



Illinois Department of Natural Resources  
Division of Fisheries  
District 6

# Crystal Lake



## Public Lake Survey Report

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Photo courtesy Google Earth

**INTRODUCTION** - A fish community survey was conducted at Crystal Lake at the request of Crystal Lake Park District. The survey took place on May 7<sup>th</sup>, 2021. Previous fishery surveys were conducted by IDNR in 2004, 2008 and 2013.

**LAKE MORPHOLOGY** – (From the 2008 report) - Crystal Lake is a 228-acre natural glacial lake located in the Fox River drainage. It is a deep, clear-water lake that has gradually sloping bottom contours around much of the shoreline, extensive vegetated shallow shelves (<10 ft. deep) extending well off-shore, and rapid drop-offs to deep water in a few locations. A slough and wetland located off the northeastern shoreline has become effectively disconnected from the lake due to past road improvements. The lake outflow is elevated above its original height and now consists of a concrete spillway fitted with a spillway screen. Much of the shoreline is developed in residential housing, although three public parks (two with swimming beaches) and 13 private beach/boat mooring areas are maintained around the lake.

The Crystal Lake fish survey consisted of 60 minutes of electrofishing with a 5000-watt DC boat mounted electrofishing unit. We made one lap around the lake sampling multiple habitat types. Water temperature was 59°F. All fish were measured, weighed, and released. Fish longer than four inches were weighed. Fish data was summarized and entered into a standard table used in constructing a lake management plan (Table 1 at end of report). The following paragraphs describe the findings:

The clear water and morphology of Crystal Lake make it difficult to sample. Electrofishing on Crystal Lake is quite efficient and gives a good snapshot of the species present, but fish could be seen swimming out of field and avoiding capture. During the hour of electrofishing, we caught 146 fish belonging to 12 species. Largemouth Bass and Bluegill made up 68% of the catch (Table 2 is a breakdown of species with lengths and weights). Yellow Perch and Pumpkinseed were fairly abundant. The following species had less than seven individuals captured: Golden Shiner, Yellow Bullhead, Channel Catfish, Warmouth, Black Crappie, Common Carp, Muskie and Smallmouth Bass. There are nine other species of fish present in Crystal Lake that were not caught in this survey. Brook Silverside, Central Mudminnow, Emerald Shiner, Iowa Darter, Johnny Darter, Northern Pike, Rock Bass, Walleye and White Bass have been sampled in recent surveys. Historic records show Banded Killifish (1968) and Blacknose Shiner (1956) were present in Crystal Lake. More details are listed below in based in the order of abundance.

Largemouth bass abundance and size structure looked better than the 2013 survey. Abundance was right where we like to see it. Largemouth Bass were captured at a rate of 69 fish per hour (Table 1). At this level of abundance, we don't have to worry about bass becoming stunted and growth is typically good. Size structure looked good, sixty-nine Bass ranging in length from 4.0 to 18.3 inches were sampled – the largest weighing 3.5 pounds. (Table 2) Proportional stock densities a little better than they were in the last survey and much better than in 2013. In a typical lake management plan, a management goal for proportional stock density (PSD) is between 40 - 60%. The PSD is the percent of fish over a quality size (12 inches) in the stock (fish over eight inches).

The PSD in Crystal Lake was 78, meaning that 78% of the stock (bass over 8 inches) was longer than the “quality” size of 12 inches. We also look at relative stock density (RSD) to determine the proportion of the stock over a given length – typically 15 and 18 inches. A good goal to shoot for is an RSD-15 of 15 – 30% and an RSD-18 of 1 – 10%. The RSD-15 and 18 in Crystal Lake were 6 and 2, meaning that 6% of the stock is longer than 15 inches and 2% was longer than 18 inches. These numbers are a little low, but we don’t catch every fish in the lake and some larger bass were observed during the survey. The young to adult ratio was low but this measurement is often under-estimated using spring electrofishing data. We do not see small bass (less than four inch) very often in spring samples of any area lakes. The presence of multiple sizes of largemouth bass indicates natural reproduction is keeping up with mortality and harvest. We use relative weight (Wr) to measure the “plumpness” of a fish. A healthy fish will have a Wr value somewhere between 90 – 105. The average Wr value for this sample was 92, indicating that the bass are getting plenty to eat. The average relative weight was 88 during the 2013 sample, which is a little low. This could have been due to the timing of the sample as that survey was later and more of the Bass had already spawned. Overall, the Largemouth fishery looks good and reminding anglers to release larger fish will improve this in the future.

Bluegill were captured at a rate of 30 fish per hour (Table 1). We typically like to see this catch rate around 120 fish per hour. This low catch rate is most likely linked to temperature and season. Bluegill had not moved into the shallows to spawn at the time of the survey. A survey later in the year would most likely collect more and larger Bluegill. While 30 fish is a small sample size, the size structure of Bluegill looked good during this survey. The Bluegill in the sample ranged in length from 2.3 to 7.8 inches (Table 2). The PSD for Bluegills was 20%, which means 20% of the stock (fish over three inches) is longer than the quality size of six inches. The RSD-7 was 12% indicating a 12% of the stock was longer than seven inches. The PSD of 20 is considered a good proportion of fish over six inches. This number may be slightly under-represented as the largest Bluegill had not moved into shallow water to spawn at the time of the survey. When Pumpkinseed and Warmouth (other members of the sunfish family) are added into these numbers they increase the panfish catch. All of the Pumpkinseed and Warmouth in the sample were longer than six inches.

Sixteen Yellow Perch were collected, ranging in length from 3.9 to 9.6 inches. Yellow Perch were more abundant in the 2004 and 2008 samples due to the use of Gill-nets and trap-nets. Electrofishing tends to sample on a small percentage of the Perch due to their habitat use.

Four Channel Catfish were captured in the survey. All of Catfish measured longer than 20 inches, the largest was just over 26 inches and weighed 8.4 pounds. If a stable Channel Catfish population is desired, this species should be stocked every one to three years, depending on the level of harvest.

Only one Black Crappie was caught in the survey. This species tends to be very cyclical in their abundance, often showing up in high numbers one year and absent in a survey a few years later. Previous netting surveys of Crystal Lake showed much higher abundance of Crappie. Two Black Crappie over ten inches were caught in the 2013 survey, indicating some harvestable size fish were present in the lake.

We caught one 38.9-inch Muskie that weighed 14.5 pounds. If Muskie are to be stocked in Crystal Lake, it should be no more than one fish per acre annually. Angler reports of muskie over 48 inches indicate this species is doing well in Crystal Lake.

One thirteen-inch Smallmouth Bass was captured. Smallmouth Bass can be more difficult to catch as they tend to use a little deeper habitat than their "Large-mouthed" cousins. Smallmouth Bass are typically considered a bonus fish in area lakes as they are usually outcompeted by Largemouth Bass. They will spawn in area lakes, but supplemental stocking will help increase numbers of this species.

Walleye and Northern Pike have been stocked and caught in past surveys. Walleye and Northern Pike will need to be stocked to keep up with harvest. These species also tend to avoid electrofishing gear after they have spawned and moved offshore.

## **RECOMMENDATIONS**

Here are recommendations from the 2008 – all previous recommendations are as warranted today as they were when written:

### **1. Nutrients**

- Lakeshore homeowners can help prevent excess nutrient loading in the lake by practicing good lawn fertilizing techniques and leaving a buffer strip of native vegetation around the perimeter of the lake, where feasible.

### **2. Aquatic plants**

- Continue spot treatment of Eurasian milfoil, as needed, to keep this invasive exotic from degrading the high-quality plant community that exists in the lake. Spot treatments should target stands of Eurasian milfoil only and should take place early in the spring (March-April). The contact herbicide Navigate 2,4-D applied at a rate of 5 lbs./2,000 sq. ft. of vegetated area will kill milfoil without killing native pondweeds or eelgrass. Herbicide applications must be made by a licensed pesticide applicator.
- Introduce desirable emergent plants in shallow, shoreline areas to increase habitat for fish and other wildlife. This may be difficult in Crystal Lake given the extent of recreational power boating during much of the growing season. Desirable species include: pickerelweed (*Pontedaria cordata*), arrowheads (*Sagittaria* spp.), water willow (*Justicia americana*), soft-stem bulrush (*Scirpus tabernaemontani*), and common bur reed (*Sparganium eurycarpum*). Avoid introducing other bulrushes (*Scirpus* spp.), cattails (*Typha* spp.), and purple loosestrife (*Lythrum salicaria*).

### 3. Wetland connection

- Re-establish the hydrological and biological link between the lake and the wetland/channel complex located north of the eastern portion of the lake. Prior to its isolation from the lake, the slough/wetland was an historical spawning ground for native fishes in the lake, such as yellow perch and northern pike. In addition, historic records indicate that the State threatened banded killifish once maintained populations in Crystal Lake. Access to the slough/wetland may be important if reestablishment of these species ever becomes a lake management goal.

### 4. Fish community

- Improvements to the sport fishery in Crystal Lake over time can be largely attributed to past stocking efforts of the Crystal Lake Anglers club and the Park District. In recent years, the stocking program has become more consistent and targeted toward specific management goals, such as enhancing prey fish populations (e.g., introducing emerald shiners, crayfish, and white suckers). Most recently, the Anglers, with approval from the Park District, have enhanced habitat in the lake by adding fish aggregating structures, cover for fry and juvenile fishes, and spawning structures for channel catfish and smallmouth bass.

The basic rules of stocking still apply. Stocking should provide the best possible variation and quality of sport fishing that a lake of a given size and ecological condition can support. Avoid stocking fish just because money is available, an angler believes more of his favorite species need to be stocked, or a great deal is available from a fish dealer.

A stocking plan was developed as part of the 2004 survey report, and it has been used as the basis for stocking in recent years. The plan below is an updated version of the original stocking plan that incorporates results from the 2008 survey. The most significant changes are a reduction in the recommended stocking frequency for largemouth bass and an increase in the stocking frequency of smallmouth bass. Reduced stocking is necessary for largemouth bass to prevent population overabundance and stunted growth, whereas increased stocking frequency is needed for smallmouth bass to bolster a limited population.

Largemouth bass, bluegill, yellow perch, and black crappie should maintain population densities that support good fishing through natural reproduction and harvest restrictions. However, stocking may be necessary when population abundance declines. Stock largemouth bass (minimum size = 4-6 in.; 10-25 fingerlings/acre or about 2,000-5,000 bass total) and black crappie (25 fingerlings/acre or about 5,000 crappie total) no more than once every three years as needed to supplement a declining population. Stock yellow perch (minimum size = 5-7 in.; 15 adults/acre or 3,500 perch total) no more than once every five years as needed to supplement a declining population. Recent data

suggests that population abundance for largemouth bass, bluegills, and yellow perch is good, so only crappie should be stocked at this time.

Natural reproduction of smallmouth bass continues to be relatively unsuccessful in the lake, so stocking is needed to enhance the population. Stock smallmouth bass fingerlings (minimum size = 4-6 in.; 10-25 fingerlings/acre or about 2,000-5,000 bass) annually for three years then every other year.

Continue stocking northern pike to maintain the quality pike fishery. Increase the stocking rate to 2 advanced fingerlings/acre (minimum length = 10 in.) or about 400 pike total, and stock every other year. If larger pike (>15 in.) are purchased, stock them at a rate of 1 fish/acre (200 pike total) every other year.

Northern pike are the esocid of choice in a lake the size of Crystal Lake. However, muskellunge may be stocked to create additional angling opportunities for a bonus trophy fish. Continue to stock pure or tiger muskie fingerlings (minimum length = 12 in.) at a rate of 1 fish/acre (about 200 fish total) once every three years. Anecdotal evidence from anglers suggests that survival, growth, and condition have been better for tiger muskies than pure muskellunge in Crystal Lake.

Continue stocking walleye annually to enhance the population of this important predator and sport fish. Stock large fingerlings (>8 in. long) at a rate of 10 fish/acre (about 2,000 fish total) or catchable-sized fish (>12 in. long) at a rate of 5 fish/acre (about 1,000 fish total).

Maintain the channel catfish population by stocking large fingerlings (>8 in. long) at a rate of 10-25 fish/acre or about 2,000-5,000 catfish total. Catchable-sized channel catfish (averaging 1-2 lbs.) may be substituted for non-vulnerable fingerlings to decrease the time to harvestable size. Stock as many catchable-sized catfish as is affordable up to the advanced fingerling rate. Catfish stocking should take place once every 3 years.

Continue to introduce emerald shiners as an alternate prey species in the lake when they become available again. Emerald shiner stocking has been successful (e.g., condition and growth of predators has improved, and a limited shiner population has become established) even though the recommended stocking density of 1,000 lbs. for three years has not been met. Only a total of 1,500 lbs. have been stocked to date. Stock 1,000 lbs. a year (~5 lbs./acre) for three of the next five years. Discontinue stocking after the three years and we will further evaluate the success of the stocking with the next fish population survey.

Stock trout periodically and only in support of a specific fishing event, such as the ice fishing derby. The lake is too big for a typical catchable trout program

and trout will not compete well with other fish populations for food. However, trout add variety and make for a nice bonus fish, particularly for ice anglers. Catchable-sized rainbow trout are preferred over brown trout because rainbows are more easily caught.

Do not stock hybrid sunfish, fathead minnows, or golden shiners. Hybrid sunfish were developed for small ponds and tend to create a genetic mess in larger lakes when they back cross with existing bluegill populations. Fathead minnows and golden shiners will not do any harm, but predators rapidly eliminate them and cost prohibits stocking at high enough density to create a meaningful food supply.

### Ten-Year Stocking Plan

Year	Species (stocking goal in total numbers)									
	Walleye	Northern pike	Pure or tiger muskie	Channel catfish	Small-mouth bass	Large-mouth bass	Black crappie	Yellow perch	Emerald shiner	Rainbow trout
2022	2,000			2,000	2,000		5,000			As \$\$\$
2023	2,000	400			2,000			3,500	1,000 lbs.	allow
2024	2,000		200		2,000	2,000			1,000 lbs.	for
2025	2,000	400		2,000					1,000 lbs.	specific
2026	2,000				2,000			3,500	Evaluate	events,
2027	2,000	400	200			2,000				such as
2028	2,000			2,000	2,000					in late fall
2029	2,000	400						3,500		before
2030	2,000		200		2,000	2,000				ice fishing
2031	2,000	400		2,000						Derby.

### Stocking Recommendation Summary

Species	Size	Number	Frequency
Largemouth bass	4-6 in.	2,000-5,000	Once every 3 years at most.
Smallmouth bass	4-6 in.	2,000-5,000	Annually for 3 years, then every other year.
Black crappie	1-3 in.	5,000	Once every 3 years at most.
Yellow perch	5-7 in.	3,500	Once every 3 years at most.
Northern pike	10 in. minimum or >15 in.	400 or 200	Every other year.
Muskellunge	12 in. minimum	200	Once every 3 years.
Walleye	4-6 in. minimum or >12 in.	2,000-5,000 or 1,000	Annually.
Channel catfish	8 in. minimum or 1 lb. average	2,000-5,000 up to 2,000	Once every 3 years.
Emerald shiners	Mixed	1,000 lbs.	3 of 5 years, then evaluate
Rainbow trout	1 lb. or larger	As \$\$\$ allow	Periodically for special events

- Remove common carp from the lake whenever possible. Continue the successful annual carp derby sponsored by the Crystal Lake Anglers. The derby is a great way to promote carp fishing and remove excess carp from the lake.
- Recommended sport fishing regulations for Crystal Lake are listed in the table below. Illinois statewide sportfishing regulations apply to all waters in the State, unless a specific water body is covered by more restrictive site-specific regulations. Site-specific regulations may be developed and enforced by a local governing body through a local ordinance. The recommendations below were developed to help sustain quality fishing and protect fisheries resources in the lake without overly limiting fishing opportunities. These recommendations are informational and **DO NOT** represent legal regulations set forth in the State of Illinois administrative rules.

### **Recommended Angling Regulations**

<b>Species</b>	<b>Creel and size limits</b>
All species	2 pole and line fishing only, except 3 ice fishing devices
Largemouth or smallmouth bass (either singly or in the aggregate)	1 fish daily creel limit, 15 in. minimum length limit
Northern pike	2 fish daily creel limit, 24 in. minimum length limit
Muskellunge	1 fish daily creel limit, 45 in. minimum length limit
Walleye	1 fish daily creel limit, 16 in. minimum length limit
Channel catfish	3 fish daily creel limit, no length limit
White or black crappie (either singly or in the aggregate)	15 fish daily creel limit, 9 in. minimum length limit
Bluegill or other sunfish species (either singly or in the aggregate)	25 fish daily creel limit, no length limit

#### 5. Evaluation

- Self-monitor changes in the lake and contact the District Fisheries Biologist or a lake consultant should problems become evident. Have the lake surveyed again after 5 years.

Table 1. 2021 Summary of Lake Management Goals.

<b>SPECIES</b>	<b>CRITERIA</b>	<b>LMP GOAL</b>	<b>2013</b>	<b>2021</b>	<b>RATING*</b>
Largemouth bass	Catch Rate	60/hr.	43	69	Good
	PSD	40-60%	50	78	Good
	RSD-15	15-30%	6	6	Fair
	RSD-18	6-10%	0	2	Fair
	Relative Weight	90-105	88	92	Good
	YAR	1:3	0	0.23	Low
	Avg. Length (In.)		11.0	11.0	
Bluegill	Catch Rate	120/hr.	18	30	Poor
	PSD	15-30%	47	20	Good
	RSD-7	6-10%	24	12	Good
	RSD-8	1-5%	0	0	Poor
	Relative Weight	90-105	88	102	Good
	Avg. Length (In.)		5.6	4.3	
Walleye	Total Catch	>10	16	0	NA
	Length Range (In)		10.7- 20.7	NA	
Smallmouth Bass	Total Catch	>10	8	1	NA
	Length Range (In)		9.7- 19.6	13	
Black crappie	Total Catch	>10	4	1	Poor
	Wr	90-105	95	NA	NA

Table 2. Summary of Catch from the 2021 Electrofishing Survey

Species	Number Collected	Length (Inches)			Weight (pounds)	
		Min	Max	Avg.	Min	Max
Largemouth Bass	69	4.0	18.3	11.0	0.0	3.5
Bluegill	30	2.3	7.8	4.3	0.0	0.3
Yellow Perch	16	3.9	9.6	6.3	0.0	0.4
Pumpkinseed	9	6.0	7.9	6.8	0.2	0.4
Golden Shiner	7	2.8	6.0	4.1	0.0	0.1
Yellow Bullhead	5	8.0	11.4	9.8	0.3	0.9
Channel Catfish	4	21.8	26.4	23.9	3.6	8.4
Warmouth	2	6.0	7.6	6.8	0.2	0.3
Black Crappie	1	4.8	4.8	4.8	0.1	0.1
Common Carp	1	27.1	27.1	27.1	12.0	12.0
Muskellunge	1	38.9	38.9	38.9	14.5	14.5
Smallmouth Bass	1	13.4	13.4	13.4	1.1	1.1
# of fish caught	146					