# FISHERIES REPORT for Lake Waconda



Report Crafted by:

Dr. Brian Graeb

Jared Engelbert



# Introduction

This is a report of the fisheries assessments conducted for Lake Waconda on July 18th, 2023. We will begin by explaining our field methods and analyses alongside each of the findings from your lakes. Then, we will provide data-driven management recommendations.

# Methods

We used electrofishing sampling data to estimate abundance and growth of Largemouth Bass and their primary prey, Bluegill. These data serve as the basis to make management decisions. The abundance of each fish species is estimated by counting and measuring fish caught during electrofishing. We report abundance as fish per hour. For example, if we caught 10 Largemouth Bass in one 20-minute run, we would standardize it as 30 Largemouth Bass per hr (0.5 bass per minute x 60 min). This is expressed below as Catch-Per-Unit-Effort (CPUE). Our goal is to maintain Largemouth Bass relative abundance below 50, and to maintain prey CPUE above 200-400.

We assess the size-structure of the population with a length-frequency histogram, which is a graph showing the number of fish in each one-inch size class. We use this to identify strong year classes, evaluate recruitment, and to give an overall picture of growth potential. A common goal for most our fisheries is to have a broad range of fish sizes, including several larger individuals (>20 inches).

Relative weight is an index of "plumpness" relative to a standard size. Individuals that are heavy for their size have a high relative weight, and individuals that are skinnier than expected have a lower relative weight. This metric is a great indicator of prey availability. We calculate the relative weight of individual fish and plot these data relative to a standard weight. The expected average condition for an individual is a relative weight of 93 (dotted line on the figures). This index is a very useful tool to monitor a management program because it is highly sensitive to changes in environmental conditions. For example, relative weight is usually the first metric to improve in a fishery after implementing management actions. Our typical management goal is to maintain relative weights above average, overall, and above 110 for larger fish (>15 inches). See the below figure for reference.



# **Goal: High Quality and Diverse Fishery**

# Site Description

Lake Waconda is an 86-acre HOA lake that sits adjacent to the Missouri River. It is a long and skinny lake with most of the shoreline having docks. The lake lacks suitable fish habitat but can be corrected with the addition of Fish Cities. This lake has great potential with a few years of professional fisheries management.

# **Fish Population Data**

Largemouth Bass (Micropterus salmoides)



Across 4 metrics, here's how the fish appeared during the electrofishing survey

- 1. <u>Abundance</u> The goal is to have a CPUE between 25 and 50 for a Quality Largemouth Bass Population.
- 2. <u>Condition</u> A Wr of 93 and greater is the goal, which is considered to be the number that represents a healthy or "plump" fish.
- 3. <u>Growth</u> The goal is to have fast growth to maximize their potential.
- 4. <u>Recruitment</u> The goal is to have enough recruitment to sustain the abundance between 25 and 50. Too much successful recruitment can lead to overpopulation and an unsustainable situation.

# Recommendations

There is wide range of management actions that will help this pond achieve the goal of a Quality Largemouth Bass Fishery. The most important recommendations are:

- 1. Stock Largemouth Bass
- 2. Improve Habitat
- 3. Stock Bluegill
- 4. Cull Rough Fish

Largemouth Bass were not captured during the electrofishing survey. Stocking them will be necessary in order to establish a population. Habitat improvements will contribute in a big way to the success of the Bass as suitable habitat was minimal

throughout most of the pond. Bluegill are the main food source for Bass, so stocking bluegill is recommended as their abundance was very low. Rough fish, such as Common Carp can have deleterious effects on the quality of a waterbody and fishery. They can root up beneficial aquatic plants, leaving minimal habitat for desirable species. They also increase turbidity and can resuspend nutrients such as phosphorous, increasing the likelihood of a harmful blue-green algae bloom.



# **Relative Abundance**

Figure 1. Relative Abundance of Bluegill, Common Carp, and Gizzard Shad as indexed by electrofishing.

# **Prey availability**

Bluegill (Lepomis macrochirus)



#### Across 3 metrics, here's how the fish appeared during the electrofishing survey.

- 1. <u>Abundance</u> was low. The catch per unit effort (CPUE) was 50 Bluegill per hour (Fig. 1). The goal is to have a CPUE of 400 or greater.
- 2. <u>Recruitment</u> was low to moderate. Smaller individuals were captured, but in relatively low numbers (Fig. 2).
- 3. <u>Size Structure</u> was bottom heavy. The population was dominated by individuals less than 4 inches (Fig. 2).

## Recommendations

There is wide range of prey fish management actions that will help this pond achieve the goal of a Quality Largemouth Bass Fishery. The most important recommendations are:

- 1. Stock Bluegill
- 2. Install fish feeders.
- 3. Install high density habitat (increase interstitial space).



**Bluegill** are the foundation of any Bass fishery. We target Bluegill as the main prey base because of their ability to spawn multiple times throughout the summer. Bluegill populations can spawn up to four times a year, which is why we trust Bluegill metrics over Redear Sunfish, Green sunfish, White Crappie, and others. As a bonus, some of these Bluegill will grow to larger sizes (1+lb) and provide great opportunities for kids' fishing.

Supplemental feeding in addition to stocking is another great way to enhance the size, condition, and abundance of Bluegill. A wellorchestrated feeding program unlocks the natural limits of a lake's ability to provide food. In lakes without supplemental feeding programs, Bluegill are the apex predator on aquatic invertebrates. Those invertebrates depend on zooplankton, and the zooplankton feed on phytoplankton. When Bluegill also have supplemental feed, we can achieve larger advanced sized (>8 inches) Bluegill while amassing a

large base of smaller (<8inches) Bluegills. Both sizes benefit a Bass population. The larger sized female Bluegills are broodstock, and smaller sizes are perfect prey for the Bass to optimize their growth potential.



## **Bluegill Size Distribution**

Figure 4. Size- structure of Bluegill.

## Other Prey Fish to Consider Stocking

#### Redear Sunfish (Lepomis microlophus)

Redear Sunfish also known as "shell crackers", primarily feed on snails, which are a large vector for aquatic diseases and parasites. Ponds with a healthy population of Redears usually have fewer visual signs of diseases and parasites. Stocking them is suggested to help control diseases and parasites.

## Recommendation

1. Stock 50,000 Redear Sunfish

# **New Opportunities**

More game species will add diversity to the pond, but certain species can compete with the Largemouth Bass. Competition only occurs when there is a finite resource (forage). Essentially, with enough Bluegill and feeders, an environment with low competition can be maintained with intensive management. Here are some ideas to increase the number of species and create a diversity of fishing types.



#### Hybrid Striped Bass (Wiper)

Wipers are a cross between a Female Striped Bass and male White Bass. They can grow to be over 20 inches long. They arrive feed trained from the hatchery. Wipers act as a great species for kids to catch due to their high aggressiveness. They are a fun side catch to Largemouth and increase the species roster count of the pond. Wipers are a pelagic fish, meaning they occupy the open water of the lake.



#### Largemouth Bass: Florida Bass

Largemouth Bass are generally the focal predator in many pond and lake fisheries. They are the most popular sport fish in the United States and can provide both fast action and trophy potential. They conduct their predation role in aquatic ecosystems very well by controlling prey populations such as Bluegill. Largemouth Bass were recently split into two species- Florida and Black (or Northern). **Florida Bass** have enormous growth potential and routinely reach double digit weights. Unfortunately, Florida Bass are intolerant of long, cold winters. They thrive north to Oklahoma, Arkansas, and the Carolinas.



**Black (Northern) Bass** in contrast to Florida Bass, do well in colder winters and range north into Ontario, Minnesota, Michigan, New York, and New England. Their growth potential is much lower than Florida Bass with few individuals exceeding 7lbs. Northern Bass also tend to be more aggressive and easier for anglers to catch than Florida Bass.

Another type of Largemouth Bass that we use quite frequently is the **Hybrid between Florida Bass females and Northern Bass males**. The F1 hybrid have the best of both parents. They have great growth potential, are aggressive, and thrive in waters as far north as Kansas... as long as they have lots of ample prey and can sustain fast growth rates. We have had great success with these fish and incorporate them into many of our fisheries plans.

# Habitat



The lake needs more hard structure and both low- and high-density habitat along the shoreline. Our research shows that both Bluegill and Largemouth Bass benefit from high coverage of diverse structural habitat such as trees, brush, etc. Bluegill use these areas as predator refuge, and Largemouth Bass use them as feeding areas. In fact, our research also suggests that Largemouth Bass are more effective predators in the presence of structural cover.

Artificial habitat increases the volume available to Bass. We build nearshore structures called "Fish Cities" that attract both Bass and Bluegill. Each Fish City includes 10 highly complex and diverse pieces of artificial structure. They are snag-resistant and last forever. Contrastingly, the brush, hinge cuts, and cedars are snag magnets and must be reinstalled after a few years of decomposition.

Natural materials provide a cheap temporary alternative to Fish Cities. Cedar trees are the best type of natural habitat. Their lifespan ranges from 3-5 years. Once the needles break down, the stem and trunk continue to provide habitat for Bass but not small Bluegill.

# Recommendation

1. Install 20+ Fish Cities and increase the availability of high-density cover. This can be accomplished through the addition of artificial habitat.



Photo of a Fish City. Includes a Trophy Tree Kit and 9 Ugly Trees.



### Across 2 metrics, here's what we learned about the vegetation

- 1. <u>Coverage</u> was around 0 percent.
- 2. <u>Biovolume</u> was around 0 percent.

# Recommendations

Two key recommendations to improving vegetation:

- 1. Increase vegetation coverage to around 30 percent.
- 2. Designate 20-30 percent of the lake as vegetated areas.

Vegetation plays a key role in rearing young fish and invertebrates. We recognize that many lake users do not enjoy swimming in areas with vegetation or seeing vegetation from the shore. We also recognize that it can be challenging to retrieve lures from vegetated areas. Our goal is to maintain 20 to 30 percent vegetation coverage by mid-summer. This level maintains the beneficial ecosystem services of vegetation- rearing habitat for small fishes, structural habitat for predators (Largemouth Bass), water filtration, etc. We restrict vegetation to areas that provide the most benefit for aquatic organisms, while minimizing interactions with humans. For example, vegetation should be controlled around access areas (boat ramp/dock), individual docks, and swimming areas.

The clarity of the pond is a direct byproduct of the aquatic vegetation. Aquatic vegetation clears the pond by two methods. It secures the sediments from mixing and filters out much of the suspended nutrients.



## Across 4 metrics, here's what we learned about the water quality

- 1. pH was basic.
- 2. <u>Conductivity</u> was moderate.
- 3. <u>Total Dissolved Solids</u> was moderate.
- 4. Alkalinity was unmeasured.

**pH** indicates how basic or acidic the water column is. Levels within 6 and 9 are safe and healthy to fish. When fish are stressed out because of fluctuating pH their growth rates decrease and will be affected by infections and diseases at a higher amount.

**Conductivity** and **TDS** are values of salts in the water column. The higher conductivity values mean the water is very conductive to electricity. We manage our electrofishing probe depth by the conductivity of the water. The higher conductivity increases the range of the electrical field within the water during electrofishing surveys.

**Alkalinity** is the measurement of calcium carbonates. Any value over 30 is healthy and anything under would need to be worked on and monitored. Calcium carbonate acts as a base in the water column. This is the primary measurement that dictates the daily cycle of pH. During the night, aquatic vegetation and algae go from photosynthesizing to respiring. When this happens the entire pond's biota consumes oxygen and produces carbon dioxide. The CO2 acts as an acid and will decrease the pH if there are not enough bases in the water.

# Executive Summary Management Plan Goal: Quality and Diverse Fishery

**Description:** We recommend creating a diverse habitat mosaic that will support a diverse fishery. This fishery will be composed of fewer, but larger Bass and other predators, and a very high abundance of prey species. Bluegill should become very abundant and have two distinct components to the population. You should have high abundance of smaller <7 inches Bluegill, and a lower abundance of large Bluegill exceeding 1lb (supported by supplemental feeding). Your fishery would benefit from several management actions. We outline specific recommendations below.

## **Recommendations:**

This property would be a great fit for our **Fisheries Management Program**. There are a lot of moving pieces required to develop and sustain a high-quality lake and fishery. Under our program, we take on this responsibility in collaboration with you. We work with you to develop an annual management plan and budget based on the below recommendations. We then implement and maintain the program, as well as maintain critical fisheries infrastructure and processes (e.g., feeding program, vegetation treatment, etc.) We conduct regular site visits every 3-4 weeks during the growing season. Finally, we provide frequent communication through written reports and discussions.

- 1. Predator management
  - a. Stock Largemouth Bass
  - b. Stock Wipers (Hybrid Striped Bass)
- 2. Follow a prey-fish stocking program.
  - a. Bluegill are the foundation of your fishery. We recommend stocking 1,000-2,000 Bluegill per acre, per year to supplement the population. Supplemental stocking should be continued until the CPUE of Bluegill is consistently above 400.
- 3. Begin a supplemental feeding program targeted at younger Bluegill.
  - a. Supplemental feeding helps Bluegill attain larger sizes and better nutritional value for predators. There is also evidence that Bluegill reproduction improves with a feeding program.
  - b. Add 10+ automatic fish feeders around the lake, near habitat enhancement sites, targeted at younger Bluegill.
  - c. Provide a high-quality feed designed to maximize Bluegill Growth.
- 4. Healthy Waters Program.
  - a. Monitor water chemistry and quality 2-3 times during Spring, Summer and Fall to determine temperature and oxygen profiles, detect shifts in pH, monitor alkalinity, conductivity, and total dissolved solids.
    - i. Consider adding beneficial bacteria every 3-4 weeks in targeted areas.
- 5. Structural Habitat
  - a. Design and implement a comprehensive habitat management plan. This plan will ensure that the lake has a robust infrastructure to support high productivity fisheries. This action should be a high priority for your fishery.
  - b. We recommend adding 20+ Fish Cities. Each Fish City consists of a variety of complex pieces of artificial habitat that work together to provide a comprehensive unit for fish. Each city has shallow, deep, tall, horizontal, high-density, and low-density pieces that provide critical infrastructure for a variety of fish species and sizes- from larvae to adults.
- 6. Aquatic vegetation management.
  - a. Aquatic vegetation is very beneficial to a fishery as long as it does not exceed 30-40% of the surface area of the pond. We recommend allowing vegetation to grow in low-use areas and control it in high-use areas.
- 7. Fisheries Population Assessment. We recommend assessing the fish populations in each lake at least twice per year (Fall and Spring). This will provide the needed information to make management decisions (e.g., stocking, culling, etc.), and will allow us to evaluate progress towards achieving management goals.