

NATURAL RESOURCES MANAGEMENT PLAN: JUDGE'S LAKE, HINCKLEY RESERVATION

Cleveland Metroparks Technical Report 2015



Above: photo from fish population survey at Judge's Lake coordinated by Cleveland Metroparks Natural Resources Division.

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Executive Summary

Judge's Lake is a 2.07 acre impoundment acquired by the Park District from private ownership in 1976. Since its acquisition, the lake has been part of an important recreation area which features fishing, picnicking, hiking, horse riding, and nature watching. There are no chronic water quality issues in the lake. 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.

The small lake offers a 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 annual stocking of rainbow trout in winter and occasional stocking of adult channel catfish, largemouth bass, and panfish species. 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 larger (>300 mm) largemouth bass (*Micropterus salmoides*), and a "fair" population of largely stunted bluegill (*Lepomis macrochirus*). The overall largemouth bass fishery would rank as "fair". On a positive note, recently stocked channel catfish offer good fishing prospects and annual winter stockings of rainbow trout offer excellent winter and spring opportunities. Given the relatively small size of the waterbody, periodic stocking of the lake with quality size (>300 mm) largemouth bass could help regain balance in the predator population and is recommended. Largemouth bass and rainbow trout are the only species in the lake are managed through bag or size regulations.

Although the lake is manmade, 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

Judge's Lake is a 2.07 acre impoundment which was acquired by the Park District upon purchase of the property from a private owner in 1976 (Figure 1). The pond, constructed in 1973, has a concrete overflow structure on the north end controls the water level. The pond inlet is shallow and located in the south end of the waterbody, with much of the main lake basin to the north having graded sloping shorelines reaching a maximum depth of 12.2 feet. The lake has a relatively small subwatershed of 0.047 miles² per USGS StreamStats program, with drainage primarily emanating from the south, over half of which is off Cleveland Metroparks property (Figure 2). 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 Ledge Road and agricultural/residential properties (Fig 1). The park area is moderately developed and possesses aesthetic vistas with the immediate lake surrounded by mowed grass, woods (8.82% per StreamStats), a parking lot/roadway, and hiking trails. Per USGS StreamStats, the subwatershed area is comprised of 8.09% wetlands and other water.

Ever since its acquisition, the lake has been part of an important recreation area which features fishing, picnicking, hiking, horse riding, and nature watching. Use is overall most intense during the late spring through summer months. The overarching goal for management of Judge's Lake 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 for this lake appears to be good for this lentic system given its watershed location in a park-suburban setting. The dissolved oxygen levels can get low under the ice during a harsh winter, but not enough so that any fish kills have been documented in the recent past. 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 Judge's Lake sub-watershed to contribute industrial 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 Judge's Lake, electrofishing was performed on 21 October 2014 in a single sampling run totaling 24 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 (Nielsen 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.

Judge's Lake 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*), warmouth (*L. gulosus*), channel catfish (*Ictalurus punctatus*), yellow bullhead (*Ameiurus natalis*), and yellow perch (*Perca flavescens*). Rainbow trout (*Onchorynchus mykiss*) are stocked at this location in winter, as well.

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 stocked rainbow trout (winter-spring) and channel catfish, "fair" for largemouth bass (good numbers overall, but low numbers of larger fish) and bluegill, 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 Judge's Lake are largemouth bass and bluegill. Properly managed ponds and small lakes can harbor self-sustaining largemouth bass and bluegill populations (Austin et al. 1996, Carlander 1977). Sampling yielded 69 largemouth bass weighing a total of 9.23 kg (20.35 lbs) (Table 1). Based on plotting length against frequency, there appears to be at least four year classes of largemouth bass present, with 2-3 year old specimens being 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. Judge's Lake, at 0.84 hectares (2.07 acres), yielded a CPH of 87.5 largemouth bass over 199 mm (35 bass over 199 mm in 0.40 hours) which would indicate a largemouth bass density of $68.34 \geq$ stock size bass per hectare ($27.66 \geq$ stock size bass/acre) when Hall's relationship is applied. This would suggest a largemouth bass abundance of $57.4 \geq$ stock size fish ($68.34 \geq$ stock size bass per hectare x 0.84 hectares) weighing a total of 13.8 kg (57.4 fish x 0.24 kg average weight of stock size bass), or 30.4 lbs in Judge's Lake. This is a slightly lower than ideal 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 low at 8.57% (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 Judge's Lake exhibited a mean W_r of 93.7 (Table 1) compared against the ideal W_r of 100. This is right around the typical healthy range for an Ohio lake and reflects a bass population with individual fish in good condition (Phil Hillman and Andy Burt, Ohio Division of Wildlife, personal communications).

Bluegill are the dominant forage fish in Judge's Lake. Sampling yielded 74 bluegill weighing a total of 2.57 kg (5.67 lbs) (Table 1). Based on plotting length against frequency, there appears to be eight year classes of bluegill 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 bluegill was low at 12.12% (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 largemouth bass predators and subsequent stunting of the bluegill prey 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 Judge's Lake were in good condition for an Ohio lake, exhibiting a mean W_r of 94.73 (Table 1). This reflects a reasonably healthy average for individual bluegill sunfish, even though the size of the fish is lacking by angler standards.

Balance within the fish community of Judge's Lake was assessed by analyzing prey-predator ratios in this system. To determine overall status of largemouth bass and bluegill dynamics in Judge's Lake 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 Judge's Lake is not within this range of mutual balance, but instead lies within the lower left grid of the plot. This is due to predator and prey PSD both being low. This would be indicative of overfishing of the largemouth bass predator population and consequent stunting of the bluegill population, the latter of which can be 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 could be scheduled allow comparison of data versus daytime sampling results.

Other Recreational Uses

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

Ecosystem Function Overview

Although Judge's Lake 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 naiads

(*Najas* spp.), watermilfoil (*Myriophyllum spicatum*), pickerelweed (*Pontederia cordata*), arrowhead (*Sagittaria latifolia*), watermeal (*Wolffia columbiana*), and a mix of unicellular and filamentous algae. A full inventory of aquatic plants at Judge's Lake has not been undertaken, so additional species are likely present.

Current Fisheries Management

Judge's Lake 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/day is in effect, as well as a bag limit of 3 rainbow trout per angler/day. 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 Judge's Lake.

The Judge's Lake fish community is supplemented with scheduled and 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,). Purchased rainbow trout are stocked twice a winter at this location (approximately 300 pounds total annually) to offer ice fishing opportunities. Although not an annual occurrence, a total of 200 pounds of channel catfish (1-5 pounds) were purchased and stocked in the lake on 21 May 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.

Judge's Lake is also stocked with native warmwater species as other opportunities become available. Notably, on 13 September 2013 a total of 105 catchable size sunfish and largemouth bass were transferred to Judge's Lake from a private lake (at Valleaire Golf Course). 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 on a non-scheduled basis, and now that a fish population assessment has been conducted at Judge's Lake appropriate supplemental stocking can occur in the future to improve the fishery further.

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 Judge's Pond in target areas to facilitate a more desirable fish habitat and fishing experience. In recent years, this has entailed spraying algae treatments with copper sulfate and nuisance aquatic macrophyte growth around shoreline fishing access points with diquat based herbicide. 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

Judge's Lake currently has two wood duck nest boxes situated around the lake, which are routinely maintained by Natural Resources Division staff (John Krock, Natural Resources Area Manager, personal communication).

Management Recommendations

The aforementioned routine management techniques have all had desirable effects on the Judge's Lake system from a recreational and ecosystem perspective and will therefore be continued into the future.

Based on initial data collection and analysis, the fishery could benefit from a greater number of largemouth bass. This could be accomplished through increasing the periodic selective stocking of bass, especially larger specimens (over 300 mm). Further improvement of the panfish population structure would follow, as well, from a more robust largemouth bass predator population.

Increasing public education regarding introduction of aquatic invasive species should also be a focus at Judge's Lake, as well as all other park waters. This issue is

should be part of a wide-reaching campaign to be most effective. 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 Judge's Lake 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 larger (>300 mm) largemouth bass to increase predator densities will be undertaken in an effort to benefit the entire fish community. Despite its smaller size, the lake is a popular fishing destination in the Park District which offers quality 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 populations based on 21 October 2014 assessment (sampling time = 24 minutes)

Species	Total Number	Total Weight (kg)	Average Size (mm)	Average Relative Weight (W_r)¹
Largemouth bass	69	9.23	185.7	93.73
Bluegill	74	2.57	116.74	94.7

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

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

Species	≥ Stock Size¹	≥ Quality Size¹	Proportional Stock Density (%)
Largemouth bass	35	3	8.57
Bluegill	66	8	12.12

¹ Designations per Gablehouse 1983.

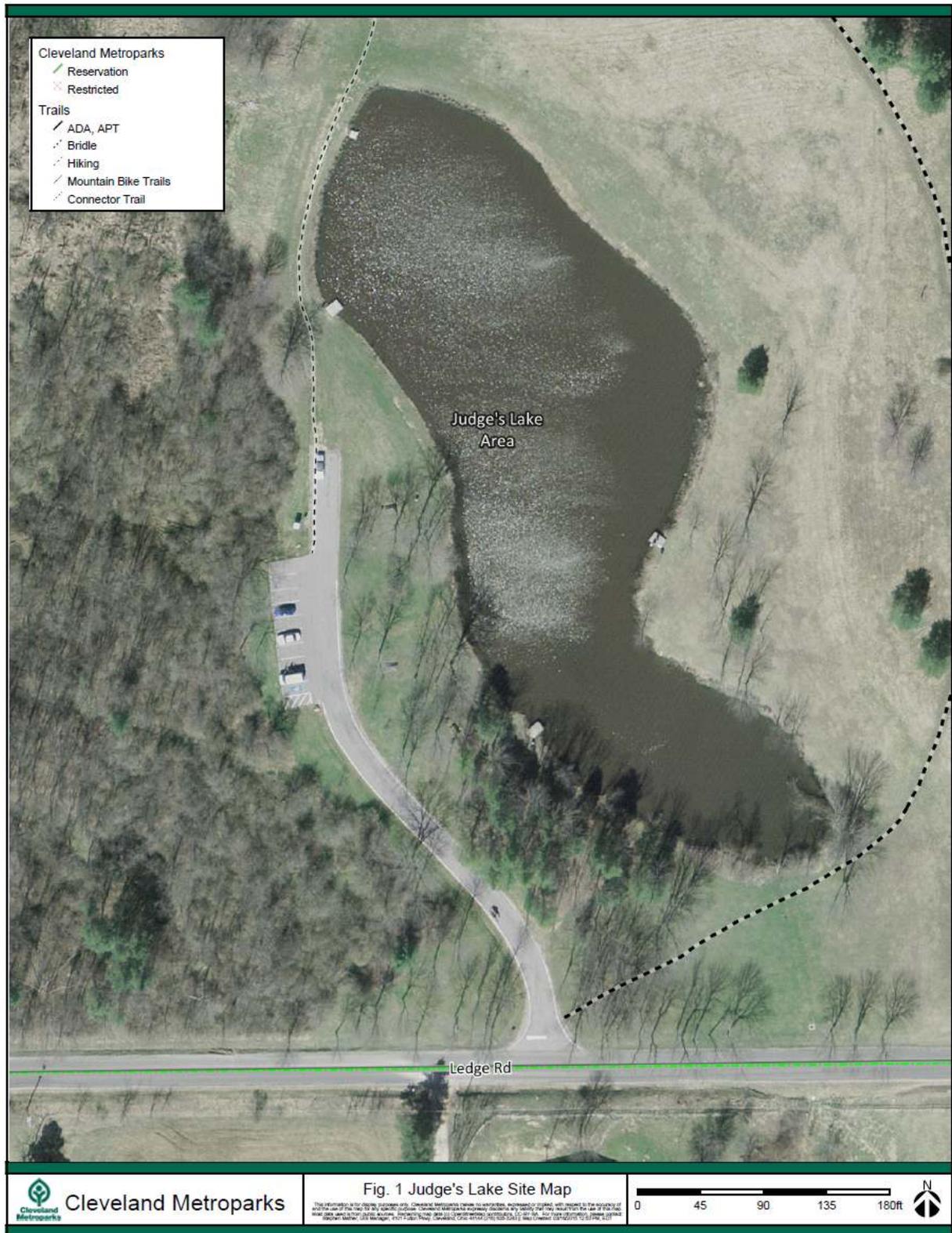
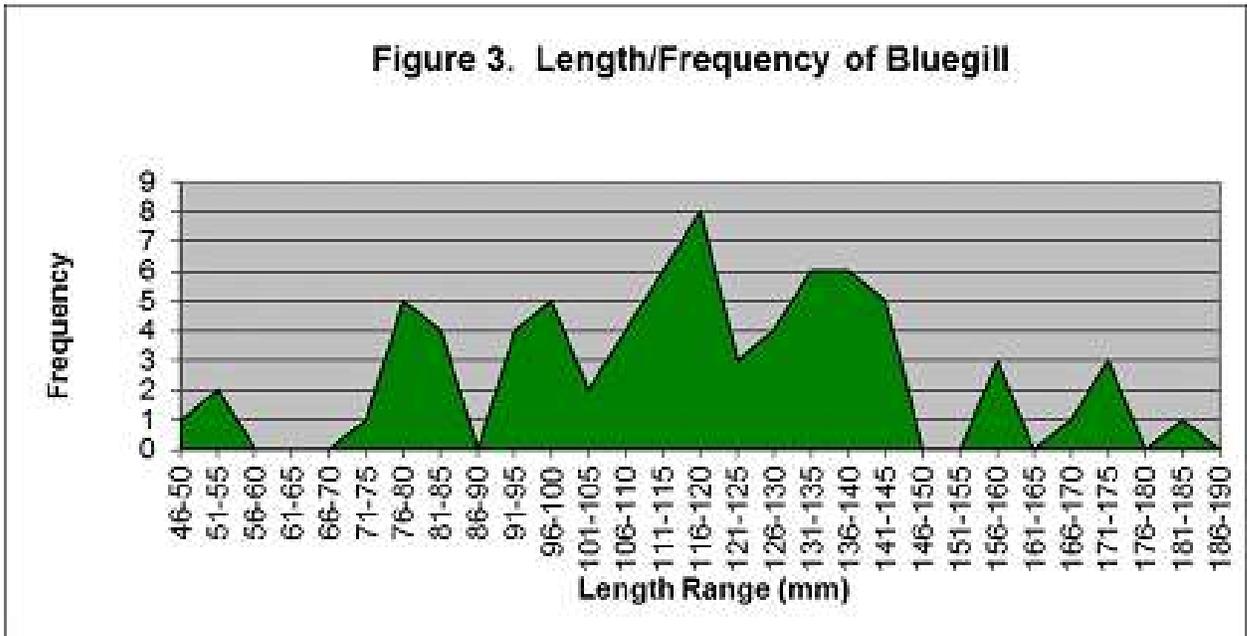
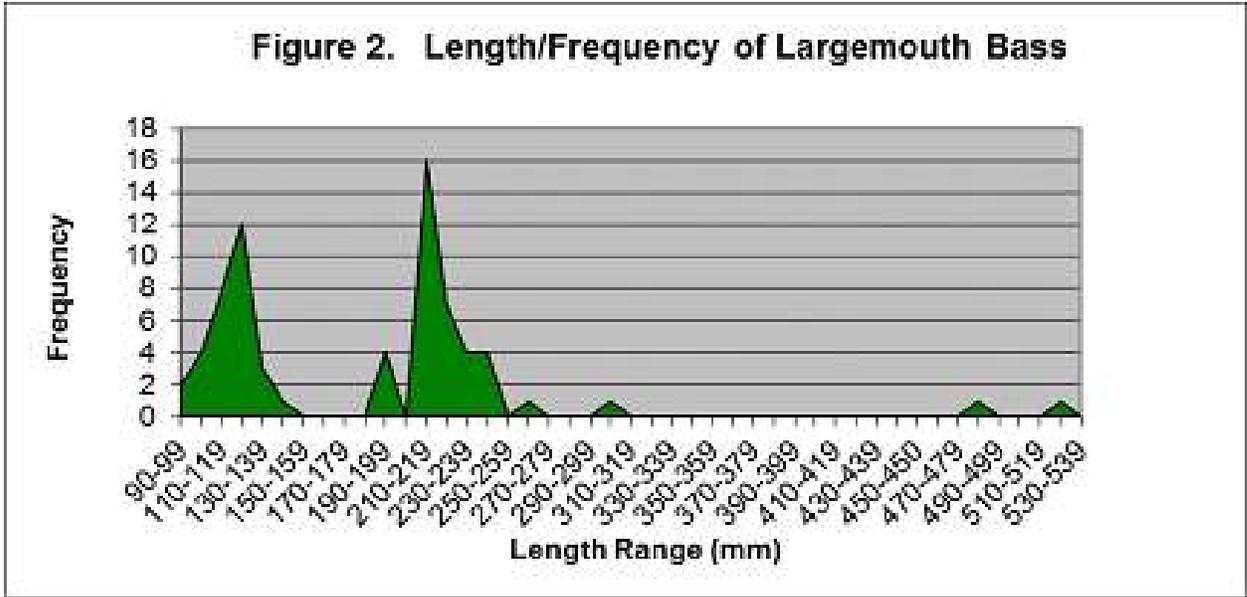
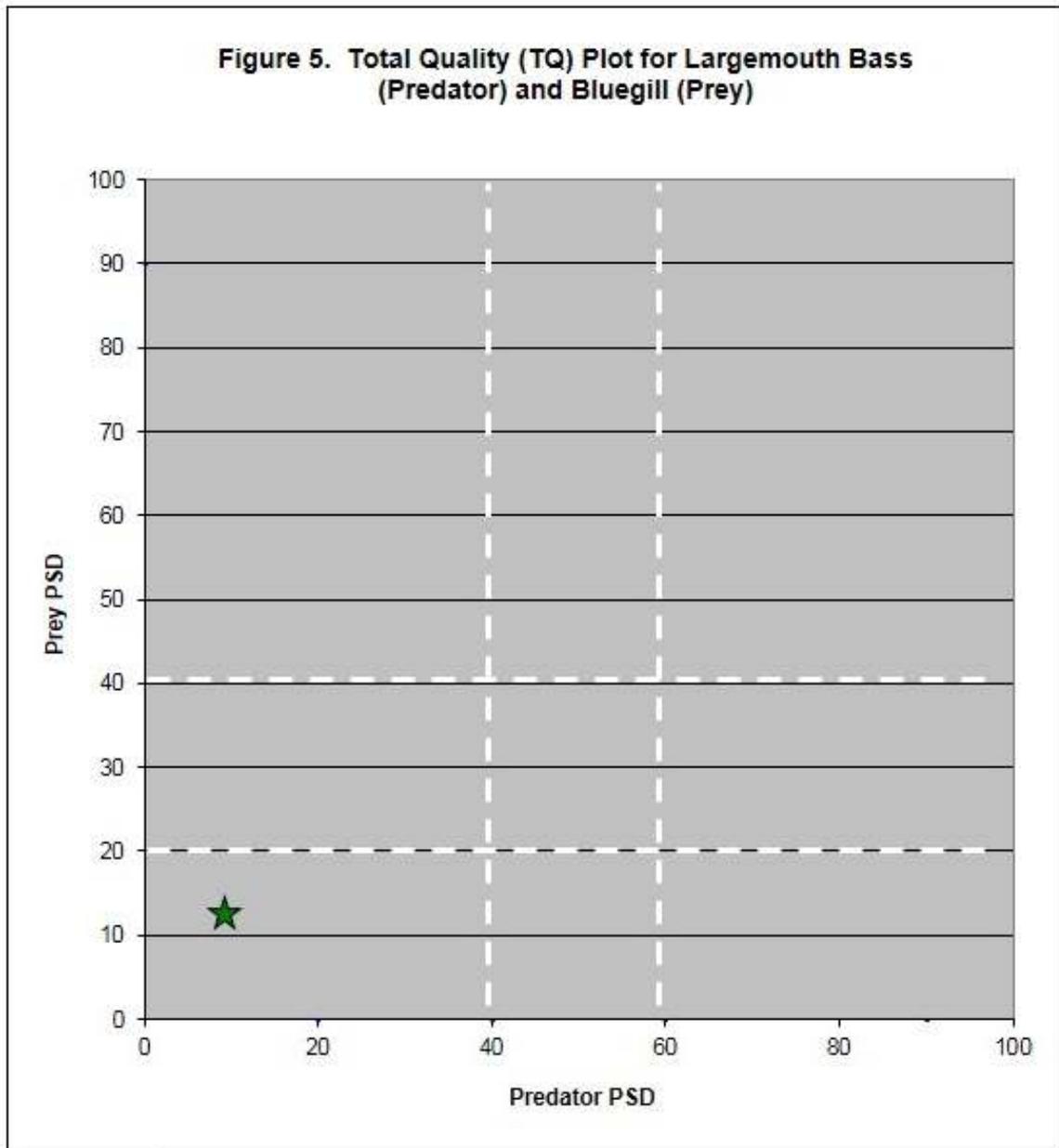




Figure 2. Judge's Lake Subwatershed Map





★ = Intersection of observed Predator and Prey PSD values.

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



Fish Population Assessment Data Sheet

max Depth 12.5ft

Date: 10/21/2014

Location: Judges Lake

Species: LMB

Time Sampled: 9:35-9:59 a.m. (24 min)

	Length (mm)	Weight (g)		Length (mm)	Weight (g)		Length (mm)	Weight (g)
1	489	1594	41	98	13	81		
2	520	2038	42	115	18	82		
3	249	175	43	114	12	83		
4	215	120	44	198	95	84		
5	105	19	45	243	162	85		
6	127	25	46	125	21	86		
7	223	120	47	225	173	87		
8	212	114	48	214	122	88		
9	219	129	49	211	112	89		
10	210	109	50	197	86	90		
11	100	13	51	212	130	91		
12	122	22	52	115	17	92		
13	233	157	53	124	22	93		
14	141	33	54	133	31	94		
15	231	133	55	125	25	95		
16	215	113	56	241	128	96		
17	307	353	57	131	29	97		
18	210	113	58	114	12	98		
19	137	33	59	128	26	99		
20	129	26	60	105	15	100		
21	222	150	61	212	118	101		
22	220	129	62	221	123	102		
23	222	225	63	123	21	103		
24	118	21	64	225	172	104		
25	212	14	65	213	120	105		
26	111	17	66	125	25	106		
27	105	15	67	215	114	107		
28	127	24	68	199	28	108		
29	233	140	69	125	21	109		
30	213	119	70			110		
31	122	28	71			111		
32	97	12	72			112		
33	211	112	73			113		
34	221	129	74			114		
35	191	89	75			115		
36	221	118	76			116		
37	113	18	77			117		
38	119	22	78			118		
39	219	120	79			119		
40	222	128	80			120		

Yellow Bullheads - 1
 Rock Bass - 11
 Common Carp - 1
 Black Crappie - 11
 Yellow Perch - 11
 White Crayfish - 1



Fish Population Assessment Data Sheet

Date: 10/21/2014

Location: Judge's Lake

Species: Sunfish

Time Sampled: 9:35-9:59 a.m. (24 min)

	Length (mm)	Weight (g)		Length (mm)	Weight (g)		Length (mm)	Weight (g)
B6 1	77	9	B6 41	47	67	81		
B6 2	140	80	B6 42	97	16	82		
B6 3	145	57	B6 43	139	46	83		
B6 4	123	34	B6 44	133	44	84		
B6 5	140	46	B6 45	143	50	85		
B6 6	73	7	B6 46	131	39	86		
B6 7	97	16	B6 47	116	67	87		
B6 8	117	28	B6 48	85	14	88		
PS 9	113	30	B6 49	93	13	89		
B6 10	57	2	B6 50	134	120	90		
B6 11	98	16	B6 51	127	46	91		
B6 12	98	15	B6 52	84	12	92		
B6 13	115	27	B6 53	126	82	93		
B6 14	180	31	B6 54	141	53	94		
B6 15	112	25	B6 55	175	106	95		
B6 16	122	32	B6 56	111	25	96		
B6 17	79	8	B6 57	152	44	97		
B6 18	173	111	B6 58	120	37	98		
B6 19	90	14	B6 59	150	38	99		
B6 20	173	93	B6 60	114	25	100		
B6 21	135	74	B6 61	117	30	101		
B6 22	117	30	B6 62	108	21	102		
B6 23	107	19	B6 63	91	11	103		
B6 24	128	36	B6 64	124	41	104		
B6 25	125	32	B6 65	120	38	105		
B6 26	128	39	B6 66	107	19	106		
B6 27	136	48	B6 67	99	17	107		
B6 28	102	17	B6 68	109	21	108		
B6 29	79	8	B6 69	77	8	109		
B6 30	80	8	B6 70	107	20	110		
B6 31	168	90	B6 71	83	6	111		
B6 32	115	25	B6 72	117	27	112		
B6 33	144	51	B6 73	112	28	113		
B6 34	142	55	B6 74	85	16	114		
B6 35	132	49	B6 75			115		
B6 36	157	76	B6 76			116		
B6 37	55	3	B6 77			117		
B6 38	138	47	B6 78			118		
B6 39	93	14	B6 79			119		
B6 40	110	27	B6 80			120		