Hey and Associates, Inc.

Project #05041

DISCUSSION DRAFT

EXECUTIVE SUMMARY

CRYSTAL LAKE

CLEAN LAKES PHASE I PROTECTION PLAN

PREPARED FOR:

CRYSTAL LAKE PARK DISTRICT

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

PREPARED BY:

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JULY 3, 2007

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INTRODUCTION

This report is executive summary of the findings and recommendations of the Crystal Lake Clean Lakes Study. The Crystal Lake Park District undertook this Clean Lakes Phase I Protection Plan with the assistance of the Illinois Environmental Protection Agency. Assistance also was provided by the City of Crystal Lake, the Village of Lakewood, McHenry County Health Department, Illinois Department of Natural Resources, and Illinois State Geological Survey. The project had four purposes:

- Define the existing hydrology, water quality, and biology, of the lake.
- Assess the status of the uses the lake has historically supported: swimming, boating, fishing, aquatic habitat, and aesthetics.
- Identify threats to these uses.
- Develop a plan to address these threats with a schedule for its implementation and identification of responsible parties.

Data collection by the CLPD began in late 2004 even before the actual project was awarded and continued through 2006 and into 2007. A Clean Lakes Study period was defined for reporting and covered the period from May 1, 2005 through April 30, 2006.

MONITORING

Figure E-1 presents the monitoring locations for the project. Six types of monitoring of the lake took place:

- Hydrology
- Lake water quality
- Lake inflow water quality
- Biology
- Sediment
- Groundwater

There were also two special studies that were undertaken as part of the State of Illinois' support for the project. The first was a "resistivity" study by the Illinois State Geological Survey (ISGS) that mapped the soils and geology around the lake. The second was a "seismic" survey also by the ISGS to map the bottom of the lake. The ISGS also evaluated sediment deposition in the lake.

Table E-1 presents the different monitoring programs and a summary of the types of data collected. Significant effort was expended by the City of Crystal Lake to collect and analyze data on the quality of inflows to the lake from the Honeysuckle sewer and Cove Pond.

Table E-1
2004/2005 Crystal Lake Clean Lakes Monitoring Program

Task	Map Reference	Collection Responsibility	2005 Frequency	Constituents Collected
Chemistry				
Tile Flow at Lippold	1, 2	CLPD Hey	Quarterly Mar-May Weekly	TSS VSS NOX TKN ALK Secchi Temp TDS TP DP NH3 Cl Phytoplankton DO
Honeysuckle Sewer Flow	VTZH-T2	Crystal Lake Hey	Weekly	
Tile Flow Cove Pond	13	Hey	Quarterly	
Cove Pond Outflow	VTZH-T3	Crystal Lake	Weekly	
Crystal Lake Surface Outflow	VTZH-T1	Crystal Lake	Weekly	
Groundwater	7, 12, 15 16, 17	Hey, IEPA ISGS	Quarterly	
Water Column	VTZH-2	CLPD	Monthly, 1 Depth	
chemistry @ 2 depths	VTZH-1	CLPD	Monthly, 2 Depths	
DO & Temp Profile	VTZH-3	CLPD	Monthly, 2 Depths	
	VTZH-1,2,3	IEPA	Monthly May, Jun, Jul, Aug, Oct	
Sediment				
Quality	VTZH-1,2,3	IEPA, Hey	Annual	VSS, TP, Metals
Water Budget				
Tile Flow	1, 2	Digital Recorder	Daily	
Lakewood Sewer	9, 10	Digital Recorder	Daily	
Honeysuckle Storm Sewer Flow	VTZH-T2	Digital Recorder	Daily	
Cove Pond Flow	VTZH-T3	Digital Recorder	Daily	
Crystal Lake Stage	VTZH-T1	Digital Recorder	Daily	
Groundwater Levels	7, 12, 15 16, 17	Hey	Monthly	
Other Studies				
Sediment Depth (Seismic)		ISGS	Spring 2006	
Seismic Geologic Profile		ISGS	Spring 2006	
Bathymetric (Seismic)		ISGS	Spring 2006	
Fishery		IDNR	Fall 2004	
Macrophyte Survey		Hey	Spring and Fall 2005, 2006	
Bacterial Monitoring	8 Sites	MCHD	June, July, August weekly	
Shoreline Erosion Map		Hey	Spring 2006	
Bird Survey		Volunteer	Annual	
Boat Survey		Lakewood	Annual	

CRYSTAL LAKE PHYSICAL PARAMETERS

Table E-2 presents the physical parameters for Crystal Lake as measured during this study. The lake was formed by a block of ice buried in the sand and gravel outwash from a glacier some 15,000 years ago. No streams flowed into the lake and at the time of European settlement in 1835, all of its inflow was groundwater or direct precipitation.

Table E-2
Crystal Lake Morphometry

Parameter	Water Surface		Units
	891.81	888.0	
Lake Surface Area	233.2	203.0	acres
Area Deeper than 10 Feet	126	110	acres
Maximum Depth	40	36.2	feet
Mean Depth	14.7	10.9	feet
Lake Volume	3,437	2,747	acre-feet
Fetch	1.3	1.1	miles
Shoreline Length	3.2	2.9	miles
Shoreline Development Factor	1.2	1.0	-
Littoral Zone (> 15 feet)	136	105.0	acres

The results of the ISGS bathymetry investigation are shown in Figure E-2. The lake is roughly divided into a shallow west end that drops into a much deeper east end past the “point” on the north shore of the lake. The resistivity results (Figure E-3) show that Crystal Lake is surrounded by sand and gravel except at its west end and on its northwest where a clay lens caused the formation of the historic wetlands at Lippold Park. The sand and gravel end near Broadway. Groundwater leaving the south side of the lake must move east and join groundwater from the east end of the lake to flow under Crystal Creek. Figure E-4 shows geologic cross sections of the lake and its watershed.

Figure E-2
Crystal Lake 1-foot Contour Bathymetry

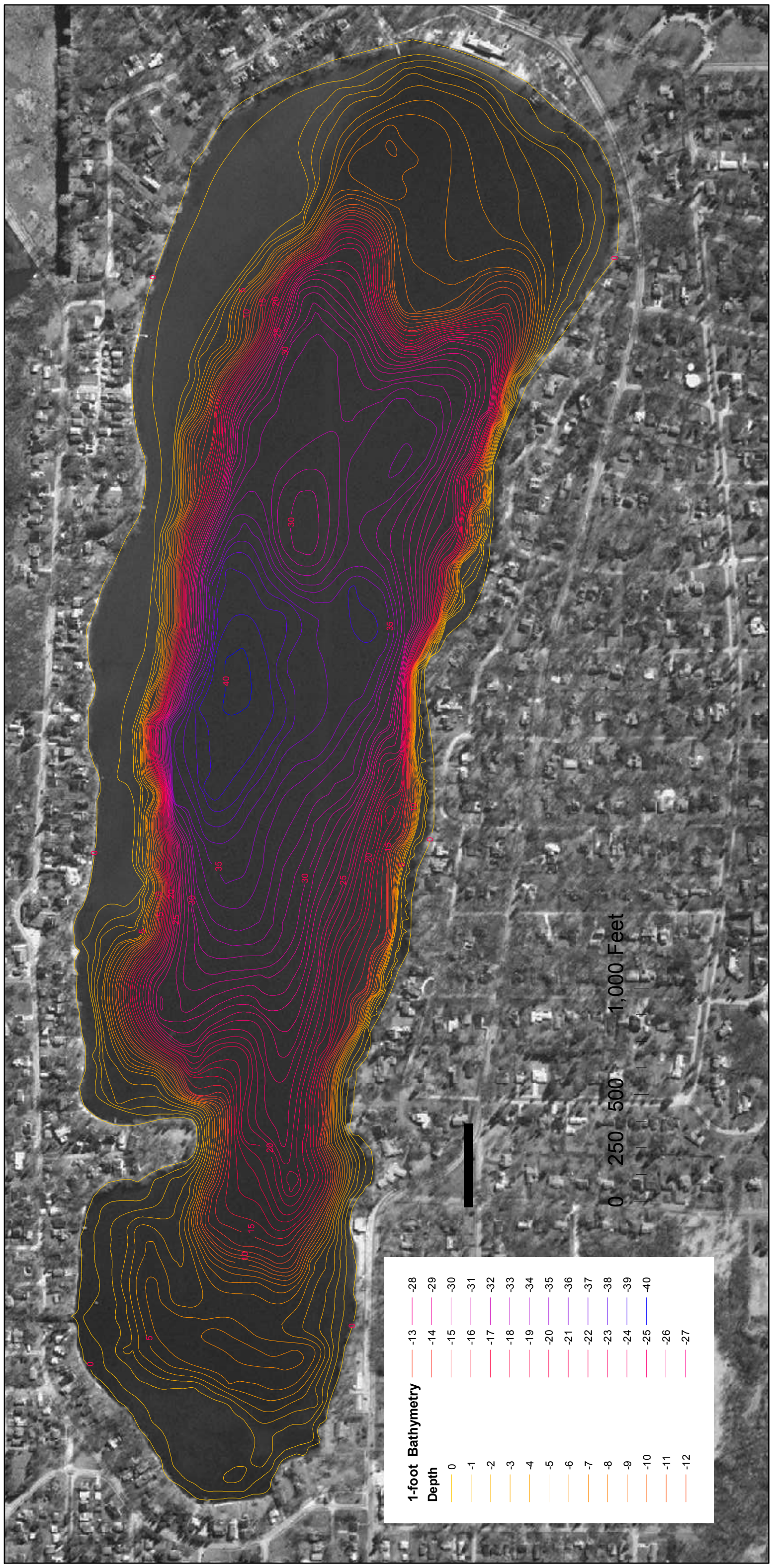
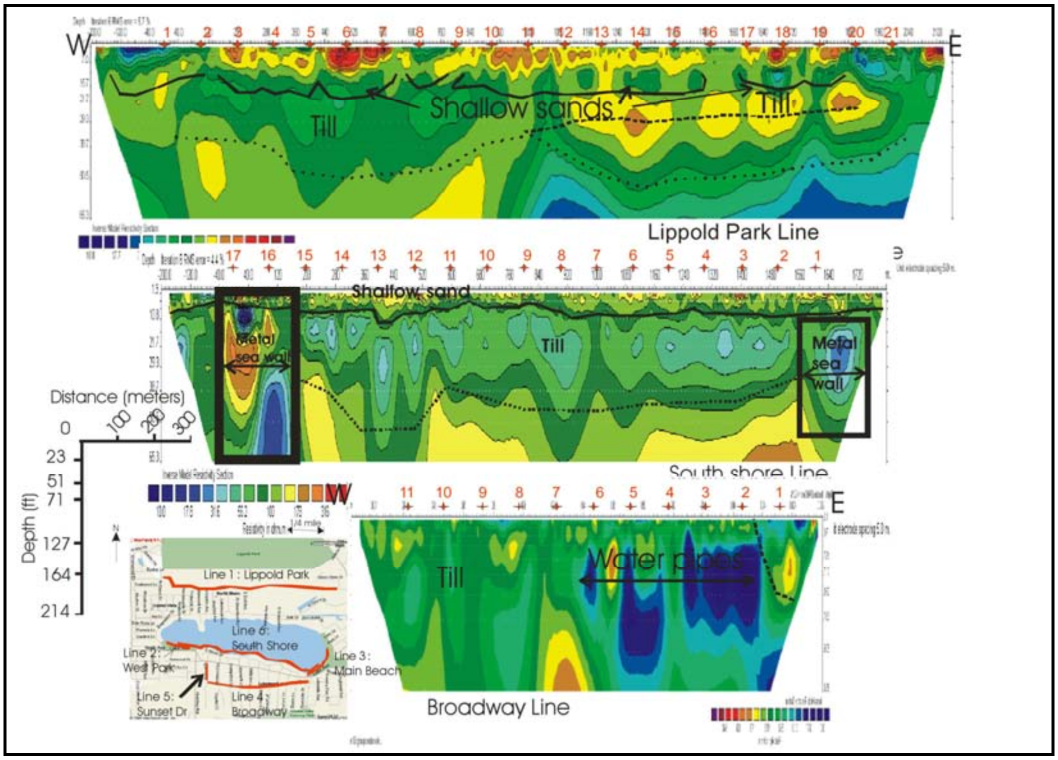


Figure E-3
Crystal Lake Geology



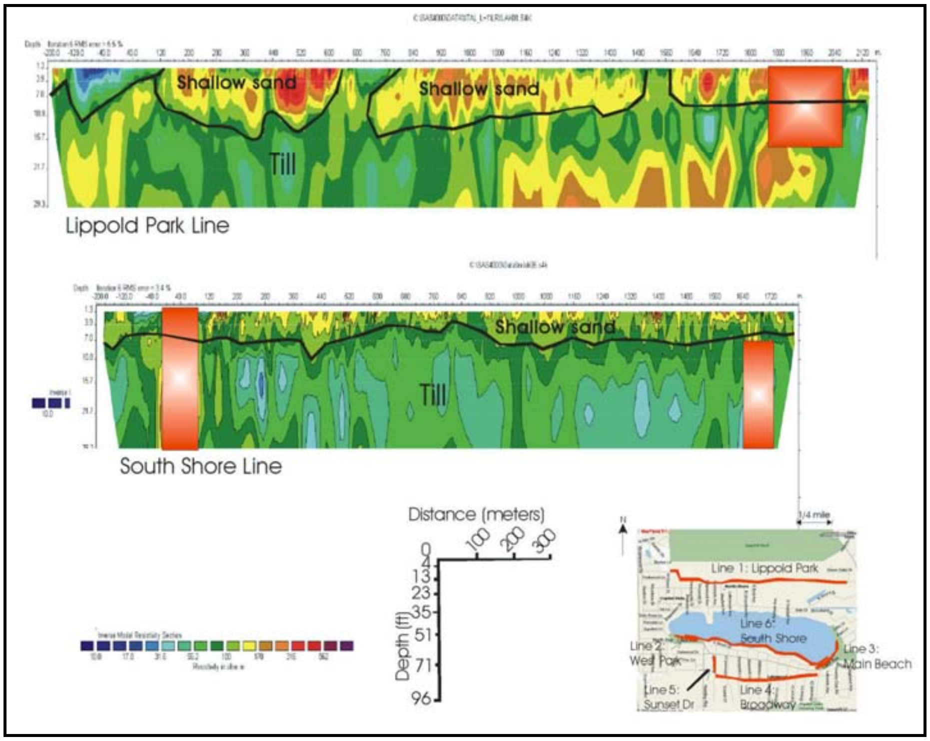
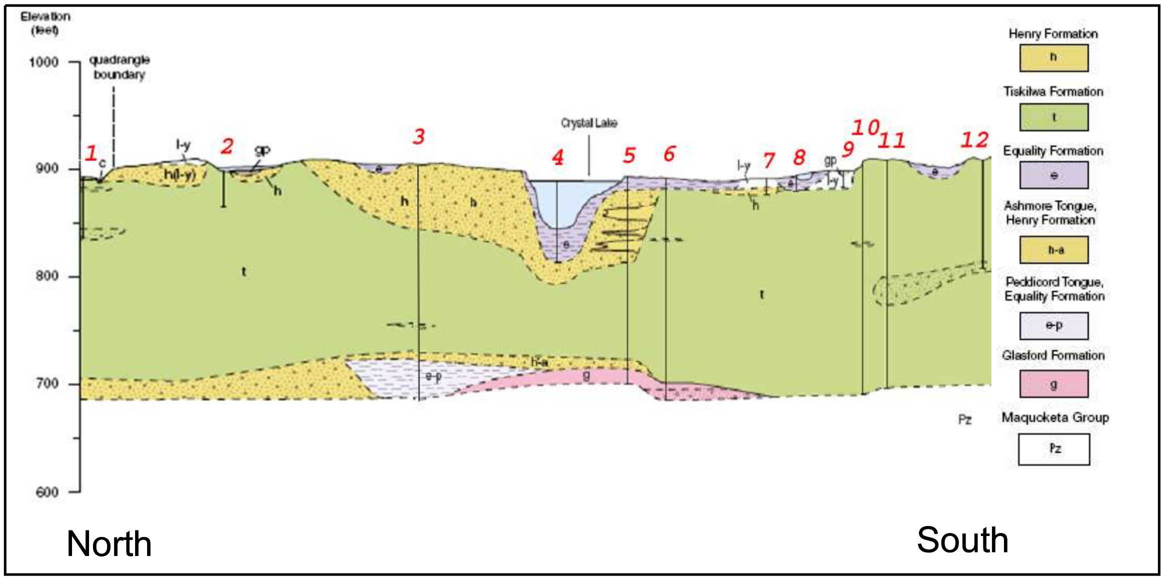


Figure E-4
Geologic Cross-section of the Crystal Lake Area



CRYSTAL LAKE WATERSHED

The watersheds tributary to Crystal Lake is shown in Figure E-5. The largest watershed is immediately north of Lippold Park, 2,305 acres. This watershed also contains the 1,310 acre Crystal Lake Drainage District (CLDD). This entire watershed flows through Lippold Park and the Lippold Wetland Restoration. To the east is the Cove Pond Watershed, which drains about 300 acres of older Crystal Lake and 640 acres in all. All of the stormwater runoff from this watershed flows through the Cove Pond Wetland Restoration. There are about 175 acres that flow directly to Crystal Lake either by overland flow, infiltration or private storm sewers.

There also are two other watersheds shown. Both of these watersheds were once tributary to Crystal Lake based on their topography. The first is the Crystal Lake East Watershed. This 384-acre area now drains to Crystal Creek as a result of storm and sanitary sewer construction over 70 years ago. The second is the Lakewood Watershed. This 299-acre watershed also flows to Crystal Creek as a result of sewer construction in the late 1930s.

Land use in the Lippold, Cove Pond, and Direct Crystal Lake watersheds is shown in Table E-3. Most of the Lippold Watershed is still rural with over 1,000 acres of cropland or about 40 percent of the watershed. The CLPD owns about 400 acres in this watershed as well (17 percent). Phosphorus loading to the watershed is estimated at 15,000 pounds annually and represents a threat to lake water quality. The use of phosphorus fertilizer on grasslands and urban areas also is a concern.

Figure E-6
Crystal Lake Watershed Soils

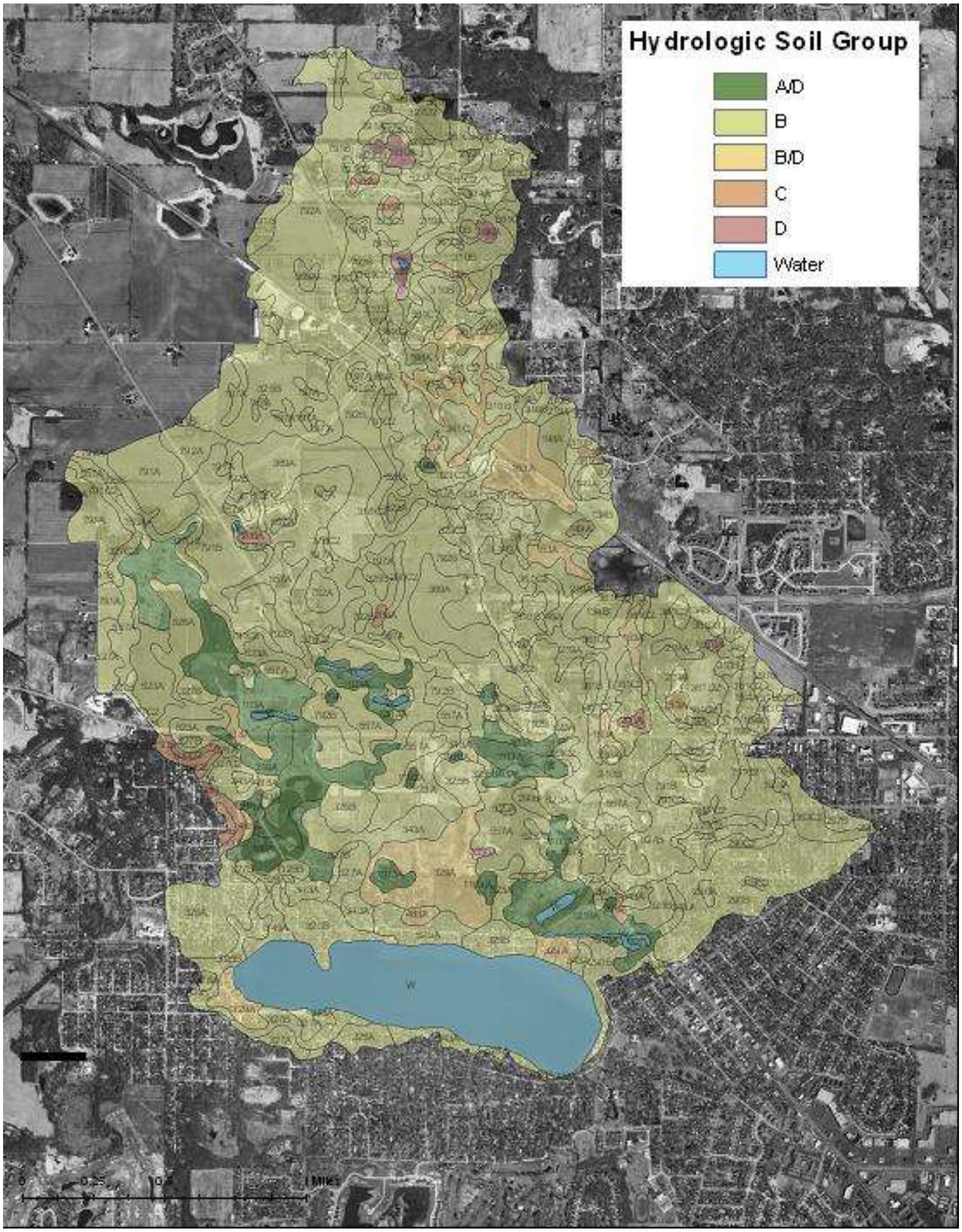


Table E-3
Crystal Lake Watershed Land Use

Land Use Type	Acres	Percent (%)
Row Crop Agriculture	1,009	30
Urban	1,030	30
Grassland	581	17
Open Space	545	16
Lake	233	7

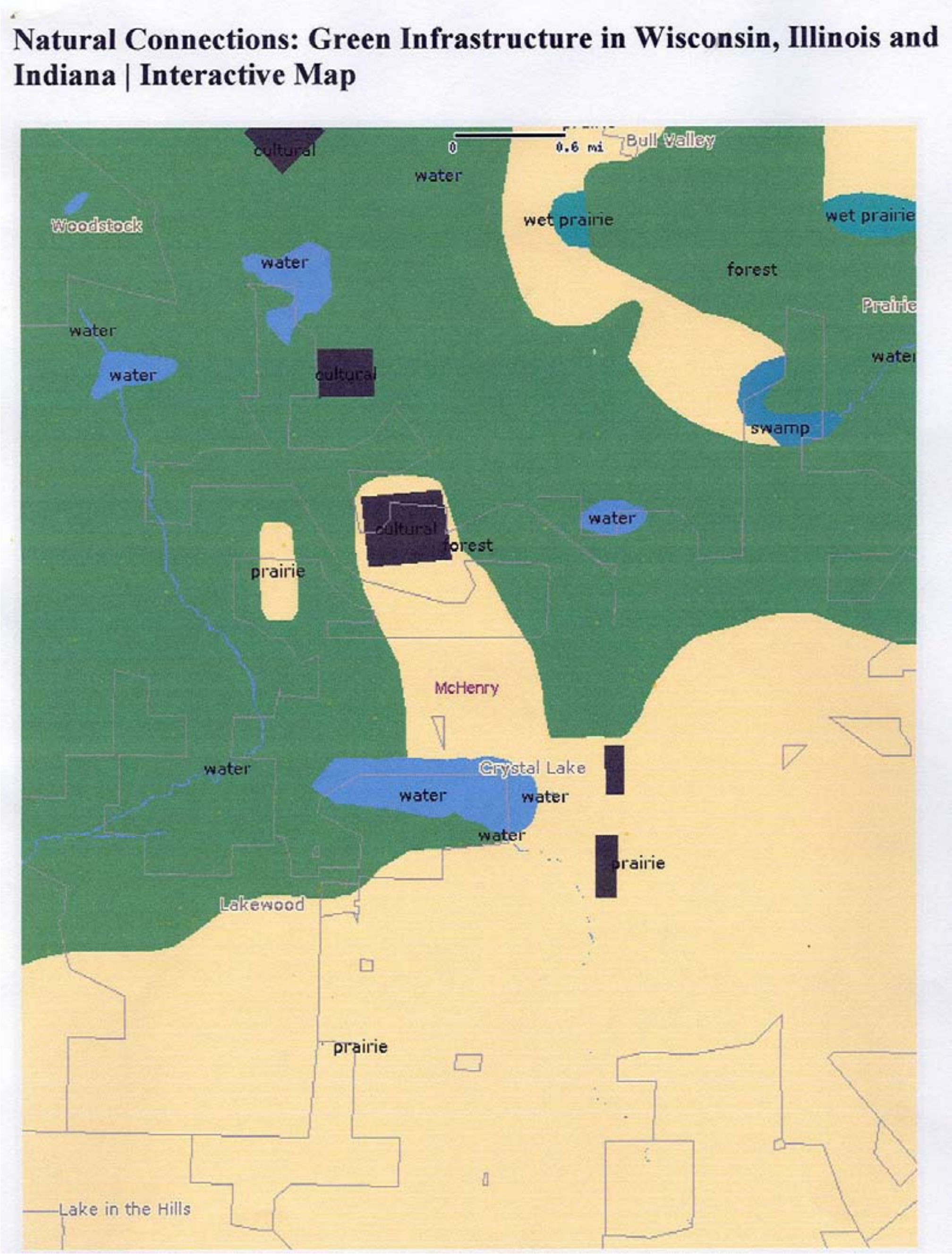
The watersheds of Crystal Lake, with the exception of the Lippold Watershed northeast of the railroad tracks, are all composed of highly permeable soils. Surficial soils are mostly classified as Hydrologic Soil Group B (2 to 6 inch per hour infiltration rate) by the NRCS (Figure E-6). Subsoils are even more rapidly permeable at about 20 inches per hour. There are no flowing streams in the watershed. All precipitation is captured in depressions and either evaporates or infiltrates into the shallow groundwater. Surface runoff is very infrequent.

MODIFICATIONS TO THE WATERSHED

At the time of European settlement in around 1840, the entire Crystal Lake watershed was entirely oak forest or prairie as shown on Figure E-7. Within a decade of settlement, most of the oaks and the entire prairie had been cleared for farming. In 1917, the CLDD built an extensive tile network to drain the land to facilitate even more agriculture (Figure E-8). Around the early 1900s, Crystal Lake built storm and sanitary sewers on the east end of the lake (Figure E-9). Crystal Lake also built storm sewers to the lake at Cove Pond and the Woodland Wetland. Fortunately, these are the only municipal storm sewers that lead into the lake. In the early 1930s, Lakewood built storm and sanitary sewers on the south side of the lake around Broadway Avenue (Figure E-9).

The impact of these changes on the lake was significant. The CLDD tile network changed flow to the lake from groundwater to pipe flow. The tile also drained the upper layers of the watershed soils. The sewers in Crystal Lake and Lakewood diverted water away from the lake and lowered the groundwater table abruptly downstream of the lake. These sewers also may have made water level fluctuations in the lake worse.

Figure E-7
Pre-settlement Vegetation Crystal Lake Watershed



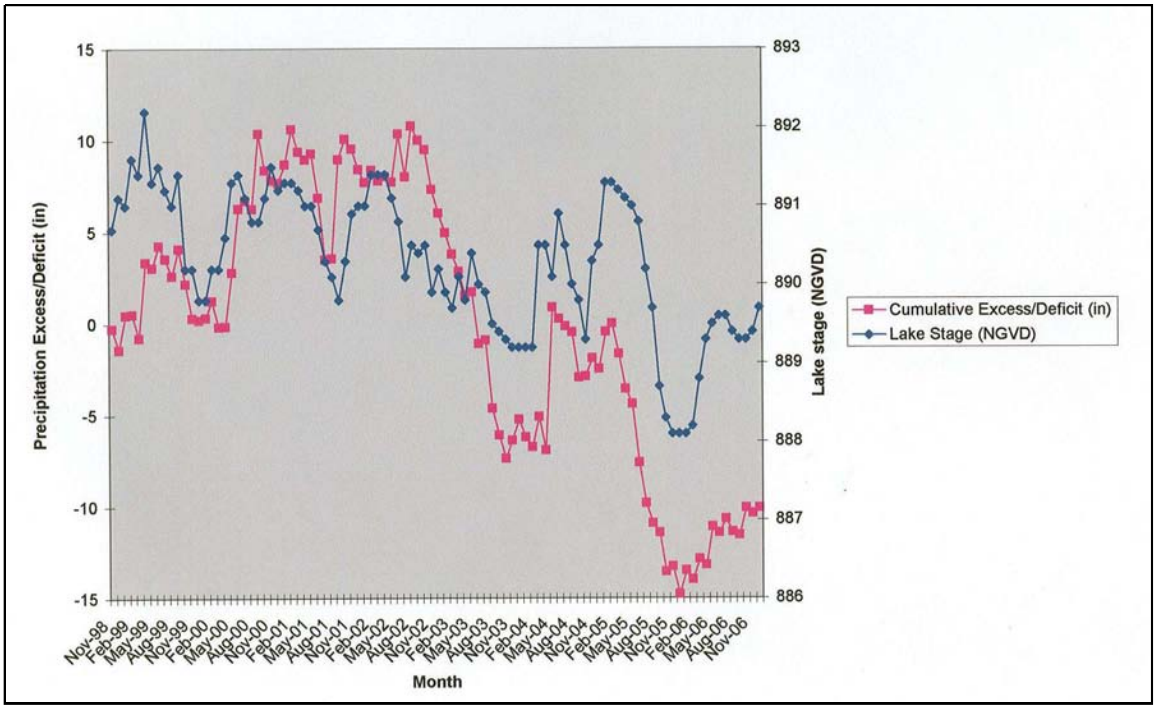
Natural Connections: Green Infrastructure in Wisconsin, Illinois and Indiana | Interactive Map

MONITORING RESULTS

Hydrology

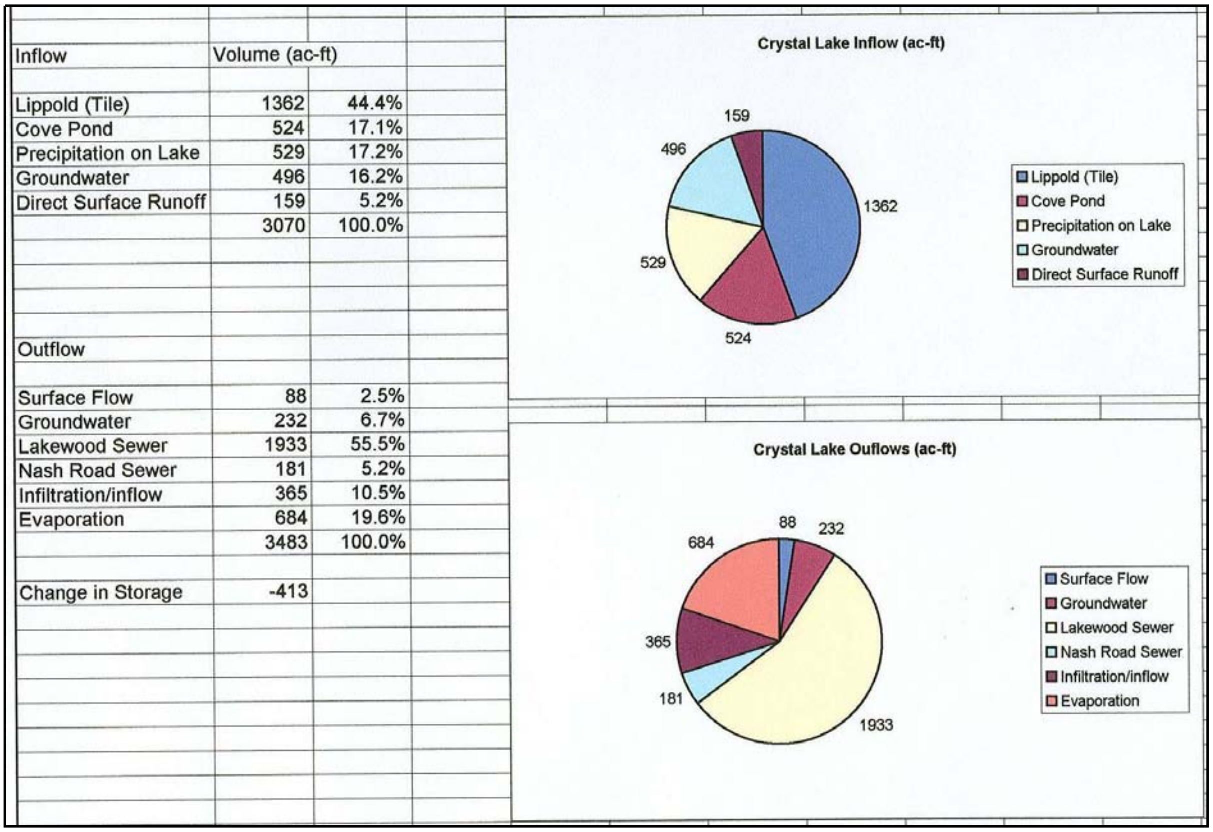
Crystal Lake experienced one of its periodic elevation drops during the project. The lake fell nearly four feet in 2005 from May to November. The relationship between cumulative precipitation deficit from normal and water level fluctuations in the lake has been known for 60 years and is shown in Figure E-10 for the recent past. The drop in water levels in the lake was mirrored by a drop in well water elevations above and below the lake as well. This meant that the gradient of groundwater flow into and out of the lake remained relatively constant.

Figure E-10
Precipitation Deficit Versus Lake Stage



The water budget for Crystal Lake during the Clean Lakes Study Period (May 1, 2005 through April 30, 2006) is shown in Figure E-11. One surprise was that most of the water reaching the lake is from the Honeysuckle storm sewer out of Lippold Park (44 percent). This flow represents the flow from the CLDD tile network. The second largest flow component was Cove Pond at 17 percent of all water entering the lake. The low amount of groundwater (16 percent) also is somewhat surprising but most of the flow in the Honeysuckle sewer is really shallow groundwater collected by the CLDD tiles.

Figure E-11
Adjusted Crystal Lake Water Budget



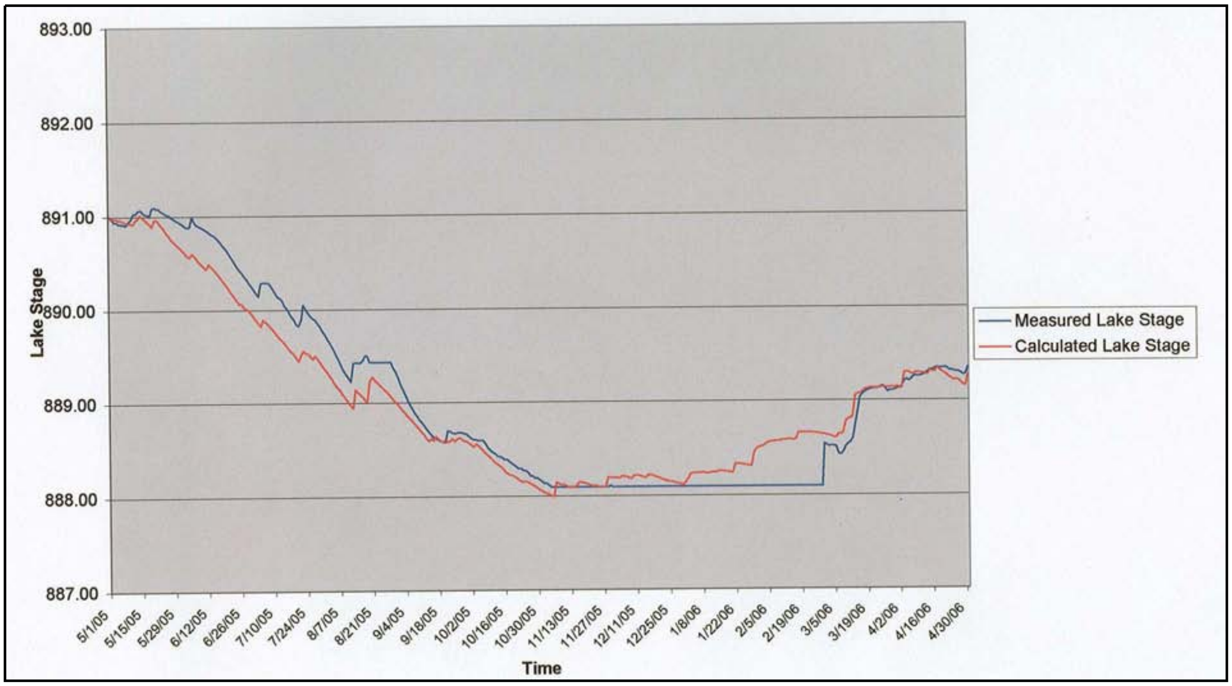
Inflow	Volume (ac-ft)	
Lippold (Tile)	1362	44.4%
Cove Pond	524	17.1%
Precipitation on Lake	529	17.2%
Groundwater	496	16.2%
Direct Surface Runoff	159	5.2%
	3070	100.0%
Outflow		
Surface Flow	88	2.5%
Groundwater	232	6.7%
Lakewood Sewer	1933	55.5%
Nash Road Sewer	181	5.2%
Infiltration/inflow	365	10.5%
Evaporation	684	19.6%
	3483	100.0%
Change in Storage	-413	

Outflows from the lake were even more surprising. The flow measured in the Lakewood storm sewer was large enough to account for almost all of the water entering Crystal Lake during the study. Even when this flow was adjusted for flow that could not be considered from the lake it was by far the most significant outflow from the lake. Other significant outflows were infiltration and inflow to sanitary sewers (particularly near Cove Pond), flows into storm sewers in Crystal Lake that are routed to Crystal Creek and evaporation. These sewers may be worsening lake water level fluctuations. Any new sewers through the watershed could have the same effect.

New development in the watershed will increase the volume of water reaching Crystal Lake. This may stress the existing CLDD tile system which has no dedicated maintenance source.

To confirm the water budget, measured lake levels were compared with lake levels calculated from the hydrology data collected. The results are shown in Figure E-12 and indicate a very high correlation between measured and calculated lake levels.

Figure E-12
Water Budget – Adjusted Flows



Lake Water Quality

The water quality results for the Crystal Lake show that it still has outstanding water quality. The sampling confirmed that its trophic status is still mesotrophic (Figure E-13).

Figure E-13
2005 Trophic Status Index Scores for In-lake Stations

Station	TSI TP	TSI chl-a	TSI Clarity
Mid-lake	44.7	48.2	50.5
West Bay	39.6	48.1	52.1
East-lake	40.4	48.8	52.6
Oligotrophic		< 40	
Mesotrophic		40-50	
Eutrophic		> 50	

Figure E-14
Clarity, Phosphorus, and Trophic State Trends for Crystal Lake Mid-lake Sampling Station

The data collected during the Clean Lakes study were compared with historical data on clarity, total phosphorus, and trophic state to see if any negative or positive trends were apparent. The comparison is shown in Figure E-14 and indicates that no trends were apparent which means that the lakes water quality appears to have been stable over the last 20 years.

The lake water quality also showed very high concentrations of calcium, magnesium, and carbonates (alkalinity). Crystal Lake appears to be a “marl” lake. This means that it has the capacity to rapidly precipitate incoming phosphorus because of high mineral concentrations.

Inflow Water Quality

The quality of water entering the lake from the Honeysuckle sewer, Cove Pond outlet, and groundwater also was measured throughout the study. Figure E-15 shows the results of this monitoring along with historical data from these sources. The results show that the Lippold and Cove Pond wetland restorations are improving the quality of water that enters them from the CLDD tile and the west end of Crystal Lake respectively. However, the quality of water entering the lake from these two sources is still well above the minimum desirable total phosphorus concentration in lake of 0.05 ppm.

Figure E-15
2004 – 2005 Results of IEPA Monitoring at Honeysuckle Storm Sewer Inlet to Lake

	Honeysuckle Sewer		Cove Pond		Groundwater	
Parameter	**2005**	**2000**	**2005**	**2000**	**2005**	**1974**
CBOD (mg/l)	2.87	-	2.64	-	-	-
Ammonia (mg/l)	0.31	0.27	0.38	0.39	-	-
Nitrate (mg/l)	0.20	1.39	0.06	-	3.37	3.3
TKN (mg/l)	1.73		1.57	-	-	
Total Phosphorus (mg/l)	0.085	0.087	0.072	0.12	0.026	0.015
Volatile Solids (mg/l)	2.5	10.5	6.25	15.0	-	-
Total suspended solids (mg/l)	20.3	16.9	6.7	26.0	-	-
Turbidity (NTU)	20.3	-	19.7	-	-	-
Chloride (mg/l)	87.2	-	95.1	90	124	10
Conductivity (uhm)	816.0	-	585	-	990	600
Fecal Coliform (CFU)	58	652	73	1652	-	-
Field pH	7.6	-	7.5	-	7.4	7.5

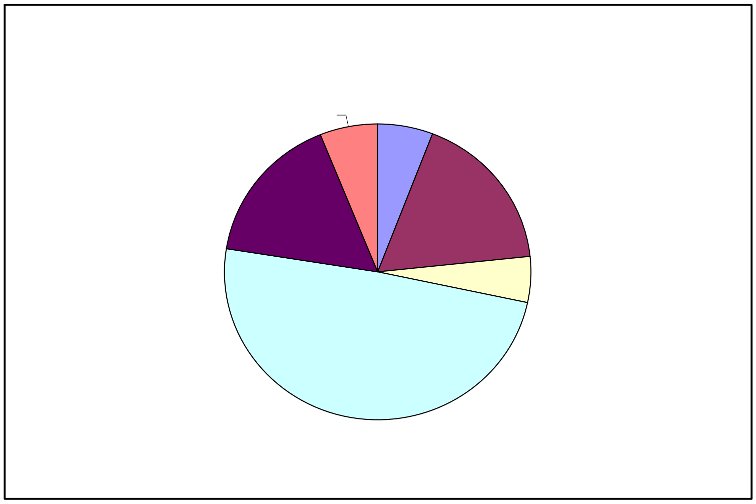
Pollutant Load Budget

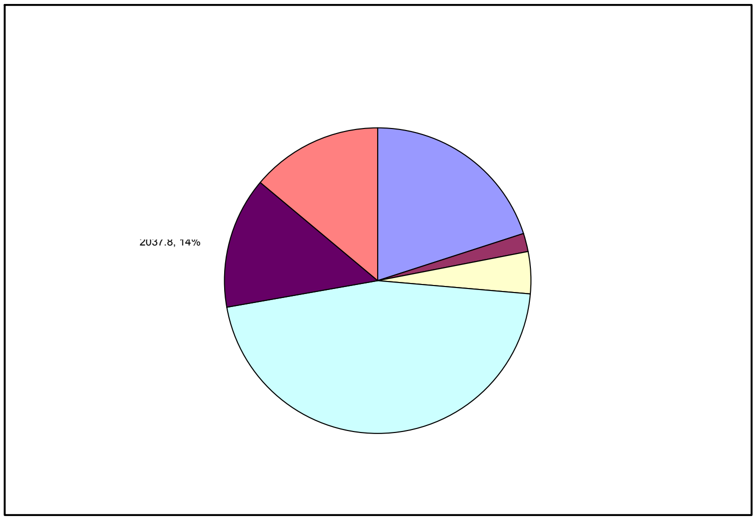
As expected, the Honeysuckle sewer is the largest pollutant load source to Crystal Lake for solids and phosphorus since it is the largest source of water to the lake. Cove Pond also is a large source of phosphorus to the lake again because of the large inflow it represents. Figure E-16 shows the results of the pollutant load budget.

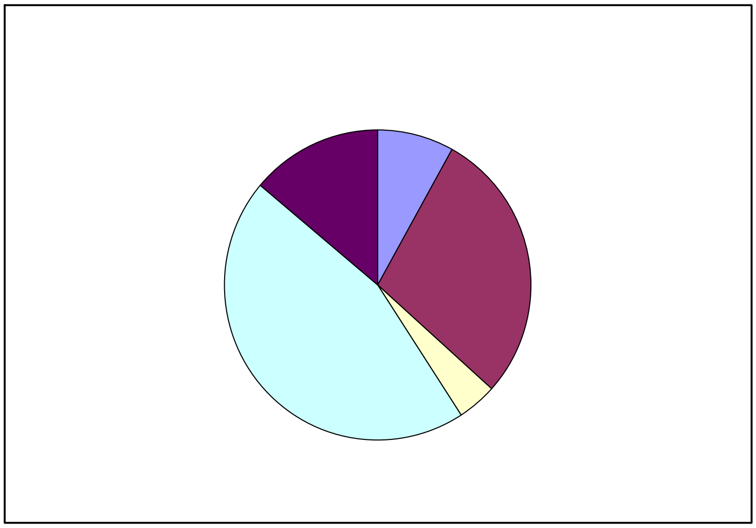
It appears that even though total phosphorus is above 0.05 ppm in the flows to the lake, it is not adversely affecting lake water column phosphorus. It appears that the high mineral and carbonate (marl) precipitation removes this phosphorus before it can be used by algae.

The phosphorus buffering capacity of the lake is not yet known but is likely finite. Additional phosphorus removal may be needed through source control or treatment above the lake. New development is a threat to the lake unless appropriate treatment measures are undertaken. Cropland and existing development also represents a significant pollutant threat to the lake.

Figure E-16
Total Phosphorus, Nitrogen, and Total Suspended Solids Loadings by Year by Source







Sediment

The IEPA sampled sediment quality as part of the Clean Lakes study at three locations in the lake (Figure E-1). The ISGS and Hey and Associates, Inc. conducted additional sediment sampling for the sediment in the West End. All of the sediment samples indicated that pollutant accumulations in the sediment are not a problem.

The sediment sampling also documented the amount of organic sediment in the lake. The results, presented in Figure E-17, show that there is little accumulation of organic sediment in the west end of the lake. The ISGS also determined that there was less than about one foot of sediment accumulation in the west end over the last 15 years (Figure E-18). As part of the literature review for the project, a study by SIU for the lake was found that indicated that total sediment accumulation in the deepest part of the lake since 1840 was less than two feet (Figure E-19) (Pan, 1997). It does not appear that the bottom of the lake has changed much in the last 100 years due to sediment accumulation.

Figure E-17
Sediment Metal and Nutrient Constituents for Crystal Lake 2005

Sediment Nutrient and Solid Constituents for Crystal Lake's West Bay 2007

Text indicates low or normal, **elevated**, or ***highly elevated***; Designations based on *Mitzlefelt (1996) and **Hite and Kelly (1981)

Figure E-18
Crystal Lake West Bay Sediment Accumulation (red) and Scour (blue) 1990 versus 2005

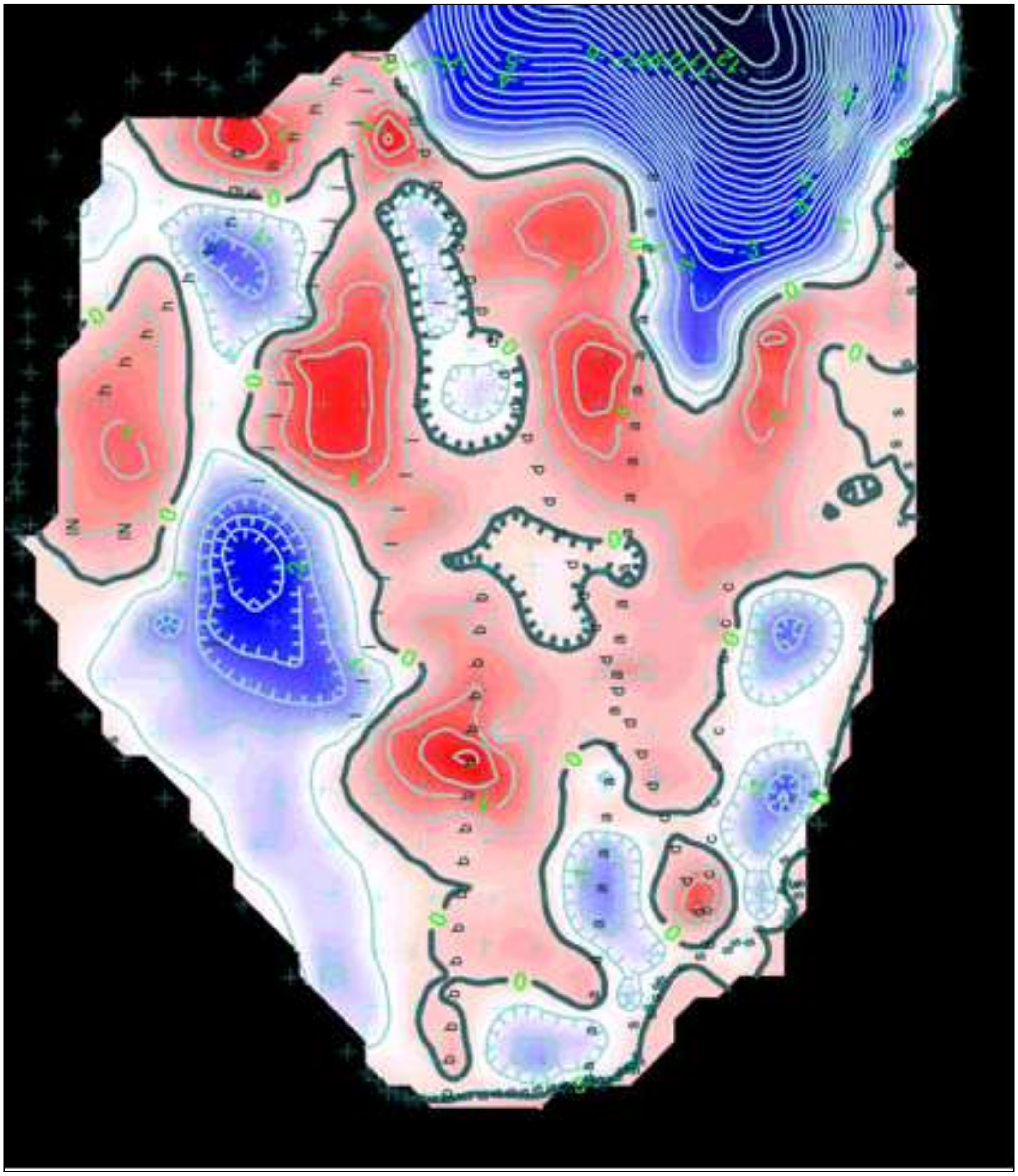
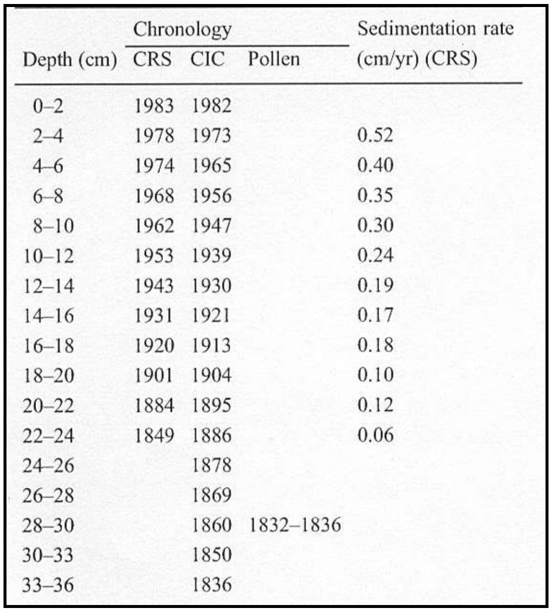


Figure E-19
Sediment Accumulation Crystal Lake (Pan, 1997)



	Chronology			Sedimentation rate
Depth (cm)	CRS	CIC	Pollen	(cm/yr) (CRS)
0–2	1983	1982		
2–4	1978	1973		0.52
4–6	1974	1965		0.40
6–8	1968	1956		0.35
8–10	1962	1947		0.30
10–12	1953	1939		0.24
12–14	1943	1930		0.19
14–16	1931	1921		0.17
16–18	1920	1913		0.18
18–20	1901	1904		0.10
20–22	1884	1895		0.12
22–24	1849	1886		0.06
24–26		1878		
26–28		1869		
28–30		1860	1832–1836	
30–33		1850		
33–36		1836		

Biology

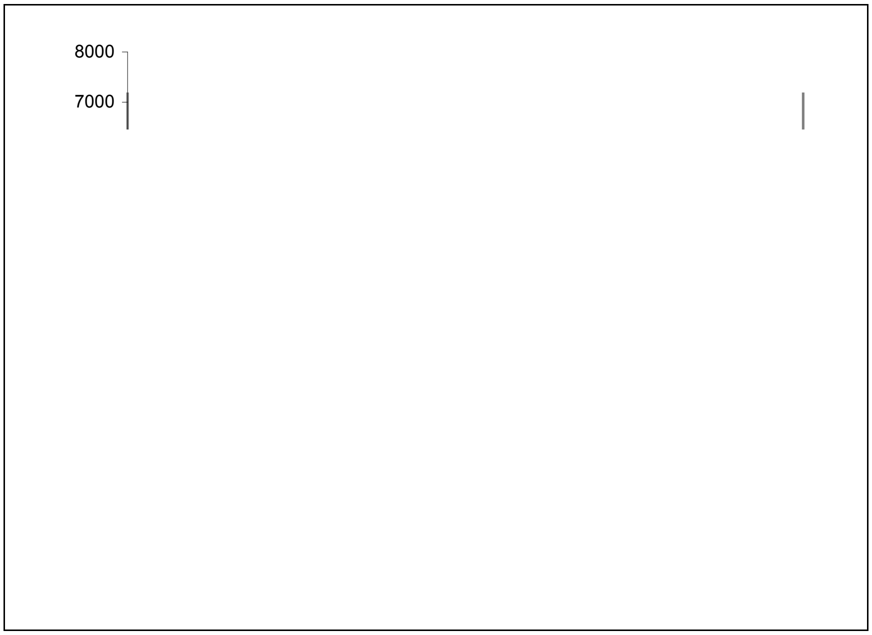
The results of the biological monitoring of Crystal Lake were both positive and negative. The fishery survey by the IDNR indicated that the lake had a healthy and diverse game fish population as shown in Table E-14. The fish flesh is safe for consumption according the IEPA analyses Crystal Lake fish. The algal population is not dominated by noxious species (Figure E-20).

Table E-4
Catch Summary for All Years Combined

	Number	Total length (in.)			Number	Weight (lbs.)		
Species	collected	Average	Min	Max	weighed	Average	Min	Max
Bluegill	109	5.4	1.3	7.9	42	0.16	0.03	0.35
Largemouth bass	48	8.1	2.4	16.9	28	0.80	0.09	2.11
Yellow perch	37	4.6	2.3	7.7	17	0.08	0.03	0.17
Black crappie	32	3.9	1.3	9.3	9	0.20	0.09	0.41
Bluntnose minnow	24	2.5	1.8	3.5	0	--	--	--
Golden shiner	12	4.1	2.7	7.0	3	0.12	0.09	0.13
Northern pike	12	24.3	17.6	33.0	12	3.21	0.85	8.36
Brook silverside	9	3.2	2.7	3.7	0	--	--	--
Smallmouth bass	7	12.2	9.6	19.4	7	1.05	0.32	4.19
Common carp	5	20.9	19.2	23.9	5	4.78	3.20	8.14
Walleye	5	14.3	12.6	16.7	5	0.85	0.45	1.44
White sucker	5	16.3	13.6	18.9	5	1.70	1.10	2.30
White bass	2	14.0	12.2	15.8	2	1.47	0.85	2.09
Rock bass	1	6.6	6.6	6.6	1	0.18	0.18	0.18
Iowa darter*	1	1.6	1.6	1.6	0	--	--	--
All species	309				136			

*Illinois threatened sp.

Figure E-20
Crystal Lake Mid-lake Seasonal Algal Community Abundance (#/ml) 2005



Negative results were that Eurasian milfoil remains a problem that must be managed in the lake. After a decline in 2004, milfoil has returned as expected and continues to require careful management. Crystal Lake has limited natural habitat and native aquatic plants need to be preserved and enhanced. Another negative finding was that zebra mussels apparently have been found in the lake according to at least one resident who brought them to the CLPD for verification.

Waterfowl may be a significant source of nutrients to the lake. They also contribute bacteria and the organisms responsible for “swimmer’s itch”.

Finally, the SIU study in 1997 noted that a species of pollution intolerant diatom has declined in the lake from 1840 to 1980 (Pan, 1997). However, they noted that it seemed to be recovering and was once again in the lake in 1996. The Clean Lakes study did not find that diatom in 2005. However, further sampling may identify it and an examination of sediment deposits since 1980 also may find evidence of its existence.

Shoreline Erosion and Riparian Habitat

A survey of shoreline erosion problems and riparian habitat was conducted as part of the study. The survey showed that most of the lake is ringed with hardscape seawalls that for the most part are in sound condition. Shoreline erosion is not a major problem. There is little or no riparian habitat as most of the first 50 feet inland from the lake edge is mowed lawn around the lake.

USE SUPPORT

The IEPA defines the following beneficial uses of inland lakes.

- Primary Contact (swimming and water skiing)
- Secondary Contact (boating)
- Aquatic Life (habitat)
- Aesthetics
- Fish Consumption

The monitoring results during the Clean Lakes study indicate that Crystal Lake meets all of the criteria to fully support all of these uses.

The limited space and high use demand on Crystal Lake creates potential use conflicts. Piers and moorings are not regulated and could reduce useable space. Water level fluctuations further reduce useable space, and the safe carrying capacity of the lake has not been studied. It appears few tickets are issued for boating safety violations.

THREATS

The following major threats to Crystal Lake beneficial uses were found during the Clean Lakes study.

1. The existing cropland in the watershed is a significant source of phosphorus to the lake.
2. The CLDD tiles have no dedicated source of funding for maintenance.
3. Additional phosphorus removal through source control or treatment may be needed.
4. Crystal Lake has limited natural habitat especially in its littoral and riparian zones.
5. Piers, moorings, and vegetation removal on the CLPD lake bottom are not regulated.
6. Boating and fishing are significant vectors for alien species.
7. The safe carrying capacity of Crystal Lake is unknown particularly during low lake levels.
8. Boating safety enforcement appears to issue few tickets.
9. Phosphorus fertilizer usage in the watershed is a threat to water quality.
10. Sanitary sewer infiltration and inflow appears to constitute a significant leak from the lake.
11. Storm sewers in Lakewood and Crystal Lake may be making water level fluctuations worse.
12. New sanitary sewers through the Crystal Lake watershed could divert water away from the lake unless carefully designed and constructed.
13. The phosphorus buffering capacity of Crystal Lake marl formation is not defined and may not be infinite.
14. Phosphorus from new development will be a threat to the lake.
15. Increased water volume from new development is a threat to the CLDD tile system and could increase groundwater levels north of the lake.
16. Phosphorus loads from existing development remain a concern for the lake.
17. Waterfowl are a vector for nutrients and bacteria and other organisms.

LAKE PROTECTION PLAN

A plan to protect Crystal Lake from existing and future threats is recommended in Table E-5.

Table E-5
Crystal Lake Protection Plan

CLPD	Crystal Lake	Lakewood	Other
🟩 • Avoid dredging west end	🟩 • Investigate utility or SSA for tile	• Minimize watershed salt use	🟩 • Add littoral and riparian habitat
🟧 • Evaluate enhanced P removal at Lippold	🟧 • Evaluate enhanced P removal at Cove	🟩 • Retrofit BMPs in existing development	🟩 • Use rain gardens and drywells in existing urban areas
🟩 • Retrofit BMPs in existing development	🟩 • Minimize watershed salt use	🟧 • Define role of Lakewood sewer in water level fluctuations	
🟧 • Define role of Lakewood sewer in water level fluctuations	🟩 • Retrofit BMPs in existing development	🟨 • Evaluate and reduce infiltration and inflow	
🟨 • Prohibit live baitfish	🟨 • Evaluate and reduce infiltra tion and inflow	🟨 • Prohibit live baitfish	
🟨 • Enhance boat inspection and boat wash facilities	🟨 • Prohibit live baitfish	🟧 • Provide lake educational materials	
🟧 • Provide lake educational materials	🟨 • Provide lake educational materials	🟩 • Limit P herbicide and pesticide usage in the watershed	
🟨 • Regulate use of lake bottom	🟩 • Limit P herbicide and pesticide usage in the watershed	🟨 • Ensure new utilities ; Do not dewater watershed	
🟧 • Continue to manage milfoil with herbicide	🟨 • Ensure new utilities ; Do not dewater watershed		
🟨 • Control goose population	🟧 • Update design criteria for new development to reduce existing P load to lake and increase water		
🟧 • Continue lake monitoring	🟩 • Monitor success of BMPs		
	🟧 • Monitor for unauthorized discharges		
	🟩 • Develop a comprehensive solution for future north shore development		

🟩	Within one year
🟧	Within two years
🟨	Within three years

MONITORING PLAN

The monitoring program to measure Plan success is presented in Table E-6. The schedule, estimated cost, and responsibilities are shown for each task.

Table E-6
Crystal Lake Future Monitoring Tasks

Threat and Recommended Tasks	Schedule	Cost (1)	Responsibility			
			CLPD	City of Crystal Lake	Village of Lakewood	IEPA
Monitoring						
Monitor BMPs to document effectiveness	Annual	$$		Lead		
Continue water column monitoring	Annual	$$$	Lead	Support (Lab)	Support (Lab)	
Continue hydrology monitoring	Annual	$$$	Lead	Support	Support	
Continue source water quality monitoring	Annual	$$$$	Support	Lead	Support	
Repeat study of lake sedimentation rates and key constituent accumulations	December-08	$$$	Lead			Support
Evaluate diatom populations in more detail to assess their status	April-08	$$	Lead			Support
Monitor Fish Population Every Two Years	Bi-annual	No New Cost	Lead/IDNR			
Define role of downgradient sewers on lake fluctuations	December-08	$$$	Lead	Support	Support	
Annual lake report card on recommendations accomplishmnet	Annual	$	Lead	Support	Support	
Publish boating enforcement monthly	Monthly	$$	Support	Lead	Lead	
Evaluate flow augmentation effectiveness	December-08	$$$	Lead	Lead	Lead	
Monitor sanitary flows annually	Annual	$$$$		Lead	Lead	
Revise CLSO as needed and to add a Crystal Lake Watershed plan element	December-08	$$$	Support	Lead	Support	
Monitor for invasive species	Annual	$$$	Lead	Lead	Lead	
Annual milfoil survey	April-08	$	Lead	Support	Support	
Annual lake meeting with scorecard	April-08	$$	Lead	Support	Support	