

NATURAL RESOURCES MANAGEMENT PLAN: BEYER'S POND, BIG CREEK RESERVATION

Cleveland Metroparks Technical Report 2015



Above: photos of fisheries management activities at Beyer's Pond coordinated by Cleveland Metroparks Natural Resources Division.

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TABLE OF CONTENTS

Table of Contents2

List of Tables, Figures, and Appendices3

Executive Summary4

Historic Overview and Background.....6

Water Quality Overview7

Fisheries Resource Overview7

Other Recreational Uses12

Ecosystem Function Overview12

Current Fisheries Management13

Current Wildlife Habitat Management15

Management Recommendations15

Literature Cited17

LIST OF TABLES, FIGURES, AND APPENDICES

Tables

Table 1. Basic characteristics of largemouth bass and bluegill/pumpkinseed sunfish populations based on 7 October 2014 assessment (sampling time = 39 minutes).....	20
Table 2. Predator (largemouth bass) and prey (bluegill and pumpkinseed sunfish) proportional stock density information.....	20

Figures

Figure 1. Beyer's Pond Site Map.....	21
Figure 2. Beyer's Pond Subwatershed Map.....	22
Figure 3. Length/Frequency of Largemouth Bass	23
Figure 4. Length/Frequency of Bluegill and Pumpkinseed Sunfish	23
Figure 5. Total Quality (TQ) Plot for Largemouth Bass (Predator) and Bluegill/Pumpkinseed (Prey).....	24

Appendices

Appendix A. Fish Population Assessment Data Sheets 7 October 2014.....	25
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Executive Summary

Beyer's Pond is a 2.04 acre impoundment acquired by the Park District from Baldwin Wallace University (formerly Baldwin-Wallace College) in 1994. Since that time, the lake and surrounding area has been an important recreation area in Cleveland Metroparks for fishing, hiking, picnicking, and nature watching. The overarching management goal of the lake is to maintain its "fishable" status per Federal Clean Water Act (CWA) objectives, which is accomplished through active management activities focused on the fishery as will be detailed in this management plan.

There are no chronic water quality issues in the lake. In late June 2014 the lake experienced uncharacteristic heavy algal growth. This issue was likely due to nutrients from runoff from exceptionally heavy spring rain and the symptoms were effectively treated with algaecide. No other negative water quality incidences have been documented at the lake.

The small lake offers a moderately popular recreational fisheries in Cleveland Metroparks. The fishery consists of a typical warmwater assemblage of fish consisting of largemouth bass predators and a sunfish forage (prey) base, supplemented by occasional stocking of adult channel catfish and white crappie. There are at least 8 species of fish known in the lake. Data collected in fall 2014 revealed that the lake has an imbalance in the predator-prey composition of the lake, with lower than ideal densities of largemouth bass (*Micropterus salmoides*), although the size tends to be quality, and a "poor" population of mostly stunted sunfish (*Lepomis macrochirus* and *L. gibbosus*). The overall largemouth bass fishery would rank as "fair". On a positive note, recently stocked channel catfish offer good fishing prospects. Given the relatively small size of

the waterbody, periodic stocking of the pond with quality size (>300 mm) largemouth bass could help facilitate balance in the predator population and is recommended.

Largemouth bass are the only species in the lake that are managed through bag or size regulations.

Although the lake is man-made, it does provide a secondary function as wildlife habitat. Although no rare species are known to inhabit the lake or immediate surrounding area, the lake does offer a typical urban lake assemblage of common waterfowl, wading birds, reptiles, amphibians, invertebrates, and aquatic macrophytes.

Historic Overview and Background

Beyer's Pond is a 2.04 acre impoundment which was acquired by the Park District upon purchase of the property from Baldwin Wallace University (formerly Baldwin-Wallace College) in 1994 (Figure 1). The pond water level is controlled by an 18" HDPE overflow pipe located at the north end. There are several small constructed wetlands in the vicinity of the pond that function as general wildlife habitat. The pond inlet is shallow and located in the south end of the waterbody, with much of the main lake basin to the northwest having graded sloping shorelines reaching a maximum depth of 12.8 feet. The lake has a relatively small subwatershed of 0.062 miles² per USGS StreamStats program, with drainage primarily emanating from the south (Figure 2). An updated bathymetric survey of the lake would be beneficial. The lake is situated in a flooded former primary headwater stream valley bordered to the north, east, and west by parkland and to the south by powerlines (Fig 1). The park area is minimally developed and possesses a natural quality with the lake surrounded by woods (73.1% per StreamStats), hiking trails, and several created wetlands. Per StreamStats, the area is 8.79% wetlands and other water.

Ever since its acquisition, the lake has been part of a recreation area which features fishing, hiking, picnicking, and nature watching. Use is overall most intense during the late spring through summer months. The overarching goal for management of Beyer's Pond is to maintain, and improve where possible, the chemical, physical, and biological integrity of the lake as reflected in the national water quality objective as contained in the Federal Clean Water Act (CWA). The CWA objective is often referred to as the "fishable/swimmable goal", and the foremost goal for the lake is its continued

management as a fishing area, since swimming is not allowed in the lake. This is currently accomplished through management activities focused on the fishery and habitat of the lake, as will be outlined in this report.

Water Quality Overview

Overall water quality is good for this lentic system given its watershed location in a park-suburban setting. Ordinarily the lake does not receive excessive nutrient loading from adjacent watershed runoff. One exception would be following exceptionally heavy rains in Spring 2014, which were the likely catalyst for uncharacteristic unicellular algae bloom that occurred in late June. Following this observation an algaecide treatment was applied at the lake and the issue has not occurred again. Aquatic macrophyte growth in the pond has not been at nuisance levels and therefore has not required treatment with herbicide. Although water in the lake is clear, overall, seasonal water transparency varies, being clearest during the colder months due to seasonal variation in phytoplankton and zooplankton communities in the lake (Wetzel 1983).

There is no significant industry in the Beyer's Pond sub-watershed to contribute industrial or agricultural pollutants. No further documentation of physical or chemical water quality issues at the lake were found in Cleveland Metroparks historic files.

Fisheries Resource Overview

In an effort to obtain current data on the fish community in Beyer's Pond, electrofishing was performed on 7 October 2014 in a single sampling run totaling 39 minutes. The sample run encompassed the entire shoreline of the waterbody.

Electrofishing is a well established method utilized by fisheries managers to accurately assess fish population dynamics, abundance, and structure (Neilsen and Johnson 1983, Reynolds 1993, Smith-Root 2007). A Smith Root GPP 5.0 electrofishing unit and customized Alweld commercial johnboat, including booms constructed by Ashcraft Machine and Supply, Inc., of Newark, Ohio, were used. One person maneuvered the boat and operated the electrofishing unit control box while two assistants collected stunned fish, which were retained in an aerated 90 gallon onboard livewell for later processing. Fish lengths (mm) were obtained using a custom measuring board and weights (g) were obtained using a digital scale. Data was recorded onsite and all fish were released afterwards. Datasheets from the sampling activity are available in Appendix A.

Beyer's Pond offers a typical fish assemblage for a small lake in Ohio. Fish species of importance (albeit to varying degrees) to anglers include the largemouth bass (*Micropterus salmoides*), crappie (*Pomoxis* sp.), bluegill (*Lepomis machrochirus*), pumpkinseed sunfish (*L. gibbosus*), warmouth (*L. gulosus*), green sunfish (*L. cyanellus*), channel catfish (*Ictalurus punctatus*), and yellow bullhead (*Ameiurus natalis*). Rainbow trout (*Onchorynchus mykiss*) are not stocked at this location.

Considering the perspective of being a small waterbody in an area adjacent to an urban center, the quality of the fishery would be characterized overall as "good" for recently stocked channel catfish, "fair" for largemouth bass (good quality of fish, poor numbers), and "poor" for panfish species, which tend to be stunted (Table 1, Table 2, Figure 5). Other species would be characterized as incidental catches by the majority of anglers who utilize the lake.

The predominant year-round predator and prey species in Beyer's Pond are largemouth bass and bluegill/pumpkinseed sunfish. Properly managed ponds and small lakes can harbor self-sustaining largemouth bass and bluegill populations (Austin et al. 1996, Carlander 1977). Sampling yielded 10 largemouth bass weighing a total of 6.42 kg (14.15 lbs) (Table 1). Based on plotting length against frequency, there appears to be at least year classes of largemouth bass present, with larger specimens being markedly dominant in the sample (Figure 3). According to Hall (1986) density of largemouth bass over 199 mm (stock size) in Ohio impoundments can be correlated to electrofishing catch per hour, and the relationship is as follows:

$$\text{Log}_{10}Y=1.2274\text{Log}_{10}X-0.5489$$

Where X = electrofishing catch of largemouth bass over 199 mm (7.83 inches) per hour (CPH) and Y = number of largemouth bass over 199 mm per hectare. Beyer's Pond, at 0.83 hectares (2.04 acres), yielded a CPH of 10.8 largemouth bass over 199 mm (7 bass over 199 mm in 0.65 hours) which would indicate a largemouth bass density of $16.29 \geq$ stock size bass per hectare ($6.59 \geq$ stock size bass/acre) when Hall's relationship is applied. This would suggest a largemouth bass abundance of $13.5 \geq$ stock size fish ($16.29 \geq$ stock size bass per hectare x 0.83 hectares) weighing a total of 24.9 kg (13.5 fish x 0.913 kg average weight of stock size bass), or 12.3 lbs, in Beyer's Pond. This is a low density of bass \geq stock size for an Ohio lake, considering that 50-75 stock size bass per acre is recommended (William Lynch, Aquatic Ecosystem Management Program Specialist, Ohio State University Extension, personal communication).

Proportional stock density (PSD) of largemouth bass in the lake was calculated using the following formula (Anderson 1976):

$$\text{PSD}(\%) = (\text{number} \geq \text{quality size} / \text{number} \geq \text{stock size}) \times 100$$

Where “quality” and “stock” designations are as outlined in Gabelhouse 1984. PSD of largemouth bass in the lake was elevated at 85.71% (Table 2), as a PSD range between 40-70 is indicative of balance when the population supports a substantial fishery (Anderson 1980).

Relative weight (W_r) of individual fish was used as the metric to determine fish condition and was calculated using the following formula:

$$W_r = (W/W_s) \times 100$$

Where W is the weight of a given fish and W_s for largemouth bass is calculated as such (Wege and Anderson 1978, Anderson and Gutreuter 1983):

$$\text{Log}_{10}W_s = -5.316 + 3.191\text{Log}_{10}L$$

Where L = the length of the specimen in mm. Largemouth bass sampled from Beyer's Pond exhibited a mean W_r of 87.9 (Table 1) compared against the ideal W_r of 100. This is a little below the typical range for an Ohio lake and reflects a bass population with individual specimens in decent condition (Phil Hillman and Andy Burt, Ohio Division of Wildlife, personal communications).

Bluegill and pumpkinseed sunfish are the dominant forage fish in Beyer's Pond. Sampling yielded 116 bluegill and pumpkinseed weighing a total of 2.69 kg (5.93 lbs) (Table 1). Based on plotting length against frequency, there appears to be approximately five year classes of bluegill/pumpkinseed sunfish in the sample (Figure 4). Note that the smallest size classes of sunfish are less susceptible to electrofishing than larger specimens

due to less surface area exposed to the electric field, hence their proportionally lower frequency in the sample. Proportional stock density (PSD) of sunfish was very low at 1.75% (Table 2), since a PSD range between 20-40 is indicative of balance when the population supports a substantial fishery (Anderson 1980). This scenario is likely due to excessive harvest of larger sunfish by anglers in this small waterbody (which has been observed at the lake by staff) and subsequent stunting of the population.

Relative weight (W_r) of individual fish was used as the metric to determine fish condition, and was calculated using the following formula, as outlined earlier, where W_s specific for bluegill is calculated as (Wege and Anderson 1978, Anderson and Gutreuter 1983):

$$\text{Log}_{10}W_s = -5.374 + 3.316\text{Log}_{10}L$$

Where L = the length of the specimen in mm. Compared against the ideal W_r of 100, bluegill sampled from Beyer's Pond were in good condition for an Ohio lake, exhibiting a mean W_r of 107.9 (Table 1). This reflects a very healthy average for individual bluegill sunfish, even though the size of the fish is lacking by angler standards.

Balance within the fish community of Beyer's Pond was assessed by analyzing prey-predator ratios in this system. To determine overall status of largemouth bass and bluegill dynamics in Beyer's Pond a Total Quality (TQ) plot was constructed by plotting a point that aligned with predator (largemouth bass) PSD on the X axis and prey (bluegill) PSD on the Y axis (Figure 5). Gabelhouse (1983) determined that the PSD ranges indicative of balance in a prey population is 20-40% and the PSD range indicative of balance in a predator population is 40-60%, which are represented by dashed lines on the TQ plot. The square formed by the intersection of the desired PSD ranges on the plot

is therefore representative of a state of mutual balance for predator and prey. The point of intersection of the bass and bluegill PSDs for Beyer's Pond is not within this range of mutual balance, but instead lies very near the far bottom right grid of the plot. This is due to prey PSD being very low and predator PSD being above the balanced range. This would be indicative of a largemouth bass predator population dominated by quality size fish well exceeding legal size (minimum of 12", or 300.8 mm) but stunting of the sunfish population, the latter of which is a common issue in small public lakes where harvest can be heavy (Ney 1993).

It should be noted that the October 2014 fish sampling was performed during daylight hours due to safety and staff scheduling concerns. Several studies have shown that night sampling can be more effective (up to 5-10 times more so) than daytime fishing in lakes, especially for larger predatory specimens such as largemouth bass (Loeb 1958, Witt and Campbell 1959, Kirkland 1962, Smith-Root 2007). In the future, a night sampling may be scheduled allow comparison of data versus daytime sampling results.

Other Recreational Uses

Swimming and watercraft are not allowed in Beyer's Pond. The pond also serves functions for aesthetics and wildlife viewing, in addition to fishing.

Ecosystem Function Overview

Although Beyer's Pond is not a natural lake, it does serve some general ecosystem functions in the watershed. Great blue heron (*Ardea herodias*), belted kingfisher (*Ceryle alcyon*), mallard duck (*Anas platyrhynchos*), and Canada goose (*Branta canadensis*) are

observed at the lake regularly. The lake is host to an assemblage of common reptiles and amphibians, including eastern painted turtle (*Chrysemys picta picta*), snapping turtle (*Chelydra serpentina*), green frog (*Rana clamitans*), and bullfrog (*R. catesbeiana*). No known threatened or endangered species of flora or fauna are resident in the lake.

Although common dragonfly (suborder Anisoptera) and damselfly (suborder Zygoptera) species can be observed utilizing the lake margin a regular basis, there is little information collected on specific macroinvertebrate or microbial communities within the lake. The vegetative/algal community of the lake is comprised predominantly of American white water lily (*Nymphaea odorata*), Eurasian watermilfoil (*Myriophyllum spicatum*), pickerelweed (*Pontederia cordata*), arrowhead (*Sagittaria latifolia*), and a mix of unicellular and filamentous algae. A full inventory of aquatic plants at Beyer's Pond has not been undertaken, so additional species are likely present.

Current Fisheries Management

Beyer's Pond is an actively managed fishery, and the urban nature of the waters of Cleveland Metroparks, in general, require intensive management efforts which go beyond traditional management approaches (Halko 1983). A bag limit of 2 largemouth bass of 12" or greater per angler per day is in effect. There are no bag or size limit regulations on any other fish species in the lake. As is the case with all Cleveland Metroparks waters, a valid Ohio fishing license is required to fish Beyer's Pond.

The Beyer's Pond fish community is supplemented with opportunistic fish stocking activities, but not on a routine schedule. Stocking of species such as channel catfish, sunfish, and largemouth bass is a very common fisheries management activity

which has been shown to have a many of benefits to the public (DesJardine 1983, Gordon 1983, Heidinger 1993, Manfredo et al. 1983, Norville 1961, Weithman 1993,). A total of 400 pounds of catchable size channel catfish (1-5 pounds) were stocked in the lake on 11 June 2014. It is not expected that these catfish will reproduce in the lake, which is typical in other similar bodies of water in Ohio (Austin et al. 1996), so periodic stocking is a reasonable way to supplement the fish population at this site.

Beyer's Pond is also stocked with native warmwater species as opportunities become available. Notably, in May 2009 and 2012 several hundred sunfish, largemouth bass, and white crappie were transferred to Beyer's Pond from a private lake and the Zoo Waterfowl Lake. Warm water species are also transferred from other Cleveland Metroparks non-fishing waters (such as golf course and nature center ponds) to public fishing waters, including Beyer's Pond, on a non-scheduled basis.

It has been noted by various fish managers that proper communication with the public and the media is a powerful, and often underutilized, fisheries management tool (Decker and Krueger 1993, Patterson 1983, Cohen et al. 2008). With this in mind, information regarding fishing at all Cleveland Metroparks fishing areas is disseminated through a number of outlets, including; Cleveland Metroparks fishing booklet and trifold, in the popular online fishing report blog on the Cleveland Metroparks website, through Cleveland Metroparks Facebook page, and in the Plain Dealer newspaper (typically in the Outdoors area of the Sports section).

Nuisance vegetation and filamentous algae management is a periodic management practice at Beyer's Pond in target areas to facilitate a more desirable fish habitat and fishing experience. In recent years, this has entailed spraying cattails at

angler access points along the dam with glyphosate herbicide. Algae treatments with copper sulfate algaecide were conducted during a bloom in late summer 2014, as well. Given the relatively small size of the lake, use of backpack sprayer units from the shoreline has served adequately as a treatment method. This targeted approach keeps nuisance growth in check in target areas, yet allows the establishment of vegetative growth beneficial to the aquatic ecosystem elsewhere in the lake. Overall, vegetative growth is currently not at nuisance levels in the lake from an ecosystem or fisheries standpoint, but is in fact, maintained at desirable levels.

Current Wildlife Habitat Management

Beyer's Pond currently has four wood duck nest boxes situated around the lake, as well as one in an adjacent wetland, which are routinely maintained by Natural Resources Division staff (John Krock, Natural Resources Area Manager, personal communication).

Management Recommendations

The aforementioned management techniques have had desirable effects on the Beyer's Pond system from a recreational and ecosystem perspective and will therefore be continued into the future. But the pond fishery does leave room for improvement.

Based on initial data collection and analysis, the fishery could benefit from a higher density of largemouth bass predators. This could be accomplished through increasing the periodic selective stocking of bass. Further improvement of the panfish population structure should follow, as well, from a more robust predator population.

Increasing public education regarding introduction of aquatic invasive species should also be a focus at Beyer's Pond, as well as all other park waters. This issue is should be part of a wide-reaching campaign to be most effective. Onsite there is currently a sign addressing proper disposal of earthworms (non-native) commonly used for bait at the main path as it leads to the lake. The Cleveland Metroparks website and social media also aim to educate the public regarding how to minimize the spread of non-native aquatic species, and will continue to do so in the future as opportunities arise.

The current overall assessment of Beyer's Pond is that it fulfills its roles within the Park District reasonably well, with room for improvement in terms of predator-prey ratio in the fish population. Although the lake does not require a drastic change in management strategy, periodic stocking of largemouth bass to increase predator densities will be undertaken in an effort to benefit the entire fish community. The lake is a quiet, moderately popular fishing destination in the Park District which offer near ideal sportfish habitat. The management practices currently employed at the lake will also continue to be utilized, as needed, and assessed periodically in an adaptive approach to management of the resource.

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Table 1. Basic characteristics of largemouth bass and bluegill/pumpkinseed sunfish populations based on 7 October 2014 assessment (sampling time = 39 minutes)

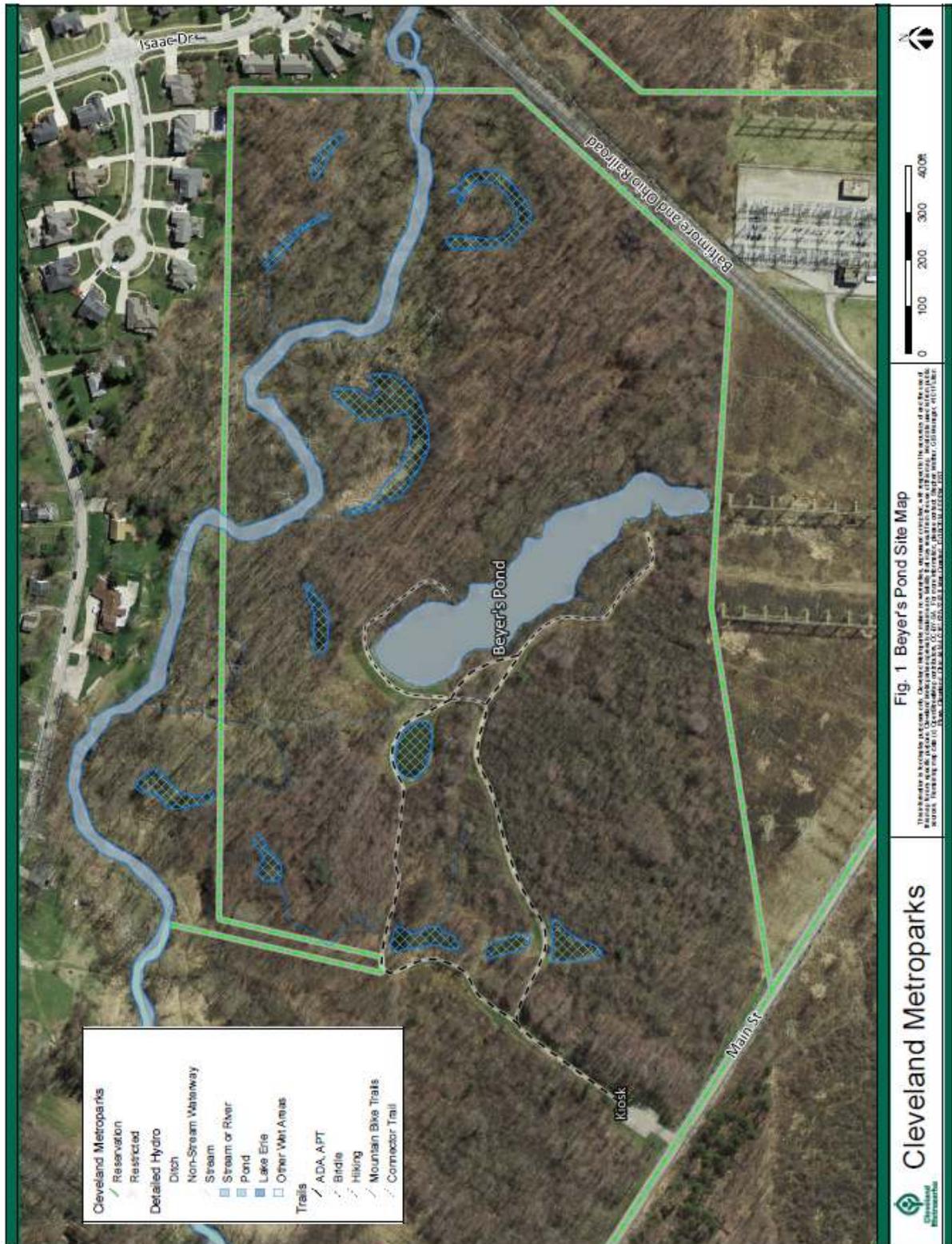
Species	Total Number	Total Weight (kg)	Average Size (mm)	Average Relative Weight (W_r)¹
Largemouth bass	10	6.42	305.2	87.9
Bluegill and Pumpkinseed	116	2.69	125.5	107.9

¹ As outlined in Wege and Anderson 1978 and Anderson and Gutreuter 1983.

Table 2. Predator (largemouth bass) and prey (bluegill and pumpkinseed sunfish) proportional stock density information

Species	≥ Stock Size¹	≥ Quality Size¹	Proportional Stock Density (%)
Largemouth bass	7	6	85.71
Bluegill and Pumpkinseed	114	2	1.75

¹ Designations per Gablehouse 1983.



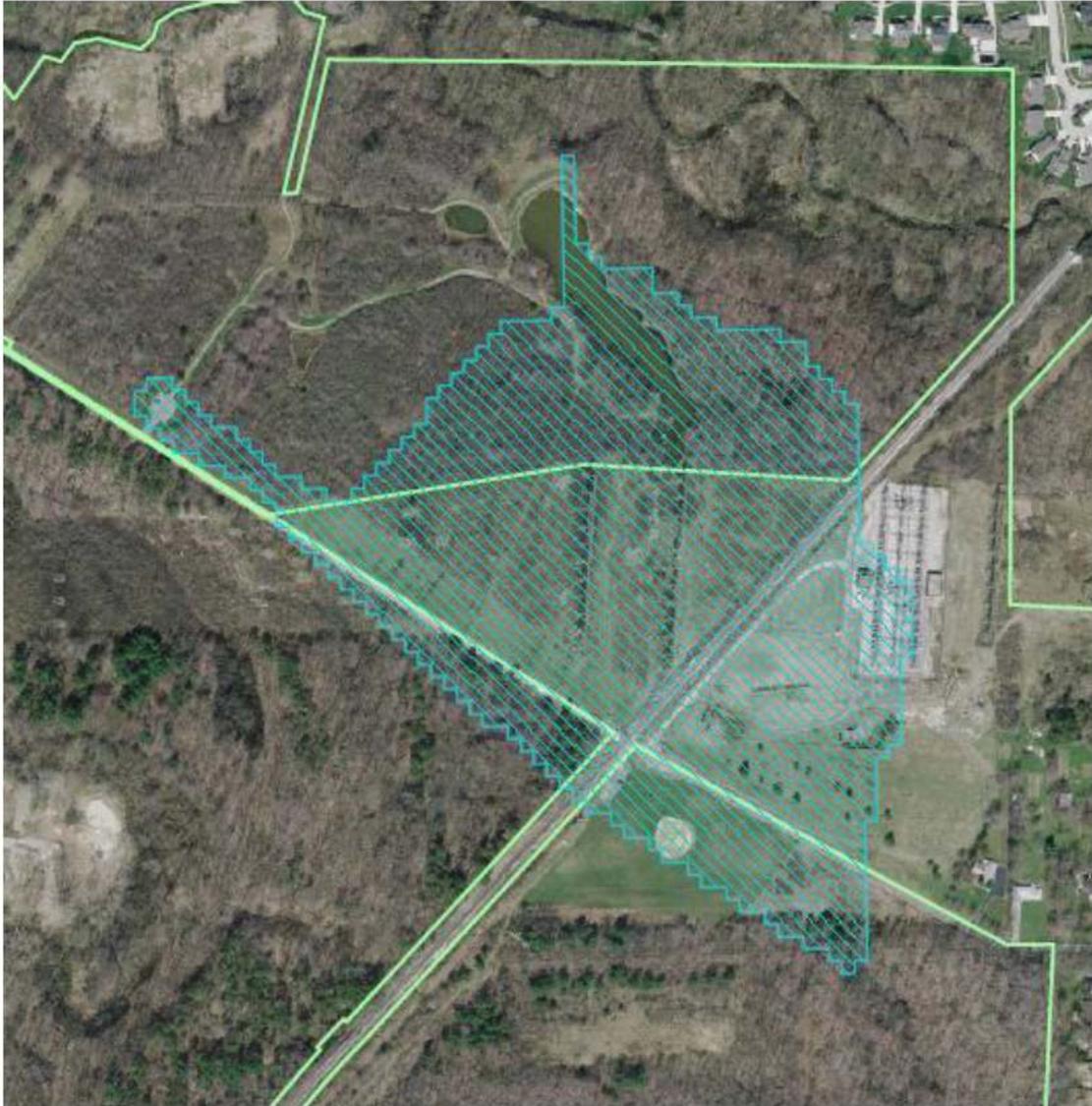
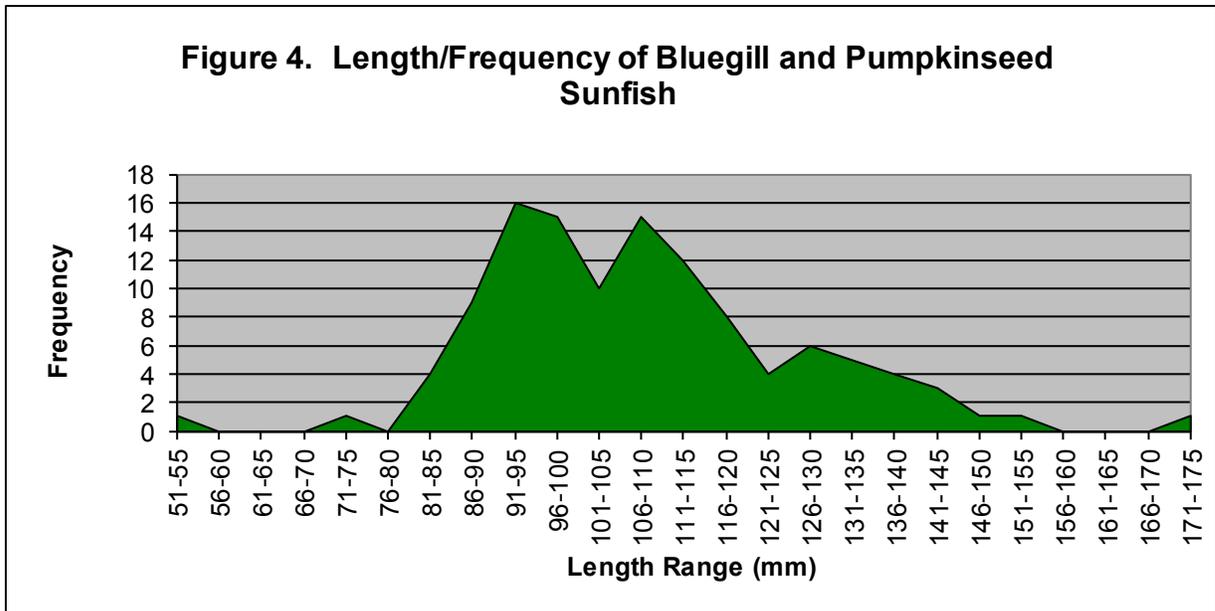
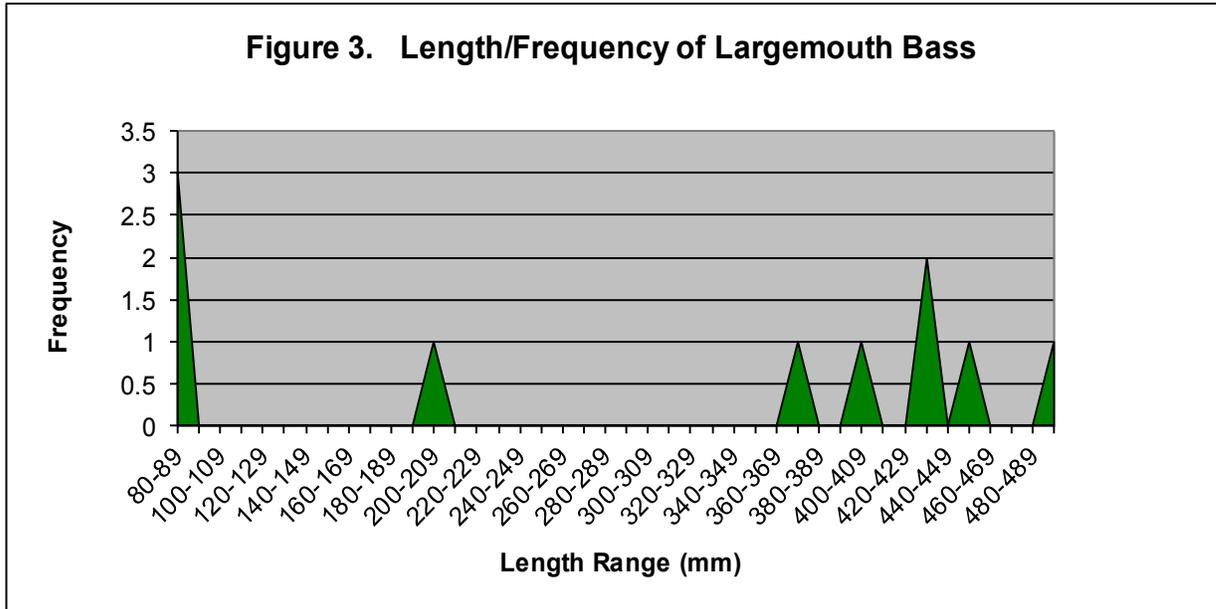
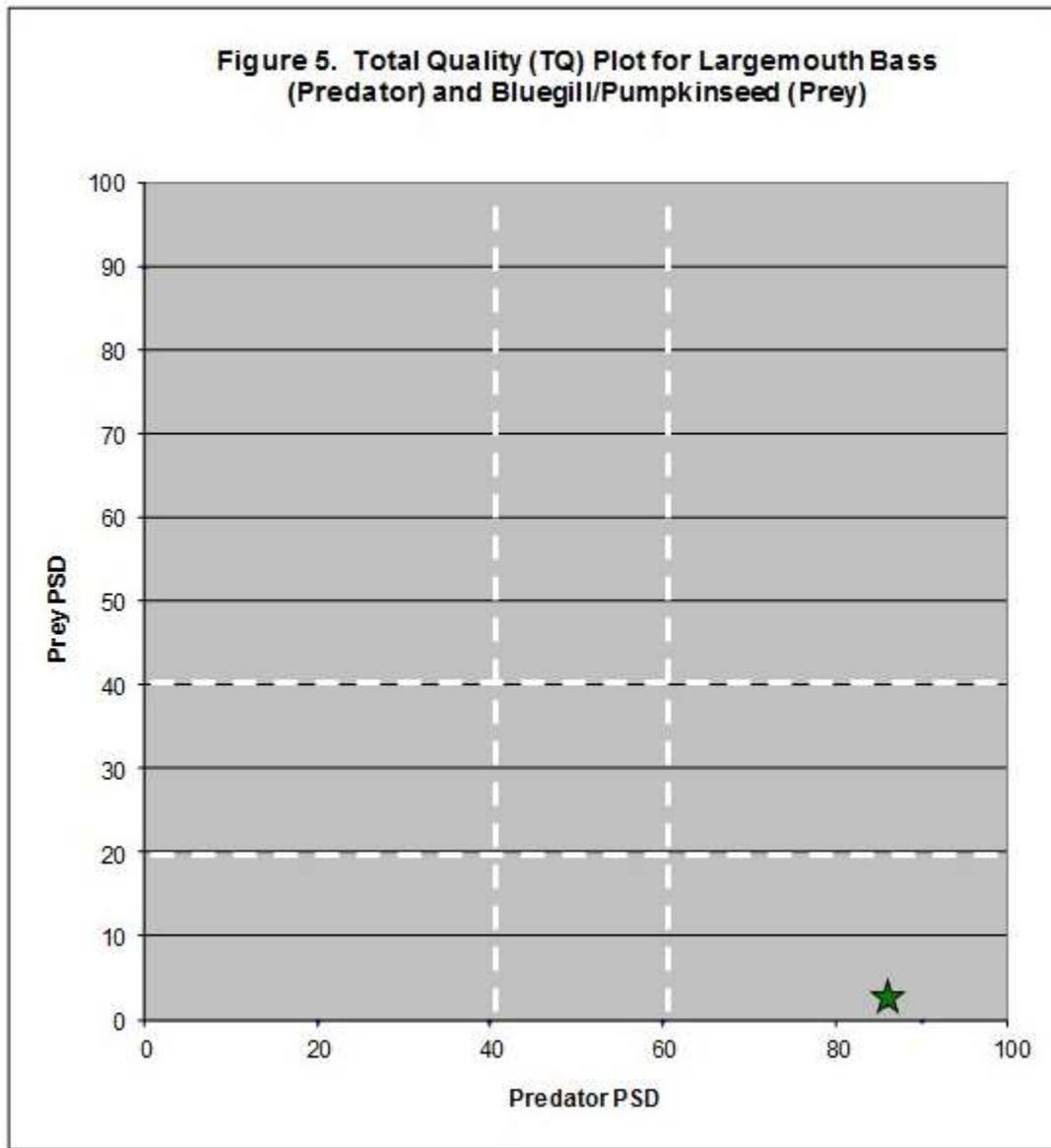


Figure 2. Beyer's Pond Subwatershed Map





★ = Intersection of observed Predator and Prey PSD values.

**APPENDIX A:
Fish Population Assessment Data Sheets
7 October 2014 (two pages)**



Fish Population Assessment Data Sheet

Date: 10/7/2014

Location: Beyer's Pond

DEEPEST
READING: 12.8 FT

Species: Largemouth Bass

Time Sampled: 10:15 - 10:54

	Length (mm)	Weight (g)		Length (mm)	Weight (g)		Length (mm)	Weight (g)
1	450	1199	41			81		
2	491	1460	42			82		
3	435	1075	43			83		
4	433	1075	44			84		
5	409	867	45			85		
6	377	636	46			86		
7	204	83	47			87		
8	90	6	48			88		
9	88	8	49			89		
10	85	7	50			90		
11			51			91		
12			52			92		
13			53			93		
14			54			94		
15			55			95		
16			56			96		
17			57			97		
18			58			98		
19			59			99		
20			60			100		
21			61			101		
22			62			102		
23			63			103		
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25			65			105		
26			66			106		
27			67			107		
28			68			108		
29			69			109		
30			70			110		
31			71			111		
32			72			112		
33			73			113		
34			74			114		
35			75			115		
36			76			116		
37			77			117		
38			78			118		
39			79			119		
40			80			120		