

# AQUATIC ENVIRONMENTAL SERVICES

## Providence Lake Electrofishing Report

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# ELECTROFISHING REPORT

- Fish population analysis conducted using electrofishing procedures on June 26<sup>th</sup>, 2009.
- Data collected from this study was analyzed to describe the current conditions of the fishery. This report provides the current status of the fishery and management recommendations to improve your fishery and reach your fishing goals.

# METHODS

## Electrofishing

Electrofishing is the most scientifically advanced method of analyzing fish populations in freshwater lakes and ponds in the southeastern United States. Electrofishing provides a fisheries biologist with a representative sample of all fish in the lake.

# METHODS

## Electrofishing

- An electrofishing boat was used that transmits an electrical current from a generator through a control box to a set of electrodes that are hanging at the front of the boat and into the lake.
- An electrical field is formed around the area of the electrodes. The field reaches up to 10 feet in front of the boat and to a depth of approximately 6 feet. This allows us to sample all habitat types found within the lake.
- Fish within this field are stunned and float to the water surface.
- No harm is done to the fish and the fish will recover completely within 5 minutes.

# METHODS





# WEIGHING



# MEASURING



# RELATIVE WEIGHT INDEX ( $W_r$ )

- During the survey, the relative weight ( $W_r$ ) was calculated for all largemouth bass collected.
- $W_r$  is a coefficient used to compare the standard weight of a bass at a given length to the actual weight of the collected bass at the same length. It is the ratio of the actual fish weight to the standard fish weight. A  $W_r$  of 80%+ is desired in a balanced fishery and above 100% for a quality bass fishery.

# RELATIVE WEIGHT INDEX ( $W_r$ )

- $W_r = (\text{Actual weight of captured fish}) * 100 / \text{standard weight of a fish of the same length (from table)}$

For example:

If we caught a 11.5-inch bass that weighed 0.6 lbs. The standard weight of a 11.5-inch bass in the table is 0.8 lbs.

$$W_r = 0.6 * 100 / 0.8$$

$$W_r = 75\%$$

- Values over 90% indicate a healthy bass population and adequate forage base. Relative weights below this level indicate limited “ideal” food sources for bass. Values below 75% indicate a “skinny” bass.



# Standard Wr table for largemouth bass

Length (inches)	Weight (lbs)	Length (inches)	Weight (lbs)
10		18	3.2
10.5	0.6	18.5	3.5
11	0.7	19	3.9
11.5	0.8	19.5	4.2
12	0.9	20	4.5
12.5	1	20.5	4.9
13	1.1	21	5.3
13.5	1.3	21.5	5.7
14	1.5	22	6.2
14.5	1.6	22.5	6.6
15	1.8	23	7.1
15.5	2	23.5	7.6
16	2.2	24	8.1
16.5	2.5	24.5	8.7
17	2.7	25	9.3
17.5	3	25.5	9.9

# GOALS

- Your goals are to produce a quality bass fishery with plenty of 3-5 lb bass with increased chance at a trophy.
- In order to achieve these goals you want to have a diverse and balanced relationship between the predator (bass) and the prey (i.e., bluegill) populations.

# ELECTROFISHING RESULTS

Species	Size (in)	Number
Bluegill	<3	Poor
Bluegill	3-5	2
Bluegill	5-7	1
Bluegill	7-9	4
Bluegill	>9	0
Shellcracker	<3	0
Shellcracker	3-5	0
Shellcracker	5-7	0
Shellcracker	7-9	0
Shellcracker	>9	7
Largemouth bass	<4	Good
Largemouth bass	4-8	2
Largemouth bass	8-10	15
Largemouth bass	10-12	19
Largemouth bass	12-14	18
Largemouth Bass	14-16	2
Largemouth bass	16-18	0
Largemouth bass	>18	0

Species	Size (in)	Number
Channel Catfish	13.5	1

# BLUEGILL SUNFISH (*Lepomis macrochirus*)

Known as bream to many, they are the backbone of forage production for largemouth bass ponds. Bluegill are very prolific, reproducing multiple times a season (3-5 times/year). This provides largemouth bass with a large quantity of food while still allowing themselves to sustain a healthy thriving population. They spawn in large colonies of nests in 3 to 6 feet in depth over sandy and gravel substrates close to the shore. Spawning occurs when water temperatures reach 67-70°F. Bluegill readily eat floating fish food and have great growth rates from supplemental feeding. They also provide excellent fishing opportunities for kids and novice fishermen. There are two subspecies, native (also called Mississippi) and coppernose. The coppernose are better suited for warm climates and are aggressive when supplemental feeding.





# SHELLCRACKER or REDEAR (*Lepomis microlophus*)

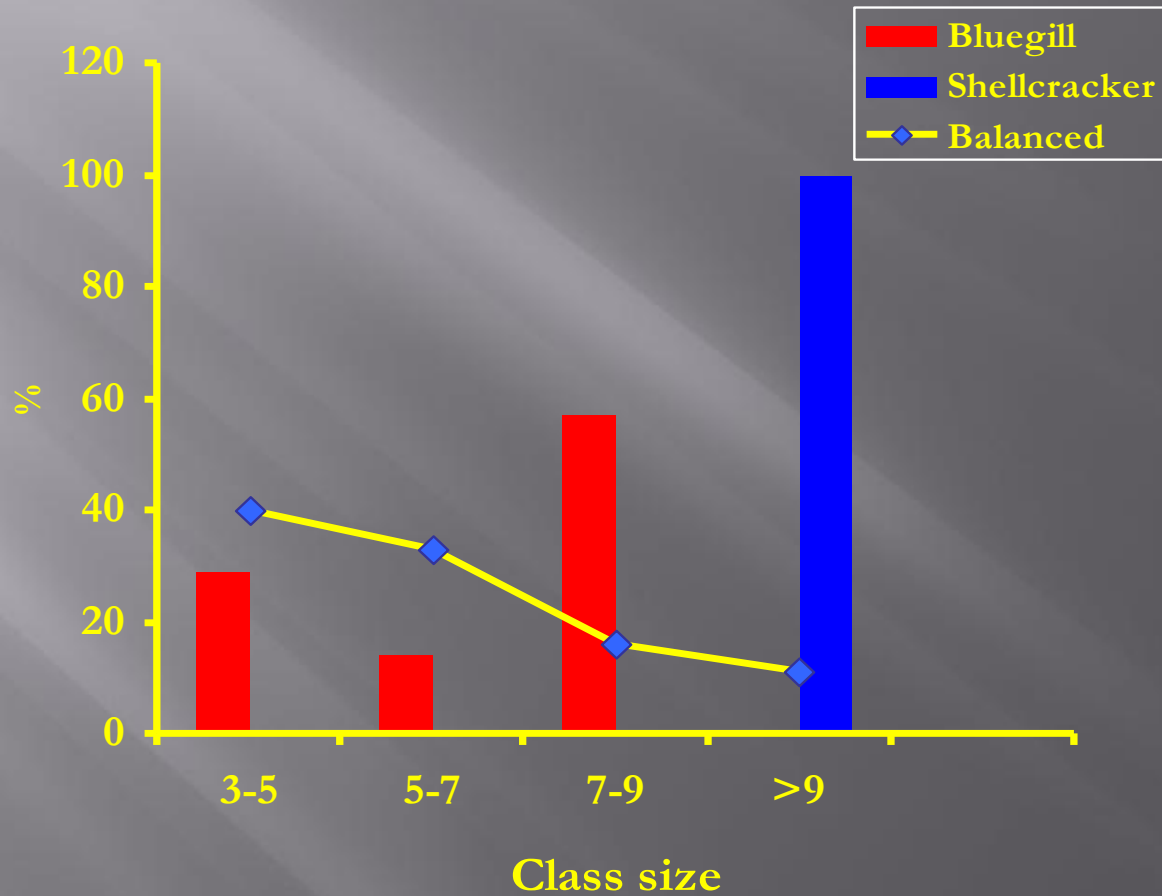
Also known as bream, they occupy a different ecological niche than bluegill, improving the utilization of the pond natural productivity. Shellcracker eat snails along with other invertebrates present in the pond and can help to reduce the incidence of some fish parasites (i.e., grubs, flatworms) that use a snail as a intermediate host. Similar to other bream species, shellcracker are a favorite prey fish for bass. They can grow larger than bluegill, but they are not as prolific, since they reproduce only once per year. Redear sunfish can be distinguished from bluegill by the presence of a red or orange ear tab.





# LENGTH DISTRIBUTION

Adult bluegill and shellcracker



# EVALUATION

- The bluegill population consisted primarily of larger fish (>7"). We want to see a high percentage of bluegill in the 3-5" size class. This is because the 3-5" bluegill will provide ideal forage for the largemouth bass. A largemouth bass prefers to consume a bluegill that is 1/3 of its size. For example, a 12" bass prefers to consume a 4" bluegill while an 18" bass prefers to consume a 6" bluegill. The average size of the bass sampled from the lake was 11", meaning they need 3-4" bluegill for forage. Unfortunately, only two 3-5" bluegill were sampled. The lack of smaller bluegill can be contributed to the lack of dense/protective cover in the lake and heavy bass predation.

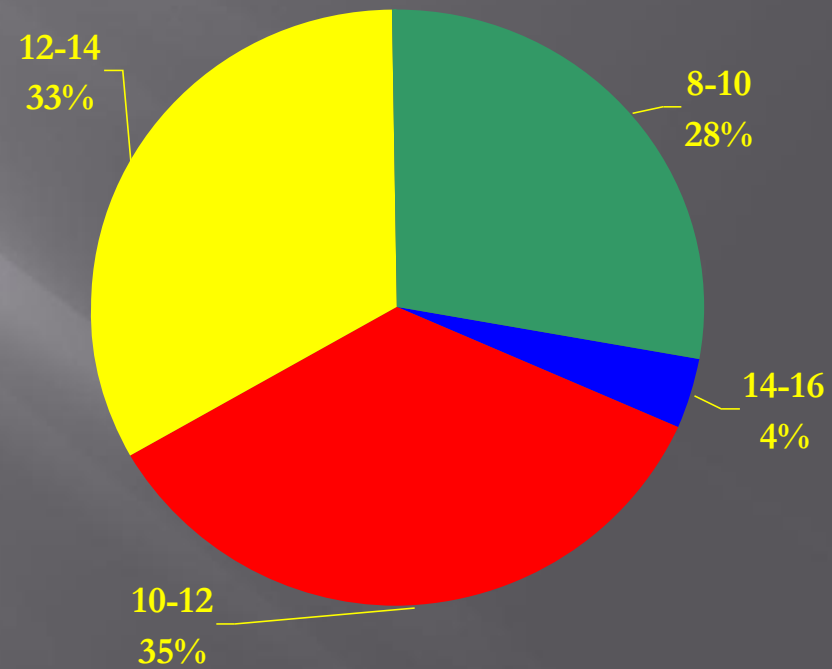
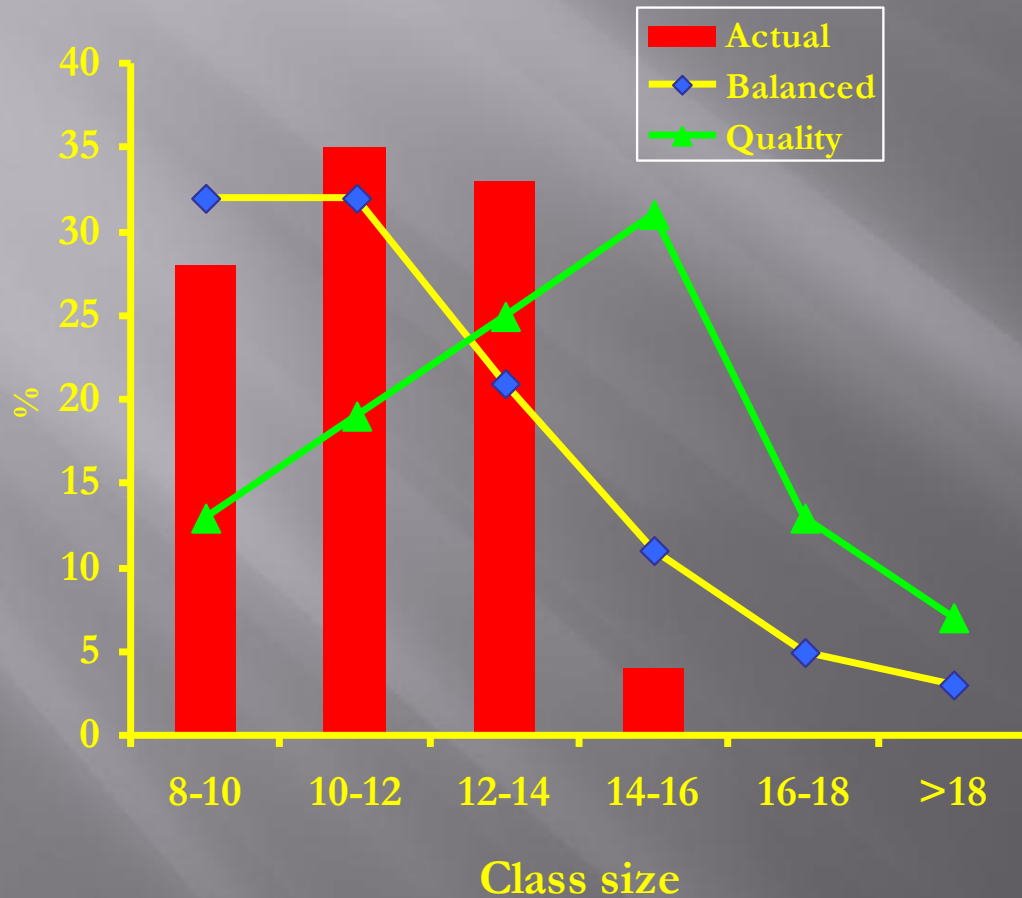
# LARGEMOUTH BASS (*Micropterus salmoides*)

Largemouth bass are the preferred game fish in the U.S. providing exciting fishing for anglers. They will eat just about anything that they can fit into their mouths making it the top end predator in most ponds. Largemouth bass begin to spawn when the water temperature reaches 63-68°F, normally once a year in the early spring before bluegill begin to spawn. There are two known subspecies, Florida and Northern. Florida bass are known to grow quite large but research has shown them to be less aggressive when adults, making them harder to catch. Northern bass are more aggressive but do not have the top end potential of Florida bass. There is also the F1, which is a pure cross between the two having the best characteristics of both subspecies (aggressive and grows big in size). You can also have Fx bass that are a mix of genetics of both subspecies. Lower stocking densities will provide increased initial growth during critical early year growth.



# LENGTH DISTRIBUTION

## Adult largemouth bass



# EVALUATION

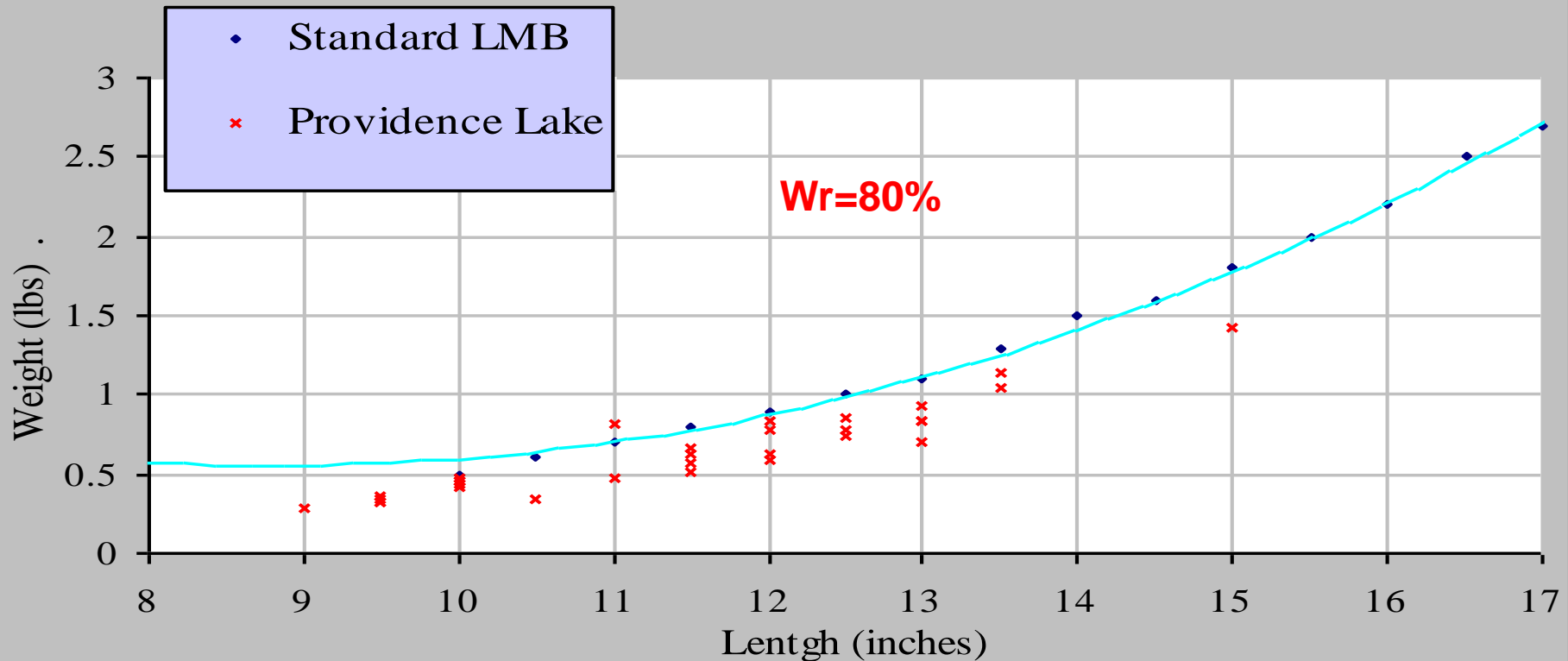
- The bass population is following a quality bass trend but due to the limited food supply (i.e. bluegill) the bass are stacking up in the smaller size classes. Basically the bass are not growing past 12-14" because there is a lack of food (i.e. bluegill).



# BASS RELATIVE WEIGHT EVALUATION OF THE LAKE

The Wr average was 80% with the biggest bass captured measuring 15 inches. This Wr indicates a un-healthy bass population. Goals should be set for an average Wr of 100% when managing for quality bass fishing. This means that currently the lake is not reaching its goals, but can have vast improvements by following management recommendations.

**Relative weight of largemouth bass**



# OTHER ESTABLISHED FISH SPECIES

Channel Catfish

# CHANNEL CATFISH

They provide a good game fish for children and novice fisherman and they diversify the fishing options in the lake. Channel catfish can not reproduce successfully in the presence of bass and they usually remain on the bottom of the pond occupying a different ecological niche. They compete very little with bass before they reach 2 lbs in weight because catfish mostly feed on fish food (if provided) or invertebrates. However, once they reach 2 lbs, they can compete with bass for prey fish.



# FISH MANAGEMENT

## Harvest

- You need to set a goal this year to harvest 20 pounds of bass per acre per year. Harvest bass measuring 14" or less.
- Limit the harvest of forage fish such as bluegill and shellcracker. It doesn't hurt to take out bluegill here and there but the bluegill are the backbone forage species for largemouth bass.
- Harvest the channel catfish. Once they reach two lbs they compete with bass. It is better to remove these and stock smaller catfish with a good feeding program when trying to grow bass.

# RECOMMENDATION TABLE

Action	Recommended Rate/Number	Total cost (\$)
(4-5") Coppernose Bluegill	250/Acre	\$0.90/each



# Appendix

- Water Quality Parameters
- Lime and Fertilization Information
- Supplemental Feeding Program
- Lake Mapping
- Reference Material (Data Sheets)

# Water Quality Parameters

## ➤ **DISSOLVED OXYGEN:**

Dissolved oxygen (DO) is a measure of the amount of oxygen available to aquatic organisms, and is reported as mg/l or percent saturation. Percent saturation is a representation of how much oxygen is dissolved in the water relative to the amount of oxygen that can be held at a specific temperature. Colder water can hold more oxygen than warm water. Dissolved oxygen fluctuates daily with it being at its lowest levels in the early morning hours. DO does not pose a problem for most fish until levels fall below 4 mg/l. Dissolved oxygen profile shows how stratification affects DO levels as depth changes.

## ➤ **CONDUCTIVITY:**

Conductivity is a measure of the ability of water to pass an electrical current. Conductivity in water is affected by the presence of inorganic dissolved solids such as chloride, nitrate, sulfate, and phosphate anions (ions that carry a negative charge) or sodium, magnesium, calcium, iron, and aluminum cations (ions that carry a positive charge). Organic compounds like oil, phenol, alcohol, and sugar do not conduct electrical current very well and therefore have a low conductivity when in water. Conductivity is also affected by temperature: the warmer the water, the higher the conductivity.

➤ **pH**

The pH measures the concentration of the hydrogen ions present in the water, and is usually thought of as the measurement of acidic or alkaline conditions. A pH of 7 is neutral with lower values being acidic and higher values being alkaline. Most organisms in a lake prosper when the pH is maintained between 6.5 and 9. The pH cycles daily due to a complex interaction of alkalinity, hardness, carbon dioxide, and photosynthesis and respiration. The lake is more acidic in the mornings, and will also vary according to depth. When pH levels are out of the desired range for long periods, detrimental affects may occur.

➤ **HARDNESS**

Hardness is a measure of the quantity of divalent ions in water. Generally in Georgia, calcium and magnesium carbonate account for the majority of the hardness. Hardness levels affect the toxicity of some algaecides, limit phytoplankton formation, and play a role in fish growth. Levels below 15 mg/l should be increased with the addition of 2-5 tons per acre of agricultural lime.

## ➤ **ALKALINITY**

Alkalinity is defined as the quantity of base present in water. The most common bases include carbonates, bicarbonates, hydroxides, and phosphates. Total alkalinity is closely related to hardness with both being reported as mg/l  $\text{CaCO}_3$ . Alkalinity basically determines the buffering capacity of a lake. A good buffering capacity will absorb introductions of acids and bases with little change in pH levels. By maintaining the desired pH levels nutrients are more available to phytoplankton resulting in a lake that has an increased carrying capacity.

## ➤ **VISIBILITY**

Visibility is measured with the use of a secchi disc. The white/black disc 20 cm in diameter is lowered vertically through the water until it can no longer be seen. Suspended particles reduce this visibility level. Therefore, in the absence of turbidity from silt or mud the secchi disc serves as a international standard to indicate phytoplankton. We recommend keeping a phytoplankton bloom with a visibility between 18-24 inches via fertilization.

# LIME AND FERTILIZATION

- The best way to increase the productivity of a fishing pond is through a good fertilization program. When performed properly the carrying capacity of a pond can go from 100 pounds of fish per acre up to 400 pounds per acre. Fertilizer alone does not grow big fish, but allows you to have more pounds of fish. However, combine fertilization with a good harvest plan and you are on the road to bigger fish whatever your goals.



- If you have a low retention time I suggest a supplemental feeding program in lieu of. If your alkalinity level is below 15 ppm then lime applications are needed prior to fertilizing. Adding 4 tons of agricultural lime per surface acre will increase your buffering capacity for up to 5 years. By increasing your buffering capacity your pH will be maintained at levels that more easily allow phytoplankton to form when applying fertilizer.

For lime applications we can help lineup a spreader truck or lime barge. Fertilization programs are provided for client's on a yearly basis. We strive to maintain proper phytoplankton blooms throughout the growing season to maximize fish production.

- We recommend using AES 10-52-4 water soluble Trophy Grower Max fertilizer. Application rate is 4-8 lbs, the 8 lbs in the spring to “jump start” then 4 lbs/acre after that. Cost is \$6 app//acre compared to liquid at 1.5 gals is \$7/app/acre. So it is slightly cheaper. That is not why we sell it though. For example, with liquid fertilizer for 12 acres you will need to put out 18 gallons or 216 lbs. With water soluble you would load up 48 lbs which is much faster and easier than the liquid fertilizer. Also it dissolves right in the top of the water column where it needs to go to work.

# SUPPLEMENTAL FEEDING PROGRAM

- One of the easiest and most efficient methods for improving your pond fisheries and bass growth is by feeding your bluegill population. Feeding the bluegill a supplemental fish food diet creates healthier fish that reproduce at higher rates, therefore increasing the population. More importantly, feeding bluegill increases their weight, which consequently increases the weight of the bass. Feeding can occur year around in some areas but generally begins in March and continue through November in much of the southeast. For bluegill use a moderate protein level such as 36%. This is a big advantage versus cheaper 32% protein food.
- For most pond owners, feeding by hand is not as efficient as using an automatic fish feeder which can feed multiple times a day. Having feeders in the pond provides a great food source on a continuous basis. Bluegill have a short intestinal tract and benefit from multiple feedings during the day. An automatic fish feeder is one of the best investments a pond owner can make. It will concentrate fish for easier fishing and grow the largest bluegill in the lake. It is also a great place for kids to learn to fish, because the action is always fast. Many people just enjoy watching the feeding frenzy that occurs and showing off your trophy bluegill to your friends.

- Bluegill will not travel far to consume food. In order to maximize bluegill growth and production, it may be necessary to feed in more than one section or to setup multiple feeders in ponds greater than 1/2 acre. All ponds are shaped different but typically a minimum of 1 feeder per acre may be necessary to feed all bluegill in smaller ponds. For ponds greater than 10 acres 1 feeder/2 acres are sufficient.
- How much should you feed? As a general rule of thumb, only cast enough feed so the fish will eat most of the food in 5 to 10 minutes. Overfeeding may cause dissolved oxygen depletion and possibly cause a fish kill. The total amount of food consumed will vary due to surface water temperature, fish species and water quality. Bluegill experience their most rapid growth in the spring and fall. To maximize growth feed four times daily in the spring and early summer. During the heat of the summer, feed only in early morning and late afternoon. As the water begins to cool in the fall, feed four times daily. Below is a feeding guide for bluegill based on the water surface temperature:

➤ Water temperature below 55°F

Feed only one time per day, during the warmest part of the day. Set the automatic feeder for one second. If fish are not feeding, discontinue feeding until water temperature increases above 55-60°F.

➤ Water temperature between 65°F and 80°F

Feed 4 times per day. Temperatures between 65-80°F are ideal for maximize fish growth and production. Bluegill will feed aggressively at these water temperatures. Separating the feedings by a few hours allows digestion of the food prior to next feeding.

➤ Water Temperature between 80°F and 90°F

Feed 2 times per day during the cooler parts of the day, typically at sunrise and sunset. The amount of food may need to be decreased as temperatures continue to rise. Discontinue feeding when water temperature increases above 90°F and start back up when it drops to 85°F or less.



# Our Most Popular Riverhawk Models (15% Discount to our clients)

Model: 13' Original  
Color: Olive Drab  
Camouflage



Model: 13' Duckboat  
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13 foot original \$930

13 foot duck boat \$1170

Procaster Deluxe \$2450

Many other models to choose from visit [www.riverhawkboats.com](http://www.riverhawkboats.com). Many options to add to these boats, please call to discuss. We love the tracking and stability of these boats.

# AVAILABLE FEEDERS



**Texas Hunter**



**Moultrie**



**Bo-Jo Fish  
Light**



# Directional Fish Feeder Options and Pricing

Item #	Fish Food Capacity	
Texas Hunter (DF125)	70 lbs.	\$599.00
Texas Hunter (DF425)	215 lbs.	\$759.00
Moultrie*	75 lbs.	\$400.00
Texas Hunter 2 watt solar panel		\$79

Price is discounted for our clients.

\*Moultrie price includes solar panel in price.

# LAKE MAPPING

- Integrates GPS and Sonar equipment to provide underwater data collection.
- GIS data are collected in the field with a Trimble GeoXH™. This unit provides GPS positions with subfoot (30 cm) accuracy.



- This service ranges from mapping a small pond for weed control calculations, to mapping a large lake for developmental purposes.
- Once a digital model has been produced, several calculations can be made. For instance, we can even tell you how many gallons of water it would take to raise a lake by an inch.
- The maps will show you the fishing hot spots.
- Channels, humps, under water islands, and deep drop-offs will make it clear where the big bass are hanging out.
- Optional fly-through capabilities allow you to see underwater through the eyes of a fish.

# Lake Mapping Example



Jim Copeland Property  
Orangeburg County, SC

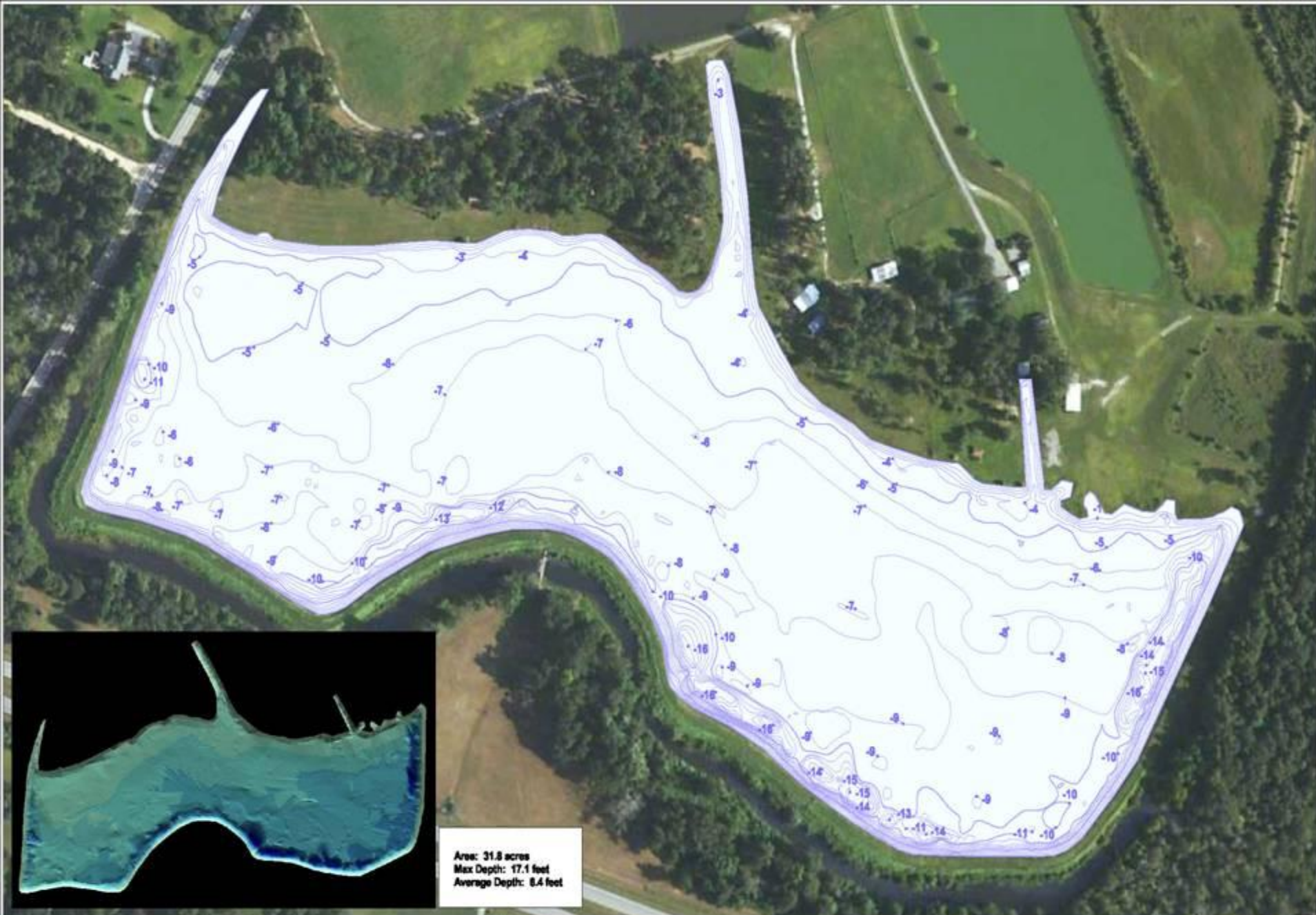


NOTES:  
1.) Data was collected using a sub-foot accurate GPS.  
2.) Data was collected December 2009.  
3.) Imagery date: 2009

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Area: 31.8 acres  
 Max Depth: 17.1 feet  
 Average Depth: 8.4 feet

Jim Copeland Property  
 Orangeburg County, SC



NOTES:  
 1.) Data was collected using a sub-foot accurate GPS unit with a depth sonar.  
 2.) Data was collected December 2005.  
 3.) 6,562 depths were recorded to generate this map.  
 4.) Imagery date: 2005

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# Reference Materials

- You can find easier to print files by going to <http://lakework.com/site/pond-information.php>
- To view all products and past articles on pond management please visit our website at [www.lakework.com](http://www.lakework.com)



# Largemouth Bass Relative Weight Chart

Weight of Bass in Grams

Length (in.)	Standard Weight (lbs.)	110%	Standard Weight 100%	95%	90%	85%	80%	75%
10	0.5	250	227	215	204	193	181	170
10.5	0.6	304	276	262	249	235	221	207
11	0.7	339	308	293	278	262	247	231
11.5	0.8	389	354	336	318	301	283	265
12	0.9	449	408	388	367	347	327	306
12.5	1.0	509	463	440	416	393	370	347
13	1.1	579	526	500	474	447	421	395
13.5	1.3	653	594	565	535	505	475	446
14	1.5	734	667	633	600	567	533	500
14.5	1.6	818	744	707	670	632	595	558
15	1.8	913	830	789	747	706	664	623
15.5	2.0	1013	921	875	829	783	737	691
16	2.2	1123	1021	970	919	868	816	765
16.5	2.5	1238	1125	1069	1012	956	900	844
17	2.7	1362	1238	1176	1114	1053	991	929
17.5	3.0	1497	1361	1293	1225	1157	1089	1021
18	3.2	1637	1488	1413	1339	1265	1190	1116
18.5	3.5	1786	1624	1543	1461	1380	1299	1218
19	3.9	1942	1765	1676	1588	1500	1412	1323
19.5	4.2	2026	1842	1750	1657	1565	1473	1381
20	4.5	2290	2082	1978	1874	1770	1666	1562
20.5	4.9	2475	2250	2137	2025	1912	1800	1687
21	5.3	2674	2431	2310	2188	2067	1945	1823
21.5	5.7	2884	2622	2491	2360	2229	2097	1966
22	6.2	3103	2821	2680	2539	2398	2257	2116
22.5	6.6	3333	3030	2879	2727	2576	2424	2273
23	7.1	3577	3252	3090	2927	2764	2602	2439
23.5	7.6	3827	3479	3305	3131	2957	2783	2609
24	8.1	4096	3724	3538	3352	3165	2979	2793
24.5	8.7	4376	3978	3779	3580	3381	3182	2984

# Harvest Log

DATE	WEATHER/LURE	SPECIES	LENGTH	WEIGHT	SEX (M/F)	Tag #	HARVESTED (Y/N)

Species: BG -Bluegill, RE -Redear, LMB -Largemouth Bass, CC -Channel Catfish, CR -Crappie

# Feeder Log

Date	Feeder #	Weather/Time	Feeding Response	Feeder Settings	Bags of Food Added	Feeder Status

Feed only enough food that the fish can consume most of it within 5-10 minutes.

Check to make sure feeder settings are correct and note if battery is weak, or timer/motor are not functioning properly.

# Fertilization Log



Apply at a rate of 4-8 pounds per acre. Monitor visibility with a secchi disk every two weeks and fertilize if needed . Desired level is 18-24 inches. If visibility is greater than 36 inches apply 8 pounds/acre. If visibility is 24-36 inches apply 4 pounds/acre. Most ponds require 6-10 applications per year. Do not over fertilize; visibilities less than 12 inches can result in low oxygen levels resulting in a fish kill. Begin fertilizing once water temperature reaches 60 degrees and stop fertilizing once temperature drops below 60 degrees. Do not add fertilizer if there is a significant amount of vegetation.



Aquatic Environmental Services

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