# WISCONSIN DEPARTMENT OF NATURAL RESOURCES

## 2021 Comprehensive Summary Report
## Bear Lake, Waupaca County
279700



## Introduction And Objectives

In 2022, the Wisconsin Department of Natural Resources conducted a comprehensive fish survey of Bear Lake in order to provide insight and direction for the future fisheries management of this system. Comprehensive fish surveys include both spring fyke netting and spring electrofishing surveys. The primary sampling objectives of these surveys are to characterize species composition, relative abundance, and size structure. The following report is a brief summary of the activities conducted, general status of fish populations and future management options for Bear Lake.


## DNR Contact

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### Lake Information

Combined Acres:199
Max. Depth: 67
Shoreline Miles: 3.62
Public Access: 1 Boat Landing

### Regulations

Statewide Default Regulations

**SURVEY INFORMATION**

| Site Location | Survey Dates | Water Temperature (°F) | Target Species | Gear | Number of Nets | Effort |
|---|---|---|---|---|---|---|
| Bear Lake | 3/22/2021 - 4/5/2021 | 39 - 52 | northern pike and walleye | Fyke Net | 7 | 110 net nights |
| Bear Lake | 5/1/2021 - 5/5/2021 | 55 - 56 | panfish | Fyke Net | 4 | 16 net nights |
| Bear Lake | 5/26/2021 | 70 | bass/panfish | Boomshocker | N/A | 3.34 miles |

## Metric Descriptions

- **Catch per unit effort (CPUE) is an index used to measure fish population relative abundance**, which simply refers to the number of fish captured per unit of distance or time. For netting surveys, we typically quantify CPUE by the number and size of fish per net night. For electrofishing, we quantify CPUE as the number caught per mile of water electrofished. CPUE indexes are compared to statewide data by percentiles and within lake trends. For example, if a CPUE is in the 90th percentile, it is higher than 90% of the other CPUEs in the state.
- **Proportional Stock Density (PSD) is an index used to describe the size structure of fish populations.** It is calculated by dividing the number of quality size fish by the number of stock size fish for a given species. PSD values between 40 - 60 generally describe a balanced fish population.
- **Length frequency distribution (LFD) is a graphical representation of the number or percentage of fish captured by half-inch or one-inch size intervals.** Smaller fish (or younger age classes) may not always be represented in the length frequency due to different habitat usage or sampling gear limitations.
- **Mean age at length is an index used to assess fish growth.** Calcified structures (e.g., otoliths, spines or scales) are collected from a specified length bin of interest (e.g., 7.0-7.5 inches for bluegill). Mean age is compared to statewide data by percentile with growth characterized by the following benchmarks: slow (<33rd percentile); moderate (33rd to 66th percentile); and fast (>66th percentile).

**Survey Method**

- Bear Lake was sampled according to spring netting I (SNI), spring netting II (SNII) and spring electrofishing II (SEII) protocols as outlined in the DNR Fisheries Monitoring Protocols. The primary objective of the spring fyke netting I survey is to count and measure adult walleye and northern pike, and mark adult walleyes to estimate walleye abundance. The primary objective of the spring electrofishing II survey is to count and measure adult largemouth bass, smallmouth bass, and panfish. Other species of fish may be sampled during each survey but are considered by-catch as part of that survey.
- Boom shockers were used to electrofish 3.34 miles of shoreline. Gamefish were collected and measured throughout, and panfish were collected and counted along 1.5 miles of shoreline.
- Fyke nets were deployed in areas of the lake that contained spawning habitat or were likely travel areas for northern pike, and walleye. All newly captured individuals were marked with a fin clip. Aging structures (spines/otoliths) were taken from a sample of Northern Pike, bluegill and black crappie for age and growth analyses.

**RELATIVE ABUNDANCE — CATCH PER UNIT EFFORT (CPUE)**

| Species | Protocol | Total Number Captured | CPUE | Units | Statewide Percentile | Abundance Rating | Length Index | Length Index CPUE | Length Index Percentile | Length Index Abundance Rating |
|---|---|---|---|---|---|---|---|---|---|---|
| northern pike | Spring Netting I | 79 | 0.7 | fish/net night | 33rd | Low | >21.0 inches | 0.2 | N/A | N/A |
| largemouth bass | Spring Electrofishing II | 184 | 55.1 | fish/mile | 88th | Moderate | >14.0 inches | 10.2 | 86th | Moderate - High |
| black crappie | Spring Electrofishing II | 4 | 2.7 | fish/mile | 30th | Low | >8.0 inches | 0.7 | 23rd | Low |
| bluegill | Spring Electrofishing II | 251 | 167.3 | fish/mile | 73rd | Moderate - High | >7.0 inches | 6.0 | 51st | Moderate |
| pumpkinseed | Spring Electrofishing II | 41 | 27.3 | fish/mile | 82nd | Moderate - High | >7.0 inches | 0.7 | 55th | Moderate |

## Northern Pike

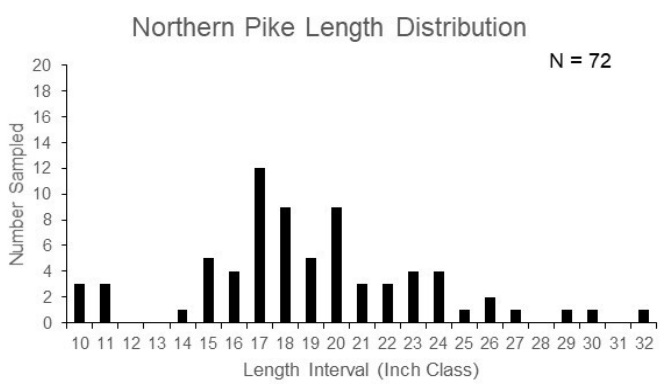
- Northern Pike (*Esox lucius*) are a common predatory fish species found across many Wisconsin waterbodies. Northern pike spawn in areas of emergent vegetation at approximately 34-40°F water temperatures. Fyke netting is the preferred sampling gear for northern pike. All results presented for northern pike are from spring fyke netting surveys.

**2021 SIZE STRUCTURE METRICS**

| Total Number Measured | Average Length (inches) | Length Range (inches) | Stock and Quality Size (inches) | Stock Number | Quality Number | PSD | Percentile Rank | Size Rating |
|---|---|---|---|---|---|---|---|---|
| 72 | 19.8 | 10.1 - 32.7 | 14.0 and 21.0 | 66 | 21 | 32 | 36th | Moderate |

**RELATIVE ABUNDANCE (CPUE = NUMBER PER NET NIGHT)**

| Total Sampled | 2002 | 2012 | 2021 | Historical Median | 2022 Statewide Percentile Rank | 2022 Abundance Rating |
|---|---|---|---|---|---|---|
| 79 | 0.9 | 5.1 | 0.7 | 0.9 | 33rd | Low |




**SIZE STRUCTURE (PSD) TRENDS**

| PSD by Year | | | Historical Median |
|---|---|---|---|
| 2002 | 2012 | 2021 | |
| 34 | 48 | 32 | 34 |

**ADULT ABUNDANCE (POPULATION ESTIMATE)**

| Marked | Captured | Recaptures | Population Estimate (95% CI) | Number per Acre |
|---|---|---|---|---|
| 70 | 77 | 7 | 312 (180 - 1,187) | 1.6 |

## Species Summary

- Bear Lake supports a low density northern pike population, with catch rates being 0.7 per net night in the 2021 fyke netting survey. A catch rate of 0.7 ranks out in the 33rd percentile when compared to lakes throughout Wisconsin. Catch rates of northern pike in historical fyke netting surveys have been similar, ranging from 0.7-5.1 per net night.
- The size structure of northern pike in the 2021 fyke netting survey was moderate with a PSD of 32, which ranks out in the 36th percentile when compared to lakes throughout Wisconsin. The size structure in 2021 was slightly below previous fyke netting surveys between 2002-2012 with PSD ranges of 34-48.
- Population estimates of northern pike are similar over the last 3 surveys in Bear Lake. However, all years show a below average fishery at 1.6 adult northern pike per acre, with only 3% of the catch being ≥26 inches.


Photo Credit : DNR Staff

## Largemouth Bass

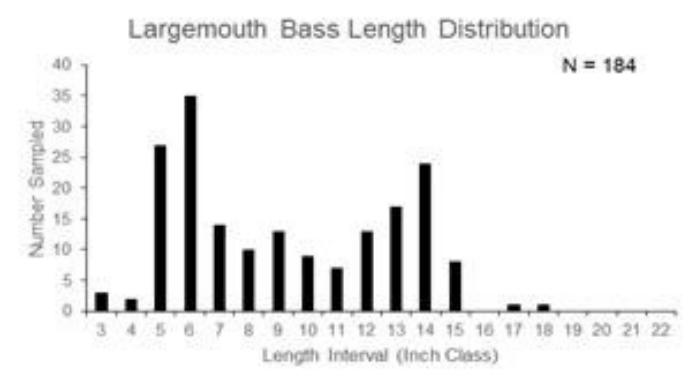
- Largemouth bass (*Micropterus salmoides*) are a common predatory fish species found in many Wisconsin waterbodies. Largemouth bass typically spawn in shallow nearshore areas consisting of sand, mud or gravel substrate at approximately 60-70°F water temperatures. Electrofishing is the preferred sampling gear for largemouth bass. All results presented for largemouth bass are from spring electrofishing surveys.

**2021 SIZE STRUCTURE METRICS**

| Total Number Measured | Average Length (inches) | Length Range (inches) | Stock and Quality Size (inches) | Stock Number | Quality Number | PSD | Percentile Rank | Size Rating |
|---|---|---|---|---|---|---|---|---|
| 184 | 9.8 | 3.4 - 18.7 | 8.0 and 12.0 | 103 | 64 | 62 | 55th | Moderate |

**2021 RELATIVE ABUNDANCE (CPUE = NUMBER PER MILE)**

| CPUE Total | Percentile Rank | Overall Abundance Rating | Length Index | Length Index CPUE | Length Index Percentile Rank | Length Index Abundance Rating |
|---|---|---|---|---|---|---|
| 55.1 | 88th | Moderate - High | ≥ 14.0 inches | 10.2 | 86th | Moderate - High |




**SIZE STRUCTURE (PSD) TRENDS**

| PSD by Year | | | Historical Median |
|---|---|---|---|
| 2002 | 2012 | 2021 | |
| 71.7 | 56.8 | 55.1 | 55.1 |

**RELATIVE ABUNDANCE TRENDS (CPUE = NUMBER PER MILE)**

| CPUE by Year | | | Historical Median |
|---|---|---|---|
| 2002 | 2012 | 2021 | |
| 74 | 45 | 62 | 62 |


Photo Credit: DNR Staff

## Species Summary

- Bear Lake supports a moderate to high density largemouth bass population. Catch rates of largemouth bass in the spring electrofishing survey were 55.1 largemouth bass per mile of electrofishing, which ranks out in the 88th percentile when compared to lakes throughout Wisconsin. Catch rates over the last three spring electrofishing surveys were very similar, ranging between 71.7 - 55.1 per mile of electrofishing.
- The size structure of largemouth bass in 2021 was also good with a PSD of 62 and high catch rates (10.2 per mile) for fish ≥14 inches.
- Optimal habitat for largemouth bass is present in Bear Lake. Interested lakeshore property owners should promote a diverse mix of native emergent, floating and submergent vegetation as well as fish sticks and large woody habitat. Recently, deepwater fish sticks have been placed in areas of the lake just offshore of emergent bullrush.

## Black Crappie

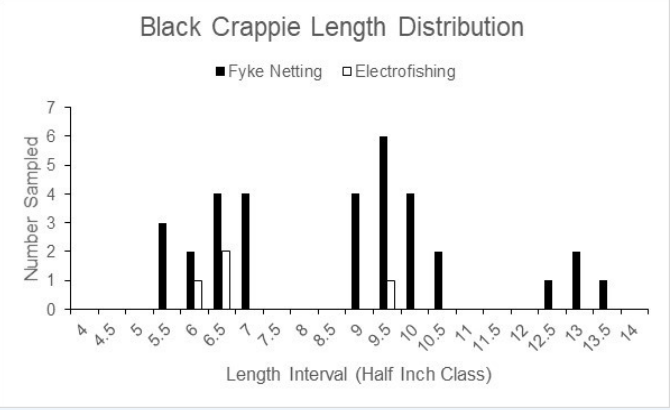
- Black crappie (*Pomoxis nigromaculatus*) are a common panfish species distributed widely across many Wisconsin waterbodies. Black crappie typically spawn in nearshore areas consisting of detritus, sand, mud or gravel substrate at approximately 58-68°F water temperatures. Electrofishing and fyke netting can be effective sampling gear for black crappie and therefore, results from both gears are presented for black crappie

**2021 SIZE STRUCTURE METRICS**

| Gear | Number Measured | Average Length (inches) | Length Range (inches) | Stock and Quality Size (inches) | Stock | Quality | PSD | Percentile Rank | Size Rating |
|---|---|---|---|---|---|---|---|---|---|
| Fyke Netting | 33 | 9.0 | 5.9 - 14.0 | 5.0 and 8.0 | 33 | 20 | 61 | 50th | Moderate |
| Electrofishing | 4 | 7.3 | 6.2 - 9.8 | 5.0 and 8.0 | 4 | 1 | 25 | 38th | Moderate |

**FYKE NETTING CPUE TRENDS (NUMBER PER NET NIGHT)**

| 2021 Number Sampled | 2002 | 2012 | 2021 | Historical Median | 2021 Statewide Percentile Rank | 2021 Abundance Rating |
|---|---|---|---|---|---|---|
| 33 | 8.8 | 3.8 | 2.1 | 3.8 | 39th | Moderate |




**SIZE STRUCTURE (PSD) TRENDS FYKE NETTING**

| PSD by Year | | | Historical Median |
|---|---|---|---|
| 2002 | 2012 | 2021 | |
| 14 | 69 | 61 | 61 |

**2021 GROWTH METRICS**

| Sample (n) | Length Bin (inches) | Mean Age | Age Range | Percentile Rank | Growth Rating |
|---|---|---|---|---|---|
| 1 | 7.5 – 8.4 | 3.0 | 3 | 98th | Fast |
| 6 | 9.5 -10.4 | 3.0 | 3 | 100th | Fast |

**ELECTROFISHING CPUE (NUMBER PER MILE)**

| CPUE Total | Percentile Rank | Overall Abundance Rating | Length Index | Length Index CPUE | Length Index Percentile Rank | Length Index Abundance Rating |
|---|---|---|---|---|---|---|
| 2.7 | 30th | Low | ≥ 8.0 inches | 0.7 | 23rd | Low |

**ELECTROFISHING TRENDS CPUE (NUMBER PER MILE)**

| CPUE by Year | | | Historical Median |
|---|---|---|---|
| 2002 | 2012 | 2021 | |
| 6.0 | 2.0 | 2.7 | 2.7 |

**ELECTROFISHING SIZE STRUCTURE (PSD) TRENDS**

| PSD by Year | | | Historical Median |
|---|---|---|---|
| 2002 | 2012 | 2021 | |
| 0 | 100 | 25 | 25 |

## Species Summary

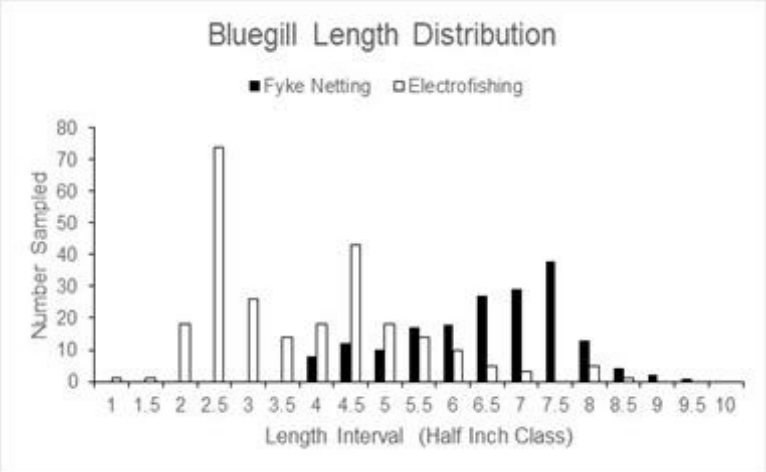
- Catch rates of black crappies in Bear Lake were moderate in the 2021 spring fyke netting survey (2.1 per net night) while the spring electrofishing survey showed low numbers (2.7 per mile of electrofishing). Catch rates from the fyke netting and electrofishing survey ranked out in the 39th and 30th percentiles when compared to lakes throughout Wisconsin. Catch rates of black crappies have been variable through time based on year-class strength.
- Black crappie PSD in the spring 2021 fyke netting survey was average when compared to the last 20 years. Black crappie are fast growing in Bear Lake reaching 3 years old between 9-11-inches. There was a year class of black crappie present in the survey that were in the 13.0-inch range. Given the small littoral zone, deep water and prolonged period of time it takes for water temperatures to rise, black crappie can be a challenge to sample during spring.

## Bluegill

- Bluegill (*Lepomis macrochirus*) are a very common panfish species distributed widely across many Wisconsin waterbodies. Bluegills typically spawn in nearshore areas consisting of sand, mud or gravel substrate at approximately 67-80°F water temperatures. Electrofishing is the standard sampling gear for bluegill, but fyke netting can show some information as well. When comparing bluegill populations to other waterbodies electrofishing data is to be used for our surveys.

**2021 SIZE STRUCTURE METRICS**

| Gear | Number Measured | Average Length | Length Range | Stock and Quality Size | Stock | Quality | PSD | Percentile Rank | Size Rating |
|---|---|---|---|---|---|---|---|---|---|
| Fyke Netting | 179 | 6.8 | 4.1 - 9.8 | 3.0 and 6.0 | 179 | 132 | 74 | 71st | Moderate - High |
| Electrofishing | 251 | 4.0 | 1.5 - 8.9 | 3.0 and 6.0 | 157 | 24 | 15 | 21st | Low |




**FYKE NETTING CPUE TRENDS (NUMBER PER NET NIGHT)**

| 2021 Number Sampled | 2002 | 2012 | 2021 | Historical Median | 2021 Statewide Percentile Rank | 2021 Abundance Rating |
|---|---|---|---|---|---|---|
| 179 | 15.5 | 27.6 | 11.3 | 15.5 | 61st | Moderate |

**SIZE STRUCTURE (PSD) TRENDS FYKE NETTING**

| PSD by Year | | | Historical Median |
|---|---|---|---|
| 2002 | 2012 | 2021 | |
| 61 | 78 | 74 | 74 |

**2021 GROWTH METRICS**

| Sample (n) | Length Bin (inches) | Mean Age | Age Range | Percentile Rank | Growth Rating |
|---|---|---|---|---|---|
| 9 | 5.5 – 6.4 | 4.1 | 4 - 5 | 61st | Moderate |
| 10 | 6.5 – 7.4 | 4.6 | 4 - 5 | 71st | Moderate - High |

**ELECTROFISHING CPUE (NUMBER PER MILE)**

| CPUE Total | Percentile Rank | Overall Abundance Rating | Length Index | Length Index CPUE | Length Index Percentile Rank | Length Index Abundance Rating |
|---|---|---|---|---|---|---|
| 167.3 | 73rd | Moderate - High | ≥ 7.0 inches | 6.0 | 51st | Moderate |

**ELECTROFISHING TRENDS CPUE (NUMBER PER MILE)**

| CPUE by Year | | | Historical Median |
|---|---|---|---|
| 2002 | 2012 | 2021 | |
| 130.0 | 129.0 | 167.3 | 130.0 |

**ELECTROFISHING SIZE STRUCTURE (PSD) TRENDS**

| PSD by Year | | | Historical Median |
|---|---|---|---|
| 2002 | 2012 | 2021 | |
| 28 | 25 | 15 | 25 |

## Species Summary

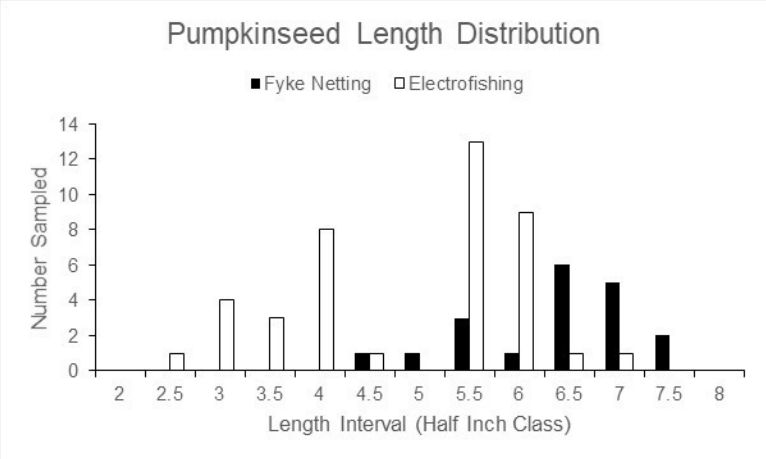
- Catch rates of bluegill in Bear Lake spring electrofishing survey showed moderate to high densities (167.3 per mile of electrofishing). Catch rates from the electrofishing surveys rank out in the 73rd percentile when compared to lakes throughout Wisconsin. Generally, catch rates have been increasing in spring electrofishing surveys.
- Bluegill PSD values in the 2021 spring electrofishing (15), were low when compared to other lakes in the state. However, when looking at the fyke netting data larger fish over 7.0-inches were present. Furthermore, bluegill growth rates are moderate as they grow to 6.0-inches in roughly 4 years. The quality of Bear Lake bluegills is average with moderate size structure and moderate abundances.

## Pumpkinseed

- Pumpkinseeds (*Lepomis gibbosus*) are a common panfish species distributed widely across many Wisconsin waterbodies. Pumpkinseeds typically spawn in nearshore areas consisting of sand or gravel substrate at approximately 60-70°F water temperatures. Electrofishing and fyke netting can be effective sampling gear for pumpkinseeds and therefore, results from both gears are presented for pumpkinseeds.

**2021 SIZE STRUCTURE METRICS**

| Gear | Number Measured | Average Length (inches) | Length Range (inches) | Stock and Quality Size (inches) | Stock | Quality | PSD | Percentile Rank | Size Rating |
|---|---|---|---|---|---|---|---|---|---|
| Fyke Netting | 19 | 6.6 | 4.7 - 7.9 | 3.0 and 6.0 | 19 | 14 | 74 | 84th | Moderate-High |
| Electrofishing | 41 | 5.1 | 3.0 - 7.1 | 3.0 and 6.0 | 40 | 11 | 28 | 44th | Moderate |




**FYKE NETTING CPUE TRENDS (NUMBER PER NET NIGHT)**

| 2021 Number Sampled | 2002 | 2012 | 2021 | Historical Median | 2021 Statewide Percentile Rank | 2021 Abundance Rating |
|---|---|---|---|---|---|---|
| 19 | 1.6 | 0.8 | 1.2 | 1.2 | 59th | Moderate |

**SIZE STRUCTURE (PSD) TRENDS FYKE NETTING**

| PSD by Year | | | Historical Median |
|---|---|---|---|
| 2002 | 2012 | 2021 | |
| 0 | 50 | 55 | 50 |

**ELECTROFISHING CPUE (NUMBER PER MILE)**

| CPUE Total | Percentile Rank | Overall Abundance Rating | Length Index | Length Index CPUE | Length Index Percentile Rank | Length Index Abundance Rating |
|---|---|---|---|---|---|---|
| 27.3 | 82nd | Moderate - High | ≥ 7.0 inches | 0.7 | 55th | Moderate |

**ELECTROFISHING TRENDS CPUE (NUMBER PER MILE)**

| CPUE by Year | | | Historical Median |
|---|---|---|---|
| 2002 | 2012 | 2021 | |
| 2.0 | 2.0 | 27.3 | 2.0 |

**ELECTROFISHING SIZE STRUCTURE (PSD) TRENDS**

| PSD by Year | | | Historical Median |
|---|---|---|---|
| 2002 | 2012 | 2021 | |
| 50 | 0 | 28 | 28 |

## Species Summary

- Catch rates of pumpkinseeds were moderate to high in the spring electrofishing survey (27.3 per mile of electrofishing). Catch rates from electrofishing has produced differing results from year to year.
- Pumpkinseeds PSD values have been variable over the years regardless of gear. Numbers of pumpkinseeds in Bear Lake are moderate, but provide an opportunity for harvestable pumpkinseeds > 6.0-inches. The 2021 electrofishing resulted in the highest number of pumpkinseeds observed over the last 20 years.


Photo Credit: DNR Staff

## Full Summary

### Northern Pike

Bear Lake supports a low density northern pike population. Plenty of cold water along with ample forage allows for northern pike to grow >30-inches. The areas of Bear Lake that have shallow water and emergent vegetation should be protected or enhanced to ensure northern pike have abundant spawning and nursery habitat in the future. Northern pike in Bear Lake can be difficult to sample because the lake is deep and takes a longer time to warm up at ice out for optimal spawning conditions. In 2021, Bear Lake was used as a northern pike brook source for other lakes within the Lake Michigan drainage.


Photo Credit: DNR Staff

### Walleye

Bear Lake supports a very low density walleye population as only one was sampled during fyke netting and one during electrofishing. Despite sampling low numbers of walleye, they have the ability to swim into the lake from the Little Wolf River. Habitat for walleyes in Bear Lake is minimal and they are not actively managed. While anglers are not likely to catch many walleyes in Bear Lake, walleyes grow very quickly and reach large sizes, providing the opportunity to catch a trophy walleye.

### Largemouth Bass

Bear Lake supports a healthy largemouth bass population with moderate to high catch rates of sub-legal and legal sizes (i.e. ≥14 inches). The largemouth bass population is flourishing in regards to size and abundance levels. The management goal is to keep bass densities at current levels where they keep panfish populations from becoming overabundant and stunting.


Photo Credit: DNR Staff

### Black Crappie

Densities of black crappie in bear lake are moderate, while showing impressive size with crappies reaching 14.0-inches. The black crappie population was dominated by three large year-classes, with most fish 2-3 years old. They have shown the ability to grow very quickly in Bear Lake. Erratic recruitment with populations dominated by 1-2 large year classes is common with crappies.

### Bluegill

The density of bluegills was moderate, while showing impressive size structure with bluegills over 9.0-inches. Bluegills in Bear Lake can reach 7.0-inches in 4-5 years.

### Pumpkinseed

Pumpkinseeds density was moderate to high, but size structure was low. They still provide a fishing opportunity as pumpkinseeds were sampled >7.0-inches.

### Yellow Perch

Yellow perch were present in our sampling but in low densities. A strong year-class is present currently with fish averaging 4.5-inches and should provide a fishing opportunity in a few years.

### Other Management Recommendations

Bear Lake is relatively unique among lakes in the area in that is has minimal development on one shoreline while the other half is heavily developed. Agriculture in the area has impacted nutrient loading over the years as Bear Lake has several algae blooms throughout the year. Optimal fish habitat is very limited in certain parts of Bear Lake. Interested lakeshore owners should promote a diverse mix of native emergent, floating and submergent vegetation as well as fish sticks along their shorelines. Deepwater fish sticks have been in place in areas of the lake in the past few years. This could be further expanded on as wood is a desirable habitat for many fish species.