



Forest Lake at sunset, Summer 2011

Forest Lake Improvement Committee

2011 Lake Management Summary 2012 Lake Management Plan

Nick Leonard, Chairman Lou DiNicola Todd Thomas Larry Steker Joe Wachter



Forest Lake Improvement Committee

2011 Lake Management Summary

Note from the Committee

The Forest Lake Improvement Committee (FLIC) is happy to announce the addition of a new member in 2011. Joe Wachter is a new Forest Lake resident and Professor of Chemistry at Harper Jr. College. Joe joined the committee in the Fall of 2011 and will initially focus his efforts on our Volunteer Lake Management Program (VLMP). Welcome Joe, and thanks for volunteering!

Water Quality Monitoring

	ТР	TSS	SECCHI	COND		LC
Year	(mg/L)	(mg/L)	(feet)	(mS/cm)	TSI	Ranking
1985	0.144	18.6	2.10	N/A	N/A	N/A
2000	0.087	15.6	2.48	0.8450	68.7	60/86
2003	0.167	16.8	2.23	1.0776	78.0	113/130
2004	0.105	10.6	3.35	0.9767	71.0	113/161
2005	0.147	14.0	2.37	1.5816	76.1	130/162
2006	0.142	15.3	2.84	1.2298	75.3	130/162
2010	0.102	12.0	2.49	1.0390	70.0	116/165
2011	0.082	14.0	3.27	0.9120	68.0	95/171
Lake County Median	0.066	8.6	2.95	0.8320	N/A	N/A
Forest Lake Avg '85-'10	0.128	14.7	2.55	1.1250	73.2	N/A

TP - Total Phosphorous, TSS - Total Suspended Solids, COND - conductivity, TSI - Trophic State Index

From a water quality standpoint, 2011 was one of the best years on record. The average total phosphorus (TP) and nitrogen levels were the lowest on record, and the Secchi depth, which measures visibility, was better than the Lake County average! This is definitely a step in the right direction, but Forest Lake still contains undesirable levels of phosphorus. The 2011 TP levels are still 24% higher than the county average and 64% higher than the level recommended by the EPA. Because of high phosphorous levels, Forest Lake continues to hold a place on the IEPA's "Impaired Lakes" list.

There are two methods used to measure the degree of water clarity: Secchi disk depth and Total Suspended Solids (TSS). Secchi depth is recorded by observing the depth at which a black and white disk placed in the water is no longer visible from the surface. TSS is an analytical method which measures the total amount of suspended particles in the water as mg/L. Both Secchi and TSS levels were the best ever recorded in May of 2011, but the August and September water samples were taken during algae blooms, which can result in worse than actual data.

Tropic State Index (TSI) is a rating used to estimate the overall water quality of a lake. Due to land development (soil erosion) and fertilization (phosphorus inputs), most lakes in the county are eutrophic (nutrient rich, TSI 50-70) or hypereutrophic (extremely nutrient rich, TSI >70). Forest

Lake has been classified as hypereutrophic throughout most of 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. This year Forest Lake made another significant improvement, achieving a record-breaking TSI of 68.0 and jumping another 21 spots on the list!

2011 Inlet Testing Program and Watershed Analysis

In an effort to obtain more information about the quality of the water entering Forest Lake, the FLIC implemented water testing on the three main inlets. Samples were taken at monthly intervals and during heavy storm events. In addition, sub-watershed maps were created and an onfoot inspection of each inlet was conducted. The information obtained from these activities will allow the FLIC to prioritize the areas of greatest concern and develop focused remediation strategies.

Inlet #1 – The northern-most inlet, crossing under N. Forest Dr. west of Bonnie Dr. Calculated as an average of all samples, Inlet #1 was the primary contributor of chloride, and to a lesser extent, contributed the largest amount of phosphorus to the lake (all inlets recorded similar phosphorous inputs). Inlet #1 was determined to have the largest sub-watershed, from which 42% of the total watershed drains into the lake. On-foot inspection revealed severe erosion. and storm water management issues.

Inlet #2 – This is the middle of the three inlets, which crosses N. Forest Dr. north of Glendale Rd. and enters the lake under the dock at Ercker Park. The sub-watershed of inlet #2 covers 25% of the total watershed, and according to the testing data and visual inspections, appears to be in good condition compared to the other two inlets. There are some areas of erosion along the creek between Quentin Rd. and N. Forest Dr., but they are less severe than the issues of inlets #1 and #3.

Inlet #3 – This inlet crosses Quentin Rd. under the bridge north of Ravine Rd. and runs under the Ravine/N. Forest intersection, entering the lake via the lagoon. Inlet #3 drains the smallest area of land (18%), but appears to contribute the largest set of problems. On-foot inspection revealed severe erosion along a majority of the creek east of Quentin Rd., with steep, unstabilized banks contributing to high TSS measurements at the lagoon inlet. Testing during rain events revealed a doubling of TSS values compared to the regular monthly testing. This data confirms the assumption that the condition of the creek contributes an extreme amount of sediment during heavy rains. The on-foot inspection also revealed another surprise; a dammed pond west of Quentin Rd. This pond is the source of the duckweed and watermeal which infiltrated the lagoon in July/August 2011.

In addition, LCEHS produced our first sub-watershed map of each inlet and a new total watershed map. The new map has significantly revised boundaries; land north of Old McHenry Rd. and west of Midlothian Rd. has been added, and large areas on the south end of the old watershed were removed. In the end, the overall size of the watershed was officially decreased from 527 acres to 437 acres. The FLIC thanks Kelly Deem, out LC representative for her diligent efforts.

The State of the Aerators

For the second year in a row, the aerators were not in operation for the entire season, and a positive response in water quality was observed. Phosphorus levels decreased another 20% from 2010 levels, Secchi depth increased 31%, and aquatic macrophyte populations increased 46%. After two full years of observation, the FLIC maintains that the operation of the aerators has a negative effect on the water quality of Forest Lake.

The lagoon water quality, however, has been found to behave differently that the main lake. Isolated from wind action and subject to high levels of sediment and phosphorus from inlet #3, the lagoon (and its residents) experienced terrible blue-green algae blooms in September and October. At the request of the lagoon residents, the aerators were operated from mid-September into November, and the presence of blue-green algae was significantly reduced. While the water movement caused by the lagoon aerator reduces the severity of blue-green algae blooms, it also disrupts the bottom sediments, which has a negative impact on water quality. The FLIC believes a better solution may be available, and will investigate all options in 2012.

Blue-Green Algae Blooms

It may seem contradictory that while the water testing results portrayed one of the best years in Forest Lake's history, severe blue-green algae blooms occurred. However, upon close review of the phosphorous and nitrogen testing results, an explanation surfaces. Since the nitrogen levels in 2011 were the lowest on record, the lake became "nitrogen limiting", meaning that algae growth was dependent on the amount of *nitrogen* in the water, not the amount of phosphorus. That sounds great, but unfortunately, blue-green algae possess certain adaptations that enable them to outcompete other algae in nitrogen-limiting conditions. While other planktonic algae is dispersed throughout the water column and dependent on the nutrient levels of the water, blue-green algae blooms are extremely weather dependent, and thrive during periods of limited wind and rain, like the 26-day drought that occurred in August and September of 2011. Unfortunately, calm, warm, nitrogen limited water (*i.e.* Forest Lake in late summer) is the perfect environment for blue-green algae to flourish.

Aquatic Plant Management

Desirable aquatic plants had another successful year in Forest Lake. LCEHS suggests that 30-40% of the total lake bottom have plant coverage. Plants provide lake bed stabilization, habitat and food for wildlife, and compete for nutrients with planktonic algae. In 2011, LCEHS conducted a grid-style plant survey, and the number of sites containing aquatic plants had nearly doubled since 2010. Also, the total bottom coverage was determined to be 27%, which is very close to suggested range. As was the case in 2010, the FLIC attributes the success of the plant population to the increase in water clarity observed since the aerators were turned off.

Unfortunately, curlyleaf pond weed (CLPW) was one of the most abundant plants observed in 2011. CLPW is considered an invasive species because of its unique growth characteristics. It's tolerant to low-light and low-temperature, which enables it to out-complete native plants early in the season and spread into deeper water more easily. It also dies off in mid to late summer (earlier than native plants), and if present in large enough populations, the decomposition of CLPW can provide nutrients for late summer algae blooms. If left unchecked, the LCEHS estimates that CLPW would be able to cover 70% of the lake. One of the main goals of the FLIC over the next few years will be the elimination of CLPW from Forest Lake.

Beach Monitoring

LCEHS sampled the beaches for the bacteria *Eschericia coli* (*E. coli*) every two weeks from mid-May to the end of August. *E. coli* can make humans sick if ingested in high enough concentrations, and is also used as an indicator organism, meaning that high concentrations of *E. coli* may suggest the presence of other harmful pathogens such as *Salemnella*, *Giardia*, etc. If water samples report high levels of *E. coli*, the beaches are closed until the levels return to normal. In

2011, the *E. coli* concentrations at Ercker Park and Lutrell Park did not exceed the impairment level, however, Central Beach had one violation and Steinken Park was closed twice. Since the main sources of *E. coli* contamination on Forest Lake are ducks and geese, the FLIC will implement duck/geese abatement techniques in 2012 to keep our beaches clean and safe.

Shoreline Management and Rehabilitation Projects

The condition of our shorelines is the only area of lake management that is completely dependent on the actions of Forest Lake residents. For that reason, the FLIC is highly involved in the promotion of proper shoreline rehabilitation and management. Through the efforts of only a few lakefront homeowners, a 10% decrease in overall shoreline erosion was observed between 2010 and 2011. Shoreline exhibiting no signs of erosion increased to 69%, while severely eroding shoreline increased slightly to 11%. With the continued collaboration of the FLIC and concerned shoreline owners, shoreline erosion and its effect on the lake can be effectively eliminated.

This year the FLIC implemented its first wave of community park shoreline rehabilitation projects. The pilot project took place at Ercker Park, concurrent with the re-decking of the wooden platform. Severely eroding shoreline was covered in high-quality fabric and rip-rap, and native plants were planted. The FLIC plans to rehabilitate one park per year, and hopes they'll serve as an example to the community's shoreline owners.

Ercker Park Before:



After:



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Fishery Management

The lake was stocked with 26 lbs. of fathead minnows, 50 lbs. of golden shiners, 100 6-12" channel catfish, and 50 9-16" tiger muskie. The FLIC is working with representatives from the Illinois DNR to establish a strategic stocking program with an emphasis on a diversified predator base. The last fish population survey was completed by the Illinois DNR in October of 2003, and one has been requested in 2012.

The FLIC continues to the stress the importance of catch and release of game fish 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. Also, studies have also shown that most game fish are commonly unable to reproduce in man-made lakes.

Measurable Goals from 2011: Last year, the FLIC set goals for the 2011 season based on the LCEHS annual report. The 2011 goals and the results are:

- Average TP below 0.100 mg/L Achieved! average TP was 0.82 mg/L
- Average TSS below 11.0 mg/L Not achieved average TSS was 14.0 mg/L
- Average Secchi depth above 2.60' Achieved! average Secchi depth was 3.27'
- 18% aquatic plant coverage Achieved! 27% plant coverage
- TSI rating below 68.0 Matched (We'll call that achieved!) TSI was 68.0
- 110 or better in the Lake County Rankings Achieved! Forest Lake ranked 95/171



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2012 Lake Management Plan

Plans for 2012:

- Continue a community outreach program to highlight the responsibilities of living in the Forest Lake watershed.
- Continue a water testing program with LCEHS, including additional inlet testing to pinpoint sources of incoming phosphorous, sediment, and chloride.
- Develop a solution for water circulation in the lagoon.
- Implement a program to combat the curly leaf pond weed population.
- Implement a pilot version of a benthic barrier loaner program.
- Continue the shoreline rehabilitation program.
- Conduct a fish population survey.

Water Quality Monitoring and Tributaries

Although the water quality of Forest Lake was much better than average in 2011, TP and TSS did not reach desired levels. The FLIC will continue to monitor the lake and tributary conditions and highlight areas that need attention in 2012.

The data collected in 2011 revealed that the current state of inlets #1 and #3 negatively impact the water quality of Forest Lake. The FLIC is working with representatives from Hawthorn Woods concerning the condition of the inlet #1 tributary, and remediation activities are underway. The severe erosion of inlet #3 poses the most significant threat to the water quality of Forest Lake. Rehabilitation will be difficult and expensive, as the affected area is vast and inaccessible. The FLIC will explore all options for rehabilitation and apply for financial assistance in 2012. The rehabilitation of inlet #3 is imperative for the future health of the lake, and will remain a top priority. Steps will also be taken to limit the amount of duckweed/watermeal entering the lagoon from the upstream pond.

Based on the visual inspection and testing data, inlet #2 is the least concerning, but still has some significant erosion issues. Because of the small scale of the problematic areas, inlet #2 may be the easiest rehabilitation project to complete. The FLIC will work with the creek owners to address concerns and determine remediation options for inlet #2 in 2012.

Options for the Lagoon

It became apparent in 2011 that the lagoon requires some level of circulation to limit bluegreen algae blooms. The aerators provided adequate circulation to limit the extent of the blue-green algae blooms, but the current design of the aerators is not optimal. The lagoon aerator was originally installed at the bottom of a pit dug during the last dredging. Over time, this pit has filled with sediment, and the aerator lines now sit under a layer of sediment estimated to be anywhere from 2-4 feet thick. When the aerator is operated, the air released from the lines disrupts this layer of sediment and mixes it into the water column. Agitation of the sediment releases phosphorous and creates turbid, murky conditions. Water circulation is needed to disrupt the BGA populations on the surface without disrupting the lake bottom, and the FLIC believes this is possible. In 2012, options will be considered regarding the re-design of the aerators or the installation of a circulation system. The aerator re-design would move the aerator lines out of the pit and expand their capability for better surface agitation. This may be the most cost effective solution if no new equipment is required or can be borrowed from one of the two main lake aerators. The other option under consideration is the installation of a surface or sub-surface circulator, which would circulate the surface water by bringing up water from below without disturbing the lake bottom. These circulators have been reported to be widely effective in eliminating blue-green algae blooms, require little electricity, and are unobtrusive and essentially silent.

Aquatic Plant Management Program

The continued expansion of curly leaf pond weed (CLPW) will be one of the major focuses of the FLIC in 2012. If the water clarity and high phosphorous conditions continue, the shallow morphology of the lake and the unique growing characteristics of CLPW will promote a complete invasion of this macrophyte. The FLIC will organize a community hand-puling event in early spring 2012, before the CLPW begins to reproduce. Without help from a large number of residents, the FLIC will have to consider chemical treatment options to combat CLPW.

The desirable aquatic plant population has done extremely well the last few years without direct intervention from the FLIC. LCEHS calculated that 27% of the lake bottom is covered with plants, which is very close to the suggested 30-40% range. If the water clarity and high phosphorous conditions continue, the aquatic plant population will begin to approach nuisance levels. The FLIC plans to initiate a benthic barrier program in 2012. A benthic barrier is a special type of fabric that is temporarily placed on the lake bed to inhibit plant growth. The program will involve the loaning of benthic barriers to lakefront residents who would like to limit the weed growth around their docks. Details will follow, but please contact the FLIC if you're interested in participating.

Blue-Green Algae Bloom Management

Forest Lake suffered from intense blue-green algae blooms in the late summer of 2011. Unfortunately, there are limited options for combating blue-green algae blooms. Chemical treatments are ineffective, and while whole-lake water circulators are available, they're expensive and positive results are not guaranteed. The most effective way to manage blue-green algae blooms is to continue to lower the phosphorous levels of Forest Lake. Of course, this requires cooperation from everyone in the watershed, but those closest to the lake have the most significant impact. Continued efforts to decrease nutrient-rich runoff and rehabilitate eroding shorelines are essential to decreasing the occurrence of blue-green algae blooms.

Beach Geese Abatement

To limit future beach closures due to high *E. coli* levels, the FLIC will implement several bird abatement techniques at the shoreline beaches and parks. First, the grassy shorelines along Lutrell, Central and South beaches will no longer be landscaped. Allowing the grasses and plants to grow creates a vegetated barrier that geese are hesitant to cross. Second, upgraded, retractable string lines will be installed at all beaches. A simple string stretched across the beach is an extremely effective method of keeping geese off the beaches. Removable lines were installed in 2011, but were commonly not replaced or even vandalized. The upgraded lines will be retractable and of higher quality, and their purpose will be better communicated to the residents in hopes of

better cooperation from beach goers. The unsuccessful use of these simple techniques will require costly alternatives, which will only take resources away from other areas of need in the community.

Shoreline Rehabilitation Program

The results of the 2011 shoreline survey showed a decrease in shoreline erosion, but much work is needed to remediate the areas of severe erosion. The FLIC will continue to rehabilitate the shorelines of the community parks, and provide assistance to lakefront residents interested in rehabilitating their shorelines. In addition, the FLIC will reach out to those lakefront homeowners whose shoreline erosion has been designated as "severe", and provide options and advice for rehabilitation. Also in 2012, the FLIC is planning a follow-up project to remediate some additional erosion concerns at Ercker Park, as well as rehabilitate a second community beach. Please contact the FLIC if you'd like to help.

Fishery Management

The fish population in Forest Lake continues to do well, and the intended actions of the FLIC should only improve the future of the fishery. We're happy to report that we have a fish survey scheduled with the IL DNR in 2012. The results will not be provided until later in the year, but will be used for future stocking decisions. No stocking is scheduled for 2011 as the yearly stocking funds will be reallocated to cover the costs of a new bathymetric map. A bathymetric map details the bottom contours of the lake, and provides a wealth of information for multiple areas of lake management. The current bathymetric map was created in the early 90's.

While it is not believed the Forest Lake's carp population is problematic, significant, yearly spawning activities have been observed. In an effort to reduce the population of common carp, the FLIC will host a carp fishing derby in 2012. Please contact the FLIC if you'd like to help organize.

Future Dredging Options

Forest Lake was last dredged in the winter of 1994-95, and it's believed that some degree of dredging will be required in the next few years. Mechanical dredging, which was used during the 1995 dredging, involves the draining of the lake and subsequent removal of sediment with land-moving equipment. This method is extremely invasive and costly, and it can take years for the lake to recover. An attractive alternative is hydro-dredging, in which the sediments are removed without having to drain the lake. All options have their pros and cons, and unfortunately they all have one thing in common; high cost. However, before dredging is even a discussion, a wealth of information is needed. In 2012, the FLIC will begin to collect the required information.

Measurable Goals for 2012:

- Average TP below 0.08 mg/L
- Average TSS below 12.0 mg/L
- Average Secchi depth above 3.40'
- 30% aquatic plant coverage
- TSI rating below 67.0
- 90 or better in the Lake County Rankings