FISH SURVEY REPORT

Autumn Lake

Prepared For:

Raintree Plantation POA

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Hillsboro, MO 63050

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Introduction

A survey of the fish community and other physical, biological, and chemical factors directly affecting the fish community was completed at Autumn Lake on May 6, 2026. The major objectives of this survey and report are:

1. To provide a current status report on the fish community of the lake.
2. To compare the current characteristics of the fish community with established indices.
3. To provide recommendations for management strategies to enhance or sustain the sport fish community.

Water Chemistry

When managing an aquatic ecosystem the quality of water should always be considered first. If a lake or pond is perfectly constructed with abundant food and habitat, but has poor water quality, the fishery will ultimately suffer and never reach it's full potential. Although oxygen is typically not a year-round issue there are certain situations that can cause oxygen to drop to detrimental levels. If parameters such as pH or alkalinity are too low or too high it can put tremendous stress on the organisms living in it or even create a toxic environment all together. Other important parameters to consider are nitrogen and phosphorus levels. Nitrogen and phosphorus are two major nutrients that drive the plant growth in an aquatic ecosystem. If the ratio of nitrogen to phosphorus is below 17:1 there is potential for blue-green algae to become abundant. These species of algae can create a stressful environment for fish due to disruption of the food web.

Table 1. Selected lake and water quality parameters.

	Surface	Ideal Range
Acres	125	-
Temperature (F)	67.6	-
Dissolved Oxygen (ppm)	8.86	5.0+
pH	8.36	6-9
Alkalinity (ppm)	126	20+
Total Hardness (ppm)	122	20+
Total Phosphorus (ppm)	0	0.01-0.09
Total Nitrogen (ppm)	0.03	1.0-10.0

The results of selected physio-chemical parameters from this waterbody are presented in Table 1. Dissolved oxygen, pH, alkalinity, and hardness levels were all in acceptable ranges. The lake had sufficient oxygen (>5.0 ppm) down to 30 feet. The temperature profile has decreasing temperature with increasing depth (Figure 1).

The nitrogen to phosphorus ratio could not be calculated because phosphorus concentrations were below detectable limits at the time of sampling. Overall, water quality parameters indicate this waterbody appears to be capable of supporting a healthy fish population.

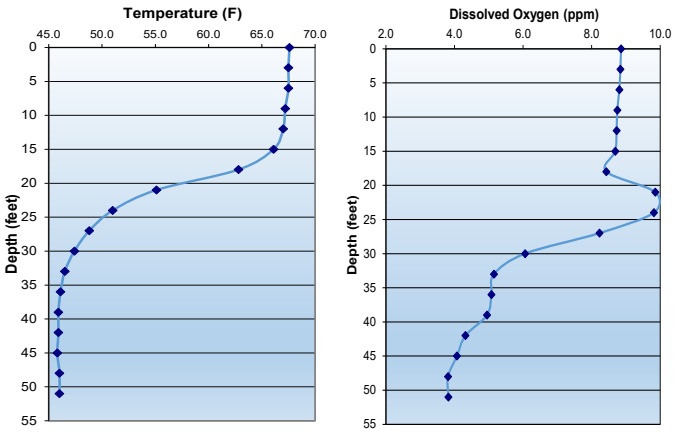
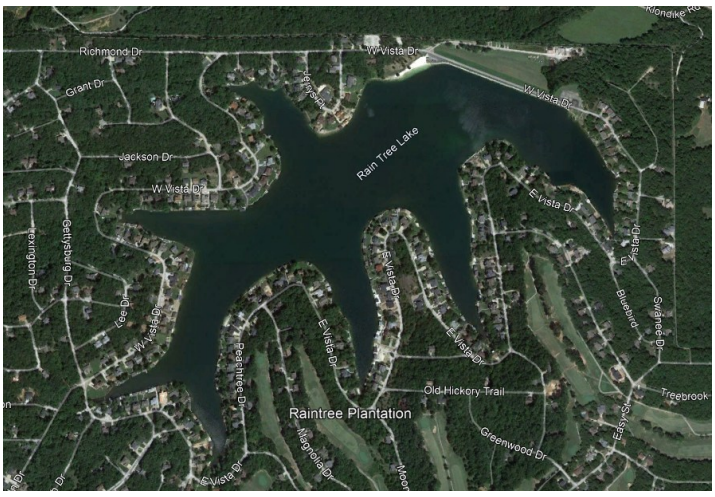


Figure 1. Temperature and Dissolved Oxygen profiles.



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Fish Collection

Fish sampling was done with the use of an electrofishing boat. Electrofishing is simply the use of electricity to capture fish for the evaluation of population status. Electrofishing equipment used in this survey consisted of a 16-foot aluminum boat equipped with a Midwest Lake Electrofishing Systems Infinity Box powered by a 6500-watt portable generator and two booms mounted with Wisconsin style rings. Electrofishing was done around the entirety of the shoreline and totaled 75 minutes of shocking.

All fish collected were placed in water filled containers aboard the sampling boat for processing. Each fish collected was measured to the nearest half-inch. Five fish in each half-inch group were weighed to determine average and relative weights. Relative weight is a condition factor used to determine the overall plumpness of an individual fish. Relative weight values from 90-100 indicate good condition while anything under 90 is considered in poor condition. It can be assumed that fish with higher relative weights are finding enough food and are growing at a higher rate than fish with a lower relative weight.

A total of 402 fish weighing 226.98 pounds and representing six species was collected from Autumn Lake. The relative abundance of these species can be found in figure 2 and a full data table can be found at the end of this report. The data collected are adequate for management implications; however, there will be unanswered questions regarding aspects of the fish population and other related factors of the biological community in the lake. All fish numbers used in the report are based on the samples collected and should not be interpreted to be absolute or estimated numbers of fish in the lake.

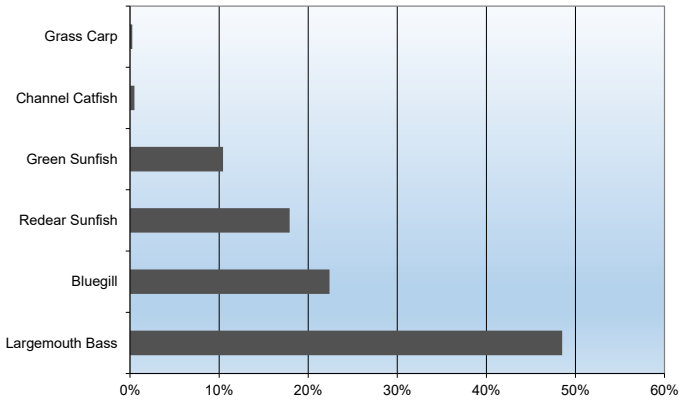

Figure 2. Relative abundance of species collected.

Redear Sunfish caught during survey.

Largemouth Bass caught during survey.

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Predator-Prey Relationship

Even the most diverse systems can be broken down into predator-prey relationships. Often times the Largemouth Bass-Bluegill relationship is the most important. Bluegill are a great prey item for Largemouth Bass because they spawn multiple times a year and are continually creating food for Largemouth Bass. Managing for one species typically involves influencing both and as one of these populations change the other typically changes with it. In a balanced state both Largemouth Bass and Bluegill can experience proper growth rates.

Bluegill

Autumn Lake—Bluegill

Bluegill were collected at a rate of 72 fish per hour during the survey, indicating relatively limited forage abundance for a lake supporting such a large Largemouth Bass population. Approximately 28% of sampled Bluegill measured between 3–6 inches, suggesting limited representation within an important forage size class supporting intermediate-sized Largemouth Bass growth. Approximately 37% exceeded 6 inches in length, indicating that some individuals were successfully escaping predation and recruiting into larger size categories. Average Bluegill relative weight was 110, suggesting excellent body condition and abundant food resources for the Bluegill that remain within the system.

Bluegill are growing to large sizes, as there were many 8.0-9.0 inch individuals collected. This is providing pan fishing anglers good quality fish to target.

In terms of a forage base, the Bluegill are extremely lacking. Largemouth Bass out numbered Bluegill in the sample by more than 2:1. A ratio of more predators compared to prey will always lead to slow growing predators.

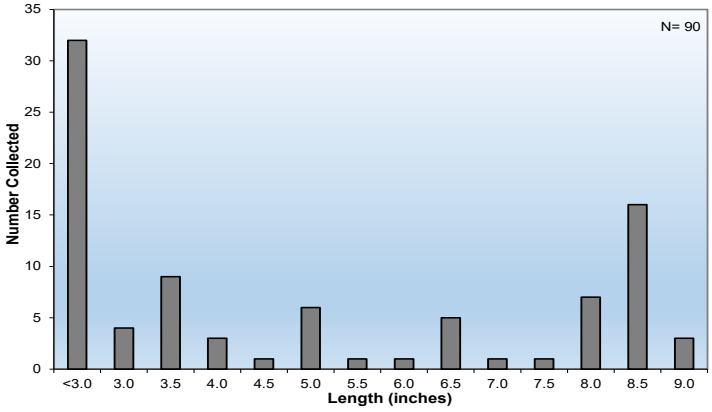

Figure 3. Length frequency distribution of Bluegill

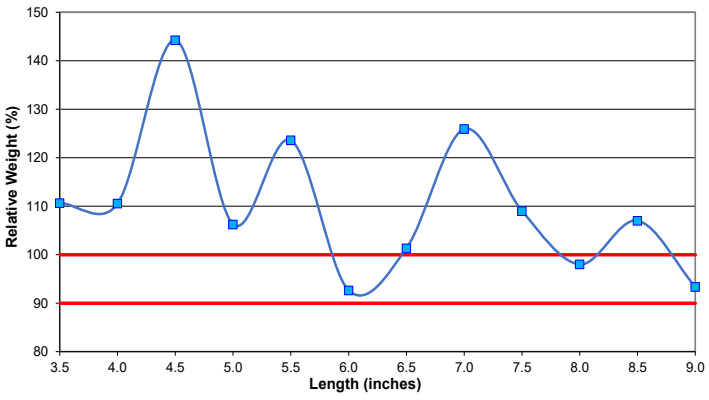

Figure 4. Bluegill relative weights

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Predator-Prey Relationship

Largemouth Bass are an opportunistic predator that will eat just about any species of fish they can catch. To keep a Largemouth Bass growing properly there needs to be several different sizes of forage available. This allows the bass to continually find the optimal size of prey as it continues to grow. When the optimal size of prey is available the fish can conserve energy, resulting in a higher growth rate. If the prey is too small a Largemouth Bass could potentially spend more energy chasing a meal than it gains by eating it. This results in skinny and slow growing fish. Managing a forage base to create a variety of sizes is key to creating a healthy and balanced Largemouth Bass population.

Largemouth Bass

Autumn Lake—Largemouth Bass

Largemouth Bass were collected at a rate of 156 fish per hour during the electrofishing survey, indicating an extremely abundant predator population and severe competition among individuals. Relative weights averaged 87 for Bass between 8–12 inches, 82 for Bass between 12–16 inches, and 81 for Bass greater than 16 inches, demonstrating that Largemouth Bass across multiple size classes were struggling to locate sufficient forage resources to maintain desirable body condition. Approximately 23% of sampled Largemouth Bass exceeded a relative weight of 90, while only 2% exceeded a relative weight of 100, suggesting that competition for available food resources was limiting growth throughout much of the population. No Largemouth Bass exceeding 18 inches in length were collected during the survey, indicating limited recruitment into larger size classes and reduced opportunities for quality-size angling.

Largemouth Bass were stunted and overabundant at the time of the survey. Individuals were heavily accumulated within the 8–12 inch size classes. This high level of competition limits growth and contributes to poor relative weights. Without a reduction in these size classes, relatively few individuals are expected to recruit into larger size classes. Additionally, having more predators than prey will ultimately lead to an imbalanced fishery. When predator abundance exceeds the system's ability to produce forage, growth rates decline and competition intensifies throughout the Largemouth Bass population.

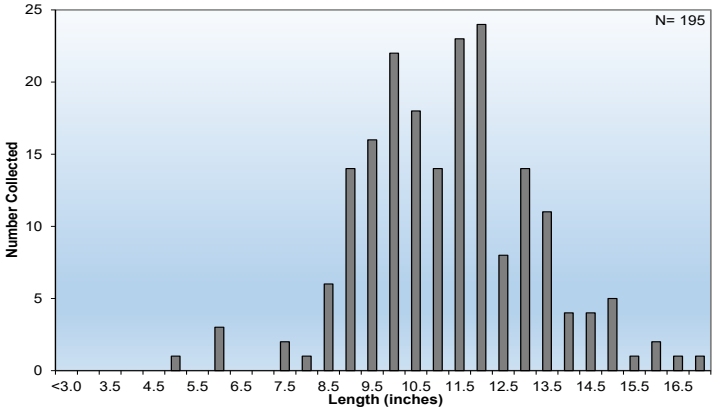

Figure 5. Length frequency distribution of Largemouth Bass

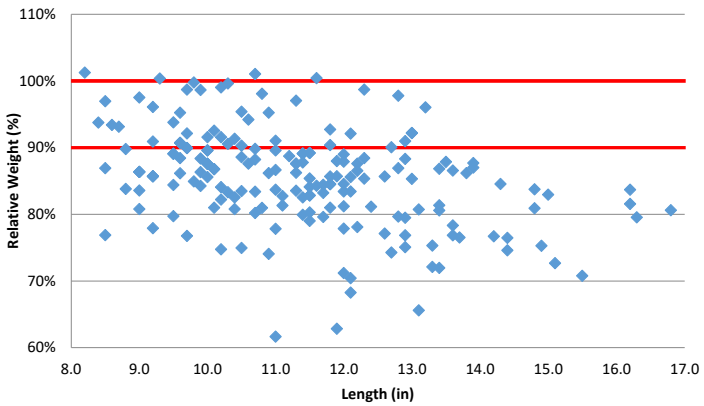

Figure 6. Largemouth Bass relative weights

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Harvest

Harvesting fish is often one of the most important and under utilized management practices in a pond or lake. Harvesting, or culling, fish is simply the act of intentionally removing fish from a specific population to decrease competition among the remaining individuals. The culture of catch and release bass fishing started in the 1970's and still has a strong hold on fisherman today. There is a misconception that taking a fish out of a system will be detrimental to the population and if released someone could catch that fish again after it has "grown up." The reality is in some situations there is too much competition and the next time that fish is caught it could be the exact same size a year later. By removing that fish, and others, it leaves more food available for the remaining individuals to continue to grow each and every year.

Example of Stunted Largemouth Bass

Ponds and lakes can both become overrun with predators or prey. Each scenario presents a different set of problems. In a predator (Largemouth Bass) dominant system prey populations are decimated and the lack of food results in slow or stunted growth. In a prey (Bluegill) dominated system spawning and recruitment success of other species can be negatively impacted due to egg predation or direct competition with young-of-year fish, along with slow growth within the population.

Fixing these issues requires targeted annual harvest. In an unbalanced system generally only one species requires a heavy amount of the harvest, while in a balanced system fish should be removed from most populations to maintain a continuous level of growth.

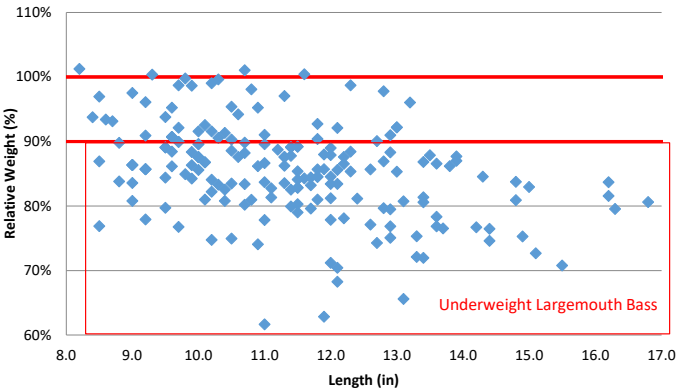

Figure 7. Largemouth Bass relative weights

Aggressive harvest of smaller Largemouth Bass is strongly recommended. Significant reductions in Largemouth Bass abundance will be necessary to alleviate competition for food resources and improve the overall balance of the fishery.

Bluegill and Redear harvest is permissible, but should be kept to a minimum. In order to move the fishery back towards a balance Bluegill and Redear need to become more abundant while Largemouth Bass are reduced.

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Structure and Habitat

Structure and habitat are an extremely important factor to consider no matter what body of water is being managed. Just like anything else, the amount of structure in a lake should be kept in moderation. Too much or too little can lead to predictable scenarios. When very little or no structure is available Largemouth Bass spend too much time roaming around looking for food instead of saving energy and waiting near a piece of structure for food to swim by. The other end of the spectrum allows so many places for Bluegill or other prey species to hide that Largemouth Bass can't efficiently catch their prey. In both scenarios Largemouth Bass tend to have low relative weights even with proper harvest rates in place. In most cases roughly 20% of the shoreline containing structure is sufficient. This number can vary depending on the complexity of the cover.

Adding structure to a pond can be beneficial in a variety of ways. It can be a great way to increase the survival of small juvenile fish. This provides a forage base with a wide range of sizes available for your predators. Another benefit of adding structure to a pond is that they attract fish. Strategically placing structure can give you places that you can reliably catch fish.

Fish structure can take many different forms . Aquatic vegetation, brush piles, Christmas trees, and a variety of man-made structures can all be utilized by fish. All of these different structure types have different benefits that make them good management options. Aquatic vegetation

Pickerelweed

Largemouth Bass utilizing a Mossback Root Wad Kit

grows on its own but can be hard to manage at times. Brush piles and Christmas trees are often free, but will break down over time and need to be replaced. Manufactured structure can be costly initially, but will last a lifetime. Variety is important when assessing structure in a body of water. Adding structures of varied complexity and in varied depth can help to provide habitat to a variety of fish at different stages of life.

Autum Lake had very little habitat at the time of the survey. The lack of habitat is playing a significant role in the lack of Bluegill and the low relative weights seen in Largemouth Bass.

Having complex habitat gives small forage fish areas to hide avoid predation long enough to recruit into the adult population, or at least grow into a more beneficial meal for Largemouth Bass. When a predator is eating a small meal on a regular basis they aren't receiving enough energy compared to the energy they spent to catch it. This is why having abundant Bluegill in the 3-6 inch size range is so important.

The lack of habitat also leads to poor relative weights for Largemouth Bass, due to a lack of areas to ambush their prey. Without habitat Largemouth Bass roam around and expend more energy looking for and chasing food.

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Summary/Recommendations

The fishery currently exhibits characteristics of a predator-heavy system dominated by an overcrowded Largemouth Bass population. Largemouth Bass abundance was extremely high, while poor relative weights across all sampled size classes indicated severe competition for available forage resources. The absence of larger Bass suggests that current predator densities are limiting the fishery's ability to consistently produce quality-size individuals. Predator abundance now exceeds available forage abundance, creating conditions that will continue to suppress Largemouth Bass growth until balance is restored.

Bluegill abundance remained relatively low for a system supporting such an overabundant Largemouth Bass population. Although the Bluegill that were collected exhibited excellent body condition, limited representation within the important 3–6 inch size range suggests that forage availability is restricting predator growth. Habitat limitations likely compound these issues, as available structure and spawning habitat were both below desirable levels.

There have been indications the lake used to contain a Threadfin Shad population. Threadfin Shad are a warm water species that does not tolerate cold conditions. This lake is too far north to expect any kind of long term population to persist. Regardless of temperature, the water column is much too clear to support any kind of truly consistent shad population (Gizzard Shad or Threadfin Shad). Lakes with a lack of productivity either have boom and bust shad populations where the population can crash at any time, or no shad population at all. While shad can be a good food source for Largemouth Bass, the boom and bust populations put a tremendous amount of stress on the system due to a food source being present for a few years and then disappearing for a few years. Bluegill are the much more stable and reliable forage species for this lake. Management moving forward should focus on improving the Bluegill population, which will lead to better Largemouth Bass growth.

Reducing the abundance of smaller Largemouth Bass should be the highest management priority. Decreasing competition within the Largemouth Bass population will improve growth rates, body condition, and increase the likelihood of recruiting fish into larger size classes.

Increasing habitat complexity should improve both forage production and predator efficiency. Habitat provides refuge for young fish while creating ambush opportunities for predators. Habitat improvements should focus on clusters of 7-8 pieces of habitat installed into a given area. The most cost effective, yet long term solution, is to use a mix of artificial and natural habitat. Creating sanctuary areas throughout the lake can make a huge impact over time. Due to the size of the lake it is recommended to start a habitat installation program. Create a budget line each year for habitat. Depending on the budget 2-10 areas could be installed each year. Over time the amount of area and the impact will grow to be significant. These habitat installation programs have proven to the most successful way to improve habitat on these larger fisheries. Allowing beneficial vegetation is also worth considering. Consider leaving low use areas untreated. Still, vegetation only provides habitat for portions of the year. Hard structure like artificial habitat and brush piles are present year around.

Supplemental forage stockings should focus on strengthening the prey base available to predators. Given the size of the lake stockings will have to be very large and consistent over multiple years to make a real impact. Improving habitat and harvest is extremely important or these large stockings will not be effective.

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Summary/Recommendations

The following recommendations, **listed in order of importance**, will help protect and enhance the fishery in Autumn Lake:

1. Harvest 1,500 Largemouth Bass less than 14.0 inches each of the next 3 years.
2. Create a Habitat Installation Program
    - Create a budget for habitat installation each year
    - Install 2-10 clusters of habitat with a mix of Mossback Habitat and natural brush piles
3. Allow vegetation growth in low use areas
4. Use current stocking budget towards habitat improvements
5. Conduct a Fisheries analysis survey in 2029.
    - Depending on harvest and habitat success a large scale forage stocking program can be considered
6. Harvest all Green Sunfish caught

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Other Species Present

Redear Sunfish (*Lepomis microlophus*)

Redear Sunfish are a member of the Centrarchidae (Sunfish) family. Redear Sunfish are not as fecund (reproductively successful) as Bluegill and rarely become overabundant. They can grow to large sizes and are regularly sought after by panfisherman. Redear Sunfish primarily feed on mollusks and invertebrates and have been shown in many cases to reduce levels of parasitism in fish populations.

Redear

Green Sunfish

Green Sunfish *Lepomis Cyanellus*

Green Sunfish are a member of the Centrarchidae (Sunfish) family. Green Sunfish can be aggressive and competitive with Bluegill and other species for food and resources therefore they are generally considered an undesirable species. Green Sunfish look superficially like Bluegill. They can easily be distinguished by their larger mouths and more rounded pectoral fins

Grass Carp (*Ctenopharyngoden Idella*)

Grass Carp are in the Cyprinidae (Minnow) family. Grass Carp are an invasive nonnative species that have been introduced to many waters across the United States and cause a variety of problems. Triploid Grass Carp are often stocked in pond and lake ecosystems to help manage aquatic plants. These Triploid Grass Carp on non-reproductive, which eliminates the risk of them becoming overpopulated. Grass Carp are rarely, if ever stocked with the goal of improving the overall fishery.

Grass Carp

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Other Species Present

Channel Catfish (*Ictalurus punctatus)*

Channel Catfish are members of the Ictaluridae family. Channel Catfish can be problematic to a fishery if overabundant, but in small or moderate abundances, rarely cause problems. They are often desirable sportfish and can be good table fare. Channel Catfish are typically not represented very well in electrofishing surveys, and can often be more abundant than the data shows. Channel Catfish often do not have a high level of natural reproduction in small ponds and some lakes, and

Channel Catfish

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Fish Collection Tables

SIZE GROUP (IN)	NUMBER	PERCENTAGE	AVERAGE WEIGHT (lbs.)	TOTAL WEIGHT (lbs.)	WS	RELATIVE WEIGHT
BLUEGILL						
<3.0	32	35.56%	0.01	0.32	-	-
3.0	4	4.44%	0.08	0.32	0.02	-
3.5	9	10.00%	0.03	0.27	0.03	111
4.0	3	3.33%	0.05	0.14	0.04	111
4.5	1	1.11%	0.09	0.09	0.06	144
5.0	6	6.67%	0.09	0.56	0.09	106
5.5	1	1.11%	0.15	0.15	0.12	124
6.0	1	1.11%	0.15	0.15	0.16	93
6.5	5	5.56%	0.21	1.07	0.21	101
7.0	1	1.11%	0.34	0.34	0.27	126
7.5	1	1.11%	0.37	0.37	0.34	109
8.0	7	7.78%	0.41	2.88	0.42	98
8.5	16	17.78%	0.55	8.80	0.51	107
9.0	3	3.33%	0.58	1.74	0.62	93
TOTAL	90			17.21		
LARGEMOUTH BASS						
5.0	1	0.51%	0.04	0.04	0.06	-
6.0	3	1.54%	0.11	0.32	0.10	-
7.5	2	1.03%	0.21	0.42	0.20	-
8.0	1	0.51%	0.27	0.27	0.25	110
8.5	6	3.08%	0.27	1.64	0.30	91
9.0	14	7.18%	0.32	4.46	0.36	88
9.5	16	8.21%	0.39	6.29	0.43	92
10.0	22	11.28%	0.45	9.83	0.50	89
10.5	18	9.23%	0.52	9.36	0.59	89
11.0	14	7.18%	0.57	7.97	0.68	84
11.5	23	11.79%	0.67	15.37	0.78	85
12.0	24	12.31%	0.74	17.74	0.90	82
12.5	8	4.10%	0.87	6.94	1.02	85
13.0	14	7.18%	0.97	13.61	1.16	84
13.5	11	5.64%	1.03	11.38	1.31	79
14.0	4	2.05%	1.23	4.90	1.47	83
14.5	4	2.05%	1.15	4.59	1.64	70
15.0	5	2.56%	1.42	7.12	1.83	78
15.5	1	0.51%	1.44	1.44	2.03	71
16.0	2	1.03%	1.94	3.87	2.25	86
16.5	1	0.51%	1.90	1.90	2.48	77
17.0	1	0.51%	2.12	2.12	2.73	78
TOTAL	195			131.58		

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Redear Sunfish

3.5	3	4.17%	0.00	0.00
4.0	1	1.39%	0.04	0.04
4.5	2	2.78%	0.00	0.00
5.0	3	4.17%	0.08	0.25
5.5	3	4.17%	0.00	0.00
6.0	3	4.17%	0.00	0.00
6.5	3	4.17%	0.20	0.61
7.0	4	5.56%	0.21	0.85
7.5	4	5.56%	0.29	1.16
8.0	5	6.94%	0.35	1.74
8.5	12	16.67%	0.43	5.21
9.0	10	13.89%	0.48	4.78
9.5	12	16.67%	0.52	6.22
10.0	3	4.17%	0.49	1.48
10.5	4	5.56%	0.76	3.04
TOTAL	72			25.37

Channel Catfish

27.0	2	100.00%	10.26	20.52
TOTAL	2			20.52

Green Sunfish

<3.0	4	9.52%	0.01	0.04
3.5	2	4.76%	0.04	0.07
4.0	3	7.14%	0.05	0.14
4.5	4	9.52%	0.06	0.22
5.0	8	19.05%	0.07	0.53
5.5	4	9.52%	0.13	0.51
6.0	1	2.38%	0.16	0.16
6.5	2	4.76%	0.24	0.48
7.0	5	11.90%	0.29	1.43
7.5	2	4.76%	0.35	0.69
8.0	4	9.52%	0.39	1.55
8.5	3	7.14%	0.49	1.48
TOTAL	42			7.30

Grass Carp

33.0	1	100.00%	25.00	25.00
TOTAL	1			25.00

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Species	Scientific Name	N	%N	Size Range (in.)	Total weight (lbs.)	%Wt.	N/hr.
Largemouth Bass	*Micropterus salmoides*	195	48.51%	5.0 - 17.0	131.58	57.97%	156
Bluegill	*Lepomis macrochirus*	90	22.39%	<3.0 - 9.0	17.21	7.58%	72
Redear Sunfish	*Lepomis microlophus*	72	17.91%	3.5 - 10.5	25.37	11.18%	58
Green Sunfish	*Lepomis cyanellus*	42	10.45%	<3.0 - 8.5	7.30	3.22%	34
Channel Catfish	*Ictalurus punctatus*	2	0.50%	27.0	20.52	9.04%	2
Grass Carp	*Ctenopharyngodon idella*	1	0.25%	33.0	25.00	11.01%	1
Total		402			226.98		

N = number of individuals
%N = percent number of a species as compared to the total number of fish collected
%Wt = percent weight of a species as compared to the total weight of all fish collected
N/hr. = catch rate of species (number of fish of a species collected per hour of electrofishing effort)