Fish Survey Report for Horsehead Lake

May 31–June 2, 2007

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INTRODUCTION

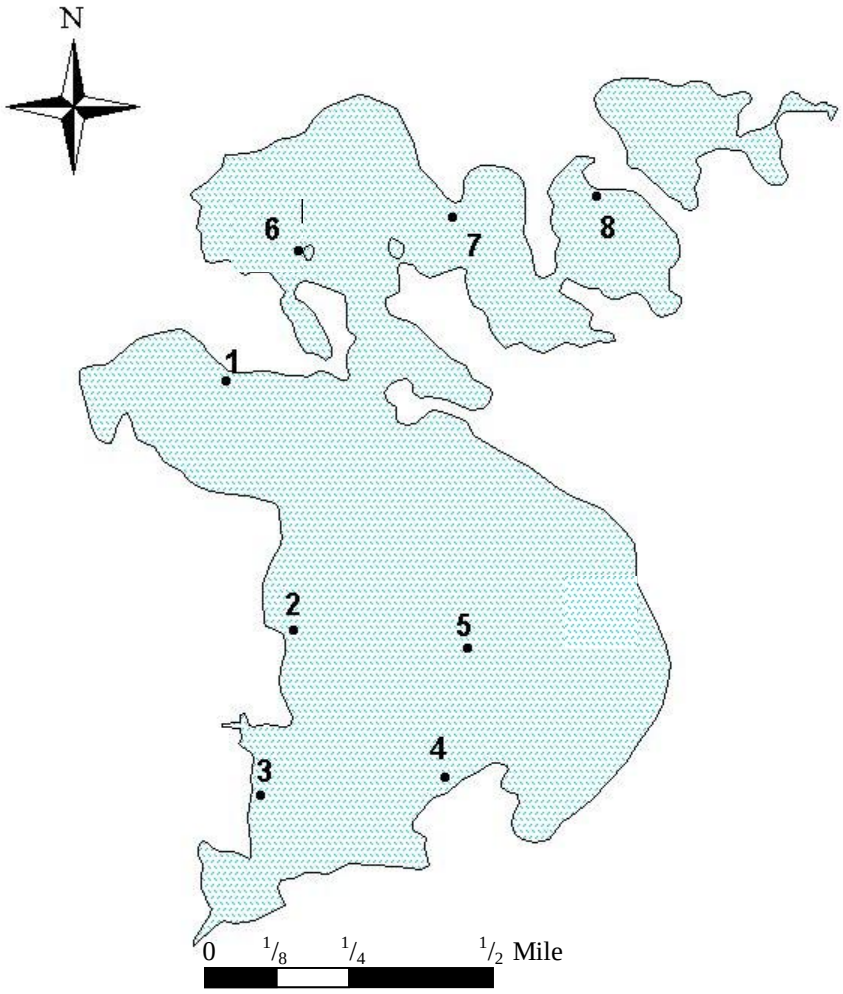
The Michigan Department of Natural Resources (MDNR), Fisheries Division has conducted fish surveys at Horsehead Lake in the past. The last fish survey was conducted in 1997. Fish populations, growth, and habitat can change in 10 years, but due to state budget restrictions, the DNR was not expecting to conduct any surveys on the lake in the near future. Horsehead Lake Association, however, partnered with Michigan State University, Department of Fisheries and Wildlife to conduct the same type of fish survey the DNR conducted historically. The purpose of the survey was to identify fish species presence in Horsehead Lake, and assess length, age, and growth rates of fish to provide lake association members and residents with data that can be used to help establish catch recommendations to improve fish populations.

METHODS

The survey was conducted on Thursday May 31 through Saturday June 2, 2007. We used similar methods and sampling locations as those used in the DNR's surveys to stay consistent with their methods and to allow comparison of results of the two surveys. Dr. Niles Kevern provided us with methods and locations of previous sampling sites from the DNR.

We set 8 fyke nets in Horsehead and John Brown Lakes at specific locations; 6 of which were previously determined by the DNR and 2 locations which were determined by members of the lake association and were known to represent typical lake characteristics (Figure 1). We checked nets at 10:00 am on Friday June 1 and Saturday June 2 and processed fish captured. We recorded species, total length (mm), and we removed a few scales to age each individual fish. Fish were released following processing. The fish survey team and lake association members also took samples with hook and line at various locations in the lake to increase our sample size.

For the data analysis, we compared average length and growth of our sampled fish to state averages. We calculated a growth index (expressed in inches) for bluegill, which indicates the degree to which the growth average of fish in a specific body of water differs from the state average (Schneider et al. 2000). The index is calculated by determining the deviation (difference) between the observed average length and the statewide seasonal average length. The deviations are added together and divided by the number of age groups. A growth index of 0.0 means that the sampled population is growing at exactly the state average for the species in question. A positive (+) index means that the sampled population is growing faster than average. Likewise, a negative (-) index means that the fish are growing slower than average. A growth index can only be formulated if an age class has five or more individuals sampled. Therefore, it could not be calculated for certain other species, such as largemouth bass.



Trap No.	Latitude		Longitude	
	Dec. Deg	Deg. Min. Sec.	Dec. Deg	Deg. Min. Sec.
1	43.6817	43 40.902	-85.2650	85 15.900
2	43.6756	43 40.536	-85.2628	85 15.768
3	43.6716	43 40.296	-85.2640	85 15.840
4	43.6724	43 40.341	-85.2557	85 15.340
5	43.6769	43 40.612	-85.2584	85 15.505
6	43.6848	43 41.087	-85.2628	85 15.766
7	43.6856	43 41.136	-85.2574	85 15.444
8	43.6860	43 41.160	-85.2526	85 15.156

Figure 1. Fyke net trap locations for fish sampling at Horsehead and John Brown lakes May 30 through June 2, 2007.

RESULTS

A total of 324 fish comprising 11 species were caught in Horsehead and John Brown lakes during the survey: bluegill (n = 250), brown bullhead (n = 4), yellow bullhead (n = 6), crappie (n = 1), bowfin (n = 2), hybrid sunfish (n = 1), largemouth bass (n = 17), northern pike (n = 2), perch (n = 3), pumpkinseed sunfish (n = 21), and rock bass (n = 17). Approximately 10% of all fish sampled were caught with hook and line. It appeared as though hook and line was a more effective method than fyke nets in sampling certain fish species during the survey. For instance, most of the largemouth bass (76.5%) and perch (66.7%) were caught with hook and line. Average length, age, and location (i.e., latitude and longitude) of each fish sampled are provided in Appendix 1.

Bluegill

Most of the bluegill caught were in the 1-year age class, which was expected (Table 1). Not many fish > 6-years old were captured; however, the maximum age captured was 8-years-old.

The average length for bluegill in Horsehead and John Brown lakes was less than that of the state average for bluegill in the 3-year, 4-year, 5-year, 7-year, and 8-year age classes (Figure 2). The difference, however, was only significant in the 3-year, 4-year, and 5-year classes. (Note: significance is represented by the error bars on the graph. These bars represent the amount of variability in the sample of fish we caught. If the bars overlap the state average length, then the difference between the length of fish we sampled was not significantly [statistically]different than the state average). We calculated an equation to determine growth rates and length at any given age. For bluegill, length = 70.313 * ln(age) + 50.966. Based on that formula, bluegill growth in Horsehead and John Brown lakes is approximately 28–48 mm (1.1–1.9 in) per year in fish < 2 years old. Growth in older fish (> 6 years) slows to approximately 10 mm (0.4 in) per year, and continues decreasing with age.

Table 1. Number and percent of individual bluegill sampled in different age classes. Length was recorded in mm, but also reported in inches. S.E. indicates standard error, a measure of variability.

Bluegill					
Age	Number	Percent	Mean length	S.E.	Length (in)
1	188	75.2	60.02	0.50	2.36
2	7	2.8	95.86	5.49	3.77
3	14	5.6	115.93	3.54	4.56
4	24	9.6	142.08	3.03	5.59
5	11	4.4	162.73	2.87	6.41
6	1	0.4	190.00		7.48
7	4	1.6	186.75	12.38	7.35
8	1	0.4	200.00		7.87
Total	250	100			

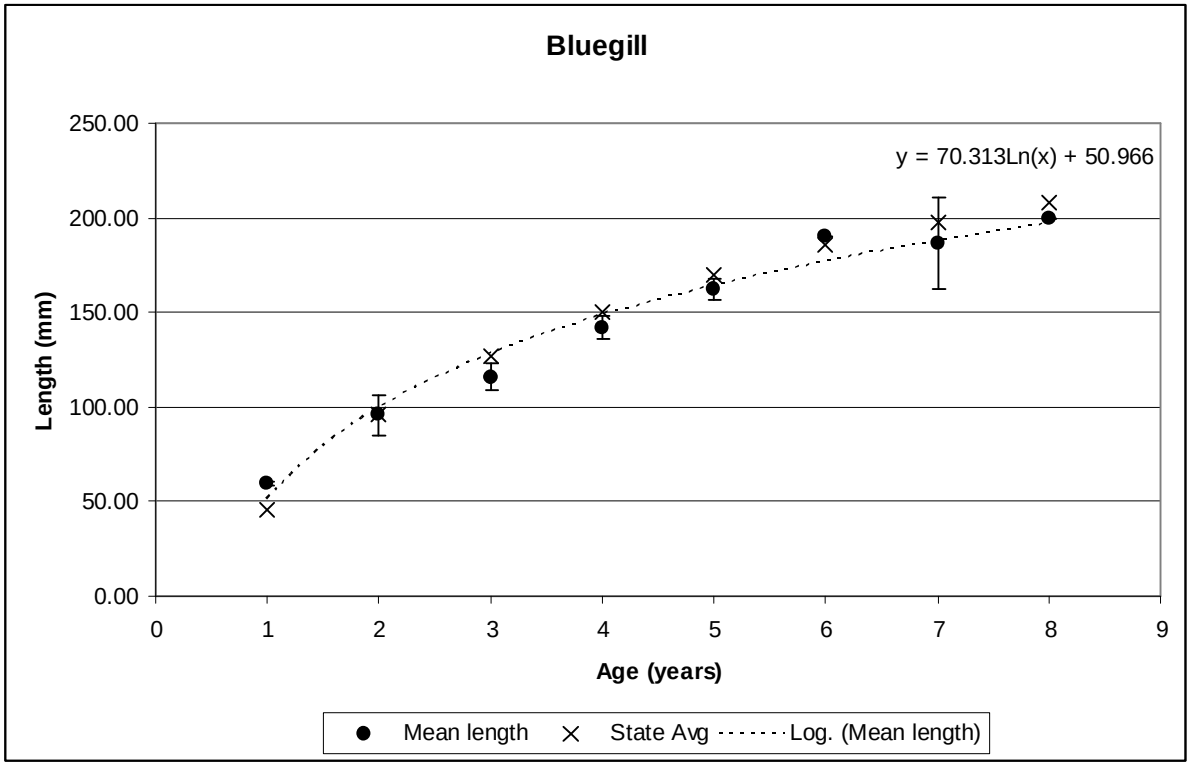


Figure 2. Comparison between mean length of bluegill in Horsehead and John Brown lakes to Michigan state average length for different age classes.

These results indicate that growth of 1–2 year-old bluegill was slightly faster than the state average, but growth becomes slower than the state average for bluegill > 3 years old. The slower growth rates in older bluegill could be due to competition for food resources between themselves and other fish. The bluegill in Horsehead and John Brown lakes have a growth index of -0.12, which means that they are growing an average of 0.12 inches below the statewide average. Satisfactory growth indices are in the range of +0.5 to -0.5 inches for panfish. Thus, the bluegill are growing rather slowly, but satisfactorily.

Our results were consistent with those of the survey in 1997, which concluded that the bluegill size was lower than that of most lakes in the surrounding area.

Largemouth Bass

Most of the largemouth bass caught were in the 2-year age class; however, numbers caught in each age class were relatively low. The oldest bass caught was 11 years old and 484 mm (19 inches) (Table 2).

Table 2. Number and percent of individual largemouth bass sampled in different age classes. Length was recorded in mm, but also reported in inches. S.E. indicates standard error, a measure of variability.

Largemouth Bass					
Age	Number	Percent	Mean length	S.E.	Length (in)
1	0	0.0			
2	4	23.5	167.50	36.21	6.59
3	2	11.8	224.00	46.00	8.82
4	3	17.6	297.30	14.72	11.70
5	3	17.6	327.33	1.33	12.89
6	3	17.6	351.67	15.62	13.85
7	1	5.9	419.00		16.50
11	1	5.9	484.00		19.06
Total	17	100			

The average length for largemouth bass in different age classes in Horsehead and John Brown lakes was slightly less than the state average, but the differences were not

statistically significant (i.e., note the overlapping error bars; Figure 3). The equation to calculate growth for largemouth bass is the following: length = 191.28 * ln(age) + 25.924. Largemouth bass in Horsehead and John Brown lakes grow approximately 130 mm (5 inches) the first 2 years, and 50–75 mm (2–3 inches) in years 2 and 3. Growth slows to < 30 mm (1.2 inches) per year in 6 year-old largemouth bass and rates continue to decrease thereafter. These results are also consistent with those from the 1997 survey, which states that "the population of largemouth bass to 14 inches appears very good." Growth index was not calculated for largemouth bass because there were < 5 individuals sampled in each age class.

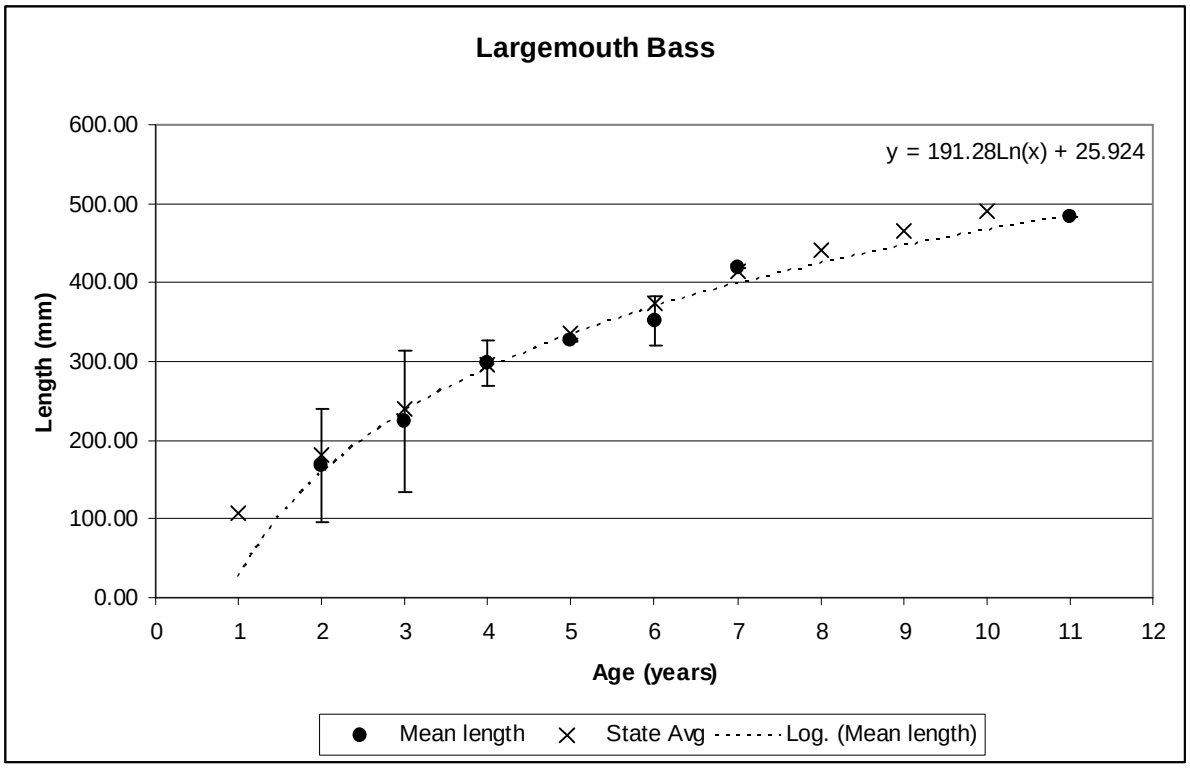


Figure 3. Comparison between mean length of largemouth bass in Horsehead and John Brown lakes to Michigan state average length for different age classes.

Pumpkinseed

Most (57.1%, n = 12) of the pumpkinseeds sampled were 4–5 years old. The oldest caught was 7 and was 197 mm (7.8 in) (Table 3).

Table 3. Number and percent of individual pumpkinseed sunfish sampled in different age classes. Length was recorded in mm, but also reported in inches. S.E. indicates standard error, a measure of variability.

Pumpkinseed					
Age	Frequency	Percent	Mean length	S.E.	Length (in)
1	2	9.5	73.00	3.00	2.87
2	1	4.8	115.00		4.53
3	3	14.3	116.33	5.36	4.58
4	5	23.8	139.00	4.53	5.47
5	7	33.3	168.14	5.54	6.62
6	2	9.5	173.50	18.50	6.83
7	1	4.8	197.00		7.76
Total	21	100			

The average length for pumpkinseeds was higher than the state average for fish in the 1-year, 2-year, 5-year, 6-year, and 7-year age classes, and was significantly higher in the 1-yeare-old age class. Length of 3- and 4-year-old pumpkinseeds was consistent with state averages. The equation to calculate growth for pumpkinseeds in Horsehead and John Brown lakes is the following: length = 60.1 * ln(age) + 67.087. Pumpkinseeds grow approximately 67 mm (2.6 in) during their first year, and growth slows to < 10 mm (0.4 in) per year by the time they reach 6 years old. Compared to state averages, 1-year-old pumpkinseeds in Horsehead and John Brown lakes are approximately 20 mm (0.8 in) larger than the state averages. Older fish (5 years) are 6.47 mm (0.25 in) larger than the state average. The pumpkinseed have a growth index of +0.5, which means that they are growing on average 0.05 inches above the state average. This growth index was only based on 2 age classes, though. Actual growth rates of pumpkinseeds > 1 year old are slightly lower than the statewide data indicate, but young fish start off larger, which possibly indicates a good zooplankton food base for young fish. These results are consistent with the 1997 survey,

which states that "except for bluegills, the panfish population is very good. The average size of panfish and the percent catchables is better than most lakes in the area."

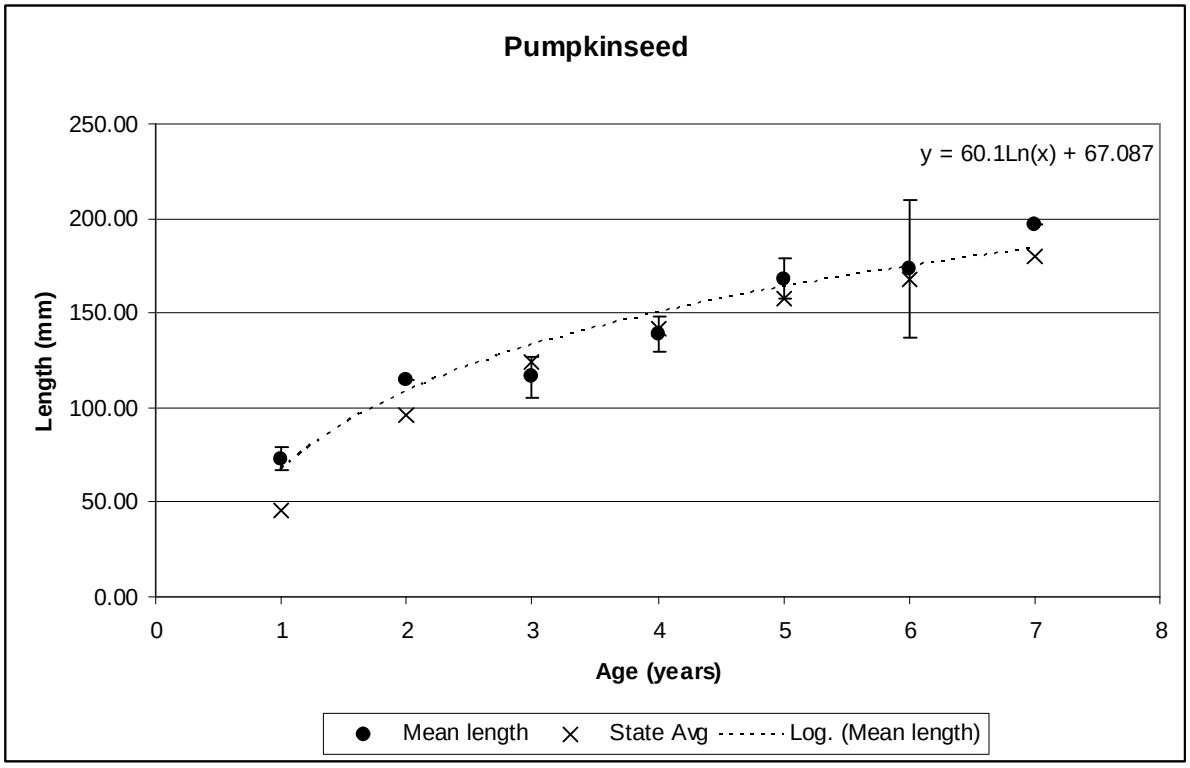


Figure 3. Comparison between mean length of pumpkinseed sunfish in Horsehead and John Brown lakes to Michigan state average length for different age classes.

Other fish species

Due to insufficient sample sizes, it was infeasible to conduct growth analyses on the following species: crappie, hybrid sunfish, northern pike, and perch. We caught 1 6-year-old crappie that was 305 mm (12 in) in length. The hybrid sunfish was 5 years old and 163 mm (6.41 in) long. We caught a total of 2 northern pike; one was caught in the fyke net at point 8 (see Figure 1) and the other was caught with hook and line. The 6-year old was 457 mm (18 in) and the 11-year-old was 737 mm (29 in). Three perch were caught: a 2-year old that was 94 mm (3.7 in), a 3-year-old that was 176 mm (6.9 in), and a 7-year old that was 250 mm

(9.8 in). Catch success rates were lower during this survey than in previous surveys. For instance, according to the 1997 report, the trap net catch rates increased from the 1981 survey. There were 15 pike caught in 6 nets in 1997, but only 1 was caught in this 2007 survey.

DISCUSSION AND RECOMMENDATIONS

Sampling gear

Fyke nets have been used in previous surveys at Horsehead and John Brown lakes; however as with any sampling procedures, there is some inherent bias associated with use of fyke nets for sampling fish populations, which could have contributed to the low capture rates in several fish species (e.g., largemouth bass, perch, northern pike) and lack of representation of certain fish species (e.g, walleye; Rogers et al. 2003). First, natural variations in weather and season affect fish behavior. Our survey was conducted at the end of May, whereas previous surveys conducted by the DNR were held in early May. Temperatures were much different during our survey than they were in 1988 and 1997. During the 1988 survey, which was conducted May 10–12, average air temperature was 58°F, and the water surface temperature was 57 °F. During the 1997 survey, the air temperature was between 51–52°F (water temperature information was not provided). During our survey, air temperatures averaged in the upper 70s to 80s, which were high for that time of year. A week or so prior to the survey, temperatures increased rapidly following a cold spell; thus shallow water temperatures increased rapidly to temperatures around 80°F. These changes likely affected fish behavior and location of fish in the lake. For instance, walleye, perch, and pike prefer cooler water temperatures and likely remained in deeper water. Bass prefer to spawn in 65–70°F water, which may be at deep (10–12 ft) depths in warmer weather.

A second potential bias associated with use of fyke nets is selectivity. According to the *Guidelines for Interpretation of Lake Surveys* from the MDNR (Schneider 2000), largemouth bass are occasionally difficult to catch with nets. In certain seasons, fyke nets may be less effective than other methods when fish such as bluegill, crappie, walleye, and northern pike are located offshore, which was likely the case during our survey.

Third, capture of predatory fish and other predators (e.g., snapping turtles) may bias data if the predators consume fish already present in the trap. There were several instances during our survey when bowfin, bullhead, pike, or snapping turtles likely ate some of our "data".

We recommend to continue sampling the fish population, but to use multiple types of sampling gear if possible (e.g., fyke nets, hook and line, gill nets, trap nets, electrofishing). During the 1988 survey, gill nets were used to compliment the fyke net sampling effort. In 1997, trap nets were used, which are slightly different from fyke nets. Electrofishing is probably has the least sampling bias of all gear types (Schneider 2000) and should be used to sample fish if Horsehead Lake Association would like to gather more detailed population data such as density of fish species. Electrofishing would more efficiently capture largemouth bass, pike, and other fish that are not typically found close to shore during certain seasons or during certain weather conditions. Michigan State University, Department of Fisheries and Wildlife owns an electroshocking barge. Perhaps a project can be developed to combine undergraduate educational experiences through the Fish and Wildlife club with data collection for Horsehead Lake.

Despite the biases associated with the use of fyke nets, our data suggest that overall, the fishery at Horsehead and John Brown lakes appears relatively consistent with state averages and previous survey data for bluegill, largemouth bass, and pumpkinseed, although there are some small deviations from state averages. Bluegill growth is above state average for young fish, but slows and becomes slower than state average in older (>3 year-old fish). The problem of stunted bluegills in Michigan's inland water bodies is common (Garling 2002) and will be addressed below. We did not collect enough data for other species to make any definitive conclusions regarding their populations or growth.

Bluegill growth

Young bluegill forage on zooplankton. Because growth of young bluegill was good in Horsehead and John Brown lakes, we can probably assume that their zooplankton food base is also good. The stunted growth in older fish, however, may be attributed to 2 possible causes: populations of large predators (e.g., pike, walleye, largemouth bass) may be small, or dense stands of aquatic vegetation may be available to hide bluegills from predatory fish

(Garling 2002). Research has shown that bass are sight feeders, and cannot locate and capture bluegill in dense vegetation (Savino and Stein 1999). The stunting problem is a function of overabundance—basically, the more fish present in the lake, the less food is available for each individual. Continuing to stock bluegill will likely not increase growth or increase the number of catchable fish over time because increasing the number of fish in the lake further reduces the amount of food available per fish.

We did not conduct a habitat assessment to determine bluegill or largemouth bass habitat suitability or assess amount of vegetation present in the lake. We recommend conducting such an assessment. By conducting a habitat assessment, we can determine factors that are limiting populations. For instance, dense submersed vegetation that covers > 40% of a lake may inhibit use of bluegills as prey, thus contributing to stunted bluegill (Stuber et al. 1982). The habitat assessments should be conducted during summer.

Predatory fish

Garling (2002) recommends stocking large predators to reduce bluegill numbers; however, this may not be effective if there is too much aquatic vegetation. Although expensive, stocking large (> 6 inches) fingerlings of predatory fish, such as walleye, has been shown to be a feasible and effective management tool for increasing slow-growing bluegill populations (Schneider and Lockwood 2002). One consideration, however, is the relative abundance of soft-rayed fishes that could be preferred alternative prey to spiny-rayed bluegill. A density estimate with data collected from electrofishing or catch-per-effort may be useful for understanding relative abundance of fish in Horsehead and John Brown lakes.

Exotic species control

Exotic species in Horsehead Lake include zebra mussels and Eurasian milfoil. Exotic invasive species can change the ecology of lakes, such as zebra mussels increasing the clarity of lakes by filtering particulates from the water column or exotic milfoil increasing the amount of vegetative cover in lakes. We understand Horsehead Lake Association is taking precautionary and preventative measures to control exotic species and recommend continuing to do so. It is difficult to know the effects of these exotics on the fish communities in Horsehead and John Brown lakes without further research.

LITERATURE CITED

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Appendix 1. Raw data from fish survey on Horsehead and John Brown lakes conducted May 31 through June 2, 2007.

Date	Site#	Lattitude	Longitude	Species	Total Length (mm)	Age (yr)
5/15/2007	*9*	*43 40.259*	*085 15.294*	*Bluegill*	*123*	*4*
5/16/2007	*10*	*43 41.124*	*085 15.223*	*Largemouth Bass*	*270*	*3*
6/1/2007	1	43 40.902	85 15.900	Bluegill	74	1
6/1/2007	1	43 40.902	85 15.900	Bluegill	106	2
6/1/2007	1	43 40.902	85 15.900	Bluegill	170	4
6/1/2007	1	43 40.902	85 15.900	Largemouth Bass	164	2
6/1/2007	1	43 40.902	85 15.900	Pumpkinseed sunfish	176	5
6/1/2007	2	43 40.536	85 15.768	Rockbass	145	4
6/1/2007	2	43 40.536	85 15.768	Rockbass	140	4
6/1/2007	2	43 40.536	85 15.768	Rockbass	75	1
6/1/2007	2	43 40.536	85 15.768	Rockbass	188	6
6/1/2007	2	43 40.536	85 15.768	Bowfish (Dogfish)	570	N/A
6/1/2007	2	43 40.536	85 15.768	Bluegill	191	6
6/1/2007	3	43 40.296	85 15.840	Bluegill	57	1
6/1/2007	3	43 40.296	85 15.840	Bluegill	69	1
6/1/2007	3	43 40.296	85 15.840	Bluegill	75	1
6/1/2007	3	43 40.296	85 15.840	Bluegill	78	1
6/1/2007	3	43 40.296	85 15.840	Bluegill	95	2
6/1/2007	3	43 40.296	85 15.840	Bluegill	125	3
6/1/2007	3	43 40.296	85 15.840	Bluegill	119	3
6/1/2007	3	43 40.296	85 15.840	Bluegill	137	4
6/1/2007	3	43 40.296	85 15.840	Pumpkinseed sunfish	143	4
6/1/2007	3	43 40.296	85 15.840	Pumpkinseed sunfish	142	4
6/1/2007	4	43 40.341	85 15.340	Bluegill	174	5
6/1/2007	4	43 40.341	85 15.340	Bluegill	74	1
6/1/2007	4	43 40.341	85 15.340	Bluegill	152	4
6/1/2007	4	43 40.341	85 15.340	Bluegill	157	4
6/1/2007	4	43 40.341	85 15.340	Bluegill	144	4
6/1/2007	4	43 40.341	85 15.340	Bluegill	147	4
6/1/2007	4	43 40.341	85 15.340	Bluegill	151	4
6/1/2007	4	43 40.341	85 15.340	Bluegill	147	4
6/1/2007	4	43 40.341	85 15.340	Bluegill	139	4
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6/1/2007	4	43 40.341	85 15.340	Bluegill	118	3
6/1/2007	4	43 40.341	85 15.340	Bluegill	126	4
6/1/2007	4	43 40.341	85 15.340	Bluegill	118	3
6/1/2007	4	43 40.341	85 15.340	Bluegill	108	3

6/1/2007	4	43 40.341	85 15.340	Bluegill	74	1
6/1/2007	4	43 40.341	85 15.340	Bluegill	85	2
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6/1/2007	4	43 40.341	85 15.340	Bluegill	63	1
6/1/2007	4	43 40.341	85 15.340	Bluegill	69	1
6/1/2007	4	43 40.341	85 15.340	Bluegill	62	1
6/1/2007	4	43 40.341	85 15.340	Bluegill	75	1
6/1/2007	4	43 40.341	85 15.340	Bluegill	65	1
6/1/2007	4	43 40.341	85 15.340	Bluegill	72	1
6/1/2007	4	43 40.341	85 15.340	Bluegill	59	1
6/1/2007	4	43 40.341	85 15.340	Pumpkinseed sunfish	192	5
6/1/2007	4	43 40.341	85 15.340	Pumpkinseed sunfish	165	5
6/1/2007	4	43 40.341	85 15.340	Pumpkinseed sunfish	157	5
6/1/2007	4	43 40.341	85 15.340	Pumpkinseed sunfish	192	6
6/1/2007	4	43 40.341	85 15.340	Pumpkinseed sunfish	174	6
6/1/2007	4	43 40.341	85 15.340	Pumpkinseed sunfish	155	6
6/1/2007	4	43 40.341	85 15.340	Rockbass	76	1
6/1/2007	4	43 40.341	85 15.340	Rockbass	93	2
6/1/2007	4	43 40.341	85 15.340	Largemouth Bass	120	2
6/1/2007	5	43 40.612	85 15.505	Bluegill	~50	1
6/1/2007	5	43 40.612	85 15.505	Bluegill	~50	1
6/1/2007	5	43 40.612	85 15.505	Bluegill	~50	1
6/1/2007	5	43 40.612	85 15.505	Bluegill	~50	1
6/1/2007	5	43 40.612	85 15.505	Bluegill	~50	1
6/1/2007	5	43 40.612	85 15.505	Bluegill	~50	1
6/1/2007	5	43 40.612	85 15.505	Bluegill	~50	1
6/1/2007	5	43 40.612	85 15.505	Bluegill	~50	1
6/1/2007	5	43 40.612	85 15.505	Bluegill	~50	1
6/1/2007	5	43 40.612	85 15.505	Bluegill	~50	1
6/1/2007	5	43 40.612	85 15.505	Bluegill	~50	1
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6/1/2007	5	43 40.612	85 15.505	Bluegill	~50	1
6/1/2007	5	43 40.612	85 15.505	Bluegill	~50	1
6/1/2007	5	43 40.612	85 15.505	Bluegill	~50	1
6/1/2007	5	43 40.612	85 15.505	Bluegill	~50	1

6/1/2007	5	43 40.612	85 15.505	Bluegill	~50	1
6/1/2007	5	43 40.612	85 15.505	Bluegill	~50	1
6/1/2007	5	43 40.612	85 15.505	Bluegill	~50	1
6/1/2007	5	43 40.612	85 15.505	Bluegill	~50	1
6/1/2007	5	43 40.612	85 15.505	Bluegill	~50	1
6/1/2007	5	43 40.612	85 15.505	Bluegill	~50	1
6/1/2007	5	43 40.612	85 15.505	Bluegill	~50	1
6/1/2007	5	43 40.612	85 15.505	Bluegill	~50	1
6/1/2007	5	43 40.612	85 15.505	Bluegill	~50	1
6/1/2007	5	43 40.612	85 15.505	Bluegill	~50	1
6/1/2007	5	43 40.612	85 15.505	Bluegill	~50	1
6/1/2007	5	43 40.612	85 15.505	Bluegill	~50	1
6/1/2007	5	43 40.612	85 15.505	Bluegill	~50	1
6/1/2007	5	43 40.612	85 15.505	Bluegill	~50	1
6/1/2007	5	43 40.612	85 15.505	Bluegill	~50	1
6/1/2007	6	43 41.087	85 15.766	Pumpkinseed sunfish	156	5
6/1/2007	6	43 41.087	85 15.766	Pumpkinseed sunfish	127	3
6/1/2007	6	43 41.087	85 15.766	Pumpkinseed sunfish	110	3
6/1/2007	6	43 41.087	85 15.766	Pumpkinseed sunfish	70	1
6/1/2007	6	43 41.087	85 15.766	Bluegill	115	4
6/1/2007	6	43 41.087	85 15.766	Bluegill	64	1
6/1/2007	6	43 41.087	85 15.766	Bluegill	82	2
6/1/2007	6	43 41.087	85 15.766	Bluegill	71	1
6/1/2007	6	43 41.087	85 15.766	Bluegill	104	2
6/1/2007	6	43 41.087	85 15.766	Bluegill	127	3
6/1/2007	6	43 41.087	85 15.766	Bluegill	80	1
6/1/2007	6	43 41.087	85 15.766	Bluegill	140	4
6/1/2007	6	43 41.087	85 15.766	Bluegill	65	1
6/1/2007	6	43 41.087	85 15.766	Bluegill	65	1
6/1/2007	6	43 41.087	85 15.766	Bluegill	81	2
6/1/2007	6	43 41.087	85 15.766	Bluegill	65	1
6/1/2007	6	43 41.087	85 15.766	Bluegill	81	2
6/1/2007	6	43 41.087	85 15.766	Bluegill	65	1
6/1/2007	6	43 41.087	85 15.766	Bluegill	65	1
6/1/2007	6	43 41.087	85 15.766	Bluegill	60	1
6/1/2007	6	43 41.087	85 15.766	Bluegill	70	1
6/1/2007	6	43 41.087	85 15.766	Bluegill	66	1
6/1/2007	6	43 41.087	85 15.766	Bluegill	70	1
6/1/2007	6	43 41.087	85 15.766	Bluegill	60	1
6/1/2007	6	43 41.087	85 15.766	Bluegill	60	1
6/1/2007	6	43 41.087	85 15.766	Bluegill	65	1
6/1/2007	6	43 41.087	85 15.766	Bluegill	65	1
6/1/2007	6	43 41.087	85 15.766	Bluegill	63	1
6/1/2007	6	43 41.087	85 15.766	Bluegill	66	1
6/1/2007	6	43 41.087	85 15.766	Bluegill	62	1

6/1/2007	6	43 41.087	85 15.766	Bluegill	68	1
6/1/2007	6	43 41.087	85 15.766	Bluegill	58	1
6/1/2007	6	43 41.087	85 15.766	Bluegill	60	1
6/1/2007	6	43 41.087	85 15.766	Bluegill	60	1
6/1/2007	6	43 41.087	85 15.766	Bluegill	60	1
6/1/2007	6	43 41.087	85 15.766	Bluegill	60	1
6/1/2007	6	43 41.087	85 15.766	Bluegill	60	1
6/1/2007	7	43 41.136	85 15.444	Bluegill	119	2
6/1/2007	7	43 41.136	85 15.444	Bluegill	64	1
6/1/2007	7	43 41.136	85 15.444	Bluegill	64	1
6/1/2007	7	43 41.136	85 15.444	Bluegill	64	1
6/1/2007	7	43 41.136	85 15.444	Bluegill	62	1
6/1/2007	7	43 41.136	85 15.444	Bluegill	65	1
6/1/2007	7	43 41.136	85 15.444	Bluegill	59	1
6/1/2007	7	43 41.136	85 15.444	Bluegill	63	1
6/1/2007	7	43 41.136	85 15.444	Bluegill	54	1
6/1/2007	7	43 41.136	85 15.444	Bluegill	65	1
6/1/2007	7	43 41.136	85 15.444	Bluegill	64	1
6/1/2007	7	43 41.136	85 15.444	Bluegill	61	1
6/1/2007	7	43 41.136	85 15.444	Bluegill	63	1
6/1/2007	7	43 41.136	85 15.444	Bluegill	57	1
6/1/2007	7	43 41.136	85 15.444	Bluegill	58	1
6/1/2007	7	43 41.136	85 15.444	Bluegill	68	1
6/1/2007	7	43 41.136	85 15.444	Bluegill	60	1
6/1/2007	7	43 41.136	85 15.444	Bluegill	62	1
6/1/2007	7	43 41.136	85 15.444	Bluegill	74	1
6/1/2007	7	43 41.136	85 15.444	Bluegill	57	1
6/1/2007	8	43 41.160	85 15.156	Pumpkinseed sunfish	115	2
6/1/2007	8	43 41.160	85 15.156	Bluegill	136	3
6/1/2007	8	43 41.160	85 15.156	Bluegill	140	4
6/1/2007	8	43 41.160	85 15.156	Bluegill	70	1
6/1/2007	8	43 41.160	85 15.156	Bluegill	150	4
6/1/2007	8	43 41.160	85 15.156	Bluegill	165	5
6/1/2007	8	43 41.160	85 15.156	Bluegill	65	1
6/1/2007	8	43 41.160	85 15.156	Bluegill	62	1
6/1/2007	8	43 41.160	85 15.156	Bluegill	60	1
6/1/2007	8	43 41.160	85 15.156	Bluegill	63	1
6/1/2007	8	43 41.160	85 15.156	Bluegill	70	1
6/1/2007	8	43 41.160	85 15.156	Bluegill	68	1
6/1/2007	8	43 41.160	85 15.156	Bluegill	67	1
6/1/2007	8	43 41.160	85 15.156	Bluegill	63	1
6/1/2007	8	43 41.160	85 15.156	Bluegill	63	1
6/1/2007	8	43 41.160	85 15.156	Bullhead	210	N/A
6/1/2007	8	43 41.160	85 15.156	Bullhead	200	N/A

6/1/2007	8	43 41.160	85 15.156	Bowfish (Dogfish)	568	N/A
6/1/2007	N/A	43 40.279	85 15.298	Bluegill	165	4
6/1/2007	N/A	43 40.279	85 15.298	Bluegill	167	4
6/1/2007	N/A	43 40.279	85 15.298	Bluegill	119	3
6/1/2007	N/A	43 40.279	85 15.298	Bluegill	162	5
6/1/2007	N/A	43 40.279	85 15.298	Pumkinseed sunfish	144	4
6/1/2007	N/A	43 40.279	85 15.298	Largemouth Bass	382	6
6/1/2007	N/A	Tice's Deck	Tice's Deck	Bluegill	161	N/A
6/1/2007	N/A	Tice's Deck	Tice's Deck	Bluegill	190	6
6/1/2007	N/A	Tice's Deck	Tice's Deck	Bluegill	127	3
6/1/2007	N/A	Tice's Deck	Tice's Deck	Bluegill	182	5
6/1/2007	N/A	Tice's Deck	Tice's Deck	Pumkinseed sunfish	197	7
6/1/2007	N/A	Tice's Deck	Tice's Deck	Pumkinseed sunfish	145	4
6/1/2007	N/A	Tice's Deck	Tice's Deck	Rockbass	195	4
6/1/2007	N/A	Dispersed	Dispersed	Largemouth Bass	271	2
6/1/2007	N/A	Dispersed	Dispersed	Largemouth Bass	326	5
6/1/2007	N/A	Dispersed	Dispersed	Largemouth Bass	326	5
6/1/2007	N/A	Dispersed	Dispersed	Largemouth Bass	484	11
6/1/2007	N/A	Dispersed	Dispersed	Largemouth Bass	305	4
6/1/2007	N/A	Dispersed	Dispersed	Largemouth Bass	419	7
6/1/2007	N/A	Dispersed	Dispersed	Largemouth Bass	343	6
6/1/2007	N/A	Dispersed	Dispersed	Largemouth Bass	279	4
6/1/2007	N/A	Dispersed	Dispersed	Largemouth Bass	330	6
6/1/2007	N/A	Dispersed	Dispersed	Largemouth Bass	178	3
6/1/2007	N/A	Dispersed	Dispersed	Largemouth Bass	330	5
6/1/2007	N/A	Dispersed	Dispersed	Largemouth Bass	254	4
6/1/2007	N/A	Dispersed	Dispersed	Pumpkinseed sunfish	121	4
6/1/2007	N/A	Dispersed	Dispersed	Pumpkinseed sunfish	179	5
6/1/2007	N/A	Dispersed	Dispersed	Bluegill	220	7
6/1/2007	N/A	Dispersed	Dispersed	Perch	176	3
6/1/2007	N/A	Dispersed	Dispersed	Perch	250	7
6/1/2007	N/A	Dispersed	Dispersed	Rockbass	178	6
6/1/2007	N/A	Dispersed	Dispersed	Crappie	305	6
6/1/2007	N/A	Dispersed	Dispersed	Northern Pike	457	6
6/2/2007	1	43 40.902	85 15.900	Bluegill	100	3
6/2/2007	1	43 40.902	85 15.900	Rockbass	142	4
6/2/2007	1	43 40.902	85 15.900	Rockbass	144	4
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1

6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	~60	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	71	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	70	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	70	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	71	1
6/2/2007	2	43 40.536	85 15.768	Bluegill	73	1

6/2/2007	2	43 40.536	85 15.768	Bullhead (Yellow)	270	N/A
6/2/2007	2	43 40.536	85 15.768	Hybrid Sunfish	163	5
6/2/2007	3	N/A	N/A	N/A	N/A	N/A
6/2/2007	4	43 40.341	85 15.340	Bluegill	117	3
6/2/2007	4	43 40.341	85 15.340	Bluegill	68	1
6/2/2007	4	43 40.341	85 15.340	Perch	94	2
6/2/2007	4	43 40.341	85 15.340	Pumpkinseed sunfish	152	5
6/2/2007	4	43 40.341	85 15.340	Rockbass	54	1
6/2/2007	5	43 40.612	85 15.340	Bluegill	~60	1
6/2/2007	5	43 40.612	85 15.340	Bluegill	~60	1
6/2/2007	5	43 40.612	85 15.340	Bluegill	~60	1
6/2/2007	5	43 40.612	85 15.340	Bluegill	~60	1
6/2/2007	5	43 40.612	85 15.340	Bluegill	~60	1
6/2/2007	5	43 40.612	85 15.340	Bluegill	~60	1
6/2/2007	5	43 40.612	85 15.340	Bluegill	~60	1
6/2/2007	5	43 40.612	85 15.340	Bluegill	~60	1
6/2/2007	5	43 40.612	85 15.340	Bluegill	~60	1
6/2/2007	5	43 40.612	85 15.340	Bluegill	~60	1
6/2/2007	5	43 40.612	85 15.340	Bluegill	~60	1
6/2/2007	5	43 40.612	85 15.340	Bluegill	~60	1
6/2/2007	5	43 40.612	85 15.340	Bluegill	~60	1
6/2/2007	5	43 40.612	85 15.340	Bluegill	~60	1
6/2/2007	5	43 40.612	85 15.340	Bluegill	~60	1
6/2/2007	5	43 40.612	85 15.340	Bluegill	~60	1
6/2/2007	5	43 40.612	85 15.340	Bluegill	~60	1
6/2/2007	5	43 40.612	85 15.340	Bluegill	~60	1
6/2/2007	5	43 40.612	85 15.340	Bluegill	~60	1
6/2/2007	5	43 40.612	85 15.340	Bluegill	~60	1
6/2/2007	5	43 40.612	85 15.340	Bluegill	~60	1
6/2/2007	5	43 40.612	85 15.340	Bluegill	~60	1
6/2/2007	5	43 40.612	85 15.340	Bluegill	~60	1
6/2/2007	5	43 40.612	85 15.340	Bluegill	75	1
6/2/2007	5	43 40.612	85 15.340	Bluegill	73	1
6/2/2007	5	43 40.612	85 15.340	Bullhead (Yellow)	~60	N/A
6/2/2007	5	43 40.612	85 15.340	Bullhead (Brown)	~60	N/A
6/2/2007	5	43 40.612	85 15.340	Bullhead (Brown)	~60	N/A
6/2/2007	5	43 40.612	85 15.340	Crawfish	~60	N/A
6/2/2007	5	43 40.612	85 15.340	Crawfish	~60	N/A
6/2/2007	5	43 40.612	85 15.340	Pumpkinseed sunfish	76	1
6/2/2007	5	43 40.612	85 15.340	Rockbass	~60	1
6/2/2007	5	43 40.612	85 15.340	Rockbass	~60	1
6/2/2007	5	43 40.612	85 15.340	Rockbass	~60	1
6/2/2007	5	43 40.612	85 15.340	Rockbass	~60	1

6/2/2007	5	43 40.612	85 15.340	Rockbass	~60	1
6/2/2007	5	43 40.612	85 15.340	Rockbass	~60	1
6/2/2007	6	43 41.087	85 15.766	Bullhead (Yellow)	255	N/A
6/2/2007	6	43 41.087	85 15.766	Bullhead (Yellow)	266	N/A
6/2/2007	6	43 41.087	85 15.766	Bullhead (Yellow)	234	N/A
6/2/2007	6	43 41.087	85 15.766	Bullhead (Yellow)	245	N/A
6/2/2007	7	43 41.136	85 15.444	Bluegill	145	5
6/2/2007	7	43 41.136	85 15.444	Bluegill	154	5
6/2/2007	7	43 41.136	85 15.444	Bluegill	200	8
6/2/2007	7	43 41.136	85 15.444	Bluegill	162	5
6/2/2007	7	43 41.136	85 15.444	Bluegill	176	7
6/2/2007	7	43 41.136	85 15.444	Bluegill	162	7
6/2/2007	7	43 41.136	85 15.444	Bluegill	123	4
6/2/2007	7	43 41.136	85 15.444	Bluegill	163	5
6/2/2007	7	43 41.136	85 15.444	Bluegill	147	4
6/2/2007	7	43 41.136	85 15.444	Largemouth Bass	115	2
6/2/2007	7	43 41.136	85 15.444	Pumpkinseed sunfish	112	3
6/2/2007	8	43 41.160	85 15.156	Bluegill	162	5
6/2/2007	8	43 41.160	85 15.156	Bluegill	189	7
6/2/2007	8	43 41.160	85 15.156	Bluegill	160	5
6/2/2007	8	43 41.160	85 15.156	Bluegill	143	4
6/2/2007	8	43 41.160	85 15.156	Bluegill	149	4
6/2/2007	8	43 41.160	85 15.156	Bluegill	109	3
6/2/2007	8	43 41.160	85 15.156	Northern Pike	737	11