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Education in the School of Fish

Electrofishing Report

Norris Lake

Fishery Goals: Healthy, Balanced Fishery



Survey Date:	**3/25/2025**
Report Date:	**4/7/2025**
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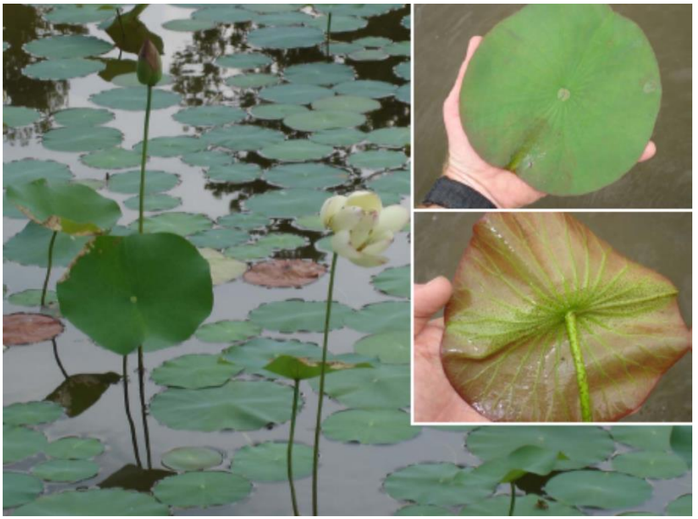
Lake Morphology / Characteristics

Item	Result	Evaluation
Lake Surface Acreage	106.7	-
Average Depth (ft.)	~4.0	-
Maximum Depth (ft.)	~12.0	-
Total Acre-Feet	426.8	-
Watershed Acreage	9,070.0	The watershed consists mainly of residential development, with some of it being forested.
Watershed Ratio	85:1	Overall, the watershed is large for the lake's surface area (20:1 – 40:1 desirable); however, this should allow the lake to maintain full pool throughout the year. In extreme droughts, the lake may still fluctuate during periods of limited rainfall.
Habitat Assessment	Limited dense habitat for forage refuge; limited fishing habitat for predators to utilize as ambush/orientation points.	Take any opportunity to add natural structure to the lake (Christmas trees, brushpiles, etc.). Install Ugly Tree artificial habitats for residents interested in adding near their dock or around favorite fishing locations (see page 17).

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Aquatic Vegetation

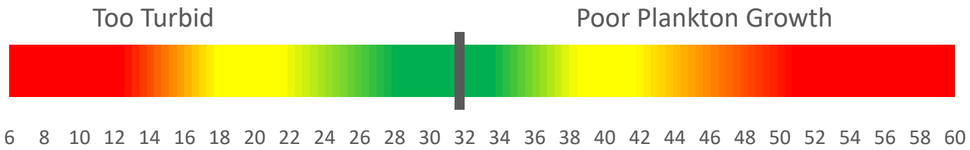
Image of American Lotus



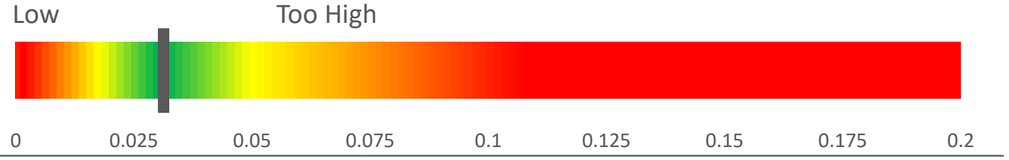
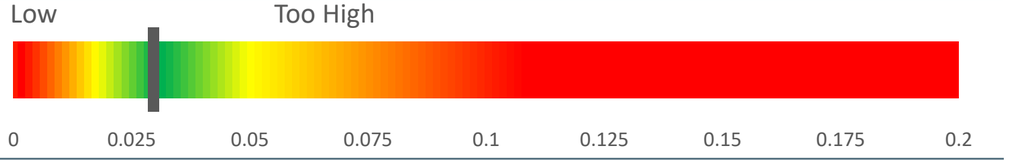
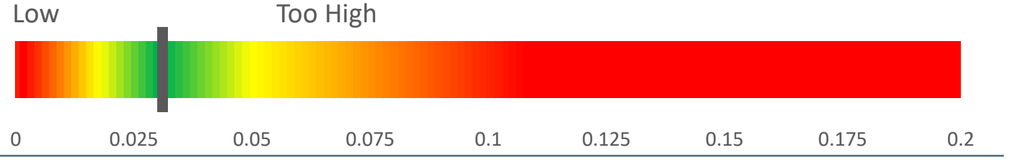
Aquatic Vegetation Species Observed	Growth Status	Recommendations
Filamentous Algae	Moderate	This species of vegetation is non-beneficial and can be a nuisance to anglers. Treating with copper-based algaecides (Captain XTR mix w/ Diquat) is recommended.
Lyngbya	Slight	This species of vegetation is non-beneficial and can be a nuisance to anglers. Treating with copper-based algaecides (Captain XTR mix w/ Diquat) is recommended.
Parrots Feather	Slight	This species of vegetation can provide beneficial, shallow habitat at low – moderate densities. This can be left to grow, but if it begins to grow heavily, it may be treated with Triclopyr and/or 2,4-D.
Lotus	Slight	This species of vegetation can provide beneficial, shallow habitat and shade at low – moderate densities. This can be left to grow in some areas for fishing, but if it begins to grow heavily, it may be treated with Triclopyr or 2,4-D.

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Water Quality

Parameter	Result
Surface Water Temperature (°F)	57
Surface Dissolved Oxygen (mg/L)	
pH	
Alkalinity (mg/L $CaCO_3$)	
Visibility (inches)	

Water Quality

Parameter	Result
Total Phosphorous (mg/L) – Site 1	
Total Phosphorous (mg/L) – Site 2	
Total Phosphorous (mg/L) – Site 3	



Plankton Analysis

Classification	Evaluation
Site 1 - Diatoms (*Pinnularia sp.)*	These are a planktonic protists (consume algae and photosynthesize) that make up the base of the food chain. These are a healthy species.
Sites 2 & 3 – Euglena (*Trachelomonas sp.)*	These are also a planktonic protist that also make up the base of the food chain. This species of Euglena in particular does not produce toxins, so no concerns with their presence either.

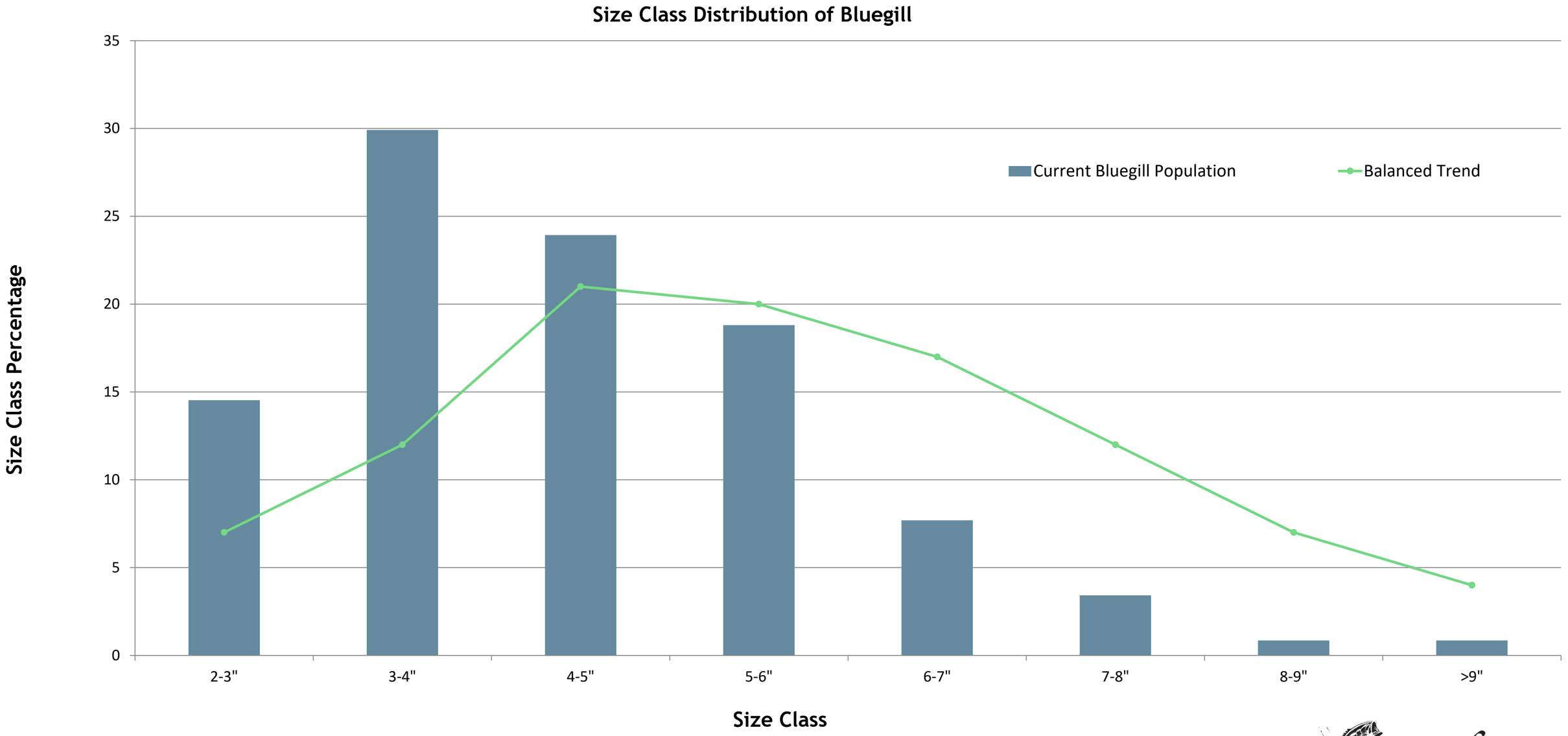
Fish Sampled

Species	Size Class (in.)	Quantity	CPUE (number/hour)	% of Total Sampled	Avg. Relative Weight/Size Class
Largemouth Bass	Reproduction	Limited	-	-	-
	2-4	0	0	0	-
	4-6	1	1	2	-
	6-8	1	1	2	-
	8-10	5	3	11	74
	10-12	1	1	2	-
	12-14	10	5	23	92
	14-16	13	7	30	89
	16-18	7	4	16	88
	18-20	3	2	7	87
	>20	3	2	7	88
Total	-	44	23	100	88
Additional Species					
Bullhead	7-12	5	3	-	-
Redbreast	4-7	9	7	-	-
Gizzard Shad	7-12	Abundant	-	-	-
White Bass	10-11	1	1	-	-
Channel Catfish	24-26	1	1	-	-
Black Crappie	8-12	18	9	-	-

Species	Size Class (in.)	Quantity	CPUE (number/hour)	% of Total Sampled
Bluegill	Reproduction	Limited	-	-
	2-3	17	17	15
	3-4	35	35	30
	4-5	28	28	24
	5-6	22	22	19
	6-7	9	9	8
	7-8	4	4	3
	8-9	1	1	1
	>9	1	1	1
Total	-	117	117	100
Redear Sunfish	Reproduction	Limited	-	-
	2-6	2	2	33
	6-9	0	0	0
	>9	4	4	67
Total	-	6	6	100

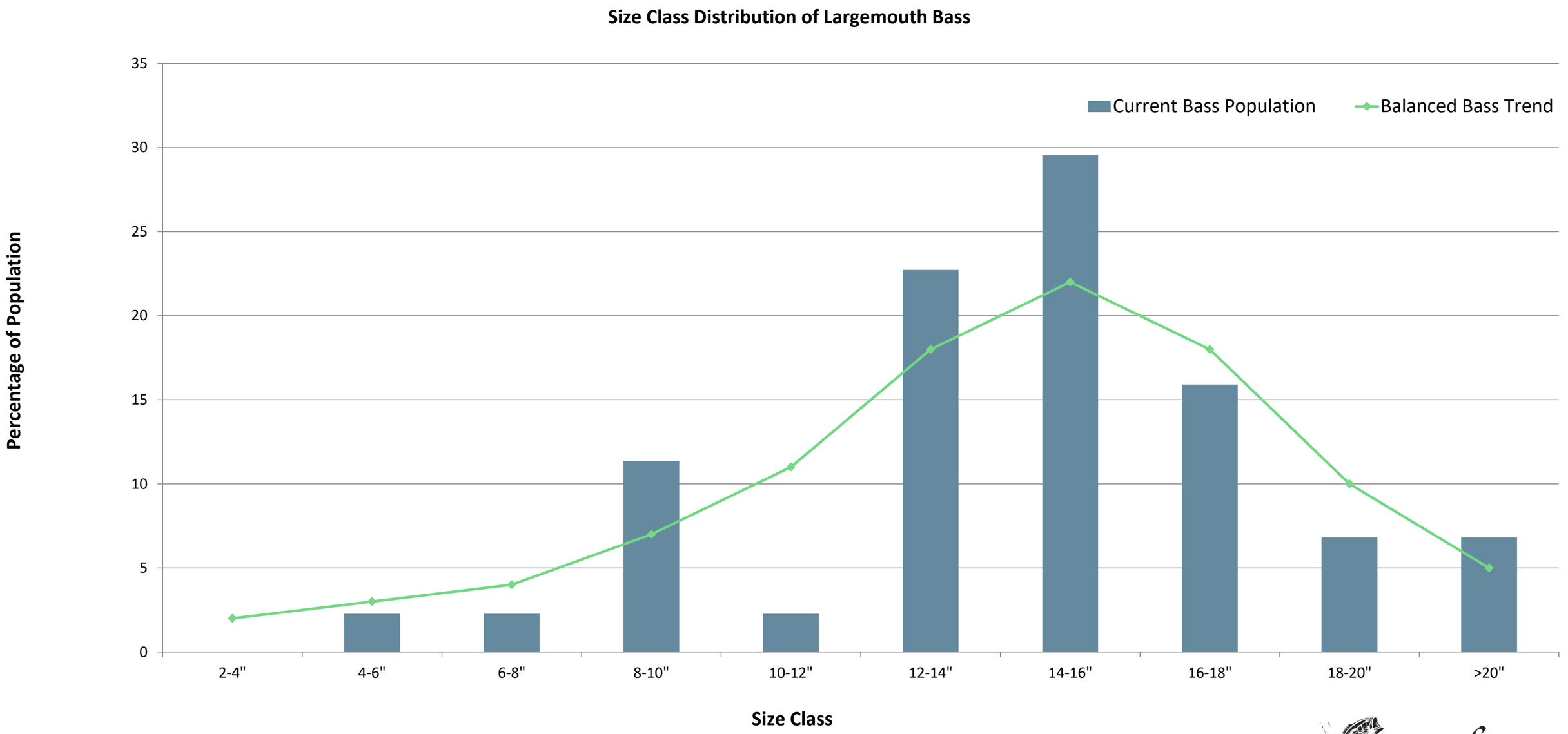
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Bluegill Results



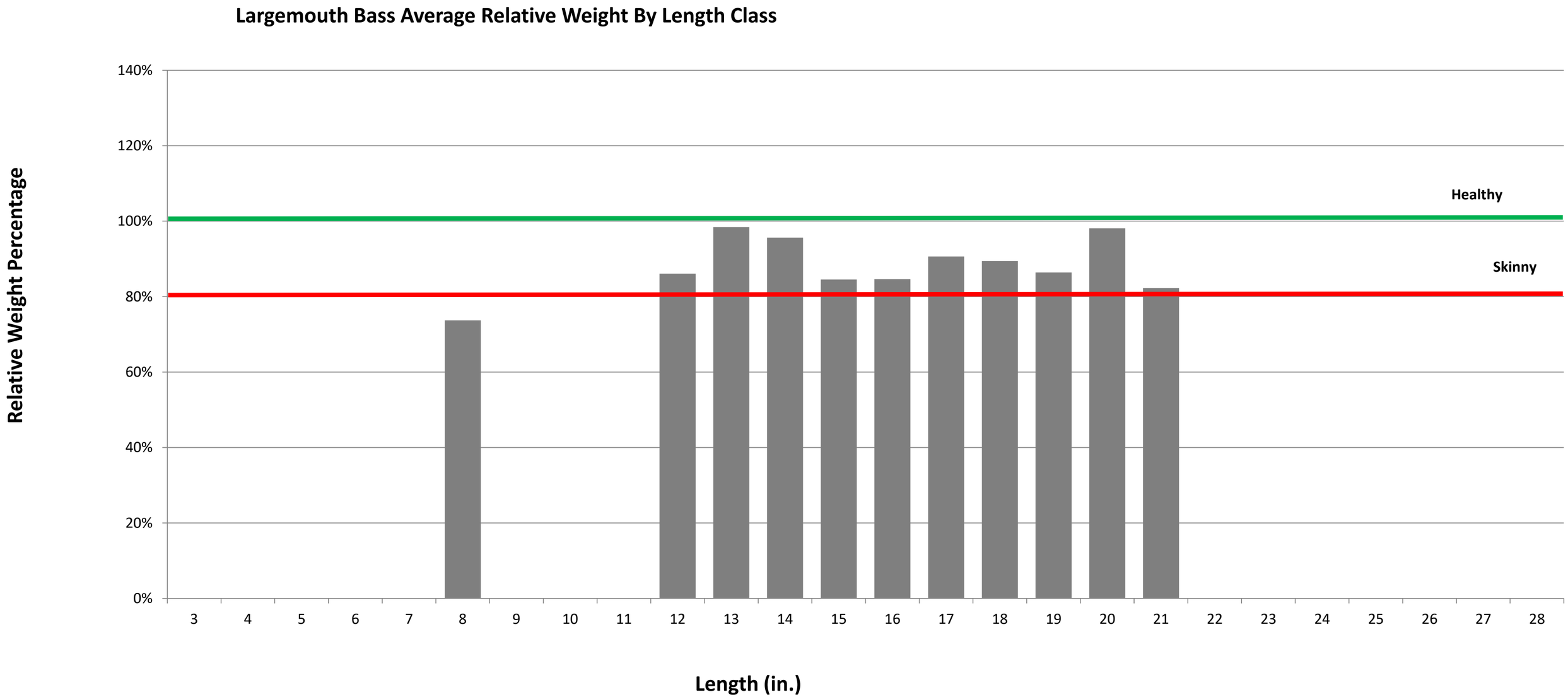
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Largemouth Bass Results



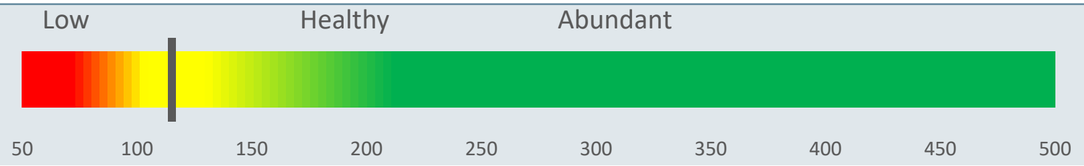
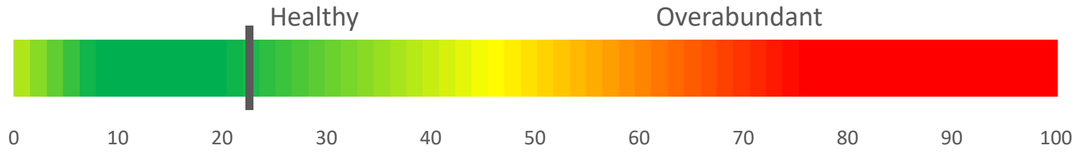
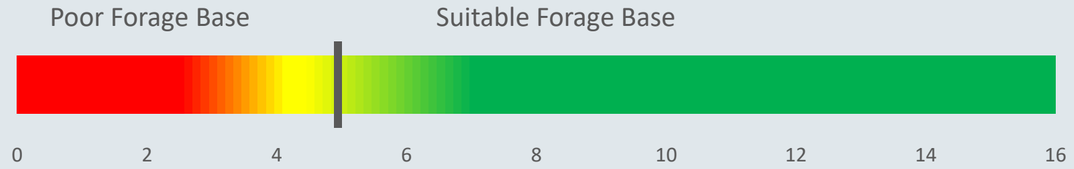
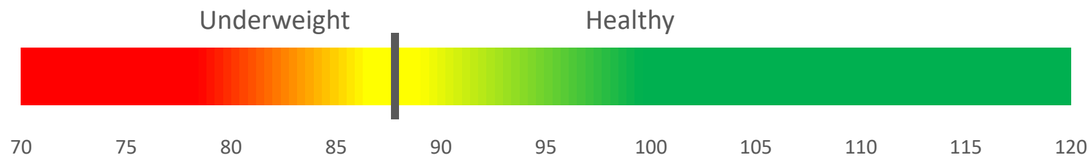
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Largemouth Bass Results



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Fishery Results

Item	Result
Bluegill CPUE (fish/hour)	
Largemouth Bass CPUE (fish/hour)	
Bluegill : Largemouth Bass CPUE Ratio (X:1)	
Average Relative Weight of Largemouth Bass (%)	
Average Length of Largemouth Bass (in.)	15.9
Average Weight of Largemouth Bass (lbs.)	2.2
Forage Species Sampled	Bluegill, Redear, Redbreast, Gizzard Shad
Predator Species Sampled	Largemouth Bass, Bullhead Catfish, Channel Catfish, Black Crappie, White Bass
Status (Balance) of Fishery	Balanced with Competitive Species

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Fishery Results

Limiting Management Factors

- ☒ Poor Water Quality (Alkalinity)
- ☐ Low Density Of Desired Plankton Bloom
- ☐ Cyanobacteria Dominant
- ☒ Poor Dense Habitat (Protective Cover)
- ☒ Poor Fishing/Predator Habitat
- ☐ Excessive Vegetation Growth
- ☒ Limited Fish Food (No Feeders)
- ☐ Incorrect Forage Size
- ☐ Low Forage Abundance
- ☒ Low Forage Base Diversity
- ☒ Presence of Competitive Species
- ☒ Limited Harvest of Predators

Summary

Overall, the pond is consisting of a relatively balanced bass population with other predators (crappie, catfish, white bass, etc.) making for a diverse, entertaining fishing experience. However, these predators are all competing for bluegill and shad, and will need to be managed properly to encourage continued, healthy growth. AES recommends the following to maintain balance, and improve the current fishery to experience more quality bass, crappie, and catfish fishing:

- Harvest small, underweight largemouth bass, crappie and catfish to decrease predator numbers and free up more forage to go around
- Install fish feeders at resident's docks to boost bluegill growth and production
- Install artificial/natural habitat to provide dense protective habitat for bluegill, and give bass/crappie areas to orient/ambush from
- Stock supplemental forage items (e.g. crawfish and shad) to add diversity and provide more sources of protein for the bass/crappie.
- Stock hybrid striped bass to provide another aggressive, fun fishing opportunity

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Recommendations

Recommendation	Cost	Timeframe
Harvesting Recommendations	AES harvested 40 lbs. of bass during the electrofishing survey. Harvest bass within the slot of 12-16”; anglers may take as many as desired. Crappie and catfish may be harvested as desired. It is recommended to limit harvest of bluegill. Anglers may take 10 per day per angler (mixed bag of shellcracker and bluegill).	
Installation of Ugly Tree artificial habitats to improve the fish habitat throughout the lake (page 17 for image and info)	$127.00 per Ugly Tree + Tax + Delivery (Minimum Order of 20 Ugly Trees) *Price Break At 26-50 Trees ($124.00/Tree), >50 Trees ($118.00/Tree)*	Spring 2025
Installation of Texas Hunter LM175 Fish Feeders (Page 21) (Includes Solar Panel, Battery, Control Panel, Dock Leg Kit)	$1,168.00 per Feeder + Tax + Shipping + Optional Installation (Dependent on # Being Installed) *Price Break at 3-6 Feeders ($1,148.00/Feeder) and >6 Feeders ($1,138.00/Feeder)*	Spring 2025
Stocking of 5 Loads of Threadfin Shad	$8,500.00 Delivered	Spring 2025
Stocking of 2,000 lbs. of Crawfish	$6,500.00 Delivered	May 2025 (Stock Annually)
Stocking of 2,000 (8-11") Hybrid Striped Bass	$9,400.00 Delivered	Fall 2025
Sign a Vegetation Management Contract with AES for 2025 Treatments	TBD *Let AES know if interested and quote will be provided*	2025

Recommendations are listed in priority from highest to lowest.

The recommendations listed above (and more importantly the timeline) are designed to improve the fishery as quickly as possible. The recommendations can be implemented over a longer period if needed for budgetary concerns. For example, the artificial habitats can be installed over a period of three years.

All pricing and products quoted are valid for 30 days of the report date. After 30 days pricing is subject to change and may have to be requoted.

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Appendix of Fact Sheets

Electrofishing

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

An electrofishing boat is designed to transmit an electrical current from a generator through a control box to a set of electrodes, which 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 ten feet in front of the boat and to a depth of approximately 6-8 feet. This allows AES 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 five minutes. Electrofishing is less stressful on the fish compared to catching fish with hook and line.

Relative Weight (Wr) 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 Wr of over 90% is desired in a balanced fishery and 100% or greater for a quality bass fishery.

Catch Per Unit Effort (CPUE) is the total number of fish captured with a defined unit of sampling effort. CPUE can be used as an index of population density and provides valuable information when tracked from year to year. Changes in CPUE will indicate corresponding changes (increases or decreases) in species abundance.



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Fishery Status

AES often refers to a fishery as a balanced fishery or an out of balance fishery. The balance of a fishery is determined by several factors such as size structure of the fishery, relative weights, and predator to prey ratio. Balance will differ from lake to lake depending on goals and what species are defined as prey and predators. In most cases, the prey species will consist of bluegill, redear sunfish, threadfin shad, etc. The predator base often consists of largemouth bass, catfish, crappie, etc.

Balanced Fishery: A fishery is in balance when there is an adequate predator population and adequate prey (forage base) permitting good growth and reproduction of all fish species. A balanced fishery will have a large distribution of predator and prey species ranging over several age and size classes. In a balanced fishery, the average relative weights of the largemouth bass will be 90% or greater.

Out of Balance Fishery: Out of balance often occurs when the predators become over abundant which allows them to limit their forage base. In an out of balance fishery, the predators will "stunt" or stop growing because they do not have the forage they need to continue growing. Stunting is often indicated when one size class of predators becomes over abundant, and one size class of prey becomes limited. In a typical out of balance fishery with largemouth bass as the top end predator and bluegill as the primary prey species, the fishery will consist primarily of underweight 10-14" bass with few larger bass. The bluegill population will consist primarily of larger bluegill with few preferred, smaller 3-5" bluegill. In an out of balance fishery, the average relative weights of the largemouth bass will be less than 90%.

Quality Bass Fishery: Is a fishery that has an abundant and diverse forage base consisting of species such as bluegill, redear sunfish, threadfin shad, crawfish, etc. Along with a strong forage base, the bass population will usually be maintained under carrying capacity through an aggressive harvesting program. By maintaining a smaller bass population, the bass will have higher growth rates producing numbers of 5-6 lb. bass and will provide the environment to allow them to potentially grow 10+ pounds. In a quality bass fishery, the average relative weights of the bass will be well over 100%.

Low Productivity Lake: A low productivity lake, or oligotrophic lake, can also be referred as a lake that has limited fertility. In such lakes, the lakes are "clear" lakes with little to no phytoplankton or zooplankton production. As a result, the lake cannot produce and sustain large fish populations and may only average 40-60 pounds of fish per acre of water. A low productivity lake will produce a fishery where all species of fish display slow growth rates, and often leads to an out of balance fishery.

Fish Harvesting

For harvesting of bluegill and redear sunfish (i.e., bream), there is no need to harvest a certain amount if managing for largemouth bass. It is not detrimental to take out bluegill on occasion, but the bluegill are the backbone forage species for largemouth bass. The more bluegill you harvest, the more food you are taking away from the largemouth bass. In a balanced fishery, AES recommends harvesting no more than 10 bream per day, keeping in mind not to over harvest. AES does not want fishermen harvesting bluegill every day. In severely out of balance fisheries, it is often best to suspend bream harvesting until the fishery is back in balance.

As a guideline, for fisheries that are out of balance with an overabundant bass population, harvesting up to 25-45 pounds of bass per acre per year may be needed to get the fishery back in balance. Typically, in an out of balance fishery, the most abundant size classes of bass must be harvested to thin them out. For fisheries that are in balance, 10-15 pounds of bass must be harvested to maintain a balanced fishery. One of the most effective methods for harvesting bass is to harvest the selected fish based off their relative weight. This method helps you remove the underweight bass while keeping the more superior bass in the lake. If the relative weight of a bass you catch is below 90%, harvest the fish no matter the size of the bass. If the relative weight is over 90%, release the bass no matter what the size of the bass is. Status and goals of a fishery will determine the exact number of pounds of fish to harvest.

Black crappie will easily overpopulate a lake and it is crucial to harvest crappie aggressively. For harvesting black crappie, a good rule of thumb is to harvest all crappie measuring less than 10". With severely overpopulated crappie populations, all crappie have to be harvested to thin out the population. Goals and status of the crappie population will determine how aggressive to harvest the crappie. But often, it is best to harvest all crappie when caught.

Channel catfish will have limited to no reproduction with largemouth bass present. For those that have catfish, it is best to manage them as a “put and take” fishery. Stock a known amount, enjoy them, and harvest them over a few years and once the population becomes limited, re-stock 8-11" catfish to start the process over again. As a rule of thumb, harvest all catfish measuring two pounds or larger. Once catfish reach two pounds, their gape size is large enough to compete with largemouth bass for forage.

For species such as bullhead catfish, gar, bowfin, chain pickerel, green sunfish, and warmouth, harvest all that are caught. These species are considered trash fish by most, do not provide any benefit to the fishery, and will limit the success of bluegill and largemouth bass populations (i.e., preferred species).

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Water Quality

AES uses an Oxygen Meter (YSI model 55) for determining the dissolved oxygen (D.O.) and temperature for a water body. Alkalinity is determined using a portable Hatch® digital titrator. A secchi disk is used to determine visibility and a portable pH/conductivity meter is used to determine pH/conductivity.

Dissolved Oxygen (D.O.) 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. D.O. does not pose a problem for most fish until levels fall below 4 mg/l.

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 effects may occur.

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 the visibility level. Therefore, in the absence of turbidity from silt or mud, the secchi disc serves as an international standard to indicate phytoplankton. We recommend keeping a phytoplankton bloom with a visibility between 24-36 inches via fertilization depending on the goals and time of year.

Alkalinity is the buffering capacity of the water and helps buffer sudden pH changes in the water. The main reason we are concerned about the alkalinity is because higher alkalinity levels allow fertilization to be more effective by making the phosphorus in the fertilizer more readily available for phytoplankton growth. If you were to try and fertilize a lake with low alkalinity, the phosphorus would just bind up with metals in the soil at the bottom of the lake.

Conductivity is not a major concern when managing a fishery. However, it is particularly important when electrofishing a body of water. Conductivity is a measure of the ability of water to pass an electrical current. The higher the conductivity, the larger the electric field generated by the electrofishing boat. The lower the conductivity, the smaller the electric field generated by the electrofishing boat.

Plankton Analysis

There are hundreds and hundreds of species of plankton found in freshwater systems. When lakes are fertilized to improve the fertility and productivity of the lake, the goal is to grow green phytoplankton. Green phytoplankton (which there are hundreds of species of) are the base of the food chain in a water body. In lakes that have a strong plankton bloom, the water will have a dark green color to it. Clear water indicates very little plankton growth. Green phytoplankton provides a food source for zooplankton, which are a microscopic organism that all species of fish will consume shortly after hatching. With a strong phytoplankton and zooplankton population, recruitment of newly hatched fish will increase, which increases the poundage of fish a lake can produce and support.

Unfortunately, there are some plankton species that are not beneficial to the fishery and can be harmful to humans and pets. Just because a lake has a green color to the water, does not mean it is helping the fishery. Cyanobacteria is a plankton species that is not beneficial to the fishery. Though it is microscopic, the majority of cyanobacteria are too large for zooplankton to consume. As a result, the cyanobacteria are not being grazed upon and not entering the food chain in the lake. So, it is not benefiting the fishery in terms of providing food for newly hatched fish. Since cyanobacteria are not being grazed upon by zooplankton, the population can easily become too dense which often results in pea soup green water. This can easily result in a fish kill due to low oxygen levels.

Another issue with cyanobacteria is that there are some species that produce toxins that are harmful to humans and pets. Known toxins produced by different species of cyanobacteria include Hepatotoxins, Neurotoxins, Dermatotoxins and Endotoxins. These toxins can result in mild to severe health issues, including death in severe cases depending on concentrations and sensitivity to those coming into contact with the water.

Aggressive research is taking place around the world on cyanobacteria as it is becoming more and more common. Cyanobacteria can be treated with an array of algaecides and implementing bottom diffused aeration. In lakes that receive a lot of phosphorus runoff, preventing this runoff at the point source is often the best approach if applicable. In most cases, it is best to avoid contact with the water and let the cyanobacteria run its course. *Unfortunately, all cases are different and there is not one specific solution that works for all cases*.

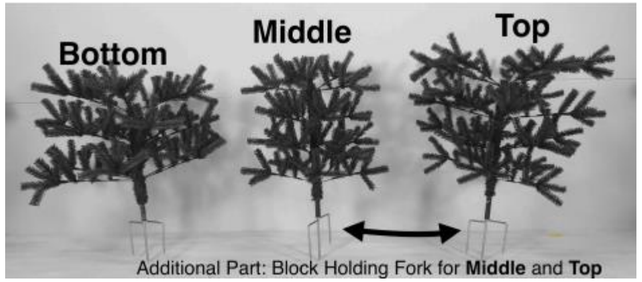


Cyanobacteria Concentrations	Hazard Status	Recommended Action
<20,000 cell/ml	Low	Continue Monitoring, Advise Lake Users
20,000 – 100,000 cells/ml	Moderate	Restrict Swimming (Humans/Pets)
>100,000 cells/ml	High	Prohibit Swimming (Humans/Pets) and All Other Water Contact Activities

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Ugly Tree Fish Habitat

Ugly Trees: The Ugly Tree was designed by Lake Managers for Lake Managers. Its Patent Pending design mimics natures most effective and efficient natural habitat - the Cypress tree. Designed with over 1,000,000 leaflets, the Ugly Tree offers a massive amount of surface area provide protective cover for juvenile fish, spawning habitats, and to grow periphyton. Each Ugly Tree will develop a highly efficient ecosystem to promote optimal health of your lake or pond







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Habitat Improvements Using Natural Material

Nearly any material can be used to create fish habitat. The key is to use the correct size and style of material to achieve the goals of improving the specific habitat your pond needs. For example, dense material such as Christmas Trees work great to provide complex habitat in shallower water depths to protect smaller forage fish. Whereas wooden pallets work well in deeper water to provide orientation/ambush points for largemouth bass. Typically, most lakes lack dense protective habitat in shallower depths, and it is critical to have ample dense habitat throughout the lake to protect forage fish. When improving dense habitat using natural material, AES recommends using Christmas Trees, dense treetops, and/or falling brush and trees growing along the shoreline and letting it fall into the lake. Rock or busted concrete is also great when it can be easily added.

For adding habitat in deeper water, 10-15' trees can be cut be used. These trees can be dragged out into the lake where cinder blocks are placed on the tree trunk. This will sink the tree trunk first allowing the tree to stand up through the water column providing excellent habitat for fish.

If a lake owner has easy access to natural material (like trees/brush), AES recommends utilizing this resource. With using natural material, it’s important to remember it will decompose over time and will need to be replenished every two – three years. AES has vast experience in installation of habitat and can provide the labor necessary for deploying the material with our barge.





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Supplemental Fish Feeding

One of the best means of increasing the enjoyment of a pond is the addition of a fish feeding program. Feeders will directly feed bluegill, trout, hybrid striped bass, channel catfish, and feed trained largemouth bass. In many ponds, you are feeding your bluegill population to indirectly feed the bass. Feeding bluegill a supplemental fish food creates healthier fish that reproduce at higher rates, therefore increasing the population. In addition, feeding bluegill increases its weight, which subsequently increases the weight of the bass. Feeding can occur year-round in some areas, but generally begins in March and continues into December in much of the Southeast.

Feeding by hand is acceptable but will not compare to using an automatic fish feeder which feeds multiple times a day. Having feeders on the lake 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 lake 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.

Bluegill will not travel far to consume food. To maximize bluegill growth and production, setup multiple feeders on lakes greater than 1/2 acre. All lakes are shaped differently, but typically a minimum of one feeder per acre is necessary to feed a majority of the bluegill population in smaller lakes. For lakes greater than 10 acres one feeder/three acres is sufficient.

For bluegill, we recommend using Purina AquaMax MVP, 500 or 600 fish food. The AquaMax 500 and 600 contain 41% protein and 12% fat and are both a floating fish food. The AquaMax 500 is 3/16” (4.8 mm) in size and the AquaMax 600 is 9/32” (7.1 mm) in size, while MVP is a mix of nine sizes of feed and contains 43% protein and 12% fat and is a floating fish food as well. For most applications where bluegill are the targeted species, we recommend the AquaMax MVP.

A research project was conducted comparing the growth of bluegill with several formulations of fish food. In short, with a higher quality fish food, less pounds of food is needed to achieve faster and higher growth rates. Though a higher quality food is more expensive per pound, it is cheaper to use because less pounds of the higher quality food is needed. The bluegill growth research project showed a feed conversion of 1.86 for AquaMax 500 and 3.3 for a 32% protein fish food. With these conversions we compared cost: cheaper feed is $1.75/lb. of weight gain compared to Purina AquaMax $1.42/lb. of weight gain. This is a huge cost savings over the course of a year, and you will have much larger fish to catch as a result.

Supplemental Fish Feeding

Feeding bluegill and catfish will occur from March – November and the feeder will need to be filled once a month on average (i.e., two bags per month). This is a total of 18 bags needed for the year and with using Purina AquaMax fish food, the yearly cost of fish food for one feeder is approximately $1,200 though this can change depending how aggressively the feeders are adjusted.

How much should you feed? Generally, only cast enough feed so the fish will eat most of the food in 5 to 10 minutes. 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 the early morning and late afternoon. As the water begins to cool in the fall, feed four times daily. In early spring and winter, feed only once at the hottest part of the day. 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 four 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 two times per day during the cooler parts of the day, typically at sunrise and sunset. The amount of food used 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.

Aquatic Environmental SERVICES, INC.

Texas Hunter Fish Feeders

AES recommends the Texas Hunter Product line of fish feeders. Texas Hunter Products have developed the best fish feeder on the market today. From excellent customer service to ease of use, these feeders were built with the lake owner in mind. We offer price breaks for quantity purchases.

Texas Hunter Fish Feeder Advantages:

- Patented, powerful centrifugal air blower engineered to eliminate the need for solenoids, gates, and augers, reducing the number of parts and possible breakdowns
- The corners of the lids are formed and welded before being powder-coated, providing a better seal and avoiding possible cuts from the sharp edges of the lid
- A quick-release side panel with a Clear-View Funnel so you can immediately detect a clog from debris, without having to take the feeder apart. Should a clog occur, you can clean out the entire blower system and you are up and running again in less than five minutes. On most feeders on the market today, the lower half of the feeder has to be disassembled just to access the motors.
- Texas Hunter's powerful 2-watt solar charger can be mounted to any side of the unit. This maximizes the sun's energy – no matter where the feeder is placed around the lake.
- Designed to feed fish pellets (up to 7mm)
- Wedge-shaped feed pattern 45' x 20'
- Large welded footpads for extra stability
- Legs & footpads are powder-coated for rust prevention
- Powerful 2-watt Solar Panel
- Different models to choose from: LM135 (70 lb. capacity), LM175 (100 lb. capacity), LM335 (175 lb. capacity) and LM435 (250 lb. capacity)
- Your choice: Adjustable legs for easy leveling or Straight legs for piers & docks
- EZ Set digital timer - no fuses - no 'timer' battery required - 5-year warranty
- 12v rechargeable heavy duty 7amp battery included
- Built-in 'nut-inserts' make leg installation a breeze



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Vegetation Management

Aquatic vegetation not only decreases the aesthetic appeal of the lake and interferes with fishing efforts and boating, but it also utilizes available nutrients. In severe infestations, aquatic vegetation utilizes all the available nutrients within the lake preventing the growth of phytoplankton. This limits the productivity of the lake. Not all aquatic vegetation in a lake is detrimental to the fishery. Some species of vegetation are encouraged in order to provide fish habitat. In larger bodies of water, aquatic vegetation coverage up to 20% can be sustained without detrimental effects to the productivity of the lake.

Aquatic vegetation needs three essential elements to grow: sunlight, nutrients, and temperature. There is nothing we can do to control temperature and there is little we can do to control nutrients in most scenarios. However, we can manipulate the sunlight penetration through the water column. If sunlight can penetrate through the water column to the lake bottom, aquatic vegetation is very likely to grow. This typically occurs in water depths of three feet or less. In lakes with “gin clear” water, weeds will grow in deeper depths due to increased sunlight penetration. Lake dyes can be used to shade out the sunlight which will help deter aquatic vegetation growth. However, for those concerned with producing a quality fishery, lake dye is not recommended because it will also shade out sunlight for phytoplankton growth. An option for growing phytoplankton and deterring vegetation growth is implementing a proper fertilization program. By establishing a phytoplankton bloom early in the spring via a fertilization program, the phytoplankton bloom will minimize sunlight penetration which will help deter submersed aquatic vegetation growth. Once vegetation is established it becomes more difficult to fertilize.

For lakes with severe vegetation growth, implementing an Aquatic Vegetation Control Program that includes a multi-prone attack to keep aquatic vegetation under control is recommended (i.e., herbicide applications, grass carp stocking, dredging shallow areas, and aeration).

For many submerged vegetation species, the best method to control aquatic vegetation is the stocking of the proper number of grass carp. They provide the most economical long-term control of submersed vegetation.

For some select species where grass carp have limited success, use an EPD approved aquatic labeled herbicide. Aquatic herbicides will often provide the quickest results for controlling aquatic vegetation. Aquatic herbicides are not harmful to fish when used properly. When treating aquatic vegetation with herbicides, the vegetation may need to be treated with multiple applications over a period of time. With severe infestations, if the entire biomass of vegetation is killed all at once, it can degrade the water quality as the vegetation decomposes potentially resulting in a fish kill.

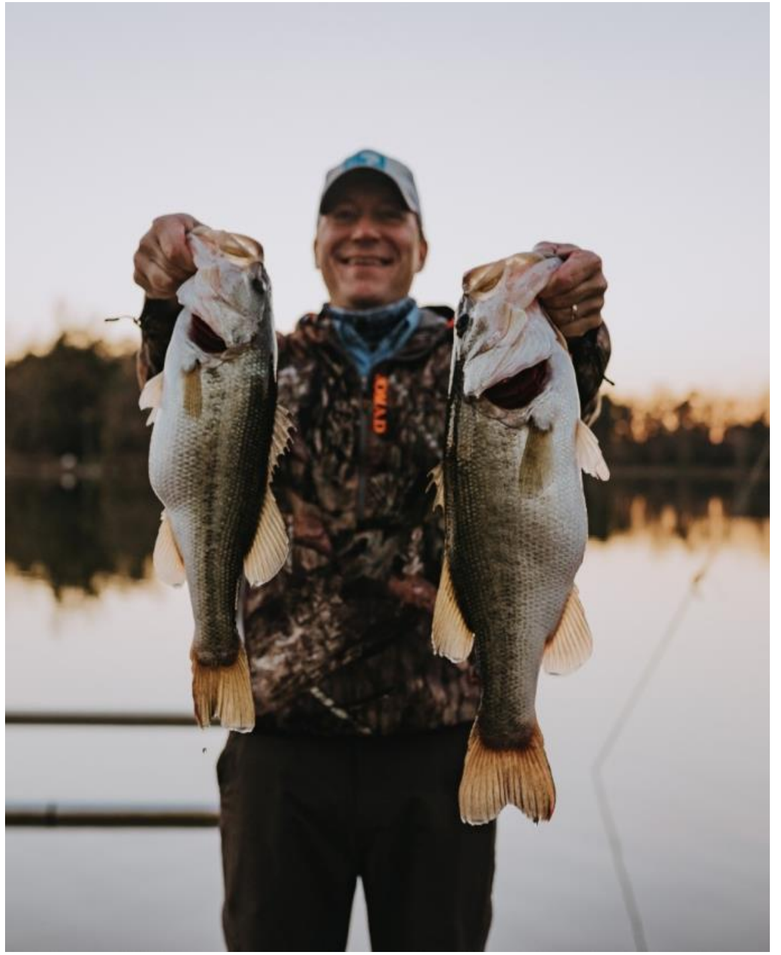
Largemouth Bass

Largemouth Bass (*Micropterus salmoides*) 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 largemouth bass the top end predator in most lakes. Largemouth bass begin to spawn when the water temperature reaches 63-68°F, and normally once a year in the early spring before bluegill begin to spawn. The average lifespan of largemouth bass is ten years.

There are two known subspecies, Florida and Northern Largemouth Bass. Florida bass are known to grow quite large, but some 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 (50% Florida and 50% Northern) 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 and are most common in older lakes.

For stocking bass in existing fisheries, Florida Bass, Northern Bass, and/or F1 Bass can be stocked. Depending on goals, 10-20 largemouth bass should be stocked in existing fisheries. The key here is to not stock too many so that the fishery becomes out of balance. If wanting to introduce fresh genetics to the fishery, ten bass can be stocked per acre; and for those wanting to increase catch rates, upwards of twenty bass per acre can be stocked.

One option that we have had great success with is creating a feed trained fishery by stocking feed trained Pure Northern Bass. This is a great option for smaller ponds. For stocking feed trained bass to create a feed trained bass fishery, Pure Northern Bass that are a pound in size and have been raised on fish food are stocked. In order to have a feed trained bass fishery, the bass will have to be stocked at a high rate of 50 bass per acre in order to maintain a high rate of competition among the bass for forage which keeps the bass on the fish food. Along with this, an aggressive supplemental feeding program needs to be in place using high quality fish food. Feed trained bass may grow upwards of 5-7lbs. when on the correct feeding program.



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Bluegill

Bluegill (*Lepomis macrochirus*) (AKA "Bream") are the backbone of the forage base for largemouth bass. Average lifespan of bluegill is 6-8 years and 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. To produce quality largemouth bass, the lake must have an abundant and healthy bluegill population. Bluegill spawn in large colonies in 1-5 feet in depth over sandy and gravel substrates. Spawning occurs when water temperatures reach 67-70°F.

There are two subspecies, native (also called Mississippi) and coppernose. The coppernose are better suited for warm climates and are more aggressive when feeding on supplemental fish food compared to the Mississippi bluegill resulting in great growth rates.

For supplemental stocking of bluegill in an existing fishery, we recommend stocking 3-5" bluegill. These fish are sexually mature at this size and will reproduce actively during the growing season. To supplement an existing bluegill population, stock 500-1000 (3-5") bluegill per acre. Keep in mind you can never have too many bluegill if wanting better bass growth, so you may consider stocking more to speed up the improvements of the fishery.





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Redear Sunfish

Redear Sunfish (*Lepomis microlophus*) (Another species that may be labeled "bream" and/or shellcracker) occupy a different ecological niche than bluegill, improving the utilization of the lake's natural productivity. The teeth in the throat of redear sunfish are adapted for crushing shells of snails and other mollusks giving them the name shellcracker. By consuming snails along with other invertebrates present in the lake, redear sunfish can help to reduce the incidence of some fish parasites (i.e., grubs, flatworms) that use a snail as an 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".

Redear sunfish spawn in the spring and spawn in colonies like bluegill. Redear sunfish typically build their nest next to aquatic vegetation. Typical life expectancy is six years.





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Threadfin Shad

Threadfin Shad (*Dorosoma petenense*) occupy an additional niche in the ecosystem. Threadfin shad provide a rich and abundant source of protein for largemouth bass and are an open water species that feed on phytoplankton, performing best when a fertilization program is in place.

Threadfin shad will help reduce predation pressure on bluegill which will help improve the bluegill population. Threadfin shad are sold by the load and a load consists of 3,500-5,000 adult fish ready to spawn, which are stocked in April and May. Spawning occurs from dawn to shortly after sunrise in shallow water where the adhesive eggs adhere to submerged objects.

Threadfin shad are cold tolerant and can die off in extreme cold winters when the water temperatures reaches 45 degrees or colder. If a pond or lake ices-over in the winter, the shad will likely winter kill. Their average lifespan is three years.



Crawfish

Crawfish: Provide a high protein forage item for largemouth bass at a fraction of the cost of other supplemental forage. The benefits of stocking crawfish are quick and catch rates have been known to increase after crawfish are stocked. Bass love crawfish and studies have shown that they prefer them over bluegill nine times to one, which means your bluegill survival rates will increase during this time.

Stocking rates vary from 40-100 lbs. per acre. Though crawfish will have some establishment, in most cases, their populations will be limited in size and AES prefers to stock crawfish each spring for providing a boost of forage for the largemouth bass. Considering that crawfish are stocked later in the spring, stocking them each year helps largemouth bass recover weight loss from spawning season.





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Channel Catfish

Channel Catfish (*Ictalurus punctatus*) are the most common catfish stocked in ponds. Channel catfish provide a great game fish for children and novice fisherman, and they diversify the fishing options in the lake.

Larger adult channel catfish lose their spots resulting in them being very similar in appearance to blue catfish. Channel catfish can live beyond twenty years though most may only live 10-15 years. Spawning occurs once the water temperature reaches 75 degrees and eggs are generally laid in hollowed out holes along the shoreline, hollow logs, under logs, or using rocks. Channel catfish have limited reproduction success in the presence of largemouth bass. Once the catfish fry leave the nest, they are no longer guarded by the adult catfish making them easy targets for largemouth bass.

Channel catfish have limited competition with bass before they reach two pounds in weight because catfish mostly feed on fish food (if provided) or invertebrates. However, once they reach two pounds, they will compete heavily with largemouth bass for forage. Channel catfish do best when provided supplemental feed and this also helps minimize their impact on the fishery. AES suggests to only stock channel catfish if fishermen want to catch them. In fisheries where largemouth bass growth is top priority, then channel catfish should not be stocked.



Black Crappie

Black Crappie (*Pomoxis nigromaculatus*) are a desirable species for many fishermen; however, they can have a negative impact on a fishery. Black crappie can live up to 15 years and spawning occurs when the water temperature reaches 62-65°F. This allows the crappie to get a head start on other species in the lake giving them a large recruitment class (i.e., small fish survive to reach a larger size). This results in the crappie fingerlings growing too big to serve as food for young of the year bass and they compete with and predate small largemouth bass. This often leads to a rapidly expanding crappie population in smaller lakes.

As the crappie population grows, so does the competition between crappie and bass resulting in decreased growth in both species.

Threadfin shad and golden shiners provide ideal forage for crappie. However, crappie are similar to largemouth bass in forage selection, as they will consume anything that will fit in their mouth.





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Redbreast

Redbreast (*Lepomis auritus*) belong to the sunfish species though they are more of a stream species compared to bluegill and redear sunfish. Typically, redbreast sunfish are found in sandy bottom creeks and rivers and rarely seen in slow moving or stagnant waters. However, for lakes that have a sizable stream flowing into them, redbreast sunfish will often inhabit the lake. Typically, the redbreast population will be small in lakes since they are not as well adapted in lake environments compared to bluegill.

Redbreast sunfish begin spawning once the water temperature reaches 70 degrees. Redbreast usually build solitary nests, unlike bluegill, and the nests are usually located near logs, stumps, etc. Redbreast nests are larger in diameter than a bluegill nest. Redbreast sunfish feed on aquatic insects, crayfish, and smaller fish.

Redbreast sunfish will provide forage for largemouth bass, and they are sought after by “bream fisherman” for their feisty nature and excellent table fare.





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Hybrid Striped Bass

Hybrid Striped Bass (*Morone spp.*) (AKA wipers, sunbass, or just hybrids) are a cross of a white bass and striped bass that are very aggressive and fast growing when stocked in the right environment. Hybrid striped bass provide an excellent sport fish for fishermen to enjoy. A five-pound hybrid on the end of the line will feel like a ten-pound largemouth bass.

Their growth rates are higher in waters with hardness levels above 50 ppm. Growth of hybrid striped bass are best in lakes having a threadfin shad population and/or a supplemental feeding program. When stocked at low densities with a supplemental feeding program in place, there is little impact on the largemouth bass population.

They do not reproduce making them easy to manage. They put up an excellent fight for their size and with the blood line removed, provide good table fare as well.



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Bullhead Catfish

Bullhead Catfish (*Ameriurus spp*) There are several species of bullhead catfish: yellow bullheads, brown bullheads, black bullheads, and speckled bullheads. Brown bullheads are most commonly found in ponds and lakes. Brown bullheads can live eleven or more years and spawning occurs when the water temperature reaches 70-75°F. Brown bullheads will spawn in excavated holes in banks, cavities in old stumps, or even burrow under the roots of aquatic plants. Bullhead catfish can reproduce successfully in a lake allowing them to build up a large population.

Brown bullheads feed primarily at night feeding along the pond bottom. They will consume small fish, crustaceans, aquatic insects and even dead animal matter.

Bullhead catfish will compete with more desired species and should be harvested when caught. Bullhead catfish have slow growth rates, are often not of interest to anglers, and they compete for food and space with desirable fish species.



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Fertilization Log

Date/Time	Weather Conditions	Secchi Reading (in.)	Fertilizer Added (lbs.)	Vegetation Status

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Feeder Log

Date/Time	Weather Conditions	Feeder Number	Feed Added (lbs.)	Feeding Response

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Largemouth Bass Harvest Log

Date/Time	Weather Conditions	Length (in.)	Weight (lbs.)	Relative Weight (%)	Harvested (Y/N)	Notes/Tag Number

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Largemouth Relative Weight Index (Grams)

	Weight of Bass Caught (Grams)						
Length (in.)	**110%**	**100% (Standard Weight)**	**95%**	**90%**	**85%**	**80%**	**75%**
10	250	227	215	204	193	181	170
10.5	304	276	262	249	235	221	207
11	339	308	293	278	262	247	231
11.5	389	354	336	318	301	283	265
12	449	408	388	367	347	327	306
12.5	509	463	440	416	393	370	347
13	579	526	500	474	447	421	395
13.5	653	594	565	535	505	475	446
14	734	667	633	600	567	533	500
14.5	818	744	707	670	632	595	558
15	913	830	789	747	706	664	623
15.5	1013	921	875	829	783	737	691
16	1123	1021	970	919	868	816	765
16.5	1238	1125	1069	1012	956	900	844
17	1362	1238	1176	1114	1053	991	929
17.5	1497	1361	1293	1225	1157	1089	1021
18	1637	1488	1413	1339	1265	1190	1116
18.5	1786	1624	1543	1461	1380	1299	1218
19	1942	1765	1676	1588	1500	1412	1323
19.5	2112	1920	1824	1728	1632	1536	1440
20	2290	2082	1978	1874	1770	1666	1562
20.5	2475	2250	2137	2025	1912	1800	1687
21	2674	2431	2310	2188	2067	1945	1823
21.5	2884	2622	2491	2360	2229	2097	1966
22	3103	2821	2680	2539	2398	2257	2116
22.5	3333	3030	2879	2727	2576	2424	2273
23	3577	3252	3090	2927	2764	2602	2439
23.5	3827	3479	3305	3131	2957	2783	2609
24	4096	3724	3538	3352	3165	2979	2793
24.5	4376	3978	3779	3580	3381	3182	2984

Measure fish from tip of nose with mouth closed to the end of the tail (make sure to “pinch” the tail). Weigh the bass in grams and measure in inches to nearest 1/4 inch; then using the table, look up the relative weight of the bass for its current length and weight. For example: a bass was caught measuring 16” and weighed 940 grams. Looking at the chart, this particular bass has a relative weight of approximately 92%. To get the exact relative weight of a bass, use the standard weight column from the table above to find the standard weight of the bass caught. Divide the actual weight of the bass caught by the standard weight and multiply by 100. This will give you the relative weight of the bass caught.

Example: a 20.5” bass was caught weighing 2100 grams. Looking at the table above, The standard weight for a 20.5” is 2250 grams. 2100/2250 = 0.933 * 100 = 93%.

1 pound = 454 grams
1 ounce = 28.35 grams
1 ounce = .0625 lbs

Aquatic Environmental SERVICES, INC.

Largemouth Relative Weight Index (Pounds)

	Weight of Bass Caught (Pounds)						
Length (in.)	**110%**	**100% (Standard Weight)**	**95%**	**90%**	**85%**	**80%**	**75%**
10	0.55	0.50	0.47	0.45	0.43	0.40	0.37
10.5	0.67	0.61	0.58	0.55	0.52	0.49	0.46
11	0.75	0.68	0.65	0.61	0.58	0.54	0.51
11.5	0.86	0.78	0.74	0.70	0.66	0.62	0.58
12	0.99	0.90	0.85	0.81	0.76	0.72	0.67
12.5	1.12	1.02	0.97	0.92	0.87	0.81	0.76
13	1.28	1.16	1.10	1.04	0.98	0.93	0.87
13.5	1.44	1.31	1.24	1.18	1.11	1.05	0.98
14	1.62	1.47	1.39	1.32	1.25	1.17	1.10
14.5	1.80	1.64	1.56	1.48	1.39	1.31	1.23
15	2.01	1.83	1.74	1.65	1.56	1.46	1.37
15.5	2.23	2.03	1.93	1.83	1.72	1.62	1.52
16	2.47	2.25	2.14	2.02	1.91	1.80	1.69
16.5	2.73	2.48	2.35	2.23	2.11	1.98	1.86
17	3.00	2.73	2.59	2.45	2.32	2.18	2.05
17.5	3.30	3.00	2.85	2.70	2.55	2.40	2.25
18	3.61	3.28	3.11	2.95	2.79	2.62	2.46
18.5	3.93	3.58	3.40	3.22	3.04	2.86	2.68
19	4.28	3.89	3.69	3.50	3.30	3.11	2.91
19.5	4.65	4.22	4.00	3.79	3.59	3.38	3.17
20	5.04	4.59	4.36	4.13	3.90	3.67	3.44
20.5	5.45	4.96	4.71	4.46	4.21	3.96	3.72
21	5.89	5.35	5.09	4.82	4.55	4.28	4.02
21.5	6.35	5.78	5.49	5.20	4.91	4.62	4.33
22	6.83	6.21	5.90	5.59	5.28	4.97	4.66
22.5	7.34	6.67	6.34	6.01	5.67	5.34	5.01
23	7.88	7.16	6.81	6.45	6.09	5.73	5.37
23.5	8.43	7.66	7.28	6.90	6.51	6.13	5.75
24	9.02	8.20	7.79	7.38	6.97	6.56	6.15
24.5	9.64	8.76	8.32	7.89	7.45	7.01	6.57

Measure fish from tip of nose with mouth closed to the end of the tail (make sure to “pinch” the tail). Weigh the bass in lbs. and measure in inches to nearest 1/4 inch; then using the table, look up the relative weight of the bass for its current length and weight. For example: a bass was caught measuring 16” and weighed 2.10 lbs. Looking at the chart this particular bass has a relative weight of approximately 93%.

To get the exact relative weight of a bass, use the standard weight column from the table above to find the standard weight of the bass caught. Divide the actual weight of the bass caught by the standard weight and multiply by 100. This will give you the relative weight of the bass caught.

Example: a 20.5” bass was caught weighing 4.5 lbs. Looking at the table, The standard weight for a 20.5” is 4.5 lbs. 4.5/4.96 = 0.907 * 100 = 90.7%.

1 pound = 454 grams
1 ounce = 28.35 grams
1 ounce = .0625 lbs.

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