FISH SURVEY REPORT

Woodland Springs

December 9, 2016

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INTRODUCTION

Woodland Springs is a 46.24 acre lake located in Hamilton County, Indiana. A Standard Survey of the fish community and other physical, biological, and chemical factors directly affecting the fish community was completed at Woodland Springs on November 8, 2016. 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 and averages for Indiana lakes.
3. To provide recommendations for management strategies to enhance or sustain the sport fish community.

The data collected are adequate for the intended uses; 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. General information regarding water chemistry, fish communities, and methods are described in Appendix A. A detailed fish collection table is presented in Appendix B.

RESULTS AND DISCUSSION

WATER CHEMISTRY

The results of selected physio-chemical parameters from Woodland Springs are presented in Table 1. Water temperatures ranged from 58.5 degrees Fahrenheit at the surface to 57.6 degrees Fahrenheit at the bottom. Dissolved oxygen ranged from 10.00 parts per-million (ppm) at the surface to 7.27 ppm at the bottom (Figure 1). A desirable oxygen level for maintenance of healthy stress free fish was present throughout the water column. These numbers indicate Woodland Springs was de-stratified at the time of the survey, which is typical for this time of year (See Appendix A for further details on lake stratification). The alkalinity level was 102.6 ppm at the surface and 85.5 ppm at the bottom. The hardness level was 136.8 ppm at the surface and 119.7 ppm at the bottom. The pH was 6.86 at the surface and 7.04 on the bottom. These numbers are normal for lakes in this area and indicate the lake is capable of good fish production. The Secchi disk depth was measured at 1.5 feet. Nitrate-nitrogen levels were 1.3 ppm at the surface and 1.6 ppm on the bottom. Ortho-phosphate levels were undetectable at the surface and on the bottom. Woodland Springs appears to have water quality which is capable of supporting a healthy fish population. However, due to the shallow nature of this lake (Figure 2) it may be susceptible to a higher incidence of nuisance algae blooms and winter or summer fish kills. Steps should be taken to dredge the lake. Woodland Springs also funded for a data collection and lake mapping project. The data sets include lake depths and vegetation coverage of the entire lake. The data collected was used to produce maps. The vegetation cover map (Figure 3) shows that 9.4% of the lake's bottom had vegetation at the time of the survey. It also illustrates that 9.7% of the lake's water volume contained vegetation. Most of the submersed vegetation was in the middle of the lake. This is a good place for vegetative cover, as it should not impede recreational activities, and provides good fish cover.

Table 1. Selected water quality parameters measured on Woodland Springs, November 8, 2016.

Sample Depth (ft.)	Temp. (°F)	Dissolved Oxygen (ppm)	pH (standard units)	Total Alkalinity (ppm)	Total Hardness (ppm)	Nitrate/ Nitrogen (ppm)	Ortho phosphate (ppm)	Total phosphorus (ppm)
Surface	58.50	10.00	6.86	102.6	136.8	1.30	0.00	0.34
3	58.40	10.04	-	-	-	-	-	-
6	58.10	9.35	-	-	-	-	-	-
7	57.60	7.27	7.04	119.7	119.7	1.60	0.00	0.41

*Dashes indicate no sample was taken at selected depth for given parameter.

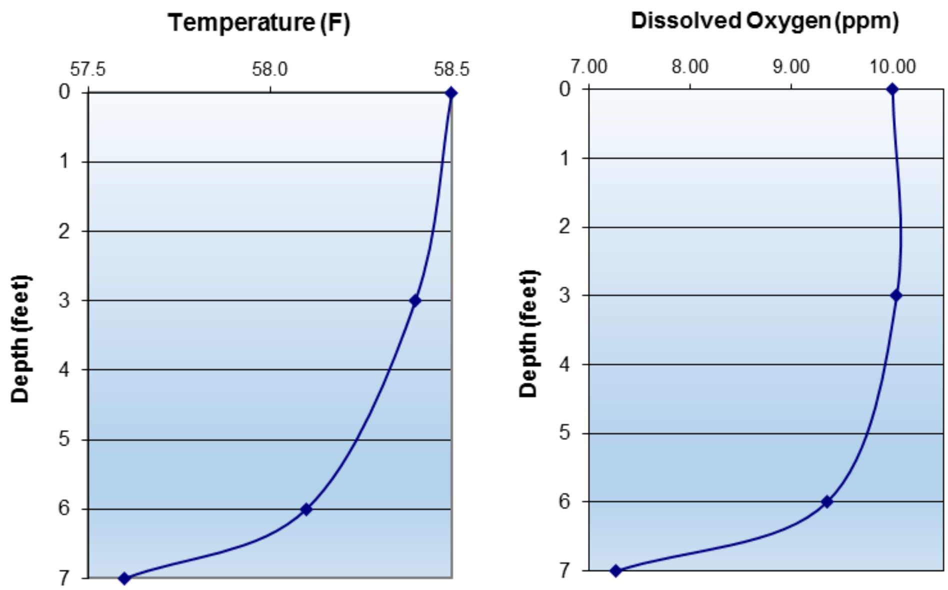

Figure 1. Temperature and dissolved oxygen profiles for Woodland Springs, November 8, 2016.

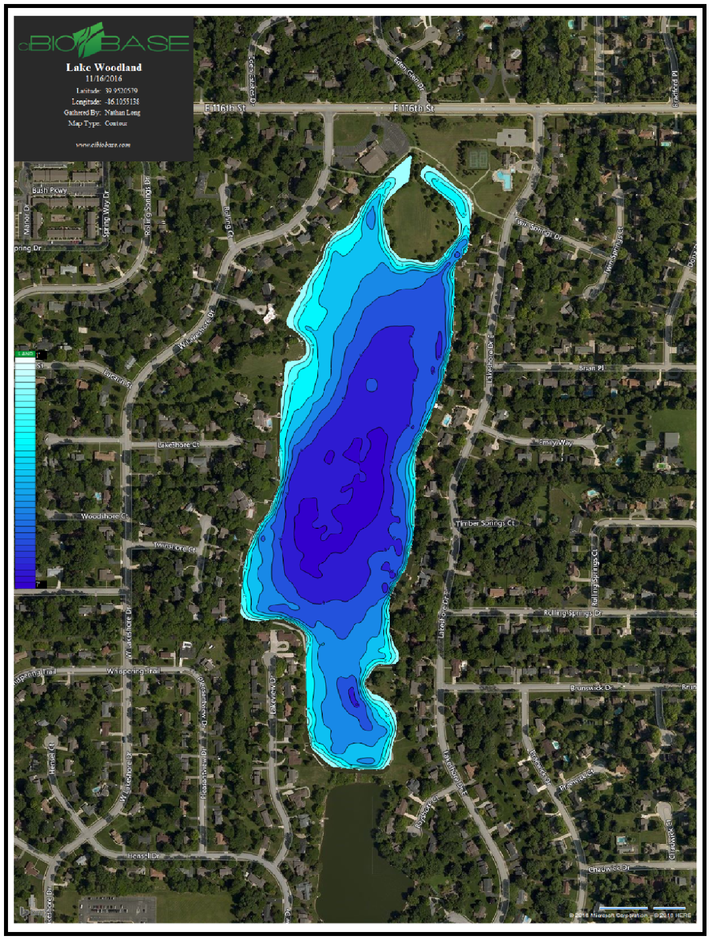

Figure 2. Woodland Springs bathymetric map.

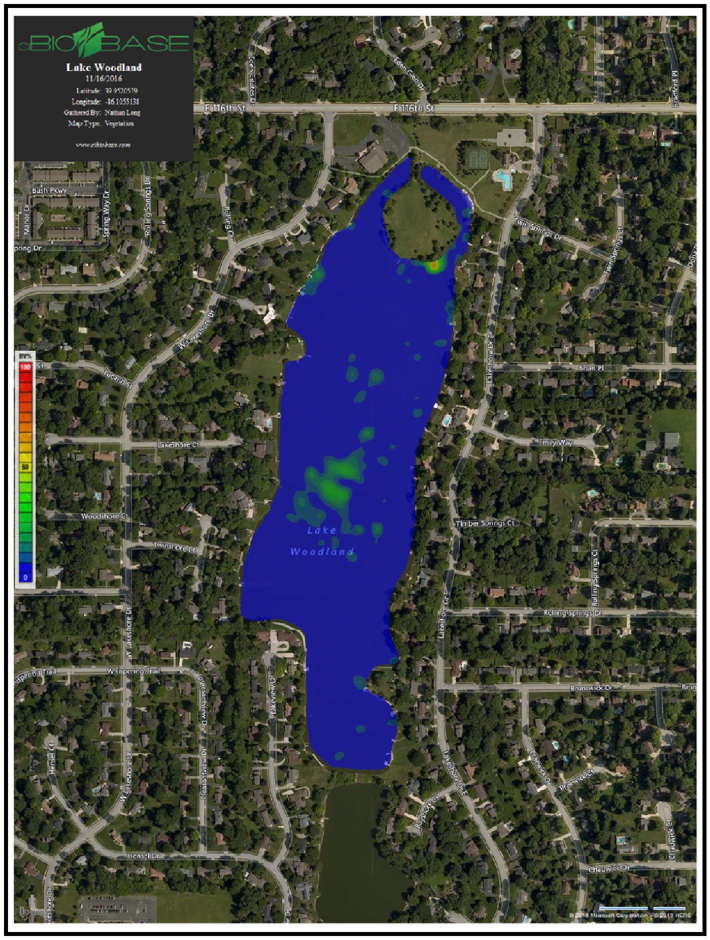

Figure 3. Woodland Springs vegetative heat map.

FISH COLLECTION

A total of 730 fish weighing 171.87 pounds and representing ten species was collected from Woodland Springs (Table 2 & Figure 4). Bluegill *Lepomis macrochirus* was the most abundant species comprising 74.11% of the fish collected. Gizzard shad *Dorosoma cepedianum* was the second most abundant species (14.25%), followed by pumpkinseed *Lepomis gibbosus* (4.93%), largemouth bass *Micropterus salmoides* (3.70%), black crappie *Pomoxis nigromaculatus* (1.10%), common carp *Cyprinus carpio* (0.82%), brook silverside *Labidesthes sicculus* (0.41%), yellow bullhead *Ameiurus natalis* (0.27%), Japanese koi *Cyprinus carpio* (0.27%), and redear sunfish *Lepomis microlophus* (0.14%). All of these species are desirable in a lake of this size with the exception of gizzard shad, common carp, yellow bullhead, and Japanese koi.

Table 2. Species collected from Woodland Springs, November 8, 2016.

Species	N	% N	Size Range (in)	Total Weight (lbs.)	% Wt	N/hr.
Bluegill	541	74.11	<3-7.5	38.00	22.11	501
Gizzard shad	104	14.25	4.5-12.0	23.03	13.40	96
Pumpkinseed	36	4.93	<3-6.0	3.57	2.08	33
Largemouth bass	27	3.70	3.5-17.5	24.55	14.28	25
Black crappie	8	1.10	4.0-7.0	0.69	0.40	7
Common carp	6	0.82	22.5-32.0	64.24	37.38	6
Brook silverside	3	0.41	3.5	0.03	0.02	3
Yellow bullhead	2	0.27	9.0-10.0	0.95	0.55	2
Japanese koi	2	0.27	23.5-25.0	16.41	9.55	2
Redear sunfish	1	0.14	8.5	0.4	0.23	1
Total	730	100.00		171.87	100.00	

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

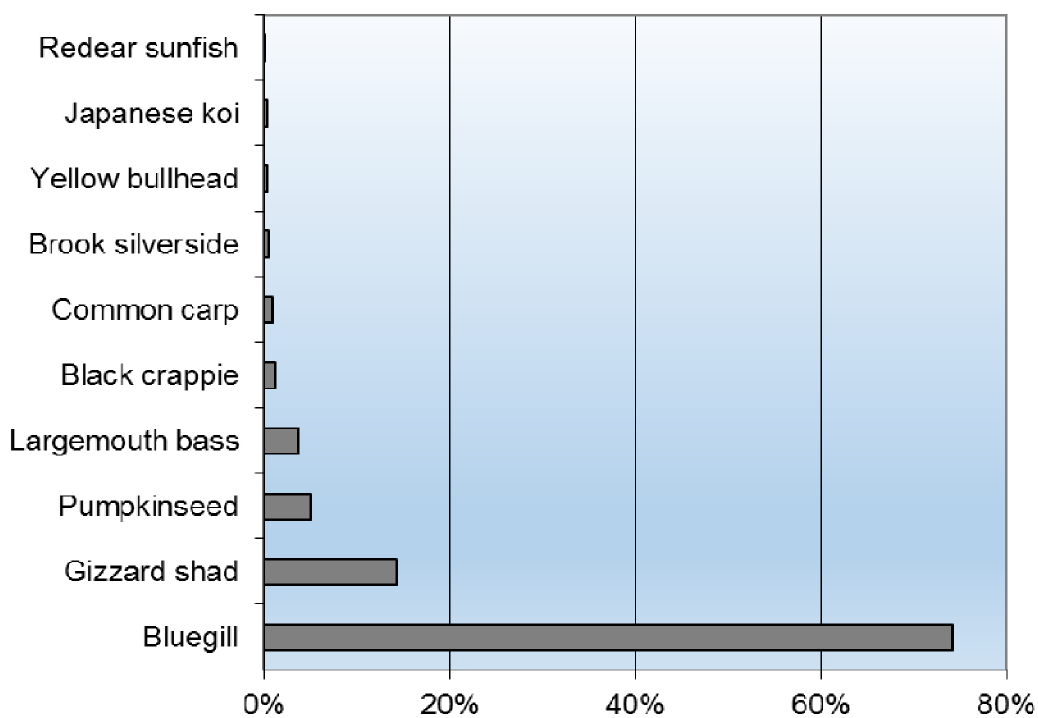

Figure 4. Relative abundance of species collected from Woodland Springs, November 8, 2016.

Bluegill

Bluegill (Figure 5) was the most abundant species collected (74.11%) and ranked second by weight (24.77%). Individuals ranged in size from less than 3.0 to 7.5 inches (Figure 6). Nearly 14% of bluegill collected were 3.5 inches or less, indicating poor reproduction occurred in 2016. There were few quality bluegill collected. This led to a proportional stock density of 15, which is below the desired range of 20-40 for bluegill (proportion of quality fish within a population, see Appendix A). Condition factors (measurement of overall plumpness) were below average for most size ranges. Bluegill weights were also found to be below standard weights in most size ranges (Figure 7).

Figure 5. Photograph of bluegill, *Lepomis macrochirus*.

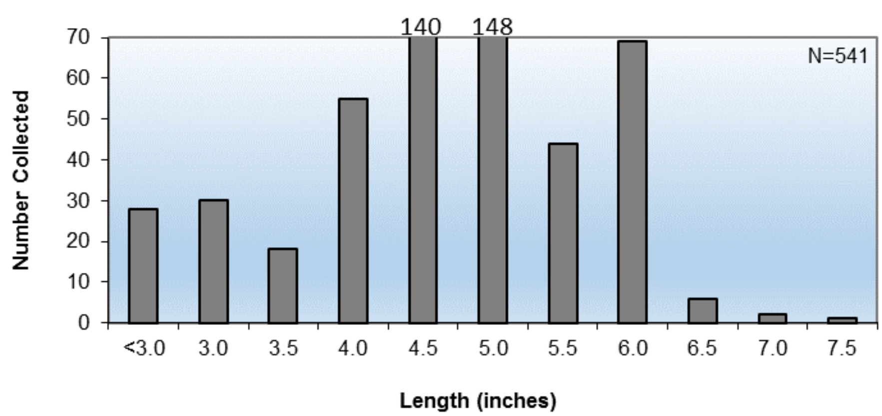

Figure 6. Length frequency distribution of bluegill collected from Woodland Springs, November 8, 2016.

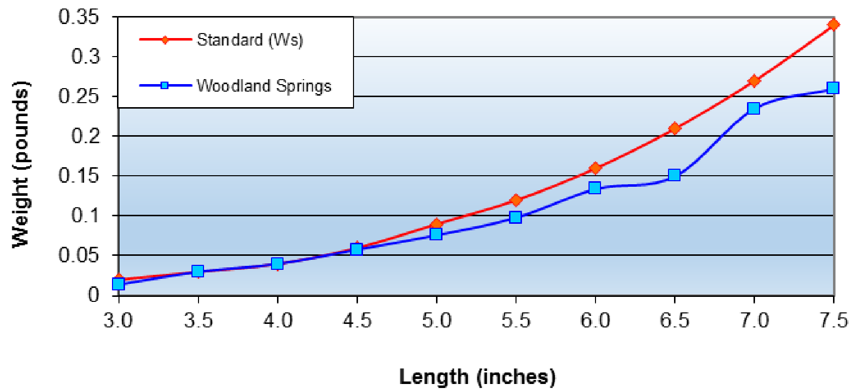

Figure 7. Comparison of Woodland Springs bluegill weights to standard bluegill weights.

Gizzard shad

Gizzard shad (Figure 8) was the second most abundant species collected (14.25%), and ranked fourth by weight (14.28%). Individuals ranged in size from 4.5 to 12.0 inches. Gizzard shad can have dramatic effects on the balance of a fish population. Typically, bluegill do not grow well in lakes containing this species. This may be due to competition with gizzard shad for food and space or largemouth bass switching to gizzard shad as their primary forage causing bluegill to become overabundant and slow growing. Largemouth bass typically grow well in gizzard shad lakes especially those individuals already above 15.0 inches; however, in most situations, largemouth bass reproduction and recruitment suffers.

Figure 8. Photograph of gizzard shad, *Dorosoma cepedianum.*

Pumpkinseed

Pumpkinseed (Figure 9) was the third most abundant species collected (4.93%) and ranked fifth by weight (2.08%). They ranged in size from less than 3.0 to 6.0 inches. This species should provide another angling opportunity in Woodland Springs. However, due to the small population, pumpkinseed should be protected with more restrictive bag limits.

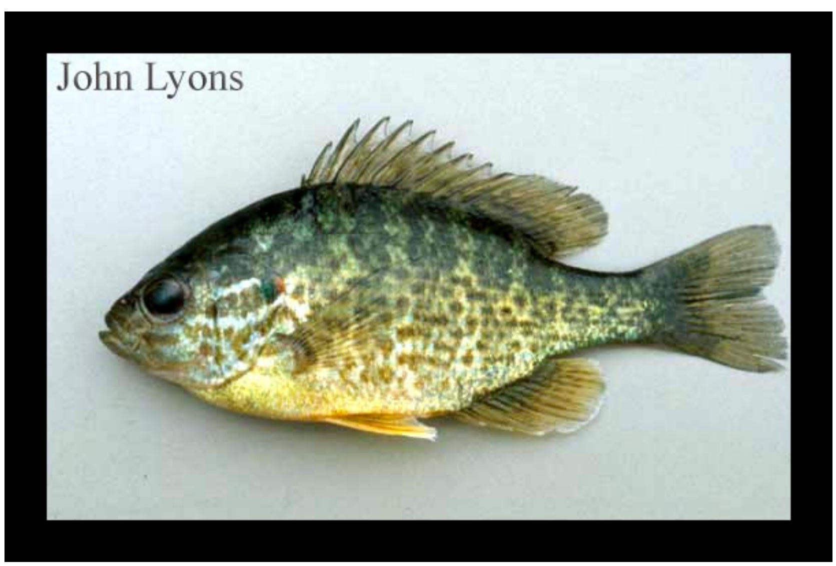

Figure 9. Photograph of pumpkinseed, *Lepomis gibbosus*.

Largemouth Bass

Largemouth bass (Figure 10) was the fourth most abundant species collected (3.70%) and ranked third by weight (14.28%). A total of 27 largemouth bass ranging in size from 3.5 to 17.5 inches was collected (Figure 11). A small number of largemouth bass less than 7.5 inches were collected indicating poor reproduction/recruitment occurred in the past two years, which is typical in gizzard shad lakes. Of the largemouth bass collected, nearly 40% were between 8.0 and 11.0 inches. The PSD for largemouth bass was 45. Condition factors (measurement of overall plumpness) were average for most size classes. The average weights for bass were below what is expected as normal weight at length in most sizes collected (Figure 12).

Figure 10. Photograph of largemouth bass, *Micropterus salmoides*.

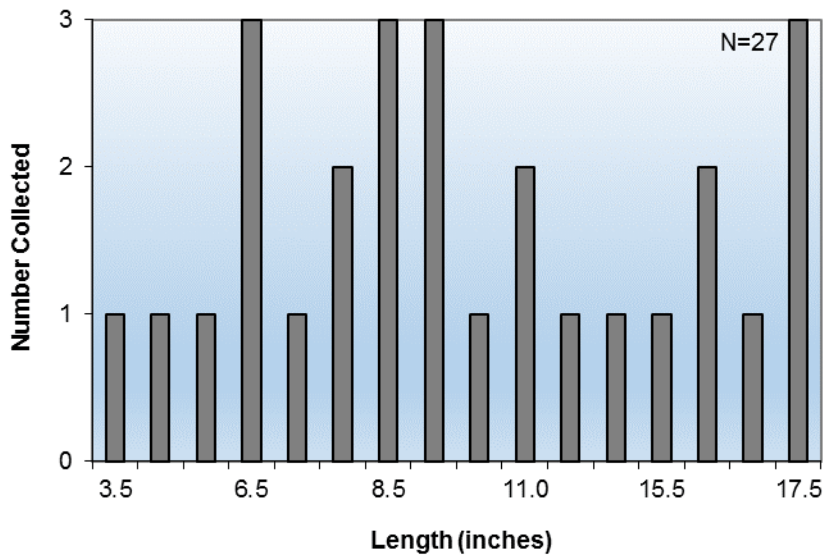

Figure 11. Length frequency distribution of largemouth bass collected from Woodland Springs, November, 8, 2016.

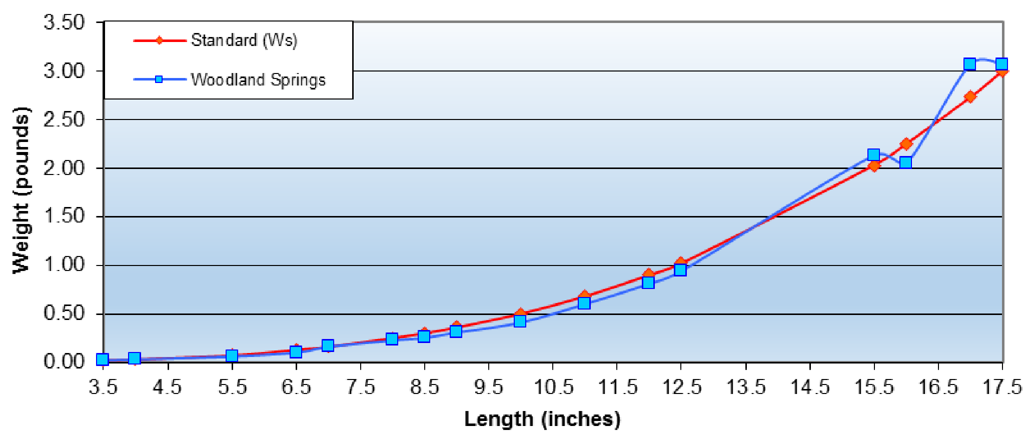

Figure 12. Comparison of Woodland Springs largemouth bass weights to standard largemouth bass weights.

Other species

A total of 8 black crappie (Figure 13) was collected while electrofishing. Individuals ranged in size from 4.0 to 7.0 inches. Crappie inhabit deeper water and are usually not well represented in electrofishing surveys, so the population is most likely higher than indicated.

Figure 13. Photograph of black crappie, *Pomoxis nigromaculatus*.

Six common carp (Figure 14) ranging in size from 22.5 to 32.0 inches were collected. Carp have the potential to disrupt a fishery by destroying bass and bluegill nests as well as increasing turbidity levels. This disruption is caused by their foraging habits. The lack of small carp implies that this species is being controlled by predators and does not pose a serious threat to the fishery; however, all carp caught should be removed from the lake. There were also two Japanese koi collected during the sample. These fish are essentially domesticated, ornamental common carp that are sold for decorative purposes in small garden ponds and water gardens. They have the same disruptive potential as common carp, and should be removed if caught.

Figure 14. Photograph of common carp, *Cyprinus carpio.*

Three brook silverside were collected during the survey (Figure 15). This species likely provides an additional forage fish for largemouth bass and other predatory fish.

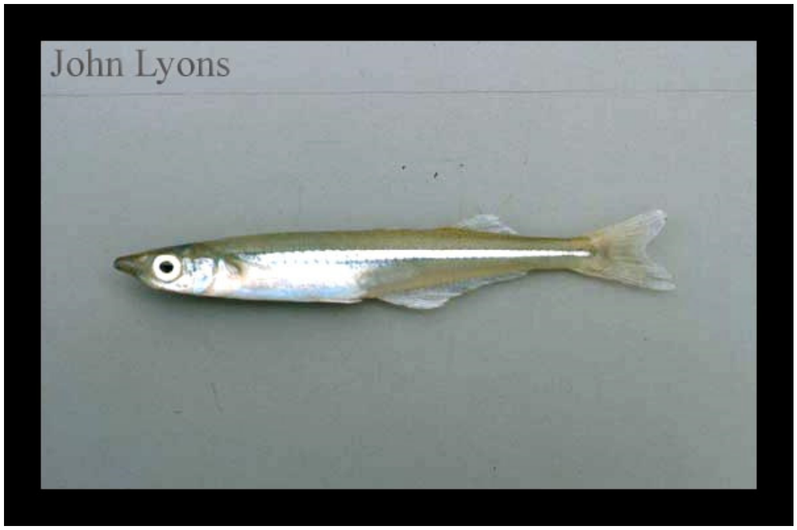

Figure 15. Photograph of brook silverside, *Labidesthes sicculus.*

Two yellow bullhead (Figure 16) were collected while sampling. Bullheads are considered undesirable and compete with desirable species for food resources. This species isn't usually considered an important game fish. They don't reach sizes comparable to channel catfish, and most anglers don't find them very palatable. All bullheads that are caught should be removed from the lake.

Figure 16. Photograph of brown bullhead, *Ameiurus nebulosus.*

A single redear sunfish was collected during the survey (Figure 17). Redear sunfish inhabit deeper water than bluegill and feed primarily on insects and snails. They also tend to grow faster than bluegill. This species should provide an additional sport fish in Woodland Springs. Due to their slower reproductive potential and small population, this species should continue to be protected with more restrictive bag limits in order to sustain a viable population for the future.

Figure 17. Photograph of redear sunfish, *Lepomis microlophus*.

SUMMARY AND RECOMMENDATIONS

The fishery of Woodland Springs is suffering from an imbalance in the predator/prey assemblage. The bluegill population appears to be dominated by small, slow growing individuals. Overabundant small bluegill and gizzard shad are negatively impacting largemouth bass reproduction/recruitment. Adding and protecting largemouth bass, and harvesting bluegill should help shift the fishery back towards a balanced state. Hybrid striped bass should also be stocked in order to aid largemouth bass in keeping gizzard shad numbers in check.

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

1. Stock 1,500 5.0 to 8.0 inch largemouth bass in the spring of 2017. A supplemental stocking is needed to sustain and increase the population.
2. Protect largemouth bass by restricting harvest for the next two years.
3. Stock 250 5.0 to 7.0 inch hybrid-striped bass in the spring of 2017. This species is especially effective in gizzard shad predation.

4. No restrictions are necessary on bluegill harvest. Harvest of this species is encouraged.
5. Conduct a Standard Fish Survey in 2019 in order to monitor the effects of the above recommendations and assess needs for further management activities.
6. The lake needs dredged. Lakes this shallow are prone to nuisance planktonic algae blooms and winter/summer fish kills.
7. Work with homeowners to educate them on best land management practices. This includes reducing fertilizer usage (use phosphorus free if necessary), allowing emergent plant growth along their shorelines, and not blowing lawn clippings into the lake.
8. Have a nutrient precipitation and inactivation treatment completed to reduce phosphate levels, lessening the chance of nuisance algae blooms. These treatments would be completed with the use of Phoslock® or aluminum sulfate.
9. Limit redear sunfish and pumpkinseed harvest to 5 individuals per day for the next two years.
10. No restrictions are needed for harvest of crappie. Crappie are prolific spawners and can maintain their own population without harvest restrictions.
11. Remove all common carp, Japanese koi, and yellow bullhead when caught.
12. Install fish structure in low-use areas around the lake. This can consist of brush piles, rock piles, or artificial fish reefs.

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APPENDIX A

GENERAL INFORMATION

In order to help understand our analysis and recommendations, basic principles of water chemistry and the physical attributes of water must be understood. Sources of dissolved oxygen (D.O.) in water include uptake from the atmosphere and photosynthesis.

Decreases in D.O. are mostly attributed to the respiration of plants, animals, and aerobic bacteria that occur in a lake or pond. Large quantities of plants may produce oxygen depletion during the nighttime hours as plants stop photosynthesis and utilize oxygen for respiration. Dissolved oxygen levels below 5.0 are considered undesirable in ponds and lakes (Boyd, 1991). Lower levels of D.O. may stress fish and decrease the rate of decomposition of organic matter entering or produced within a lake or pond. If oxygen depletion is determined to be a problem in a lake or pond, solutions exist to help improve conditions. Vegetation control to reduce overly abundant vegetation may improve conditions. Aeration systems may also be used to increase oxygen levels and promote the breakdown of organic matter.

Water temperature of a lake or pond affects the activity of "cold-blooded" animals such as fish and invertebrates as well as the amount of D.O. that water is capable of holding. Deeper ponds and lakes may thermally stratify in the summer months and result in deeper waters becoming depleted of oxygen. Lake stratification is a result of the peculiar property of water density changes with temperature. The density of all liquid changes with changes in temperature, however, water behaves in a special way. As most liquids are cooled the density, or relative weight, of the liquid increases due to the compaction of the molecules in the liquid, and conversely, as liquids are heated the density decreases. Water, because of its unique characteristics, is at its maximum density at 4 degrees Centigrade, or approximately 39.2 degrees Fahrenheit. When water is either heated above this temperature or cooled below this temperature its density decreases. This is why ice floats, or forms on the surface of lakes and ponds. A normal cycle of stratification in lakes in our region of the country, in early spring after ice out is as follows: the lake water will all be nearly the same temperature shortly after ice out and wind action on the lake surface will induce circulation of the entire volume of water. As spring advances and the increased sunlight energy warms the surface waters, these become lighter and tend to separate from the deeper waters and essentially float on top of the cooler water. This continues until there is a very stable "layering" or stratification of water in the lake. There are three distinct layers of water in stratified lakes, as described by limnologists:

1. Epilimnion (upper warm layer) - this is, generally speaking, confined to the top 10 ft. to 15 ft. of the lake volume. This is a warm region, mixed thoroughly by wind to a more or less uniform temperature. It is also the zone of most photosynthetic production and is usually high in dissolved oxygen.

2. Thermocline or Metalimnion (middle layer of rapidly changing temperature)

this layer is the area in the lake where temperature decreases rapidly, usually about 1 degree centigrade or more per meter (or approximately 3 ft.). Oxygen depletion generally begins in this layer.

3. Hypolimnion (deep, cold layer) - this layer is relatively unaffected by wind mixing or motor boat activity, and is often devoid of oxygen. Oxygen is depleted by the decomposition of dead organic matter falling from the upper waters as well as external sources such as leaves and grass clippings that sink to the bottom of the lake.

Once this stratification is established (usually by early to mid-June, in our area) it is very stable and stays intact until the fall turnover, which is caused by decreasing surface water temperatures (causing increased density), and the mixing of the lake waters by the wind. The lake then circulates completely for a period of time, usually until ice cover forms, sealing off the surface of the lake from the atmosphere. A reverse stratification then sets in where the water just under the ice is just above 32 degrees Fahrenheit with increasing temperature with depth to a temperature of 39.2 degrees Fahrenheit. Decomposition continues in the bottom throughout the winter, resulting in oxygen depletion in the bottom waters. This progresses towards the surface throughout ice cover and can cause an oxygen depletion fish kill under the ice during severe winters. After the ice melts, the lake begins to circulate again, and the cycle has completed itself. This phenomenon has a profound affect on the biological and chemical components of the lake ecosystem. Alkalinity is the ability of water to buffer against pH changes upon the addition of an acid or base. The alkalinity of a lake or pond is generally determined by the characteristics of the watershed or local geology. As a general guideline a well-buffered system has an alkalinity of 50 parts per million (ppm) or greater. Well buffered systems have potential for moderate to high productivity. Alkalinity is important in determining algaecide dosages, particularly copper sulfate. The maximum safe dosage for fish of copper sulfate if total alkalinity is less than 50 ppm is 0.25 ppm or .68 pounds / acre-foot, 1.00 ppm or 2.7 pounds / acre-foot for a total alkalinity range of 50 to 200 ppm, and 1.5 ppm or 4.0 pounds / acre- foot for a total alkalinity greater than 200 ppm.

Hardness is a measure of the calcium and magnesium (and some other ions) concentrations in water. The concept of hardness comes from the field of domestic water supply. It is a measure of soap requirements for adequate lather formation and is an indicator of the rate of scale formation in hot water heaters. Hardness and alkalinity are sometimes used interchangeably; however, these parameters sometimes have very different values. Waters containing a hardness measure of greater than 75 ppm may be considered hard and are often clearer and weedier then soft waters (Walker et al., 1985).

Nitrogen can exist in several forms within a body of water, including: ammonia, nitrite, nitrate, and organic nitrogen (amino acids and proteins). Ammonia results from the biological decomposition of organic matter by bacteria. During the process of nitrification, nitrate (which is directly available for plant uptake) is formed from the complete biological oxidation of ammonia in which nitrite is an intermediate product. Nitrate is a major plant nutrient. The most important forms of nitrogen for the growth of algae include ammonia and nitrate. Total nitrogen levels above 1.9 ppm are generally indicative of nutrient enrichment or eutrophic conditions (Wetzel, 1983). Inorganic nitrogen (nitrite, nitrate, ammonia, and ammonium) levels greater than 0.30 ppm are indicative of eutrophic lakes and ponds (Sawyer, 1948). Nitrogen in surface waters cannot be controlled by any economical method. Blue-green algae can fix nitrogen directly from the atmosphere unlike other forms of plants.

Phosphorus is a major plant nutrient and is most often the limiting factor for algae and macrophyte (vascular plants) growth within an aquatic system. Total phosphorus levels in excess of 0.03 ppm indicate eutrophic conditions (Vollenwieder, 1968). Waters with excessive plant growth high nutrients and degraded water quality are typical of eutrophic lakes and ponds. Ortho-phosphorus is a measure of the dissolved inorganic phosphorus available for immediate plant uptake. Concentrations of ortho-phosphate above 0.045 ppm may be considered critical concentrations above which nuisance algae blooms could be expected (Sawyer, 1948). The remainder of the total phosphorus is most likely bound onto particulate material and although not immediately available for uptake, could become available through biochemical degradation. Dissolved phosphorus is absorbed from the water column primarily by phytoplankton. Phosphorus supply to aquatic macrophytes is primarily from the sediment rather than from the water column. Phosphorus is released from sediment under anaerobic conditions but is precipitated to the sediment under aerobic conditions. Phosphorus can be precipitated from the water column by use of alum (aluminum sulfate). Sediment phosphorus can be inactivated and made unavailable to macrophytes by heavy applications of alum to the sediment surface.

EQUIPMENT AND METHODS

Water quality analysis equipment used in this survey included a YSI ProODO oxygen-temperature meter with 60 ft. remote sensing probe, a Hach field test kit, and a Wildco Alpha Water bottle sampler. The following water quality parameters were measured and recorded: dissolved oxygen, temperature, pH, total hardness, total alkalinity, nitrate-nitrogen, and orthophosphate. The parameters selected are the major water quality factors influencing the lakes productivity and fish health. Water quality testing to determine nutrient levels was completed in the lab using a Hach DR/2010 photospectometer.

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. Various types of equipment are in use today, however, most fisheries biologists agree that pulsed DC current is more efficient and less harmful to the fish collected than AC current. Electrofishing with an experienced crew using proven equipment is probably the least selective method of sampling warm water fish species in the temperate waters of our area. Evaluation of electrofishing efficiencies have shown that night electrofishing is a reliable method for sampling populations of largemouth bass, bluegill, and redear sunfish, and generally detects the presence of green sunfish and other scaled fish species. The method is less efficient for sampling populations of channel catfish, bullheads, and crappie (Reynolds and Simpson, 1976). The largest bias in electrofishing is generally that of collecting more large fish of a given species than smaller individuals. This is due to the differential effect of the electric current on fish of different sizes, interference with collection from dense weed beds, if present, as well as the potential bias of the person dipping stunned fish (Nielsen & Johnson, 1983). Many years of experience by our personnel has reduced this bias to an acceptable level.

Electrofishing equipment used in this survey consisted of a 16 foot workboat equipped with a Midwest Lake Electrofishing Systems Infinity Box powered by a 6500 watt portable generator and a boom mounted electrosphere designed by Coffelt Manufacturing. The electrosphere allows the use of higher voltages at lower amperage. This has proven to improve the efficiency of the electrofishing technique with lower damage to captured fish. The electrofisher was operated in the pulsed DC mode using an output level of 350 to 375 volts. The increased effectiveness of this electrofishing system makes fish of all species, including channel catfish, more vulnerable to capture. This results in a better sampling of all fish species with a higher capture rate of the more vulnerable species (bass, bluegill, redear, and green sunfish) in the samples taken. All fish collected were placed in water filled containers aboard the sampling boat for processing. A sub-sample of up to five specimens from each species was taken in each one-half inch group. The individual fish in these sub samples were weighed to the nearest hundredth pound for average weight determinations. Additional specimens were recorded by length group.

Field data was summarized and is presented in table and graph form. Condition factors and relative weight calculations (standard measurements of the relative plumpness) were calculated for important species using standard formulas (Anderson and Gutreuter, Carlander 1977, Hillman 1982, Wege and Anderson 1978). Relative weight is a comparison of fish weights at certain sizes to standard calculated weights at those sizes. Relative weights of 100 or greater are considered good. An important procedure used in our evaluation of the bass – bluegill populations, and other species to a lesser extent, is the Proportional Stock Density Index. This population index was developed by intensive research into dynamics of fish population structure, primarily in largemouth bass - bluegill dominated populations (Anderson 1976), and subsequent field testing by numerous fisheries research and management biologists in mid-western states. Bluegill samples are divided into three major groups: those less than 3.0 inches in length, those 3.0 inches and larger, and those 6.0 inches and larger. The group 3.0 inches and larger are called the "stock". The 6.0-inch and larger individuals are considered to be "quality" or harvestable size. Bluegill PSD is the percentage of bluegill "stock" that is in the harvestable size. Largemouth bass samples are separated into "stock size" (8.0 inches plus) and quality size (12.0 inches plus), for PSD calculations. Largemouth bass PSD is the percentage of bass "stock" that are of a "quality" or harvestable size.
This study, and subsequent studies and application of the techniques developed in those studies, have shown that fish populations that are producing, or are capable of producing, a sustained annual harvest of "quality" largemouth bass and bluegill have certain characteristics. These include the following:

1. Reasonably high numbers of bluegill smaller than 2.5 inches (young-of-the-year)
2. Proportional Stock Density index of 20 - 40 for bluegill.
3. Bluegill growth which results in a length of 6.0 inches by age III or IV, with low numbers of age V or older fish.
4. Proportional Stock Density index of 40 - 60 for largemouth bass.
5. A minimum of 20 adult bass per acre.
6. A maximum of 50% annual mortality (harvest) of bass in age II - V.

7. Growth rate that results in 8 inch bass reaching quality size (12 inch plus) in approximately 1 year.
8. No missing year classes in ages 0 - V.
9. A maximum of 10% of the lake bottom covered by dense weed beds.

These parameters, and other factors, are used in the evaluation and development of recommendations from Aquatic Control surveys.

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Appendix B

Fish Collection Table

Size Group (IN)	NUMBER	PERCENTAGE	AVERAGE WEIGHT (lbs.)	TOTAL WEIGHT (lbs.)	CONDITION FACTOR	WS	RELATIVE WEIGHT
BLUEGILL							
<3.0	28	5.18%	0.01	0.28	-	-	-
3.0	30	5.55%	0.01	0.42	5.19	0.02	86
3.5	18	3.33%	0.03	0.54	7.00	0.03	111
4.0	55	10.17%	0.04	2.20	6.25	0.04	95
4.5	140	25.88%	0.06	8.12	6.36	0.06	93
5.0	148	27.36%	0.08	11.25	6.08	0.09	86
5.5	44	8.13%	0.10	4.31	5.89	0.12	81
6.0	69	12.75%	0.13	9.25	6.20	0.16	83
6.5	6	1.11%	0.15	0.90	5.46	0.21	71
7.0	2	0.37%	0.24	0.47	6.85	0.27	87
7.5	1	0.18%	0.26	0.26	6.16	0.34	77
TOTAL	541	14.05%		38.00			
GIZZARD SHAD							
4.5	5	4.81%	0.03	0.17			
5.0	7	6.73%	0.04	0.29			
5.5	6	5.77%	0.05	0.32			
7.0	2	1.92%	0.11	0.22			
7.5	7	6.73%	0.15	1.05			
8.0	16	15.38%	0.17	2.75			
8.5	21	20.19%	0.23	4.87			
9.0	15	14.42%	0.25	3.75			
9.5	10	9.62%	0.29	2.90			
10.0	5	4.81%	0.35	1.77			
10.5	1	0.96%	0.39	0.39			
11.0	3	2.88%	0.47	1.42			
11.5	5	4.81%	0.52	2.62			
12.0	1	0.96%	0.50	0.50			
TOTAL	104			23.03			
PUMPKINSEED							
<3.0	1	2.78%	0.01	0.01			
3.0	1	2.78%	0.02	0.02			
5.0	21	58.33%	0.09	1.85			
5.5	8	22.22%	0.12	0.96			
6.0	5	13.89%	0.15	0.73			
TOTAL	36			3.57			

LARGEMOUTH BASS

3.5	1	3.70%	0.02	0.02	4.66	0.02	-
4.0	1	3.70%	0.03	0.03	4.69	0.03	-
5.5	1	3.70%	0.06	0.06	3.61	0.07	-
6.5	3	11.11%	0.10	0.30	3.64	0.13	-
7.0	1	3.70%	0.16	0.16	4.66	0.16	-
8.0	2	7.41%	0.23	0.45	4.39	0.25	91
8.5	3	11.11%	0.25	0.76	4.12	0.30	85
9.0	3	11.11%	0.31	0.92	4.20	0.36	85
10.0	1	3.70%	0.41	0.41	4.10	0.50	82
11.0	2	7.41%	0.60	1.20	4.51	0.68	88
12.0	1	3.70%	0.81	0.81	4.69	0.90	90
12.5	1	3.70%	0.94	0.94	4.81	1.02	92
15.5	1	3.70%	2.13	2.13	5.72	2.03	105
16.0	2	7.41%	2.05	4.10	5.00	2.25	91
17.0	1	3.70%	3.07	3.07	6.25	2.73	112
17.5	3	11.11%	3.06	9.19	5.72	3.00	102
TOTAL	27			24.55			

BLACK CRAPPIE

4.0	1	12.50%	0.04	0.04
4.5	1	12.50%	0.04	0.04
5.5	2	25.00%	0.09	0.17
6.0	1	12.50%	0.11	0.11
6.5	2	25.00%	0.09	0.18
7.0	1	12.50%	0.15	0.15
TOTAL	8			0.69

COMMON CARP

22.5	2	33.33%	5.74	11.48
26.0	1	16.67%	10.03	10.03
28.0	1	16.67%	11.39	11.39
30.5	1	16.67%	14.63	14.63
32.0	1	16.67%	16.71	16.71
TOTAL	6			64.24

BROOK SILVERSIDE

3.5	3	100.00%	0.01	0.03
TOTAL	3			0.03

YELLOW BULLHEAD

9.0	1	50.00%	0.40	0.40
10.0	1	50.00%	0.55	0.55
TOTAL	2			0.95

JAPANESE KOI

23.5	1	50.00%	7.71	7.71
25.0	1	50.00%	8.70	8.70
TOTAL	2			16.41

REDEAR SUNFISH

8.5	1	100.00%	0.40	0.40
TOTAL	1			0.40