

Spring 2023

**Introduction:**

Fisheries management is a dynamic process and continued monitoring and analysis is needed to maintain a level of fishing that is desired by the community. Ongoing data collection assists biologists with evaluating trends in the fishery. This monitoring allows biologists to make changes, if needed, to the fishery to maintain the quality of fishing the membership has come to expect. JadEco, LLC was contacted to follow up the collection from 2019 on the fishery for Beaver Lake at the Goose Lake Association property. This is a comparison of the 2023 data to the 2019 data collected.

To assess the fishery, we utilize several indices in fisheries management as tools to interpret the population structure and condition of the fishery. Data analysis tools such as Catch Per Unit Effort (CPUE) provide information on the abundance of species. The quantity of fish collected within a certain amount of time determines the CPUE. This is used for the collection as a whole, or per species comparisons. Proportional stock density (PSD) is also analyzed on important game species. This is a fisheries assessment tool used to determine the size distribution of the fish within a population. Relative weights ( $W_r$ ) are calculated to provide insight into the condition of the fish in a population or fish community. They also provide an understanding of the size structure of game species within the lake and provide information on length to weight relationships to better understand if your game fish are relatively fat, or relatively thin. Potential changes in the predator / prey relationships and available forage can be interpreted through these metrics. Combined, these metrics provide information on the game fish community, species density and potential trends in the fishery.

Day and night time DC Electrofishing was conducted for a total of 113 minutes throughout much of the lake on May 26, 2023 (68 minutes day and 45 minutes night). A total of 11 species were represented during the survey, of which 10 were considered important game species and one of the other species were considered non-desirable (common carp). A total of 369 fish were collected with nearly 97% of the collection comprised of desirable sport species.

Water clarity readings were good during the survey, with visibility over 6 feet deep. Water temperature was at 74°F. Air temperatures were at 80°F.

**Summary of Fisheries Data Collected – Spring 2023:**

The following is a summary and interpretation of the data from the spring 2023 fish survey on Beaver Lake.

The overall collection was lower than desired again in 2023 with a total CPUE of 3.28 fish per minute (objective is 6 fish per minute or more). Both bass and bluegill had lower than our objective collection rates at 0.83 and 1.66 fish per minute respectively. We collected largemouth bass (94), bluegill (188), black crappie (3), red ear sunfish (28), walleye (1), channel catfish (10), yellow perch (2), rock bass (3), warmouth (27), and white bass (1). Non-desirables collected were common carp (12). No bullhead or gizzard shad were collected this time.

Based on actual collection numbers, bluegill represented 51% of the collection. Largemouth bass comprised 25% of the overall collection. Red ear sunfish represented 7.6% of the collection, warmouth represented 7.3%, channel catfish represented 2.7%, and carp represented nearly 3.3% of the total fish collected. Black crappie, white bass, rock bass, walleye, and yellow perch all represent the remaining percentage.

Average relative weight (Wr) for the game species of concern were variable but the main concern was the low average relative weights of the largemouth bass again in 2023. Objective ranges are 90-110 and the average for largemouth during this survey was at 89 (range 71-190). This was up from 88 in 2019. Largemouth bass, black crappie (84) and walleye (80) were all below objective average Wr while all other sport species were within our objective ranges.

### **Largemouth Bass:**

The collection rate for largemouth bass was below our objective collection rate at 0.83 fish per minute. The average relative weight of bass collected was below our objective range at 89 and ranged from 71 to 190 with a 11" bass outlier at 190. This would indicate thinner bass collected than our goals. The bass under 9" had decent Wr while other size classes were low.

The PSD or 'proportional stock density' metric to analyze the size structure of the bass population was used. This is a comparison of the stock (>8") to quality (>12") size bass in the sample. The objective range for largemouth bass PSD is 40-70. The PSD for Beaver Lake was at 54, and within our objective. This means that of bass collected over 8" in length, 54% of them were larger than 12" and there is a decent distribution of size classes of bass.

The RSD14 is an evaluator of how many bass are over 14" in proportion to the total number over stock size at 8". Twelve (12) largemouth bass were collected over 14" in length. The RSD14 for largemouth bass was at 11 and falls within our objective range (10 to 20). This would indicate a decent number of bass greater than 14" in the fishery. Average largemouth length in the survey was 11.2" with a range of 4" to 17". There was a better distribution of bass in the 12" to 14.9" size range in 2023.

**Bluegill:**

Bluegill comprised nearly 51% of the total fish collected during the survey. We collected 188 bluegills with a CPUE of 1.66 fish per minute, which is below our objective range for bluegill (2 to 4.5 fish per minute). In the previous survey, we were concerned the bluegill were in deeper, less accessible waters near drop offs so we focused on trying to work shallower areas in 2023. Unfortunately, it does not appear to have made any difference in bluegill collected.

The bluegill PSD was at 38 for this survey and is within our objective range (20-60). This would indicate that of the fish greater than 3" in length (stock size), 38% were larger than 6" in length (quality size). We collected 68 bluegill over 6" in length. The Wr for bluegill averaged 99 with a range from 77 to 129. This is within our objective range (90 -110), and it is at the upper end of the range. Bluegill collected ranged from 1.7" to 9" with an average size at 5.1". This indicates a good bluegill fishery representing a desirable size structure for the anglers at Beaver Lake.

**Redear Sunfish:**

The redear sunfish comprised 7.6% of the overall collection at Beaver Lake. A total of 28 redear were collected for a CPUE of 0.25 fish per minute. Average relative weight for redear was high at 102 with a range of 73 to 120. Redear were collected from 5.1" to 11.8" with an average length of 9.1". The higher collection and smaller sizes represented may be an indicator that the redear stocking in 2019 was successful.

**Black Crappie:**

Three black crappie were collected with a length of 8.1" to 11.6". The Wr for the crappie collected were low at 84, and was well below our objective range. This was down from 93 in 2019. A low collection of crappie electrofishing is not a direct indicator of a poor crappie fishery, but the low relative weights are a concern.

**Walleye:**

Only one walleye was collected with a length of 21.7". The Wr for the walleye collected was low at 80 and was well below our objective range.

**Channel Catfish:**

We collected 10 channel catfish during this survey. The catfish collected ranged from 17.5" to 24.6" in length. All the catfish were albinos. The catfish stocked in 2019 were all albinos, and if this is the same year class we collected, this indicates excellent survival and growth with the catfish stocking program. Catfish relative weight was excellent at 126 and ranged from 108-170. This is well above our objective range.

**Warmouth:**

We also collected twenty-seven warmouth ranging in size from 2.5” to 9.3” and averaged 7.1”. Warmouth Wr ranged from 91 to 115, with an average of 103, indicating the warmouth are recruiting and doing well in this fishery.

**Non-desirable species:**

Only non-desirables collected were twelve common. Carp collected averaged 28.5” and ranged from 21.3” to 36”. The carp CPUE is desired to be less than 0.25 fish per minute and this survey was at 0.11 fish per minute, and within our management objective. Observation of larger carp only would indicate there is limited spawning recruitment occurring at this time.

**Recommendations:**

**Habitat Enhancement:**

One of the most important things that can improve the bass fishery is improving habitat for young of the year survival and ambush for larger bass hunting grounds. The less energy a largemouth bass has to use to catch forage, and the bigger the forage base (or ‘food packet’) the more the bass can put into growth and less energy into hunting. Strategic placement of quality structure throughout the lake will improve the fishery. With this being a multi-use lake for more than fishing (ie swimming, boating, skiing), care should be taken to ensure any structures placed are placed safely for these multi uses. I cannot stress enough the importance of fish structure and habitat within your lake.

To my knowledge, the Association currently maintains an aggressive aquatic plant and algae management program. This program is likely needed due to non-native invasive species control as well as algae control. However, there is a need for native aquatic plants in the lake.

The management of a quality native plant community would provide food and cover as well as water quality benefits to the lake and members. Native aquatic plants can help balance the use of nutrients, such as phosphorus and nitrogen, which would otherwise be available only to the planktonic algae.

It is important that Goose Lake Association work to reduce non-native plants while managing natives, not eradicating them, to allow for other recreational opportunities on the lake. These plant communities are nurseries for young of the year bass, bluegill, and crappie.

**Size and creel limits:**

Our previous report from 2019 recommended changes to Beaver Lake creel limits, but the current website lists show the recommendations have not been

implemented yet. We still recommend implementing those same changes recommended in 2019.

Beaver Lake is regulated with its own limits according to the Goose Lake Association website. Current limits allow for selective harvest of bass under 12" and over 18". Two bass may be harvested under 12" and 1 over 18".

- 1) At this time, I suggest you remove the slot limit temporarily to allow a larger age structure of bass. I don't believe your bass are stunting in size due to high numbers of bass, but rather forage availability.
- 2) Muskie should be catch and release. The 40" size limit allows muskie to be harvested when they are getting to the size range needed to control the larger gizzard shad biomass.
- 3) The bag limit for panfish (crappie and bluegill combined) appears to be working. However, placing a size limit on bluegill allowing the harvest of only 5 over 8" of the 25 allowed would help to maintain the bluegill size structure currently in place. There is currently no size limits on crappie, and placing a size limit of 9" would allow for better angling as the size structure improves.

Enforcement of creel limits can be a difficult task for Lake Associations. It is important to provide educational material to your membership to educate them on the need for limits to manage a fishery. I can provide you with an article for your paper to educate on why you should reduce the harvest on bluegill over 8".

**Stocking:**

Stocking is always subjective to budgetary constraints, and all recommendations may not be able to be met. Stocking recommendations should always be re-evaluated based on subsequent fish population sampling. Stocking should be done based on individual lake size. It is my understanding that the total fish are separated into each stocking based on numbers purchased instead of the size of the water body. Each water body needs to be managed separately.

- 1) Continue the reduced walleye stockings at Beaver Lake until we are able to get the largemouth bass fishery back in balance (higher average relative weights). Walleye stocking can still be done every other year to ensure no large gaps in size structure for the anglers that desire walleye. Stock no more than 10 walleye (6"-8") per surface acre every other year.

- 2) The higher collection of redear sunfish in 2023 might be attributed to the stocking in 2019. Continue to stock redear periodically to ensure recruitment is continued.
- 3) If smallmouth bass are desired by your anglers, periodic smallmouth bass stockings can be done in an attempt to create a self-sustaining, spawning smallmouth bass fishery. No smallmouth bass were observed during this survey. Stocking up to 5 per acre (5"-8") for a few years might be enough to get the fishery started. However, it is difficult to get smallmouth to thrive in an environment with largemouth bass. Largemouth bass tend to out compete the smallmouth. While the largemouth bass CPUE is low, it might be a good opportunity to get a recruiting population of smallmouth established.
- 4) With the presence of large gizzard shad in the lake, stocking of keystone predators that can convert the biomass of shad into a desired sport species is important. Stocking of 0.25 to 0.3 fish per surface acre annually would begin to establish this fishery. \*\*\*NOTE: Muskie stocking can be controversial to anglers (especially pan fishermen and bass anglers) because they believe the muskie will eat all of their gamefish. However, the scientific studies done in Illinois provide insight into the benefits of stocking muskie and their dietary habits. This stocking rate is a low rate.

If budgetary constraints are a problem, working on a rotational stocking every other year may be an option, keeping in mind limited year-class strength and size gaps in the fish that may be observed by fisherman and their creel.

Lastly, continue to monitor the bass and bluegill population structure through electrofishing data collection to make changes to the creel and size limits as needed. This fishery is not currently well balanced and collection of more data will provide better insight into changes that need to occur.

As previously recommended, conducting age and growth studies on the bass would provide better insight into the population and whether it is stunting or just slow growth. It may be more important to reallocate funds towards more fish sampling to understand the trends and track the changes than to stock. I would recommend annual electrofishing efforts temporarily until this bass fishery improves. With no real change observed since the 2019 survey, I would recommend a follow up survey no later than 2025 if it can be done in 2024.

Table 1: Catch Per Unit Effort (CPUE) by species on Beaver Lake

| <b>Species:</b>  | <b>Number</b> |               | <b>Fish/Minute</b> |               | <b>Objective</b> |
|------------------|---------------|---------------|--------------------|---------------|------------------|
|                  | <i>2023 S</i> | <i>2019 S</i> | <i>2023 S</i>      | <i>2019 S</i> |                  |
| Largemouth Bass: | 94            | 70            | 0.83               | 1.6           | 1.0 – 2.5        |
| Bluegill:        | 188           | 83            | 1.66               | 1.8           | 2.0 – 4.5        |
| Black Crappie:   | 3             | 1             | 0.03               | 0.07          | 0.2 -0.8         |
| Red Ear Sunfish: | 28            | 13            | 0.25               | 0.29          | -----            |
| Walleye:         | 1             | 11            | 0.01               | 0.24          | -----            |
| Channel Catfish: | 10            | 1             | 0.09               | 0.02          | -----            |
| Yellow Perch:    | 2             | ---           | 0.02               | ---           | -----            |
| Rock Bass:       | 3             | ---           | 0.03               | ---           | -----            |
| Warmouth:        | 27            | 5             | 0.24               | 0.11          | -----            |
| White Bass:      | 1             | ---           | 0.01               | ---           | -----            |
| Gizzard Shad:    | ---           | 2             | ---                | 0.04          | -----            |
| Carp:            | 12            | 6             | 0.11               | 0.13          | > 0.25           |
| <b>Bullhead:</b> | ---           | <b>1</b>      | ---                | <b>0.04</b>   | -----            |
| <b>Total</b>     | <b>369</b>    | <b>193</b>    | <b>3.28</b>        | <b>4.29</b>   | <b>6.00 +</b>    |

\*2023 is both day and night combined

Table 2: Proportional Stock Density (PSD) – Beaver Lake

| <b>Species:</b>  | <i>2023 S</i> | <i>2019 S</i> | <b>Objective</b> |
|------------------|---------------|---------------|------------------|
| Largemouth Bass: | 54            | 38            | 40-70            |
| Bluegill:        | 38            | 68            | 20-60            |

Table 3: Relative Weight (Wr) – Beaver Lake

| <b>Species:</b>  | <b>Wr (Ave)</b> |               | <b>Range</b> |               | <b>Objective</b> |
|------------------|-----------------|---------------|--------------|---------------|------------------|
|                  | <i>2023 S</i>   | <i>2019 S</i> | <i>2023</i>  | <i>2019 S</i> |                  |
| Largemouth Bass: | 89              | 88            | 71-190       | 72-142        | 90-110           |
| Bluegill:        | 99              | 102           | 77-129       | 78-133        | 90-110           |
| Black Crappie:   | 84              | 93            | 75-94        | 93            | 90-110           |
| Redear Sunfish:  | 102             | 106           | 73-120       | 100-115       | 90-100           |
| Walleye:         | 80              | 91            | 80           | 83-101        | 90-100           |
| Channel Catfish: | 126             | 87            | 108-170      | 87            | 90-100           |

Table 4: Length Ranges by Species – Beaver Lake

| <b>Species:</b>  | <b>Length:</b> |               | <b>Average</b> |               |
|------------------|----------------|---------------|----------------|---------------|
|                  | <i>2023 S</i>  | <i>2019 S</i> | <i>2023 S</i>  | <i>2019 S</i> |
| Largemouth Bass: | 4"-17"         | 3.9-16.6"     | 11.2"          | 10.6"         |
| Bluegill:        | 1.7"-9"        | 1.8-9.1"      | 5.1"           | 6.3"          |
| Black Crappie:   | 8.1"-11.6"     | 7.5"          | 9.6"           | 7.5"          |
| Redear Sunfish:  | 5.1"-11.8"     | 8.6-9.5"      | 9.1"           | 9.1"          |
| Walleye:         | 21.7"          | 7.5-23"       | 21.7"          | 12.7"         |
| Channel Catfish: | 17.5"-24.6"    | 26.1"         | 21.8"          | 26.1"         |
| Warmouth:        | 2.5"-9.3"      | 4.8-8.5"      | 7.1"           | 6.8"          |
| White Bass:      | 15.7"          | ----          | 15.7"          | ----          |
| Rock Bass:       | 5.7"-8.2"      | ----          | 7.3"           | ----          |
| Yellow Perch:    | 3.5"           | ----          | 3.5"           | ----          |
| Gizzard Shad:    | ----           | 18.9-19.3"    | ----           | 19.1"         |
| Carp:            | 21.3"-36"      | 13.8-28"      | 28.5"          | 24.1"         |
| Bullhead:        | ----           | 10.2"         | ----           | 10.2"         |











