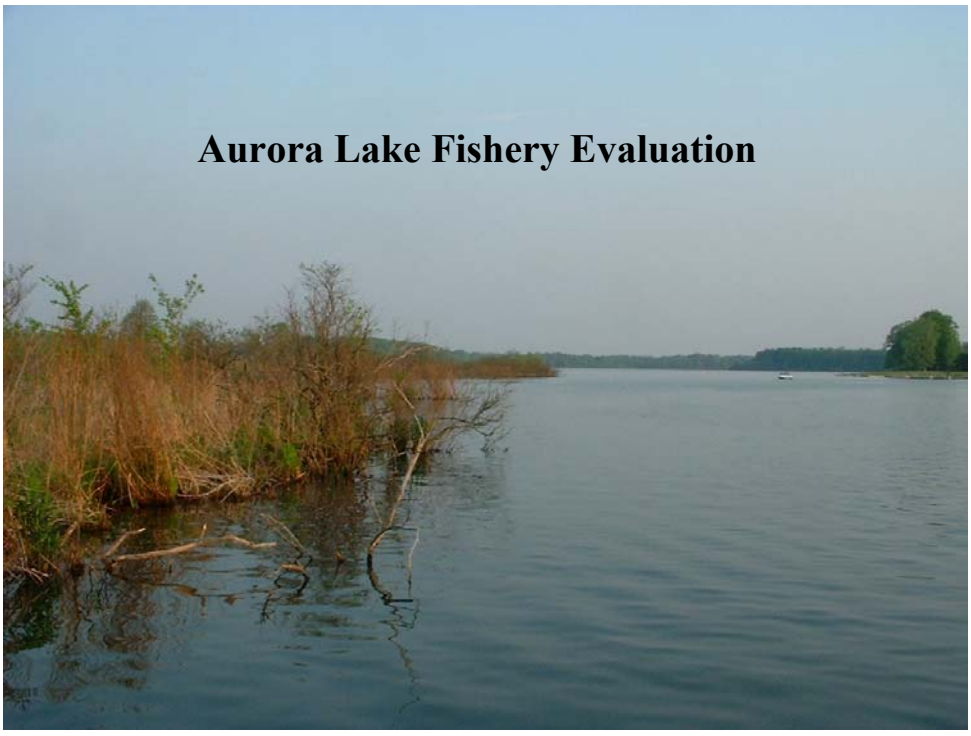
Aurora Lake Fishery Evaluation



Prepared for:

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Table of Contents

List of Figures

List of Tables

1.0 Introduction

EnviroScience, Inc. performed a fish community survey on Aurora Lake in Portage County, Ohio on May 12th and 13th, 2004. The fish community was evaluated by electrofishing three sampling zones of representative near-shore habitat (Figure 1-1). Night boat electrofishing began at dusk in an effort to effectively sample the entire fish population. The goal of the study was to assess the annual status of the Aurora Lake fishery with comparison to past studies as well as formulate recommendations for future management.

During the fishery evaluation, exotic species such as common carp (*Cyprinus carpio*) and white amur (*Ctenopharyngodon idella*) were not returned to the lake. In addition, exotic species were targeted with supplemental electrofishing efforts following the site evaluations.

2.0 Methods

Night-boat electrofishing was used to collect fish community data from representative habitats within Aurora Lake. Length and weight data were recorded for every fish species collected. The collection methods are summarized in the following paragraphs.

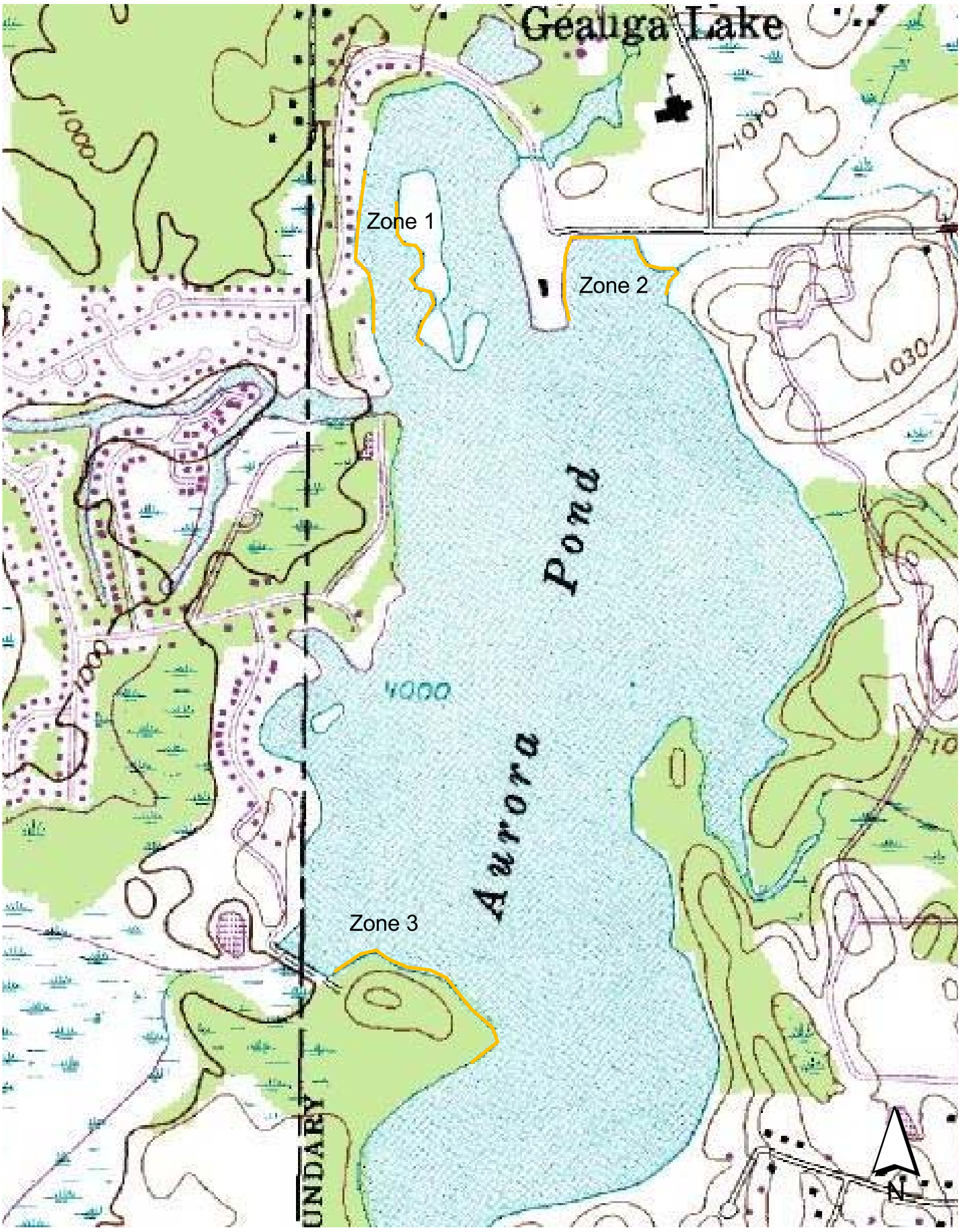
2.1 Fish Survey

A Smith-Root® 5.0 GPP Electrofisher was used to sample the fish community at three zones. The electrofisher supplied pulsed-direct current to anodes mounted to a boom on the front of a 14'6" boat. During electrofishing, the control unit was adjusted according to the conductivity of the water and fish capture effectiveness and response. Lower conductivity water, requires higher voltage to effectively sample the area. Applying higher voltage will increase the electrical current flowing through the water. The degree to which fish are affected by electric current is a function of their surface area. Generally, larger fish are more sensitive to the electric currents. The electrofisher was adjusted to 35-45% (600 volts at 4-8 amps) of its available power at 120 pulses per second.

Electrofishing was conducted at night because of the well-established tendency of fish to rise within four to six feet of the surface to night feed. When shocked, the fish became temporarily stunned and floated to the surface where they were netted. To aid in capture, the boom of the boat was also equipped with three 250 watt flood lamps.

Each of the sampling zones were approximately 500 m (1640.4 ft.) in length and all available habitat was sampled for approximately 2000 seconds. The boat was maneuvered by directing the bow toward the shore and/or submerged objects while shocking the near shore area. The boat continued in this manner in one direction down the shoreline. Zone 3 was shifted slightly in 2004 to a more natural shoreline for the entire reach. Previously in 2003, the zone incorporated an area along the spillway that is devoid of vegetation with the exception of deep water borders. The zone was shifted to the east at the point where the existing vegetation meets the spillway.

Figure 1-1. Aurora Lake Fishery Sample Locations



All fish were weighed, measured for total length, and examined for the presence of gross external anomalies. Gross external or DELT (deformities, erosions, lesions, and tumors) anomalies are defined as externally visible skin or subcutaneous disorders. Anomalies were recorded on fish data sheets (Appendix A). Exact counts of anomalies present on each fish were not made, although light and heavy infestations were noted for certain types of anomalies.

In the case of samples comprised entirely of one size class of the same species (e.g. adults, juveniles, young-of-the-year), weighing was performed on a subsample of 50 individuals either as individuals or in aggregate as a species. If there was a noticeable variation in sizes between individual fish of a species, individual weights were taken. All results were recorded on fish data sheets for each sampling site.

2.2 Catch per Unit Effort and Proportional Stock Density

An attempt was made to apply equal electrofishing effort (approximately 2000 seconds) in each 500 meter sampling zone. The catch per unit effort (CPUE) was calculated for 2000 seconds, allowing for equal comparison between zones.

To gain further insight to the quality of the bass, bluegill, and black crappie populations, a Proportional Stock Density (PSD) was determined. This value was calculated by dividing the number of quality size fish by the total number of fish that were longer than the minimum stock size and multiplying the quotient by 100 (Anderson 1979, Murphy and Willis 2000). A quality size fish is the minimum length that most anglers prefer to catch. A stock length fish is a fish at approximate maturity, and/or an individual that is the minimum length of fish that can provide recreational value. The minimum stock and quality sizes for largemouth bass are >8.0 inches and >12.0 inches (20cm and 30cm), respectively. The stock and quality sizes for bluegill are >3.0 inches and >6.0 inches (8cm and 15cm), respectively, while black and white crappie are >5.0 inches and >8.0 inches (13cm and 20cm), (Anderson 1979, Murphy and Willis 2000).

The PSD provides valuable understanding of the current adult population and an estimate of recruitment for the following season. The PSD is typically calculated for bass and bluegill, which are generally the major fish of concern to anglers and fishery managers. The black crappie was also chosen for this survey since it was an abundant component of the community in the 2001 and 2002 evaluation. Analysis of PSD values can also identify problems with reproduction, growth and mortality. To sustain quality bass fishing, optimum PSD values for largemouth bass are 40-60, bluegill PSD values are 20-40, and crappie values should be 30-60 (Anderson, 1979, Murphy and Willis 2000).

3.0 Results

3.1 Fish Survey

In total, 15 species of fish were encountered in the Aurora Lake study area (Table 3-1). The fish collection totaled 501 individuals and 131.2 kg of fish (Tables 3-2 and 3-3). The four dominant fish species in contribution to total abundance included the bluegill sunfish, black crappie, pumkinseed sunfish, and white crappie (Table 3-2; Figure 3-1). Common carp, contributed (47.1%) to the total mass, while white amur, channel catfish and largemouth bass contributed 22.07%, 8.17%, and 6.89% to the mass, respectively (Table 3-3; Figure 3-2).

A total of 23 carp (136.11 lbs, 61.74 kg) and 4 amur (63.82 lbs, 28.95 kg) were removed from the lake during the fishery evaluation. During the exotic species removal, an additional 29 (131.15 lbs 59.49 kg) carp and 4 amur (70.72 lbs 32.04 kg) were removed from the lake (Table 3-4). The total number of exotic species removed in 2004 was 52 carp and 8 white amur.

3.2 Catch per Unit Effort and Proportional Stock Density

The number of fish caught per 2000 seconds of electrofishing was calculated for each sampling zone. Catch per unit effort was highest at zones 1 and 3, where values of 214.0 and 153.1 fish were recorded, respectively (Table 3-5). The lowest CPUE of 123.6 was recorded at zone 2.

The proportional stock density was calculated for largemouth bass, bluegill sunfish, black and white crappie. There were too few largemouth bass collected to calculate an accurate PSD per site. The PSD for the total number of bass collected was 18 (Table 3-6). The largemouth bass PSD was based on 10 quality and 7 stock sized fish yielded a value of 58.8. This value falls within the target PSD range of 40-60, however the number of specimens on which the value is based is very low. The combined PSD value for bluegill sunfish was 42.5, which indicates a large adult population but is only slightly over the desired range. A sufficient number of black crappie were collected per site but not enough quality-sized fish were in each sample to calculate a PSD per site. Therefore, a combined PSD values calculated for both black and white crappie. The results were low at 9.7 and 10.3 for black and white crappie respectively. These values would indicate a low proportion of quality-sized white and black crappie and a large proportion of stock-sized fish between 3-8 inches. It should be noted that a majority of the black crappie population was at the upper end of the stock sized range with many between 6-8 inches.

Length frequency histograms were created for bass and bluegill to evaluate trends in the fish community between the 2001 and 2004 surveys. Figure 3-3 indicates an increasing trend toward a larger size class bass between 2001 and 2004. The 2001 data depicts an overall low abundance of bass but distribution within each size class. In 2002, there was a considerable increase in bass abundance and a good cohort of stock-sized fish. In 2003, the population continued to demonstrate stock-sized fish but with more adult-sized bass. A majority of these fish were represented as adult-sized bass with the highest totals of 20-30 cm and 30-40 cm bass frequencies since the surveys were initiated. In 2004, despite a low number of 10-20 cm bass, the population shifted toward a greater abundance of larger sized 20-30 and 30-40 cm bass. This

is a positive sign that a reproducing adult population is established for the spring of 2004. The population structure of the bass population seems to be in proper proportions as indicated by the PSD value of 58.8 but the abundance of bass is too low. It would be desirable to increase bass abundance while maintaining or improving the bass community structure.

Figure 3-4 displays the length frequencies of the bluegill population since 2001. In 2001, the bluegill population displayed a large number stock size and adult fish. The overall population structure has continued through each survey with minor variations in abundance. For example, the overall abundance of bluegill in the 9-15 cm class has decreased since 2001. This could be attributed to an increase in the proportion of adult bass in the last several years due to supplemental stocking in 2001, or an increase in black crappie abundance. For comparative purposes, it should be noted that four zones of electrofishing were performed in 2001 so the total number of bluegill will appear greater than the following years. The last two years have indicated a relatively similar population structure with a good cohort of recruitment-sized bluegill and a large adult population. This population structure will likely prove beneficial to bass restocking efforts, as it will provide a large food base.

4.0 Discussion and Year Comparison

The dominant fish species present during the evaluation of Aurora Lake was the northern bluegill sunfish (*Lepomis macrochirus*). This species comprised 35% of the fish abundance in the lake and 6% of the fish mass. Black and white crappie together comprised 30% of the abundance, while the largemouth bass contributed 3.6% to the abundance. The bass abundance is considered a low percentage for a top predator. The largest sample of bass occurred in 2003 with 25 specimens collected. Based on the average number of total fish collected since 2001 (520.7), largemouth bass should comprise 50-75 individuals in the sample. This would increase their percent abundance to a range between 10-15%. According to the ODNR, a healthy largemouth bass fishery should contribute approximately 15% to the abundance (ODNR, 1996). In order to balance this increase, additional habitat and area within the food web must be created. Largemouth bass could exploit the larger sunfish population to increase population size while reducing and controlling the abundant sunfish. The issue of habitat is also important, but management decisions have been working to improve lake conditions. For example, the continued removal of amur species will allow macrophytes to reestablish in the lake. The recent demonstration riparian buffer project installed in 2004, is a good example of near shore habitat enhancement and an excellent method to minimize nutrient loadings. Additional projects such as these and/or the reintroduction of aquatic macrophytes would be highly encouraged. The water quality-monitoring project is also an important component, in particular, the nutrient loading and fecal coliform analysis.

The sunfish species (bluegill and pumpkinseed) have consistently comprised 45-55% of the total abundance of fish sampled since 2001. The average length of bluegill was 13.3 cm (5.2 in.) while the average length for bass (excluding juveniles) was 32.0 cm (12.5 in). Therefore, the average size bass may be too small to efficiently consume the most common food source (5.2 inch bluegill). Even though the average size bass has increased from 9.5 inches in 2001 to 12.5

inches in 2004, the abundance remains low. The average size increase is a positive sign that adult bass may be surviving angling pressure, but reproduction needs to be increased. Supplemental stockings and habitat improvement could help increase the bass population.

The 2003 and 2004 survey indicates a declining trend in the proportion of bluegill from 45% in 2002 to 40% and 35% in 2003 and 2004, respectively. The black crappie proportion increased from 13% in 2002 to 21.5% and 23.5% in 2003 and 2004, respectively. Black crappie is a desirable game fish if a quality size is attained. However, in this case, the majority of black crappie fall within the 5-8 inch range as indicated by the low PSD of 9.7. The black crappies are essentially competing with the other sunfish species but do not have adequate food supply to reach quality lengths. Selective harvest of the 5-8 inch range could provide an adequate food supply to increase a larger proportion of black crappie to quality size.

The Proportional Stock Density (PSD) reveals information concerning the population structure of the fish population. The PSD values calculated for both bass and bluegill in Aurora Lake are within or near their target range for a healthy bass/bluegill fishery. However, proportional values can be misleading because they are based on a total number. This is the case, with the bass population in which the total number of bass sampled is too low to correlate with good bass population even though the PSD value suggests an adequate community structure proportionally. The bass population has shown an increase in number of recruitment and adult sized bass since 2001 but the increase is not substantial. The bluegill population on the other hand, has always been abundant and with a stable population structure. There is consistently a strong cohort of both recruitment and adult-sized individuals. Sunfish typically become dominant when the bass population is sparse and dominated by a few large individuals. While there are many sunfish, it is fortunate that the average size is normal and that the fish are not stunted. As mentioned previously, the large sunfish population could be utilized to support an increase in the bass population once the appropriate habitat has been established.

Common carp and white amur are continually a concern for Aurora Lake due to their direct and indirect impacts on the fishery and lake habitat. Common carp are an introduced species, and are considered an undesirable rough fish due to their feeding and breeding activities, which disturb the sediment, other spawning fish, and uproot aquatic vegetation. White amur can be beneficial in controlling aquatic macrophytes when stocked properly, however, they are often overstocked and overgraze the aquatic vegetation. Fortunately, white amur are sterile and their overall numbers appear to be near extirpation. Even though, submerged aquatic macrophytes are not yet present, emergent water lilies (*Nuphar variegatum*) are increasing bed size in several areas of the lake. Furthermore, evidence of amur targeting overhanging vegetation was not apparent which is typically a last resort for amur when all aquatic vegetation is gone.

A total of approximately 900 kg (1983.1 lbs) of carp and amur have been removed from the lake between the fish survey and exotic species removal since 2001. Little change in abundance and overall mass had occurred until the 2004 survey. Previously, carp had comprised 70-75% of the mass represented by 45-55 individuals during all the fishery zone surveys. In 2004, this data was reduced to 47.1% represented by only 23 individuals. This would indicate that the overall

population may be on the decline since many reproducing adults are removed prior to spawning. The continued reduction of this species will not only aid the fish population but also the habitat and turbidity of the lake. Carp are susceptible to predation by fishing eating birds and therefore the continued increase in water clarity but reestablishing aquatic macrophytes will make juveniles even more susceptible to predation in the shallows.

The results of the fishery evaluations to date indicate that Aurora Lake continues to be a sunfish dominated lake but with a majority of the biomass contributed by common carp. The largemouth bass population continues to be low abundance even though the population structure has begun to exhibit a healthy proportion. This slight increase in adult and recruitment-sized bass is likely due to supplemental stocking in Fall 2001. Additional stockings could help bolster the population. The food supply is present in the large sunfish population. Past recommendations by EnviroScience included the selective harvesting of bluegill and crappie as well as the protection of bass between 12-15 in. The 2003 and 2004 surveys indicate a reduction in bluegill numbers, which may be attributed to angler harvest or an increase in adult bass or a combination of both factors. The protection of the adult population is critical due to the low density that already exists within the lake. Improvements to habitat and supplemental stockings will help establish a more dense and harvestable population. Aurora Lake has already begun management steps towards improving habitat such as the native plantings along the shore, and water quality investigations. The reintroduction of aquatic macrophytes will greatly help increase clarity and lake productivity. The white amur population is near extirpation, which will hopefully promote aquatic macrophyte growth and reproduction. It is recommended that Aurora Lake Association discuss the type(s) of plant species desired for reintroduction to the lake. There are many species of native plants that provide good habitat and act to reduce suspended particles. The Association may also want to attempt the reintroduction of plant species within exclusion fencing. Species such as southern naiad (*Najas guadalupensis*), muskgrass (*Chara sp*.) pondweeds (*Potamogeton sp*.), tape grass (*Vallisneria Americana*) are some submerged plants that are native. Plants will return naturally but will likely be invasive or exotic species. To avoid the dominance of exotic plants, a monitoring program should detect and eliminate the presence before it can spread throughout the lake. If Eurasian water milfoil is discovered it should be removed immediately but take caution in removing the plant since it can spread by fragmentation.

In summary, Aurora Lake data is indicating improvement in the fish population and the reduction of exotic species. The bass population, even though still a low proportion of the fish population, has displayed a relatively good population structure despite its size. The sunfish population also seems to be declining whether through angler harvest or increase number of adult bass. However, the black crappie population is increasing and competing with the sunfish while simultaneously not attaining a quality size. The reduction of exotic species was evident during this survey with a decrease in biomass abundance from 70-75% in 2001-2003 to 47% in 2004. While the common carp will never be extirpated from Aurora Lake, there abundance can be controlled and minimized with targeted removals. The white amur is near extirpation in Aurora Lake, which is a key component in reestablishing macrophytes and habitat. While aquatic macrophytes and habitat will begin to increase with good management, the bass population could be augmented this spring with an additional stocking similar to the Fall of

2001. Harvest of sunfish and crappie should also continue in order to reduce competition and produce larger quality-sized fish. Bolstering the bass population in the next couple of years will prepare the population for the additional habitat that will be available from macrophyte growth and shoreline planting projects.

Table 3-1 Fish Species List

Common Name	Species Name
Black crappie	*Poxomis nigromaculatus*
Brook silverside	*Labidesthes sicculus*
Brown bullhead	*Ictalurus nebulosus*
Common carp	*Cyprinus carpio*
Channel catfish	*Ictalurus punctatus*
Golden shiner	*Notemigonus crysoleucas*
Largemouth bass	*Micropterus salmoides*
Smallmouth bass	*Micropterus dolomieu*
Pumpkinseed sunfish	*Lepomis gibbosus*
Bluegill sunfish	*Lepomis macrochirus*
Warmouth sunfish	*Lepomis gulosus*
White amur	*Ctenopharyngodon idella*
White crappie	*Pomoxis anularis*
Yellow bullhead	*Ictalurus natalis*
Yellow perch	*Perca flavescens*

Table 3-2 Electrofishing Abundance Results

Species	Zone 1	Zone 2	Zone 3	Total
Black crappie	97	11	11	119
Brook silverside	0	1	0	1
Brown bullhead	1	3	0	4
Common carp	3	12	8	23
Channel catfish	1	7	9	17
Golden shiner	3	3	2	8
Largemouth bass	12	4	2	18
Smallmouth bass	0	1	0	1
Pumpkinseed sunfish	16	32	49	97
Bluegill sunfish	62	45	70	177
Warmouth sunfish	2	0	0	2
White amur	0	1	3	4
White crappie	20	12	0	32
Yellow bullhead	0	1	1	2
Yellow perch	0	0	1	1
Total	217	133	156	506

Figure 3-1 Fish Species Percent Contribution to Abundance

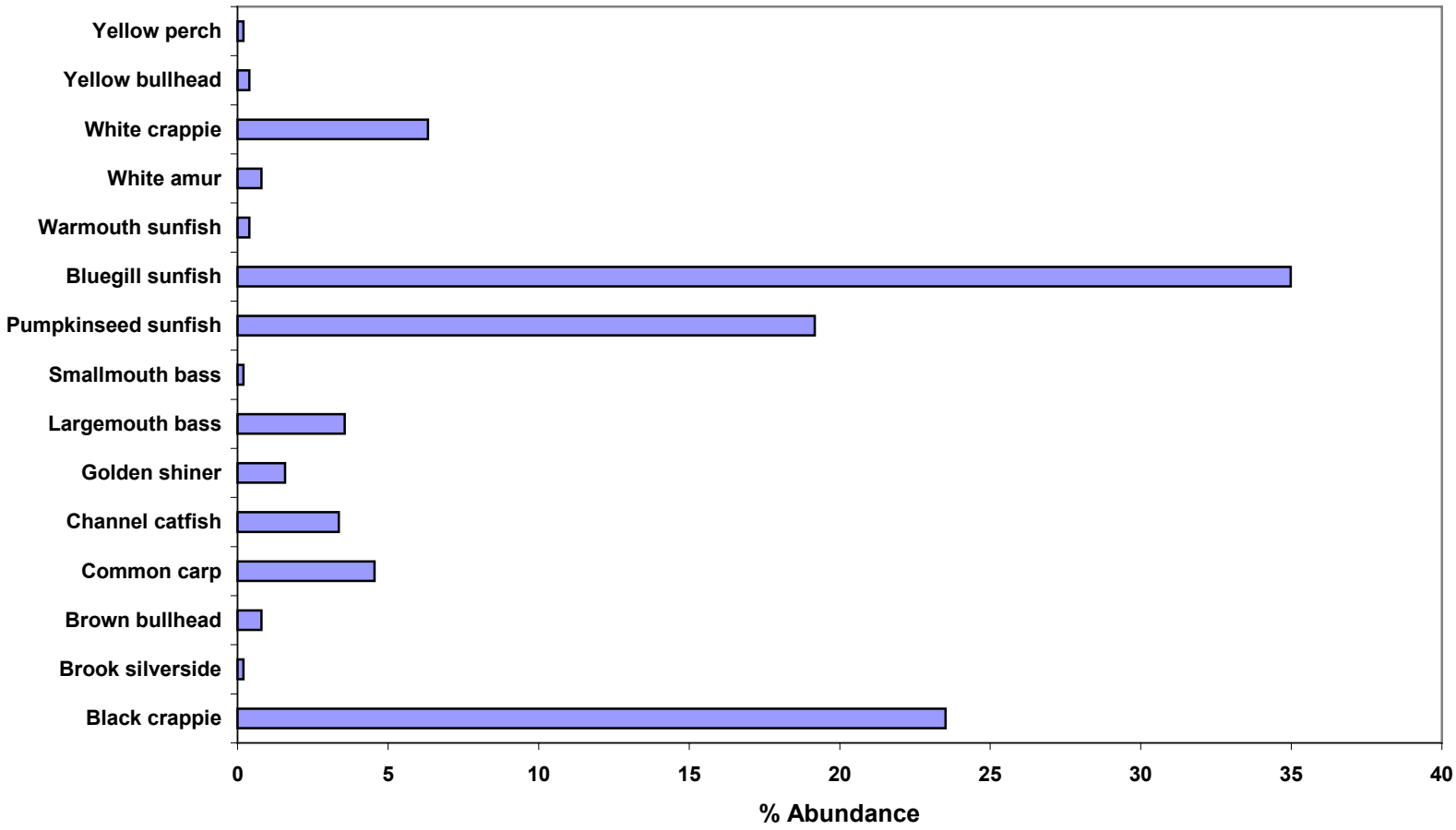


Table 3-3 Electrofishing Mass Results (kg)

Species	Zone 1	Zone 2	Zone 3	Total %	Total (kg)
Black crappie	4.18	0.86	0.90	4.53	5.94
Brook silverside	0.00	0.00	0.00	0.00	0.00
Brown bullhead	0.30	0.51	0.00	0.62	0.81
Common carp	6.42	30.59	24.73	47.06	61.74
Channel catfish	0.37	5.99	4.36	8.17	10.72
Golden shiner	0.11	0.15	0.05	0.24	0.31
Largemouth bass	6.45	0.09	2.50	6.89	9.04
Smallmouth bass	0.00	0.08	0.00	0.06	0.08
Pumpkinseed sunfish	0.78	1.60	1.12	2.67	3.50
Bluegill sunfish	2.87	1.90	2.79	5.76	7.56
Warmouth sunfish	0.11	0.00	0.00	0.08	0.11
White amur	0.00	7.65	21.30	22.07	28.95
White crappie	1.45	0.65	0.00	1.60	2.10
Yellow bullhead	0.00	0.20	0.12	0.24	0.32
Yellow perch	0.00	0.00	0.02	0.02	0.02
Total mass (kg)	**23.04**	**50.27**	**57.89**		**131.20**
Total mass (lbs)	**50.79**	**110.8**	**127.6**	**100.00**	**289.3**

Table 3-4 Abundance and Mass(kg) of Exotic Species

Species	Zone 1	Zone 2	Zone 3	Search	Total
Common carp	3	12	8	29	52
White amur	0	1	3	4	8
Total #	3	13	11	33	60
Common carp	6.42	30.59	24.73	59.490	121.23
White amur	0.00	7.65	21.30	32.080	61.03
Total Mass (kg)	6.420	38.240	46.030	91.570	182.26

Figure 3-2 Fish Species Percent Contribution to Mass

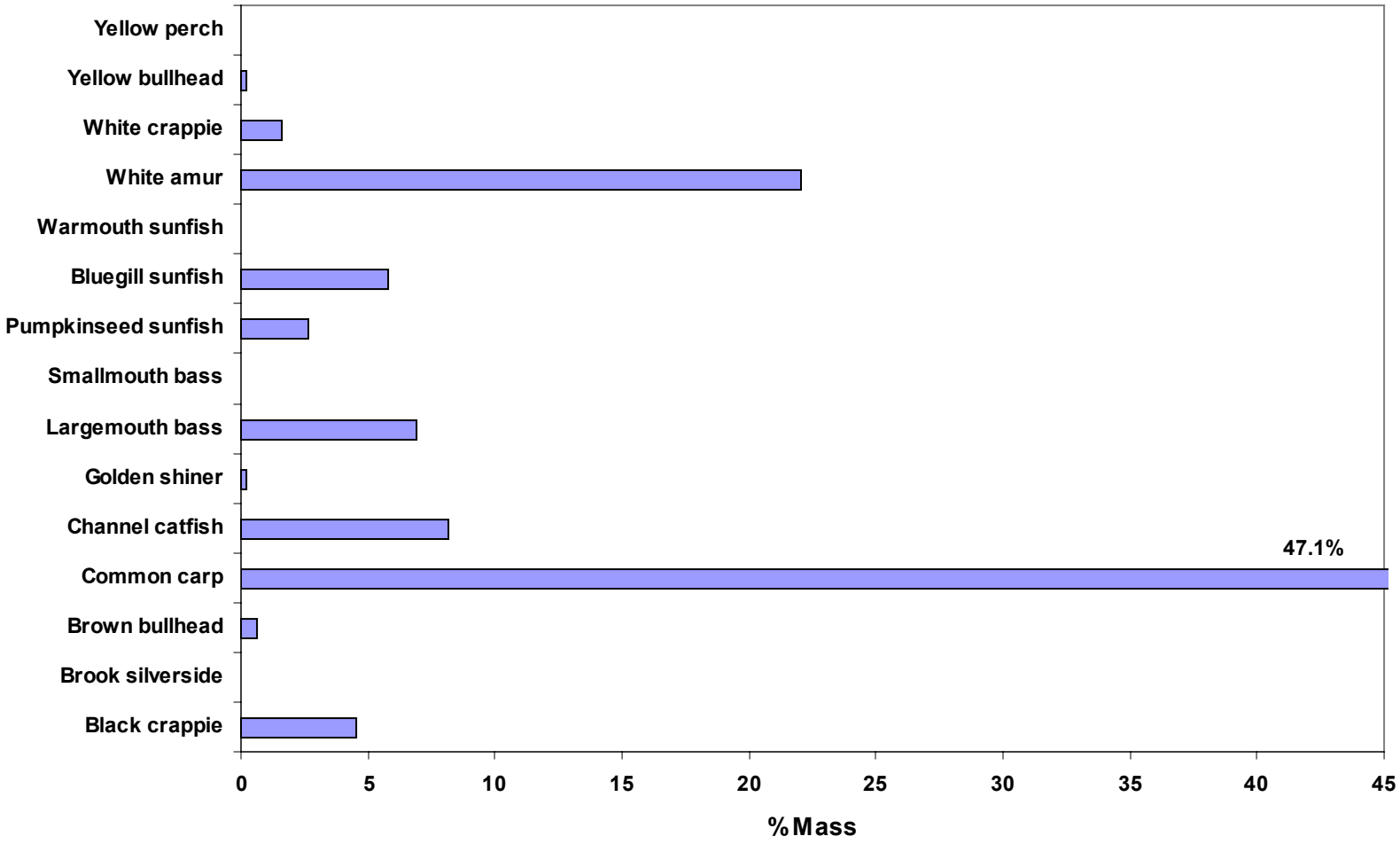
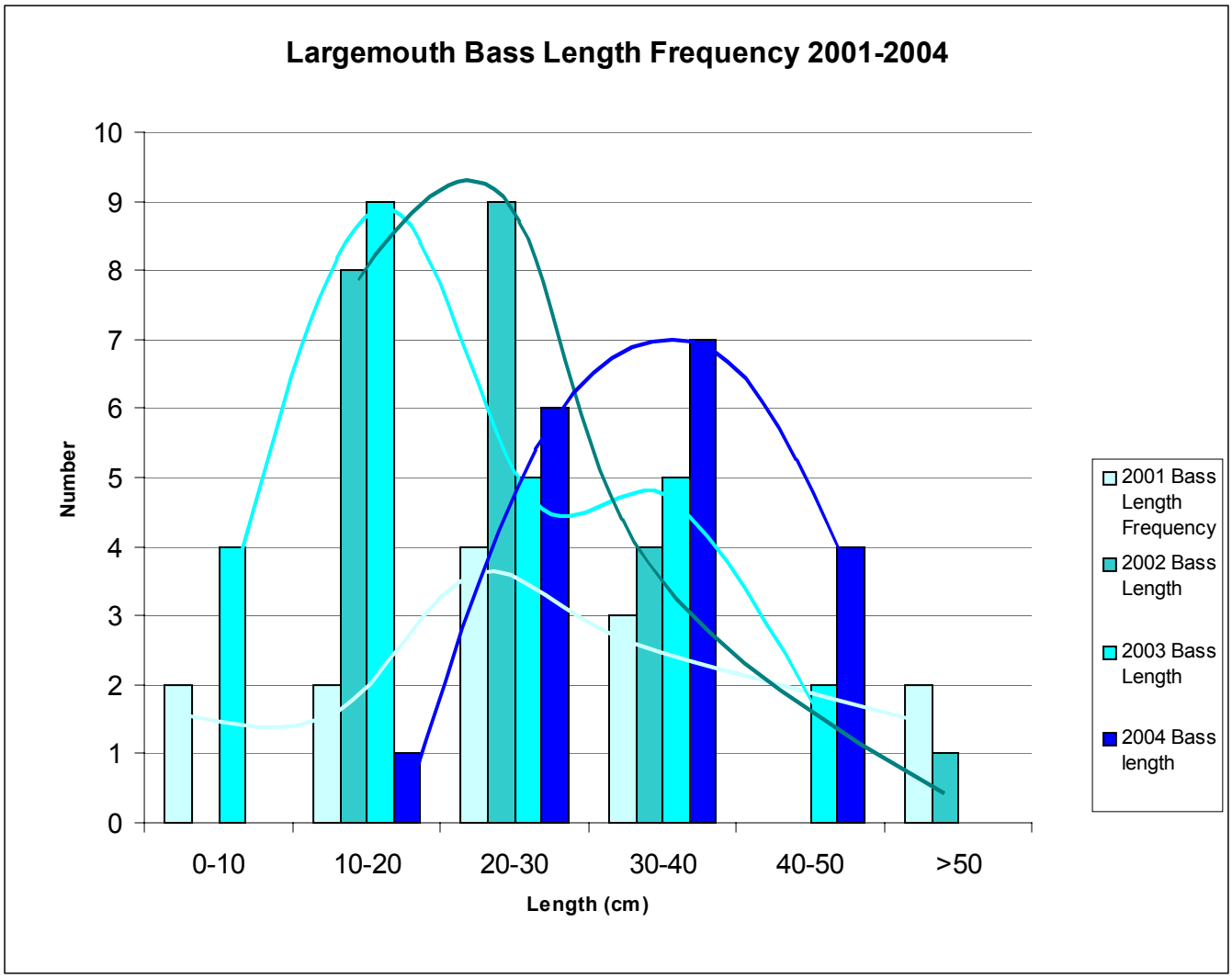


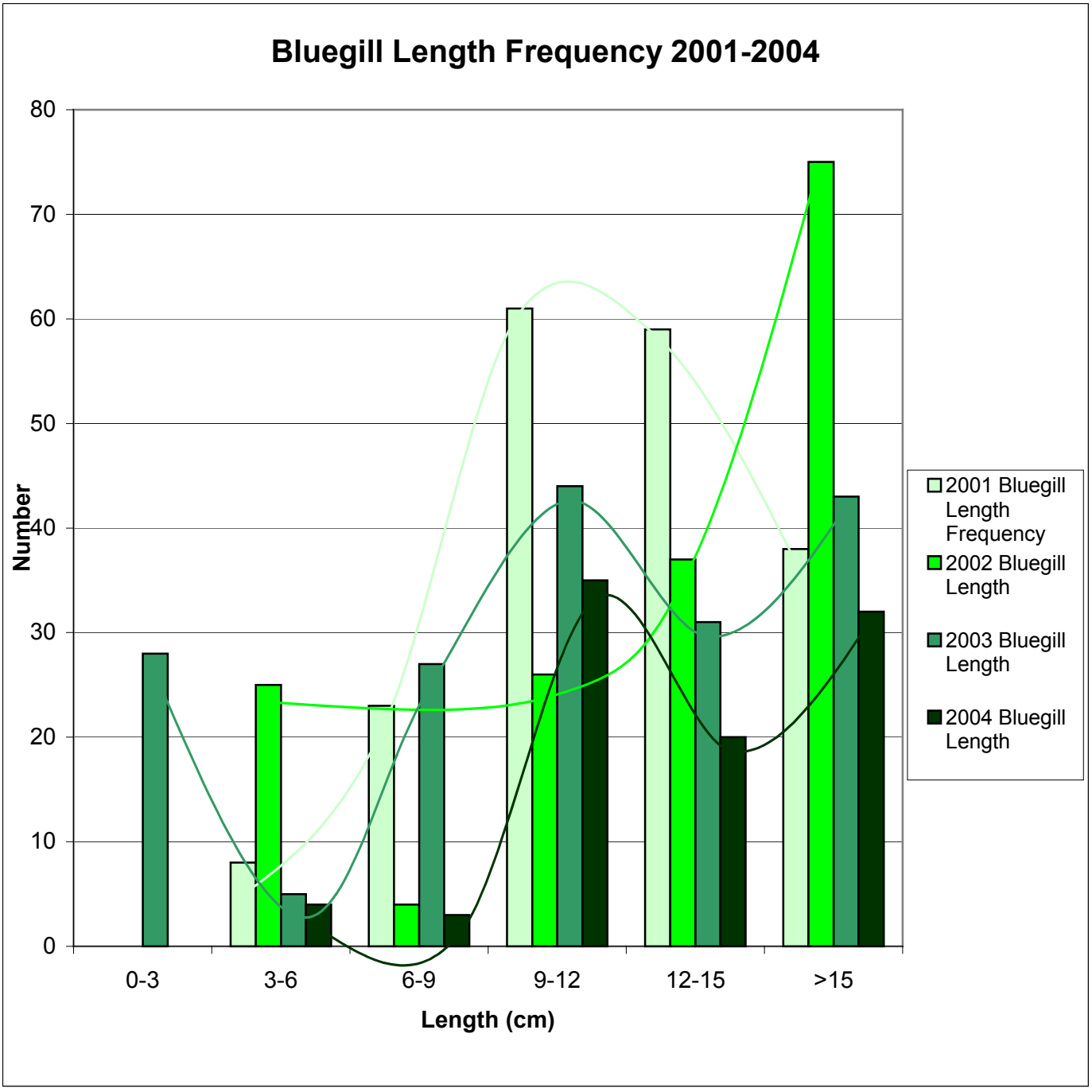
Table 3-5 Catch per Unit Effort for 2000 seconds fished

Species	Zone 1	Zone 2	Zone 3
Black crappie	95.7	10.6	10.8
Brook silverside	0.0	1.0	0.0
Brown bullhead	1.0	2.9	0.0
Common carp	3.0	11.6	7.9
Channel catfish	1.0	6.8	8.8
Golden shiner	3.0	2.9	2.0
Largemouth bass	11.8	3.9	2.0
Smallmouth bass	0.0	1.0	0.0
Pumpkinseed sunfish	15.8	30.9	48.1
Bluegill sunfish	61.1	43.5	68.7
Warmouth sunfish	2.0	0.0	0.0
White amur	0.0	1.0	2.9
White crappie	19.7	11.6	0.0
Yellow bullhead	0.0	1.0	1.0
Yellow perch	0.0	0.0	1.0

Table 3-6 Proportional Stock Density (PSD) Results

Species	Zone 1	Zone 2	Zone 3	Total
Largemouth bass	0	0	0	58.8
Bluegill	45	32.5	48	42.5
Black crappie	14	0	0	9.7
White crappie	0	0	0	10.3


Largemouth Bass Length Frequency 2001-2004
Number
10
9
8
7
6
5
4
3
2
1
0
0-10
10-20
20-30
30-40
40-50
>50
Length (cm)
2001 Bass Length Frequency
2002 Bass Length
2003 Bass Length
2004 Bass length


Bluegill Length Frequency 2001-2004
80
70
60
50
40
30
20
10
0
Number
0-3
3-6
6-9
9-12
12-15
>15
Length (cm)
2001 Bluegill Length Frequency
2002 Bluegill Length
2003 Bluegill Length
2004 Bluegill Length

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Appendix A

Fish Data Sheets

Appendix B

2003 Data Summary

2003 Fish Species List

Common Name	Species Name
Black crappie	*Poxomis nigromaculatus*
Brook silverside	*Labidesthes sicculus*
Brown bullhead	*Ictalurus nebulosus*
Common carp	*Cyprinus carpio*
Channel catfish	*Ictalurus punctatus*
Golden shiner	*Notemigonus crysoleucas*
Largemouth bass	*Micropterus salmoides*
Pumpkinseed sunfish	*Lepomis gibbosus*
Bluegill sunfish	*Lepomis macrochirus*
Warmouth sunfish	*Lepomis gulosus*
White amur	*Ctenopharyngodon idella*
White crappie	*Pomoxis anularis*
Yellow bullhead	*Ictalurus natalis*
Yellow perch	*Perca flavescens*

2003 Electrofishing Abundance Results

Species	Zone 1	Zone 2	Zone 3	Total
Black crappie	84	30	13	127
Brook silverside	0	1	3	4
Brown bullhead	0	1	0	1
Common carp	11	22	23	56
Channel catfish	4	8	3	15
Golden shiner	5	2	2	9
Largemouth bass	6	11	8	25
Pumpkinseed sunfish	8	15	15	38
Bluegill sunfish	61	104	71	236
Warmouth sunfish	6	7	2	15
White amur	0	0	0	0
White crappie	30	3	8	41
Yellow bullhead	4	3	0	7
Yellow perch	1	2	13	16
Total	220	209	161	590

2003 Electrofishing Mass Results (kg)

Species	Zone 1	Zone 2	Zone 3	Total %	Total (kg)
Black crappie	8.15	0.80	0.72	5.98	8.15
Brook silverside	0.00	0.00	0.02	0.01	0.00
Brown bullhead	0.00	0.29	0.00	0.18	0.00
Common carp	32.23	42.83	44.64	74.04	32.23
Channel catfish	2.17	3.78	2.18	5.03	2.17
Golden shiner	0.22	0.03	0.07	0.20	0.22
Largemouth bass	4.12	1.77	0.81	4.14	4.12
Pumpkinseed sunfish	0.54	0.49	0.38	0.87	0.54
Bluegill sunfish	3.01	5.06	1.55	5.95	3.01
Warmouth sunfish	0.25	0.45	0.01	0.44	0.25
White amur	0.00	0.00	0.00	0.00	0.00
White crappie	2.72	0.34	0.42	2.15	2.72
Yellow bullhead	0.64	0.41	0.00	0.65	0.64
Yellow perch	0.04	0.05	0.47	0.35	0.04
Total mass (kg)	**54.09**	**56.32**	**51.26**	**100.00**	**54.09**
Total mass (lbs)	**119.2**	**124.2**	**113.0**		**119.2**

2003 Abundance and Mass (kg) of Exotic Species

Species	Zone 1	Zone 2	Zone 3	Search	Total
Common carp	11	22	23	35	91
White amur	0	0	0	2	2
Total #	11	22	23	37	**93**
Common carp	32.23	42.83	44.64	102.3	222.0
White amur	0.00	0.00	0.00	15.1	15.1
Total Mass (kg)	32.23	42.83	44.64	117.4	237.1

2003 Catch per Unit Effort for 2000 seconds fished

Species	Zone 1	Zone 2	Zone 3
Black crappie	78.1	29.8	12.9
Brook silverside	0.0	1.0	3.0
Brown bullhead	0.0	1.0	0.0
Common carp	10.2	21.9	22.9
Channel catfish	3.7	8.0	3.0
Golden shiner	4.7	2.0	2.0
Largemouth bass	5.6	10.9	8.0
Pumpkinseed sunfish	7.4	14.9	14.9
Bluegill sunfish	56.7	103.4	70.7
Warmouth sunfish	5.6	7.0	2.0
White amur	0.0	0.0	0.0
White crappie	27.9	3.0	8.0
Yellow bullhead	3.7	3.0	0.0
Yellow perch	0.9	2.0	12.9

2003 Proportional Stock Density (PSD) Results

Species	Zone 1	Zone 2	Zone 3	Total
Largemouth bass	0	0	0	53
Bluegill	34	42.5	13.7	32
Black crappie	6.1	0	0	4.9
White crappie	0	0	0	6.2