouth bass seem to be abundant, and large schools of smaller fish were observed when the water cleared in October/November. The last fish population survey was completed by the Illinois DNR in October of 2003, and the FLIC has requested a survey for 2011. The FLIC has also compiled a complete stocking history from 2003 through 2010, and will use this information, along with the survey results, to more strategically stock the lake in the future.

The FLIC continues to stress the importance of catch and release in Forest Lake. Although we stock the lake each year, the Illinois DNR estimates that only 50% of those fish survive the first five years. Studies have also shown that most game fish are commonly unable to reproduce in man-made lakes. These facts, coupled with low visibility and limited plant cover for feeding, make it difficult for large game fish to thrive in Forest Lake.



# Forest Lake Improvement Committee

## 2011 Lake Management Plan

### Plans for 2011:

- Initiate a community outreach program to highlight the responsibilities of living in the Forest Lake watershed
- Establish a water testing program with LCEHS to determine the sources of phosphorus and investigate the June-July increase in TP levels
- Install staff gauge for lake level monitoring
- Determine the future of the aerators
- Implement an aquatic plant program
- Implement a shoreline rehabilitation program
- Conduct a fish population survey

### Water Quality Monitoring

Although the water quality of Forest Lake was better than average in 2010, it was still below the Lake County averages and desirable levels. The FLIC has highlighted several areas that need attention in 2011.

The FLIC will initiate a watershed education program, aimed at informing the community about how daily activities affect the lake. Initially, links to informational websites will be posted on the FLCA website ([http://www.flcaonline.org/The\\_Lake.htm](http://www.flcaonline.org/The_Lake.htm)). Ultimately, the FLIC would like to create an informational manual to be distributed throughout the watershed community.

The FLIC will work with representatives from LCEHS to establish a water testing program in addition to the standard LCEHS testing and our continued VLMP responsibilities. The FLIC is focused on determining the major sources of phosphorus in Forest Lake, and establishing a ratio of internal versus external. The FLIC plans to monitor the incoming water from the three main tributaries and the outgoing water at the damn for TP and TSS. The results of this data should provide insight into the amount of phosphorus and sediment entering the lake from external sources, and which tributary is the largest contributor. The proposed testing will also provide information about the amount of phosphorus available from internal sources, such as decomposing algae, vegetation, and the lake bottom sediment.

To accommodate easier monitoring of the lake level, a staff gauge will be installed at a to-be-determined location. Once installed, the level will be recorded daily/weekly by a FLIC member. This was a suggestion in the LCEHS 2010 report, and will provide useful information for comparing water parameters from year-to-year.

### The Future of the Aerators

The FLIC, as advised by LCEHS, has decided to leave the aerators off in 2011. The decreased TSS levels observed in 2010 are imperative for a successful aquatic plant management program. Dissolved oxygen, Secchi depth, TSS and TP measurements will continue, and will be analyzed at year's end. If TSS levels continue to decrease, an increase in water clarity (Secchi

depth) should result, which will benefit the aquatic plant and fish populations of the lake. The current state of the aerators and the in-lake sediment pits will also be investigated to determine if the aerator lines are in fact buried in sediment on the lakebed. In the 2000 LCEHS report, the complete removal of the aerators was recommended with exception of the south bay. Due to resident complaints of odor/stagnation, LCEHS suggested that the aerator in the south bay remain operational. To determine if the water quality in the south bay differs from the main lake, additional VLMP testing for Secchi and dissolved oxygen will be performed in 2010.

### **Aquatic Plant Management Program**

With assistance from the professionals at LCEHS, the FLIC will initiate an aquatic plant management program in 2011. The program will require proper planning for optimal planting locations and conditions, and will have greater chances for success if TSS and Secchi readings maintain or improve in 2011. Care will be taken to consult lakefront owners before planting adjacent to private shorelines, and donated plants from area lakes will be sought to keep costs at a minimum. Volunteers will be needed so please contact Nick Leonard if you'd like to help and/or would like to plant along your shoreline.

### **Shoreline Rehabilitation Program**

The results of the 2010 shoreline survey were alarming, and rehabilitation of our shoreline is imperative for the future health of the lake. Shoreline mismanagement can contribute to murky water, lake fill-in, and limited habitat for wildlife. The FLIC will provide the community with information on how to properly design a shoreline, and plans to initially target the areas of severe erosion. However, since most of Forest Lake's shoreline is privately owned, cooperation from the lakeshore homeowners is imperative. Discussions are underway to initially rehabilitate a community shoreline, and use it as an example of a properly designed shoreline. Please contact Nick Leonard if you'd like to help with the rehabilitation of a community area or would like information on how to improve your own shoreline.

### **Fishery Management**

The fish population in Forest Lake continues to do well, and the intended actions of the FLIC should only improve the fishery in the future. The lake has been stocked every year since the 2003 survey, and recently, a new method for stocking has been established that should increase the survival rate of the new additions. A fish population survey was requested for 2011, however, is unlikely due to the current IL DNR resources. The results and suggestions will be taken into consideration for the 2012 stocking. Also, the Forest Lake creel limits will be reassessed once the results of the survey are reviewed. In an effort to reduce the population of common carp, the FLIC is also discussing the possibility of a carp fishing derby in 2011.

**Measurable Goals for 2011:** The FLIC will begin to set goals for the upcoming year, which will be evaluated upon receipt of the LCEHS annual report. The goals for 2011 are:

- Average TP below 0.100 mg/L
- Average TSS below 11.0 mg/L
- Average Secchi depth above 2.60'
- 18% aquatic plant coverage
- TSI rating below 68.0
- 110 or better in the Lake County Rankings