

RESERVOIR BLACK BASS MANAGEMENT PLAN

2022 – 2031



ARKANSAS GAME AND FISH COMMISSION FISHERIES DIVISION

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EXECUTIVE SUMMARY

Recreational fishing is popular in Arkansas and provides a significant economic boost to the state's economy. Arkansas had 343,135 resident anglers that held fishing licenses in 2016, and Hunt and Westlake (2018) reported that 36% of those anglers preferred to fish for black bass. The black bass present in Arkansas are Largemouth Bass (*Micropterus salmoides*), Smallmouth Bass (*M. dolomieu*), and Spotted Bass (*M. punctulatus*). Black bass anglers in Arkansas fish about 30 days yearly and have fished, on average, for 32 years. Anglers fishing for black bass invest greatly in their fishing and boating equipment, which averages more than \$11,000 per angler (Hunt and Westlake 2019). About 8% of black bass anglers fish in tournaments, and 9% participate in online forums related to black bass fishing (Hunt and Westlake 2019). Most black bass anglers practice catch and release. However, these values represent averages; anglers of all ages fish for black bass and vary in their preferences, attitudes, and opinions. Thus, successful management requires that the Arkansas Game and Fish Commission (AGFC) manage the distinct black bass fisheries to meet the diverse needs of its stakeholders.

Due to the popularity and importance of black bass fishing in Arkansas, AGFC has developed management plans that guide activities to improve black bass populations. Previous plans written in 1992, 2002, and 2017 created the foundation for monitoring and managing black bass fisheries. This plan builds on that work while seeking new ways to improve black bass fishing and management, and increase angler satisfaction. Specifically, this plan seeks to increase public involvement throughout the planning process. Thus, black bass stakeholders developed the goals of this plan and focused on areas where AGFC could improve black bass fishing and management. This plan creates a blueprint for black bass management for the next ten years and aims to advance the science of black bass management and create excitement for black bass anglers and fishing in Arkansas. By January 31st of each year, a report of the prior year's achievements, successes, and challenges will be created and available to the public.

To create the Reservoir Black Bass Management Plan (RBBMP), AGFC first utilized results from a 2018 survey of black bass anglers. This survey revealed critical information on black bass anglers' attitudes, opinions, and perceptions across Arkansas. AGFC also collected information in 2021 that described Arkansas black bass anglers' motivations, likes, and dislikes (Appendix A). These two surveys clearly demonstrated that anglers enjoy fishing for black bass for many reasons and seek various experiences from their fishing trips. These differences challenge fisheries biologists to create a management plan that meets the diverse needs of Arkansas' anglers.

A critical step in developing the RBBMP involved the creation of a Stakeholder Advisory Committee (SAC). This group of 13 stakeholders (Appendix B) represented the broad interests in black bass fishing and management and worked with AGFC staff to create this plan. The planning process focused on balancing stakeholder values and sound biological information provided by AGFC to produce a technically sound and publicly supported plan. As a result, the RBBMP includes values and goals identified by stakeholders to determine what Arkansans want black bass management to achieve. The plan also includes objectives and strategies developed by AGFC technical staff to describe how to achieve stakeholder goals. The SAC and AGFC staff were asked to rank each objective to prioritize the importance of each objective (Appendix C).

Using information from the two previous surveys, the SAC identified seven key areas that serve as the basis for the work AGFC will accomplish over the next several years. Below are the seven key areas, the stakeholder goal for the key area, and specific objectives related to the general goal.

Key Area #1 – Diversify Black Bass Fishing Opportunities

Black bass anglers differ in a number of characteristics including why they fish, where they fish, and how they fish. Some anglers prefer high catch rates, while others seek opportunities for trophy-size bass. Many black bass anglers practice catch-and-release while others like to harvest their catch. Some anglers enjoy the competitiveness of tournament fishing, while many others do not. Some anglers fish many days each year, while others just fish occasionally. Similarly, some anglers invest a great deal of resources into pursuing black bass, while others may fish from the bank with less equipment.

Goal – Manage black bass in Arkansas' reservoirs to optimize the diverse fisheries that anglers seek across the state.

Objectives

1. Identify at least five reservoirs > 500 acres and at least five reservoirs < 500 acres to manage for trophy Largemouth Bass by December 31, 2024.
2. Identify at least ten reservoirs to manage for high catch rates of Largemouth Bass across Arkansas by December 31, 2024.
3. Promote the diverse opportunities for black bass fishing in Arkansas by December 31, 2024.

Key Area #2 – Communication and Education

The AGFC utilizes a variety of communication tools to disseminate information to stakeholders. Using the AGFC newsletter and constant contact emails, AGFC fisheries staff share information on projects and developments on reservoirs across Arkansas. The AGFC Black Bass Management Facebook and Instagram pages share information with the public regarding black bass management. While popular, increased communication, especially using a broader array of social media platforms would improve information exchange with our diverse stakeholders.

Goal – Utilize diverse strategies to broadly connect with black bass stakeholders to inform and educate on black bass fishing, management, and conservation efforts.

Objectives

1. Each year, increase online educational materials on black bass management in Arkansas' reservoirs by 10%.
2. Each year, increase educational materials on black bass fishing in Arkansas' reservoirs by 10%.

Key Area #3 – Access and Facilities

Anglers require adequate access and facilities to fish for black bass at Arkansas' reservoirs. Access includes more than boat ramps. Satisfactory access also includes courtesy piers and docks that are in good working condition and safe to use. More access areas should have the facilities to attract large fishing tournaments. Boat ramps should be constructed for high and low water levels so that anglers can safely launch a boat under a wide array of conditions. Access areas should also provide more ADA-approved opportunities.

Many reservoir access areas lack adequate facilities that could improve the angler experience. Other access areas have facilities that may require improvements. Anglers often seek access areas that have adequate parking, outdoor lighting, restrooms, trashcans, information kiosks, etc.

Finally, many anglers fish from the shoreline but access to bank fishing is often lacking. The AGFC should place greater attention on opening areas to bank fishing.

Goals – Improve public access for boat, non-motor boat, and shoreline anglers to black bass fisheries. Provide safe access areas with facilities that improve stakeholder satisfaction.

Objectives

1. Construct or enhance seven mega-tournament facilities at major bass fisheries around the state by December 31, 2031.
2. Conduct an access site and facility inventory assessment that provides site details and amenities at AGFC owned or managed reservoirs by December 31, 2023.
3. Increase or improve access at 75 locations for black bass anglers by December 31, 2029.

Key Area #4 – Habitat

Habitat is the most important component related to having quality black bass fisheries in reservoirs. Habitat encompasses a number of features including aquatic vegetation, natural cover, artificial cover, water levels, water quality, and bathymetry. Having diverse and quality habitat is critical for creating high quality black bass fisheries in Arkansas' reservoirs.

Goals – Increase the number of fish habitat sites using natural and artificial materials to improve black bass production and angler catch. Manage aquatic plant communities that favor desirable plants rather than undesirable species.

Objectives

1. Conduct a black bass habitat assessment at 50 reservoirs that summarizes fish cover and aquatic plant abundance by December 31, 2025.
2. Manage aquatic plant communities at an intermediate level (20-30% coverage) at 10 reservoirs by December 31, 2031.
3. Conduct 20-large-scale projects using natural and/or artificial materials to improve fish habitat by December 31, 2031.
4. Conduct research to evaluate fish habitat using a variety of artificial and natural materials to create fish reefs at three reservoirs by December 31, 2027.

Key Area #5 – Reservoir Use

Black bass anglers identified several factors that can interfere with their use of reservoirs while fishing for black bass. Reservoirs are popular with recreational boaters and personal watercraft, which can compete with anglers for space and create excessive wakes that can disturb fishing. About 8% of black bass anglers fish in tournaments. Generally, tournament anglers' fish in multiple tournaments per year and have fished for many years. Tournaments generate significant economic benefits to local economies throughout the state. Additionally, tournaments can be effective at promoting the popularity of black bass fishing. However, many black bass anglers believe that tournaments cause crowding at access areas and on the water. Non-tournament anglers would like to know when and where tournaments occur so they can plan accordingly to fish elsewhere. The information is also beneficial to reduce conflict between tournaments falling on the same date at the same reservoir.

Goal – Promote safe use and minimize conflict among all reservoir users.

Objectives

1. Utilize a variety of outreach strategies to create five public service announcements each year (May, June, July, August, and September) that promote wise and safe use of reservoirs for black bass anglers and recreational boaters.
2. Create a free, online, voluntary tournament registration program by December 31, 2023.

Key Area #6 – Promote Bass Fishing

A recent survey of Arkansas black bass anglers showed that most black bass anglers consisted of individuals who were older, Caucasian, male, and had higher incomes than the overall licensed Arkansas angler population. Additionally, there is a segment of black bass anglers who lapse (do not buy a fishing license every year). Therefore, the AGFC should seek ways to recruit new anglers to bass fishing. The AGFC should also seek ways to retain current black bass anglers, minimize lapses in license purchases, and increase participation.

Stakeholders recognize the importance of black bass fishing to tourism in Arkansas.

Goal – Promote black bass fishing to attract younger and more diverse anglers and to retain those already engaged.

Objectives

1. Create Project Razorbass, a free angler recognition program for anglers catching Largemouth Bass > 8 pounds or 23 inches by December 31, 2023.
2. Coordinate with AGFC marketing to create a brand and promote black bass fishing in Arkansas by December 31, 2023 with four print or video messages each year.
3. Increase the visibility of black bass fishing as a tourist attraction through partnerships with at least three state tourism organizations each year.
4. Estimate the economic impact of black bass fishing in Arkansas by December 31, 2030.
5. Create a series of four popular articles/materials each year to promote black bass fishing.

Key Area #7 – Interactions with Other Species

Largemouth Bass are the most common and the most popular with anglers. Smallmouth Bass are less common and most anglers would like to see more opportunities to catch them. Spotted Bass are common in many reservoirs but have slower growth rates than Largemouth and Smallmouth Bass. Many anglers perceive that Spotted Bass compete with Largemouth Bass and that management should favor Largemouth Bass populations where both species occur.

The AGFC stocks certain reservoirs with Striped Bass and Hybrid Striped Bass to provide an open-water fishery. Many of these fisheries provide opportunities to catch trophy fish. While popular, many black bass anglers believe that these species compete directly with Largemouth Bass for food and habitat and this competition adversely affects black bass fishing.

Goals – Manage populations of Largemouth Bass, Smallmouth Bass, and Spotted Bass to maximize angler satisfaction. Evaluate ecological and behavioral interactions between black bass populations with Striped Bass and Hybrid Striped Bass.

Objectives

1. Describe current Smallmouth Bass management in Arkansas reservoirs by December 31, 2025 using a variety of print and video platforms.
2. Optimize Largemouth Bass and Spotted Bass abundance and size structure by December 31, 2025.
3. Describe interactions between black bass populations and temperate bass (Striped Bass and Hybrid Striped Bass) by December 31, 2027.

ACKNOWLEDGEMENTS

The AGFC thanks the many Arkansans who provided valuable input to the RBBMP. The AGFC shared all information with the SAC comprised of 13 individuals who represented all stakeholders. Throughout the process, the SAC demonstrated a high level of commitment, utilized all information (not just their own values), and worked collectively to help develop the RBBMP. The AGFC appreciates the time and commitment invested in developing this plan.

A number of AGFC staff worked with the SAC to complete the RBBMP including Ben Batten, Darrell Bowman, Jason Olive, Tommy Laird, Kelly Winningham, Jenn Ballard, Trey Reid, Randy Zellers, and Jessica Feltz. Additionally, Director Austin Booth and Commissioner Ann Marie Doramus addressed the SAC and supported this process.

Finally, the RBBMP benefited from the reviews of Todd Driscoll (Texas Parks and Wildlife Department), Dr. Steve Lochmann (University of Arkansas-Pine Bluff), John Odenkirk (Virginia Department of Wildlife Resources), and Nick Trippel (Florida Fish and Wildlife Conservation Commission).

TABLE OF CONTENTS

<u>Executive Summary</u>	2
<u>Acknowledgements</u>	6
<u>Table of Contents</u>	7
<u>List of Figures and Pictures</u>	8
<u>List of Tables</u>	8
<u>Introduction</u>	8
<u>What is the Reservoir Black Bass Management Plan?</u>	9
<u>Plan Development</u>	9
<u>Glossary</u>	10
<u>Overview of Black Bass Management</u>	12
<u>Previous Plans</u>	13
<u>AGFC Funding</u>	13
<u>Species Descriptions</u>	14
<u>Fisheries Management</u>	15
<u>Sampling</u>	15
<u>Population Characteristics</u>	16
<u>Population Dynamics</u>	17
<u>Population Modeling</u>	19
<u>Harvest Regulations</u>	20
<u>Hatchery Production and Stocking</u>	23
<u>Forage Fish Management</u>	26
<u>Fish Health</u>	27
<u>Tournament Angling</u>	29
<u>Research</u>	29
<u>Uncontrollable Factors</u>	30
<u>Habitat</u>	30
<u>Aquatic Plants</u>	30
<u>Fish Cover</u>	31
<u>Liming and Fertilization</u>	32
<u>Drawdowns and Seeding</u>	32
<u>Human Dimensions</u>	34
<u>Creel Surveys</u>	34
<u>Angler Surveys</u>	34
<u>Education and Outreach</u>	35
<u>Public Meetings</u>	35
<u>Issues – Values – Goal – Objectives – Strategies</u>	37
<u>Key Area #1 – Diversify Black Bass Fishing Opportunities</u>	37
<u>Key Area #2 – Communication and Education</u>	39
<u>Key Area #3 – Access and Facilities</u>	41
<u>Key Area #4 – Habitat</u>	43
<u>Key Area #5 – Reservoir Use</u>	45
<u>Key Area #6 – Promote Bass Fishing</u>	47
<u>Key Area #7 – Interactions with Other Species</u>	49
<u>References</u>	51
<u>Appendix A</u>	54

Appendix B	57
Appendix C	58

LIST OF FIGURES AND PICTURES

Figure 1 – Biologists sampling black bass with a boom-mounted electrofishing boat.	16
Figure 2 – Model output for mean total length across a range of exploitations rates for four minimum length limits.	20
Figure 3 – AGFC warmwater fish hatcheries and nursery ponds often used to produce black bass. Stars represent fish hatcheries and triangles represent nursery ponds.	23
Figure 4 – Biologists sinking natural fish habitat in Bull Shoals Reservoir.	32
Figure 5 – The AGFC Black Bass Management Facebook page.	35

LIST OF TABLES

Table 1 – History of key activities in black bass management in Arkansas.	12
Table 2 – Average length-and weight-at-age for Largemouth Bass ages 1 to 10 collected during springtime electrofishing samples from 2012 to 2021.	18
Table 3 – Length and creel limits for black bass in Arkansas reservoirs (as of August 2022).	22
Table 4 – Characteristics of forage fish species that are stocked by the AGFC.	27

INTRODUCTION

The Arkansas legislature created the Arkansas Game and Fish Commission (AGFC) in 1915 and in 1945, Amendment 35 gave AGFC the authority to enact and enforce fish and wildlife regulations. Seven governor-appointed Commissioners provide oversight for the AGFC.

The mission of the AGFC is to conserve and enhance Arkansas's fish and wildlife and their habitats while promoting sustainable use, public understanding, and support. Within AGFC, the Fisheries Division manages Arkansas's aquatic resources for recreational and commercial fishing, preservation of rare species, and enjoyment by the public. The Fisheries Division has a vision that includes managing and overseeing sustainable, diverse, and accessible aquatic resources for the benefit of current and future citizens and visitors to the state.

Black bass represent a diverse group of 13 fish species that collectively comprise some of the most popular recreational fisheries in the U.S (Long et al. 2015). Largemouth Bass *Micropterus salmoides*, Smallmouth Bass *M. dolomieu*, and Spotted Bass *M. punctulatus* constitute the black bass native to Arkansas and can be found in most reservoirs in the state. For this plan, we define reservoirs as any public standing waterbody > 50 acres. Nearly 500,000 people fish in Arkansas each year and approximately 40% fish for black bass (U.S. Fish and Wildlife Service 2011, Hunt and Westlake 2018). In 2018, Hunt and Westlake (2019) surveyed 1,339 black bass anglers and 519 anglers responded. Black bass anglers in Arkansas on average fish about 30 days per year and have fished for 32 years. Anglers fishing for black bass invest greatly in their fishing and boating equipment, which averages more than \$11,000 per angler (Hunt and Westlake 2019). About 8% of black bass angler's fish in tournaments and 9% participate in online forums related to black bass fishing (Hunt and Westlake 2019). However, these values represent averages. Black bass anglers vary considerably in their preferences, attitudes, and opinions. Thus, successful black bass management requires that AGFC manage fisheries to meet the diverse needs of its stakeholders.

WHAT IS THE RESERVOIR BLACK BASS MANAGEMENT PLAN?

The AGFC Fisheries Division created the first Reservoir Black Bass Management Plan (RBBMP) in 1992. This plan evaluated black bass populations across Arkansas' reservoirs and identified appropriate harvest regulations to manage fisheries. Fisheries staff created the second RBBMP in 2002. This version compared black bass populations across the state. In 2017, the Fisheries Division wrote the third RBBMP, which identified strategies to manage black bass populations in three key areas: fish, habitat, and people.

Historically, management plans describe things that are already being done. Previous plans benefitted from public input but this plan sought new ways to involve the public in the planning process. Traditionally, AGFC received public comments when draft plans were completed. The process for developing this iteration of the plan utilized broad public input throughout its development. By utilizing public input, this RBBMP identified areas where management could improve black bass fishing. The current RBBMP also builds on the previous three plans while exploring new ways to improve black bass fishing, management, and conservation. We utilized a 2018 survey of black bass anglers to better understand participation, opinions, and preferences (Hunt and Westlake 2019). Additionally, we administered an opinion poll in October 2021 to clarify why anglers' fish for black bass and what anglers like and dislike about fishing for black bass (Appendix A). Finally, the Fisheries Division created a stakeholder advisory committee (SAC) in November 2021. The SAC consisted of 13 individuals to broadly represent the diverse interests (industry, tournaments, local government, unaffiliated anglers, etc.) in black bass management in Arkansas (Appendix B). Members of the SAC varied in age, race, gender, and region of the state, providing diverse viewpoints.

The RBBMP is a comprehensive plan that identifies management priorities for reservoir black bass fisheries in Arkansas. The RBBMP consists of two primary sections. First, the RBBMP describes the history of black bass management in Arkansas, provides information on AGFC, and details many of the tools and components of black bass management. Next, it describes stakeholder goals for black bass management and details objectives and strategies on how AGFC can meet those goals. Collectively, the RBBMP provides a blueprint for improving black bass management in Arkansas reservoirs. The SAC and AGFC staff were asked to rank each objective to prioritize management objectives (Appendix C). The rankings will guide AGFC staff for prioritizing work in the plan. For example, habitat and communication about black bass management activities were high priorities for the SAC. The RBBMP does not set goals for individual reservoirs, which can be found in reservoir specific fishery management plans. For example, the goal for catch rate of bass over five pounds at Lake Ouachita can be found in the Lake Ouachita Fishery Management Plan. By January 31st of each year, a report of the prior year's achievements, successes, and challenges will be created and available to the public.

PLAN DEVELOPMENT

This RBBMP follows the philosophy of stakeholders making value choices and AGFC making technical choices (McMullin and Pert 2010). Examples of value choices include the preferences that anglers seek with respect to a resource and factors that drive satisfaction. Value choices should reflect broad public interest. Therefore, identifying stakeholder values requires various public engagement techniques. Essentially, the AGFC wants stakeholders to help create a vision for black bass management.

Conversely, AGFC fisheries professionals have a public trust responsibility to manage aquatic resources for all stakeholders to enjoy. This requires making the technical decisions to shape black bass fisheries to meet public desires. Examples of technical decisions include assessing and monitoring black bass populations, identifying factors that affect fish populations, and analyzing the outcomes of fisheries management strategies (McMullin and Pert 2010). Examples of technical decisions include when and where to stock fish, implementing regulations, and when it is appropriate to fertilize.

Development of the RBBMP began with summarizing the attitudes and opinions of black bass anglers from the 2018 survey (Hunt and Westlake 2019) and the 2021 online poll. Using these data, the SAC then identified a range of issues with black bass fishing and management. AGFC staff organized these issues into seven key areas. While considering the interests of all stakeholders, the SAC then developed goals for each of these seven key areas. AGFC developed objectives for each of the seven goals and identified a range of strategies to meet those objectives. The SAC then had the opportunity to review these objectives and strategies. A series of 12 open house meetings were held throughout the state to gather comments from the public on the draft RBBMP. Finally, the draft RBBMP was shared online allowing all stakeholders to provide input. Therefore, this plan represents a collaboration of black bass stakeholders and AGFC staff. Public comment occurred throughout the planning process and all stakeholders had opportunities for input.

GLOSSARY

Words and phrases that are underlined in the text are defined in the glossary.

Alkalinity – the total concentration of bases in the water, primarily bicarbonates, carbonates, and hydroxides. Adequate alkalinity is important for reservoir productivity and water chemistry. Agricultural lime can increase alkalinity.

Bathymetry – the measurement of depth in waterbodies.

Broodfish – a group of mature individuals used in hatcheries for breeding purposes.

Catch-per-unit-effort (CPUE; catch rate) – the number of fish captured per defined unit of sampling or fishing effort, such as time or sampling units. In angler surveys, the number of fish caught in an hour or day by an angler.

Creel limit – number of fish that can be legally harvested by an individual during a single day.

Ecoregion – a geographically defined area where ecosystems share similar soil and landform characteristics. For example, the Ozarks or the Delta are considered distinct ecoregions.

Fishery – a system that includes organisms, the habitat in which they exist, and the humans who exploit or affect them.

Growth – the addition of length or weight by an individual. Growth rate describes the increase in length or weight per unit of time.

Herbivore – animals that feed upon plants. Examples that eat aquatic plants include Grass Carp, turtles, beavers and deer.

Introgression – the transfer of genes from one species to another as a result of hybridization and repeated backcrossing.

Length limit – length of fish that can be legally harvested.

Minimum length limit – length of fish that must be attained or exceeded before being harvested. Fish less than the minimum length must be released.

Mortality – the loss of fish from the population due to death.

Nutrients – substances that provide nourishment essential for growth.

Otoliths – calcified structures within the inner ears of bony fishes with aid in hearing and balance, which can be used to determine the age. Rings are laid down similarly to tree rings.

Overexploitation – removal of fish at rates faster than natural populations can recover.

Phytoplankton – free-floating, microscopic algae that inhabit the sunlit, upper layer of most freshwater and marine environments and are the base of the food chain. They are usually responsible for the color and clarity of reservoirs.

Passive Integrated Transponder (PIT) Tags – electronic, implantable microchips used in fisheries and wildlife science to identify individuals.

Productivity – the ability of a waterbody to produce biomass. High productivity reservoirs produce more living organisms per acre of water and typically faster growth rates for fish.

Proportional size distribution – the percentage of fish in a population that are adult length or longer (8" for Largemouth Bass) that also exceed quality length (12"), preferred length (15"), memorable length (20"), or trophy length (25").

Public trust doctrine – a legal principle establishing that the government manages certain natural and cultural resources for public use. Natural resources held in trust can include navigable waters, wildlife, or land. The public is considered the owner of the resources while the government is entrusted with managing these resources.

Recruitment – the number of fish surviving to a defined age or size; often the number of fish surviving to age one.

Relative weight – an index that compares body condition of an individual fish to the body condition of an average fish of that size and species.

Reservoir – standing water greater than 50 acres. For the purpose of this plan, this includes natural lakes.

Selective fish kills – the use of toxins to eliminate a certain size of fish or a portion of a fish population to get the population to a desired state.

Slot limits – range of fish lengths within which fish are either protected or exposed to harvest.

Stakeholders – individuals or groups that are affected by management actions, including those that think they will be affected and those that do not know they will be affected.

Turbidity – the measure of the clarity of the water. This is influenced by the amount of suspended particles in the water.

Zooplankton – small, aquatic microorganisms in the water column that include crustaceans, rotifers, open water insect larvae and aquatic mites. The zooplankton community is composed of both primary consumers, which eat free-floating algae, and secondary consumers, which feed on other zooplankton.

OVERVIEW OF BLACK BASS MANAGEMENT

Table 1 – History of key activities in black bass management in Arkansas.

1903	Mammoth Springs fish hatchery constructed
1920-30's	Arkansas Power and Light begins reservoir construction (Lakes Hamilton and Catherine)
1930's	AGFC builds hatcheries at Lonoke, Centerton, and Hot Springs
1930's	First Largemouth Bass stocked
1942	US. Army Corp of Engineers completed first reservoir (Nimrod Lake) in Arkansas
1950	U.S. Congress passes Sportfish Restoration Act providing funding to states
1950's	AGFC hires the first four fisheries biologists
1950's	AGFC biologists begin using rotenone and gill nets to sample fish populations
1967	First Florida Largemouth Bass stocked
1969	State record Smallmouth Bass caught from Bull Shoals Reservoir (7 pounds, 5 ounces)
1970's	AGFC begins utilizing creel surveys to measure angler effort, catch, and harvest
1976	State record Largemouth Bass caught from Mallard Lake (16 pounds, 8 ounces)
1980	First electrofishing boat used to sample black bass populations
1981	The first length limit for black bass enacted
1983	State record Spotted Bass caught from Bull Shoals Reservoir (7 pounds, 15 ounces)
1984-1985	Bassmaster Classic held on Arkansas River
1986	First electrofishing standard sampling protocols (SSP) was approved
1991	First Black Bass Management Plan created
2001	Black Bass Program created
2002	Black Bass Management Plan revised
2002	Andrew Hulsey Hatchery renovated
2008	William H. Donham Hatchery renovated
2009	Intensive Florida Bass 'mat spawning' begins at the Hulsey Hatchery
2010	Last rotenone sample collected
2016	First large-scale reservoir habitat project conducted
2017	Black Bass Management Plan revised

Previous Plans

The AGFC manages Largemouth Bass using a variety of strategies to allow sustainable recreational use of populations. Past Largemouth Bass management efforts in Arkansas focused on increasing the abundance and growth of Largemouth Bass by manipulating a reservoir's environment and fish community. Fourt (1977) guided Largemouth Bass management for Arkansas using water level manipulation, fertilization, stocking of black bass and forage, along with selective fish kills. Keith (1981) studied the use of length limits in Arkansas and recommended liberal creel limits to stimulate harvest (Keith 1981).

The AGFC Fisheries Division developed its first comprehensive Largemouth Bass management plan, the *Arkansas Largemouth Bass Management Plan* in 1991. The plan utilized recruitment, mortality, and growth data to evaluate the need for harvest restrictions. Target ranges for these vital rates were developed to guide management at reservoirs. The AGFC revised the plan in 2002 and suggested categories for all Arkansas reservoirs based on the quality of the Largemouth Bass fishery. Reservoirs were assigned an index number indicating the estimated Largemouth Bass potential in each location. A graphic system of assessing bass population characteristics was utilized based on the work of Dean and Wright (1992) in Oklahoma. For example, reservoirs with low abundance of young Largemouth Bass and high relative weights would be considered for a minimum length limit.

In 2017, AGFC developed the *Reservoir Black Bass Management Plan*, which expanded black bass management to include all three black bass species present in Arkansas reservoirs. Additionally, this plan sought to broaden the scope of black bass management by also focusing upon habitat and stakeholders. The goal was to utilize the most recent scientific knowledge, management techniques, and programs to enhance fishing opportunities for black bass in Arkansas. The 2017 plan established new guidelines to justify implementing harvest restrictions and supplemental stockings utilizing science-based population characteristics data (size structure, recruitment, growth, and mortality).

AGFC Funding

The AGFC has three primary sources of revenue: license sales, Federal Aid in Wildlife and Sportfish Restoration, and the Arkansas Conservation Sales Tax. There are a few other, smaller sources of funding that AGFC utilizes for various activities and programs. This section will focus only on those related to fisheries management.

Fishing licenses are part of the foundation of the American System of Conservation Funding, a "user pays - public benefits" model that supports the North American Model of Fish and Wildlife Management run by each state. Anyone over the age of 15 who fishes in Arkansas must purchase a fishing license. AGFC offers a number of options for both residents and non-residents, including annual licenses, short-term "trip" licenses, and lifetime licenses. In addition to these licenses, the AGFC requires a Trout Permit for anyone fishing in a designated trout stream. Annual revenue from all fishing licenses and Trout Permits is around \$4.2 million.

The Federal Aid in Sport Fish Restoration Act, commonly referred to as the Dingell-Johnson Act, passed on August 9, 1950, which was modeled after the Pittman-Robertson Act (aka Federal Aid in Wildlife Restoration) to create a parallel program for management of fishery resources,

conservation, and restoration. The Sport Fish Restoration Program is funded by revenues from excise taxes on sport fishing equipment. In 1984, the program expanded to include import duties on fishing tackle and pleasure boats, as well as the portion of the gasoline fuel tax attributable to small engines and motorboats in what is known as the Wallop-Breaux Amendment. Each state's share is based 60 percent on its licensed anglers and 40 percent on its land and water area. No state may receive more than five percent or less than one percent of each year's total apportionment. It is a cost-reimbursement program, where the state covers the full amount of an approved project then applies for reimbursement through Federal Aid for up to 75 percent of the project expenses. The state must provide at least 25 percent of the project costs from a non-federal source. Fifteen percent of these funds must be used for boating access maintenance and improvements. Annual apportionment of these funds to AGFC exceeds \$6 million.

The Arkansas Conservation Sales Tax is a $\frac{1}{8}$ of 1% statewide sales tax that was implemented following the passage of Amendment 75 to the Arkansas Constitution in 1996. The AGFC receives 45% of the proceeds from the tax, while the Arkansas Department of Parks, Heritage, and Tourism receives the other 55%. Amendment 75 was passed by Arkansas voters who recognized the need for more resources for wildlife and fisheries management, more protection for rare and threatened species, more access to Arkansas' public lands and waters, and more enforcement of hunting and fishing regulations. These were the primary pillars of the campaign for achieving this funding. The AGFC's annual share of the tax revenues is now close to \$40 million.

There are other, smaller sources of revenue obtained by AGFC for use in managing and conserving fisheries resources. The Arkansas Marine Fuel Tax (MFT) is a cooperative effort between the AGFC and the Arkansas Department of Transportation (ARDOT). The MFT uses a formula to determine the amount of state gas taxes that boaters pay and places those funds in an account to improve boating access across the state. These funds help build and maintain boat ramps, parking lots, courtesy docks, and local roads leading to boating access areas. A key component of this program is that projects often involve partnerships with counties and cities to improve roads, where the local entity provides equipment and labor, and AGFC, through the MFT program, purchases materials. Thousands of miles of Arkansas roads have been hard-surfaced since this program's inception in the 1970's. Historically MFT provided around \$1.8 million annually, but a new agreement signed in 2022 between AGFC and ARDOT will result in that total exceeding \$3.6 million annually beginning in 2023.

SPECIES DESCRIPTIONS

Largemouth Bass is a widespread species that occupies many types of aquatic systems and utilizes a variety of habitats. They are found throughout Arkansas in clear, calm waters, in natural and manmade impoundments, rivers and streams, bayous and backwaters, and small ponds (Robison and Buchanan 2020). Like most sight-feeding predators, Largemouth Bass avoid turbid or muddy waters, and will often search out clearer waters with better water quality (Shoup and Wahl 2009). Largemouth Bass often outnumber other black bass in reservoirs. However, in streams and rivers, Spotted Bass and Smallmouth Bass are more abundant. Largemouth Bass grow larger than the other black bass species in the state. The current state record Largemouth Bass is 16 pounds 4 ounces and was caught from Mallard Lake on March 2, 1976 by Aaron Mardis.

The AGFC stocks Florida Largemouth Bass (FLMB; *Micropterus salmoides floridanus*) in many reservoirs to increase the trophy potential of a reservoir. Although native to peninsular Florida,

many agencies have stocked FLMB outside their native range. Florida Largemouth Bass differ from Largemouth Bass in coloration, have smaller and more numerous scales, and attain a larger size (Robison and Buchanan 2020). There has been widespread introgression between the two subspecies in Arkansas (Johnson and Staley 2001). For the purposes of management, the AGFC manages Florida Largemouth Bass and Largemouth Bass under the same harvest restrictions.

Spotted Bass primarily inhabit large streams and rivers, but have also adapted well to impoundments found throughout the state (Robison and Buchanan 2020). Spotted Bass tolerate turbid and warmer water better than Smallmouth Bass. Spotted Bass are more commonly found in reservoirs than Smallmouth Bass. However, Spotted Bass are generally outnumbered in reservoirs and other standing waters by Largemouth Bass (Robison and Buchanan 2020). Growth rates for Spotted Bass are substantially slower than Largemouth Bass, and they have a shorter lifespan and smaller maximum size. The current state record Spotted Bass is 7 pounds 15 ounces and was caught from Bull Shoals Reservoir by Mike Hellich on March 26, 1983.

Alabama Bass (*Micropterus henshalli*) were once considered a subspecies of Spotted Bass, but were described as their own species in 2008. They are native to the Mobile River basin in Alabama, Mississippi, and Georgia. They have been stocked by resource agencies in some states because of their ability to obtain larger sizes than Spotted Bass. Alabama Bass have also been stocked illegally by anglers in several mid-Atlantic states, where they have become a nuisance species because they are negatively affecting Largemouth Bass populations through competition and hybridizing with Smallmouth Bass. Because of these invasive qualities, Alabama Bass are not stocked in Arkansas waters.

Smallmouth Bass are mainly inhabitants of cool, clear mountain streams, but also occur in moderate numbers in some Arkansas reservoirs (Robison and Buchanan 2020). They are the least tolerant of habitat alteration of the black bass species, and are especially intolerant of high turbidity and siltation (Robison and Buchanan 2020). Smallmouth Bass also prefer cooler water temperatures than Largemouth Bass and Spotted Bass. In Arkansas, several productive Smallmouth Bass fisheries exist in reservoirs such as Beaver Lake, Bull Shoals Lake, Norfolk Lake, and Greers Ferry Lake. Other impoundments where Smallmouth Bass are occasionally caught include Lake Ouachita, Lake Hamilton, Lake DeGray, and Lake Greeson, but contribution to the overall black bass fishery is minimal. Growth rates of Smallmouth Bass typically lie between Largemouth Bass and Spotted Bass. The current state record Smallmouth Bass is 7 pounds 5 ounces and was caught from Bull Shoals Reservoir on April 1, 1969 by Acie Dickerson.

FISHERIES MANAGEMENT

Sampling

Fisheries biologists utilize electrofishing as the standard sampling method for collecting data on black bass populations. Electrofishing boats send controlled electricity into the water to momentarily stun fish so they can be collected by biologists. The AGFC Fisheries Division's *Electrofishing Standardized Sampling Procedures* (AGFC 2016) outlines the effort needed to collect a representative sample of black bass from Arkansas' reservoirs. Biologists select random electrofishing sample sites each year (typically 0.37-mile shoreline segments) to collect black bass. Biologists collect samples during the spring or fall and day or night depending on the characteristics of a particular reservoir. The choice of day vs night and spring versus fall must be

consistent from year to year so that samples are comparable over time. Sampling objectives include obtaining appropriate sample sizes to estimate recruitment, size structure, relative abundance, and condition. Periodically (e.g., every five years), biologists keep a sample of black bass for aging to evaluate recruitment, growth, and mortality. AGFC biologists utilize protocols for aging outlined in the Fisheries Division's *Standard Procedures for Estimating Age of Common Commercial and Sportfish Species in Arkansas* (AGFC 2016). Biologists use age and growth data to inform management decisions on stocking and harvest regulations.



Figure 1 – Biologists sampling black bass with a boom-mounted electrofishing boat.

Population Characteristics

Fisheries biologists utilize routine, standardized electrofishing results to understand essential population characteristics governing a black bass population. The most common population metrics used by AGFC are relative abundance, size structure, and condition. The AGFC uses this information to monitor populations through time and aid in management decisions.

Relative Abundance

Biologists cannot count all the black bass in a given water body. Instead, biologists use catch rates from electrofishing samples to measure relative abundance (e.g., low-density vs. high-density) and monitor changes in population numbers over time. Biologists commonly use catch rates called catch-per-unit-effort (CPUE) as a measure of relative abundance. The AGFC defines CPUE as the number of black bass caught per hour of electrofishing and computes it for each electrofishing sample site. Biologists then use these data to determine an overall average catch rate and an average catch rate for each reservoir section sampled. The statewide average for Largemouth Bass CPUE is 111 fish per hour; however, CPUE can vary by reservoir type and location and from year to year within reservoirs. For example, AGFC biologists found CPUE to be the highest in Ozark Highlands systems (150 fish/hour) and lowest in South-central Plains systems (71 fish/hour).

Size Structure

Biologists commonly use size structure as an assessment tool. Size structure measurements provide a snapshot of what fish population looks like when sampling, reflecting the interaction of recruitment, growth, and mortality of the age groups present. Therefore, changes in size structure can provide an understanding of fisheries issues, such as poor recruitment, slow growth, and excessive annual mortality (Anderson and Neumann 1996). Biologists often evaluate size structure by examining length-frequency distributions and stock density indices. A length frequency histogram (vertical bar chart) shows the number or percentage of fish in various length groups. A length-frequency distribution can also clearly show the effects of length limits, such as minimum length limits or slot limits. Biologists throughout the U.S. also use proportional size distribution indices (e.g., PSD, PSD-P, PSD-M, PSD-T) to describe the size structure of a population. These indices numerically describe length-frequency data that can summarize the size structure of a fish population. Like CPUE, size structures can vary among systems, regions, and years.

Body Condition

Biologists commonly measure the body conditions of individuals within a population to determine their well-being or plumpness. In addition, biologists can use condition indices as indicators of issues related to habitat, prey availability, and competition. Biologists routinely use relative weights for individual fish as an index for fish conditions. Relative weights are calculated by taking the fish's weight and dividing it by the length-specific standard weight developed for that species. When averaged for a population, scores in the 90s for relative weight are considered average, whereas an average score exceeding 100 indicates mostly plump fish and likely ample forage available to the population (Pope et al. 2010). Any score below 80 indicates a skinny fish and limited prey availability or inefficient foraging by the population, likely due to a lack of complex habitat. Biologists must consider that body condition is highly influenced by season.

Population Dynamics

Recruitment, growth, and mortality are the three major population rates that affect a fish population's abundance, age structure, and size structure of a black bass population. Biologists evaluate these three rates to assess populations and develop management strategies. Values for each rate differ from reservoir to reservoir and year to year within reservoirs. The variable nature of recruitment, growth, and mortality is primarily due to the influence of watershed size, ecoregion, reservoir depth, water quality, habitat, and productivity. Variability within these three rates requires that biologists manage reservoirs and species individually. In addition, biologists collect age samples to estimate these population rates and utilize them to maximize potential.

Recruitment

Biologists define recruitment as the number of fish that survive to a specific age (e.g., age-1) or size (e.g., minimum length limit) each year. Recruitment is important in determining harvest restrictions since recruitment also affects growth and mortality. Numerous studies have identified factors that can affect black bass recruitment. High growth rate, habitat, abundant prey availability, and good water quality can be important factors for successful recruitment (Jackson and Noble 2000, Parkos and Wahl 2010). Additional factors include water temperature, water level fluctuations, water flow in mainstem impoundments, and overwinter size of young of year

bass. These factors vary greatly among Arkansas reservoirs and can vary yearly within those systems. AGFC biologists collect recruitment data during electrofishing samples by calculating the CPUE of age-1 bass. The CPUE of age-1 bass serves as a measure of year-class strength and recruitment that biologists can track from year to year. Additionally, biologists utilize aging studies to determine when strong or poor recruitment may have occurred which can aid in future management decisions.

Growth

Biologists define growth as the change in fish size over time. Black bass growth can differ substantially based on environmental conditions, including the length of the growing season, productivity, habitat availability, water temperature, and forage availability. Biologists commonly use average length-at-age as a useful indicator for growth. Biologists determine the age of black bass by counting annuli rings on otoliths from individual bass. Lengths are averaged by age to calculate a mean length-at-age. Biologists use growth data during population modeling to determine proper harvest restrictions. Table 2 shows the statewide average lengths-at-age and weight-at-age samples collected during spring electrofishing.

Table 2 – Average length-and weight-at-age for Largemouth Bass ages 1 to 10 collected during springtime electrofishing samples from 2012 to 2021.

Age	Total Length (in)	Weight (lb)
1	7.4	0.4
2	11.4	0.8
3	13.7	1.6
4	15.4	2.3
5	16.4	2.7
6	17.1	3.1
7	18.4	3.9
8	19.5	4.6
9	20.4	5.3
10	20.6	5.4

Mortality

Biologists separate mortality into two distinct categories: fishing (harvested by an angler or hooking mortality of released fish) and natural (predation, disease, starvation, or old age). The sum of both of these occurring over one year gives the total annual mortality of the fish population. Biologists determine total annual mortality by evaluating the rate of decline in the number of fish caught during an age and growth evaluation. To estimate fishing mortality, biologists often

conduct tagging studies using monetary reward tags to incentivize anglers to report catching tagged fish. The percentage of tags returned gives an estimate of the rate of catch and harvest. Biologists can then estimate natural mortality by subtracting fishing mortality from the total annual mortality estimate. The statewide average annual mortality in Arkansas is 0.39 based on recent AGFC electrofishing data (2012-2021), which means that 39% of the bass population dies over the course of one year due to angling or natural causes. Generally, fishing mortality in Arkansas is low because most anglers practice catch and release fishing for black bass.

Population Modeling

Fisheries management decisions or actions (e.g., implementation of harvest regulations or stocking programs) not only affect fish populations but also can influence angler satisfaction and participation and have a direct economic impact on communities and regions (Allen and Hightower 2010). Given the wide-ranging consequences, biologists rely upon pertinent data and analysis before implementing a management decision or action (Slipke and Maceina 2014). Fisheries models are one of the biologist's most popular analysis tools. These mathematical models allow biologists to synthesize and interpret large amounts of data quickly and efficiently and provide a conceptual assessment of how management decisions or actions might influence fish abundance and sizes and angler catch and harvest rates (Allen and Hightower 2010, Slipke and Maceina 2014). In addition, these models also allow biologists to assess the effects of uncertainty on a management decision or action, explore trade-offs, and determine alternatives (Slipke and Maceina 2014).

Fisheries biologists must have a general understanding of the population dynamics (i.e., growth, recruitment, and mortality) regulating a fishery before using models to evaluate management options, develop associated alternatives, and assess uncertainty surrounding potential decisions (Slipke and Maceina 2014). Biologists collect population dynamics data by aging a sample of fish from a population. Once these data are collected, biologists utilize popular fish population models to understand recruitment, growth, and mortality interactions. Biologists often use these models to compute multiple simulations utilizing a variety of length limits (e.g., 13-inch vs. 15-inch minimum length limit vs. 13 to 16-inch protective slot limit). Outputs from these models help predict how adjusting length limits could affect a population. Popular output includes the expected number and average size of fish harvested, yield (total weight of all fish harvested), number of fish reaching a given length or age (e.g., number in the population at 13 inches or reaching age 3), and size structure variables.

Figure 2 provides an example of model output. In this simulation, biologists were interested in understanding how various minimum lengths would affect the mean length of Largemouth Bass in a population across a range of exploitation rates, especially at an exploitation rate of 20%. Results indicated that a higher minimum length limit would result in a larger average size of Largemouth Bass. For example, at 20% exploitation, the mean length of Largemouth Bass was 13.3 inches with a 10-inch minimum length limit versus 16.3 inches with a 15-inch minimum length limit.

Population modeling is essential for effective fisheries management and is vital in regulation selection (Allen and Howtower 2010, Slipke and Maceina 2014). These models simplify the complex interactions among population dynamics. Additionally, they provide clear, easy-to-understand outputs that allow biologists to analyze and compare management options based on predicted results.

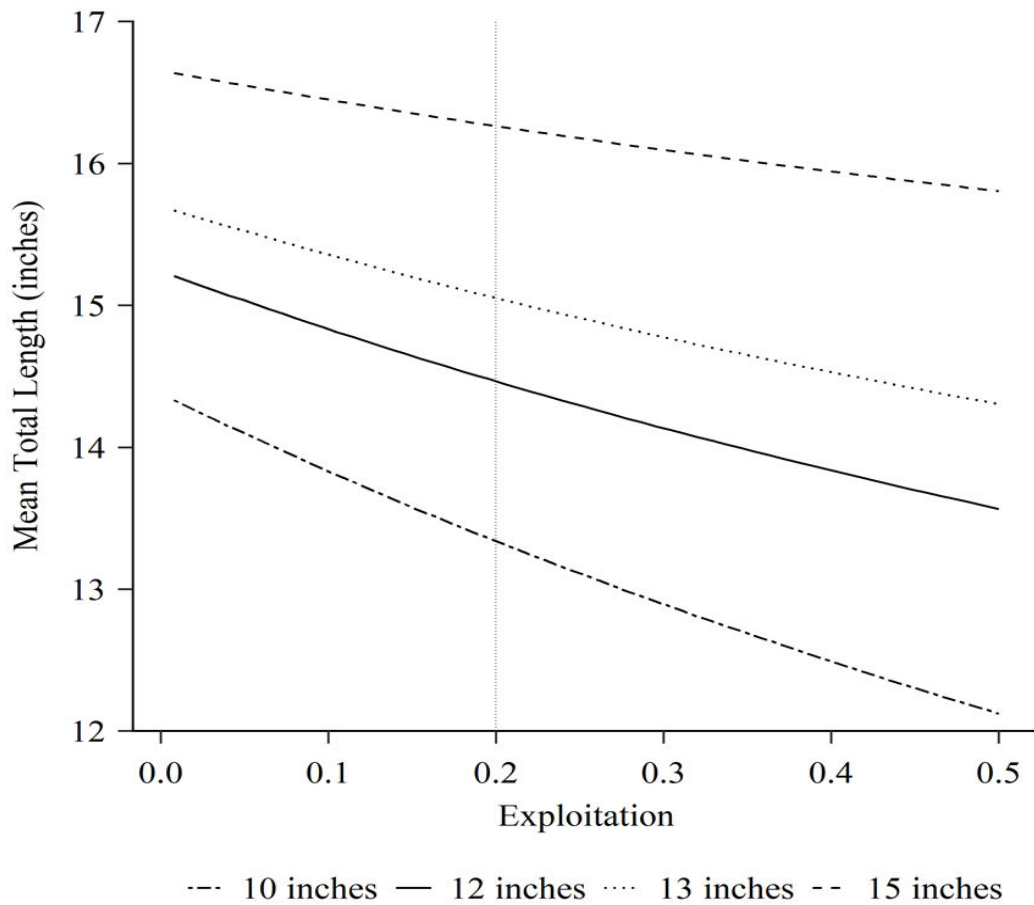


Figure 2 – Model output for mean total length across a range of exploitations rates (0 to 50%) for four minimum length limits. The vertical line represents an exploitation rate of 20%.

Harvest Regulations

Harvest regulations are a fundamental part of managing and protecting black bass fisheries and can significantly affect population sustainability and viability, the quality and value of a fishery, and angler satisfaction (Iserman and Paukert 2010). Within Arkansas, the AGFC classifies black bass as sportfish and manages them to allow for sustainable recreational use. As a result, biologists frequently use creel and length limits to shape black bass population characteristics, abundance, and size structure within reservoirs (Table 3). However, many anglers practice catch-and-release fishing which can negate the effectiveness of harvest regulations. In other words, harvest regulations on a fishery are irrelevant if there is not a high level of harvest. Thus, some black bass harvest is helpful in improving black bass populations.

Creel limits are the most frequently used regulation to increase or reduce harvest and improve the quality of a fishery (Iserman and Paukert 2010). The AGFC uses creel limits to safeguard new and renovated reservoirs, protect against overexploitation, and redirect harvest. For example, the statewide daily creel limit for black bass (combined) is ten fish in Arkansas; however, creel limits may vary among reservoirs depending on management objectives and angler input.

Length limits are also popular for regulating harvest for various reasons, such as preventing overexploitation, improving population abundance and size structure, and increasing angler catch rates and the size of fish caught (Iserman and Paukert 2010). In Arkansas, there is no statewide length-based restriction for black bass. That said, AGFC utilizes a variety of length limits for black bass in reservoirs depending on management objectives and angler input. The most common length limit used in Arkansas is the minimum length limit. Minimum length limits allow for the harvest of individuals once they have attained or exceeded a specified length (e.g., 13 inches; Iserman and Paukert 2010). They are practical when fishing mortality is high, recruitment is low or inconsistent, growth is moderate to fast, and natural mortality is low (Novinger 1984, Iserman and Paukert 2010). An example of when a biologist might use a minimum length limit is to protect black bass spawning stock by restricting harvest below 13 inches (i.e., 13-inch minimum length limit) to allow them to spawn once before being harvested. On the other hand, biologists use slot limits to protect a specific size range of fish. For example, a protected slot limit of 13 to 16 inches allows only fish less than 13 and greater than 16 inches to be harvested while protecting fish between 13 and 16 inches. This length limit is adequate when fishing mortality and recruitment are high and growth is slow to moderate (Novinger 1984). For example, a biologist may use a slot limit to protect black bass from 16 to 21 inches, which are desirable to anglers while allowing for harvest of the abundant smaller fish below 16 inches. It is paramount that anglers harvest sufficient numbers of fish below the slot limit for this length limit to be beneficial and avoid becoming a high minimum length limit. On some occasions, biologists may use a maximum length limit or length-based creel limits to limit the harvest of larger, older individuals to achieve management objectives (e.g., trophy bass management). For example, a biologist may restrict anglers from harvesting black bass over 20 inches or only allow anglers to harvest one fish over 20 inches.

Selecting harvest regulations to meet management objectives can be challenging due to inherent population and environmental variability and differing public opinions and desires (Iserman and Paukert 2010). With that said, the AGFC has a standard protocol for selecting appropriate harvest regulations. First, biologists must complete a thorough assessment utilizing data from sampling, population modeling, and angler surveys to determine whether pursuing harvest regulations is warranted and which harvest regulations best meet management objectives. Biologists then present their proposed harvest regulations to the AGFC Fisheries Division's Management Section and Administration for review and approval. If the proposed harvest regulations make it through this rigorous review, the AGFC Fisheries Division's Administration will formally present them to the AGFC Commissioners for consideration. Afterward, the AGFC collects public comments on all proposed harvest regulations through a formal 30-day public comment period. Finally, the AGFC Commissioners review the public comments and information staff provided to decide whether to approve or reject regulation proposals.

Table 3 – Length and creel limits for black bass in Arkansas reservoirs (as of August 2022).

Reservoir	Species	Length Limit	Daily Possession Limit
Statewide	BB	No MinLL	10 BB with no more 4 SMB
Lake Sylvia Lake Terre Noire	LMB	No MinLL	5 LMB
Lake Millwood	LMB	No MinLL	6 LMB
Lake Jack Nolan Lake Ashbaugh	BB	No MinLL	6 BB
Lake Lou Emma	BB	No MinLL	5 BB
Lake Catherine	LMB and SPB SMB	No MinLL C & R	10 LMB and SPB (combined) SMB must be IR
Lake Frierson	LMB	12 inch MinLL	10 BB with no more 4 SMB
Greers Ferry Lake	LMB and SMB SPB	12 inch MinLL No MinLL	10 BB with no more 6 SMB
Lake Greeson	LMB and SPB SMB	No MinLL 12 inch MinLL	10 BB with no more 2 SMB Additional 10 SPB may be kept
Lake Degray Lake Ouachita	LMB SMB SPB	13 inch MinLL 12 inch MinLL No MinLL	6 BB with no more 2 SMB Additional 10 SPB may be kept
Felsethal NWR	LMB	13 inch MinLL	10 BB
Arkansas River	LMB	14 inch MinLL	10 BB with no more 4 SMB
Blue Mountain Lake Lake Georgia Pacific Kingfisher Lake Lake Chicot Lake Greenlee Moss Creek Pond	LMB	15 inch MinLL	10 BB with no more 4 SMB
Beaver Lake	LMB and SMB SPB	15 inch MinLL No MinLL	6 BB
Lake June	LMB	16 inch MinLL	5 LMB
Lake Barnett Brewer Lake Lake Wilhelmina Bear Creek Lake	LMB	13 to 16 inch PSL	10 BB with no more 4 SMB
Mallard Lake	LMB	14 to 17 inch PSL	10 LMB with one over 17 inches
Lake Atkins	LMB	16 to 21 inch PSL	10 LMB with one over 21 inches
Lake Winona	BB	16 inch MaxLL	10 BB with no more 4 SMB
Swepco Lake	LMB	No MinLL	10 LMB with one over 18 inches

Lake Columbia			
Lake Austell			
Lake Dunn	LMB	No MinLL	10 LMB with one over 20 inches
Lower White Oak Lake			
Marion McCollum Lake	LMB	C & R	LMB must be IR
Lake Poinsett	BB	C & R	All BB must be IR

*BB – black bass, LMB – Largemouth Bass, SMB – Smallmouth Bass, SPB – Spotted Bass, MinLL – minimum length limit, MaxLL – maximum length limit, IR – immediately released, and C & R – Catch and Release.

Hatchery Production and Stocking

The Arkansas Game and Fish Commission Fish Culture Section utilizes its facilities and district nursery ponds to produce the various fish species for stocking throughout the state based on District Biologist requests for water bodies within their respective districts. The AGFC Fish Culture Section consists of four warmwater hatcheries, totaling 379 acres, and one trout rearing facility (Figure 3). A total of 9-10 species are produced among the four individual warmwater hatcheries with a total annual production for stocking public waters of 10.5 million fish. In addition to hatchery facilities, the Fisheries Division also operates 10 nursery ponds throughout the state. District fisheries personnel manage these ponds for the culture of multiple species for direct release into the respective reservoir. Of these ten ponds, three have historically been utilized for the production of black bass.

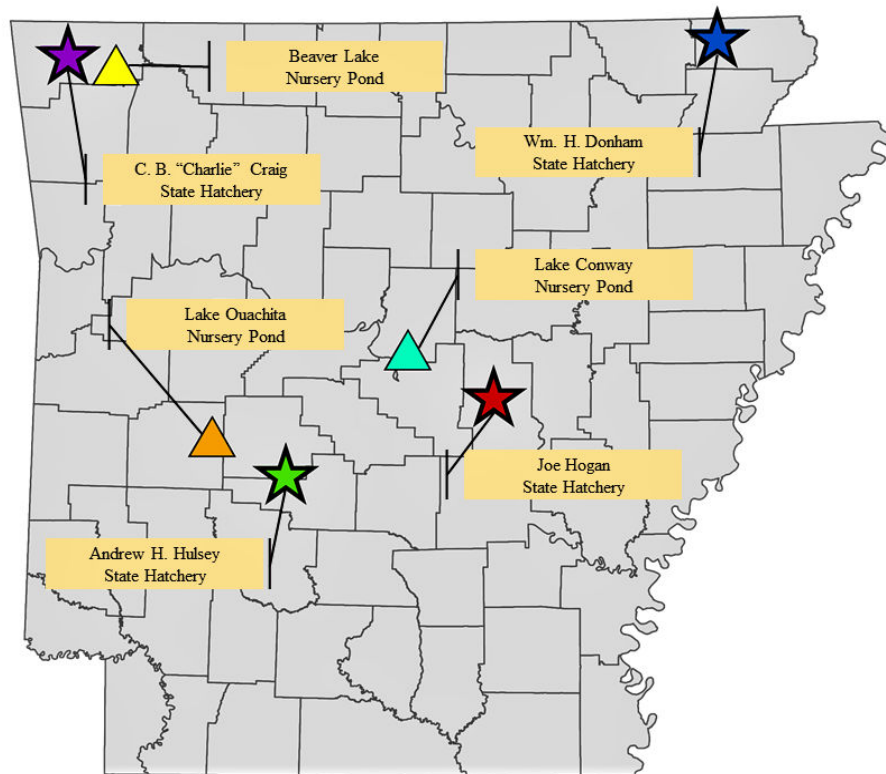


Figure 3 – AGFC warmwater fish hatcheries and nursery ponds often used to produce black bass. Stars represent fish hatcheries and triangles represent nursery ponds.

Spawning and Pond Culture

Each of the four warmwater facilities does some aspect of black bass production with three facilities conducting spawning operations. A total of 70 acres is allocated for the production of black bass (Northern Largemouth Bass, Florida Largemouth Bass, and Smallmouth Bass), which is roughly 18% of all available acreage for all species. This includes acreage allocated for broodfish holding (13 acres), fingerling production (53 acres), and advanced fingerling production (4 acres). Acreage is also allocated for the production of forage species (i.e. Bluegill, Fathead Minnows and Golden Shiners) for the growth and maintenance of broodfish and/or advanced fingerlings.

Each facility that conducts spawning operations for black bass utilize what is called the “mat spawning” technique. This technique involves placing a known number of both male and female bass in an enclosure within a pond where they will spawn on an artificial grass mat. Mats are collected by hatchery personnel daily and transferred to indoor hatching facilities where conditions can be controlled and maintained. Eggs will hatch in 2-3 days and newly hatched fry will be ready to transfer to production ponds in 5-7 days. Production pond stocking rates in hatchery ponds vary among facilities but average between 70,000-100,000 fry per acre. Each female produces roughly 30,000 fry per year. Fish are monitored for growth and condition throughout the grow-out period, which ranges from 45 -60 days. The majority of black bass production is stocked out at the fingerling stage (1.75 - 2 inch) while a smaller number is grown to the advanced fingerling stage (approximately 4 inches). Though numbers requested by District Biologists vary from year to year the hatchery system produces roughly 2.8 million black bass annually. Northern Largemouth Bass production averages 600,000 fingerlings and 20,000 advanced fingerlings. Florida Largemouth Bass production averages 2 million fingerlings and 20,000 advanced fingerlings. Smallmouth Bass production totals around 30,000-40,000 during years when requests for this species are made.

Broodfish Management

The hatchery system maintains broodfish for both Northern and Florida Largemouth Bass year around. The William H. Donham Hatchery in Corning maintains and produces all Northern Largemouth Bass, while the Andrew Hulsey Hatchery (Hot Springs) and Joe Hogan Hatchery (Lonoke) maintain and produce all Florida Largemouth Bass. Each facility maintains multiple year classes of broodfish for current and future use. Typically fish will be spawned beginning at age-3 and will be retired at age 6-7. Each facility keeps a minimum of 200 adult bass for current spawning activities. Approximately 1,500 fingerlings are held for growth to broodstock size. Numbers are then reduced once the threat of cannibalism has receded after year one. To achieve good growth and maximize condition, the hatchery system produces various forage species for bass brood management. The species used varies based on the year class and size of the future broodfish. Currently the hatchery system utilizes Bluegill, Fathead Minnows, Golden Shiners and Threadfin Shad for grow- out of black bass broodfish. A threshold of 5 pounds of forage per pound of growth is used to estimate total forage required for broodfish development.

Currently, genetic testing is only performed on Florida Largemouth Bass broodstock being used for spawning. This involves collecting a fin clip from the pectoral fin and the insertion of a numbered PIT tag into the abdomen of the fish for later identification. Only bass exhibiting 100% Florida Largemouth alleles are utilized in the production of this species. This testing is performed

during the fall on age-2 in preparation for spawning the following spring. Retired broodfish are either stocked as spawning fish for nursery ponds and/or stocked in other suitable water bodies.

Stocking

Historically, fisheries agencies stocked black bass to supplement wild populations, correct predator-prey imbalances, establish new populations, or respond to pressure from the angling public or political interests (Buynak and Mitchell 1999). However, black bass stockings by state fish and wildlife agencies have decreased substantially over the last 20 years. For example, in 2018, 20 states collectively stocked about 2.5 million Largemouth Bass fingerlings, a small fraction of what was stocked annually in the 1990's and prior (Hal Schramm, personal communication). Although an important tool in limited situations, stocking is not a "cure all" for improving fisheries. Generally, habitat improvement is the most effective way to improve fish populations.

The AGFC Fisheries Division stocks Northern Largemouth Bass to supplement natural recruitment in locations where natural spawning is consistently poor and sampling data indicate that Largemouth Bass stockings could make a significant impact on a population. For example, Largemouth Bass in the Arkansas River experience repeated poor year classes due to degraded backwater habitat and either low or high spring flows. Research has shown that stocking Northern Largemouth Bass contributed 10-13% to the population of age-1 fish in the Arkansas River (Heitman et al. 2006). Therefore, AGFC fisheries staff frequently stock the Arkansas River with Northern Largemouth Bass. Conversely, research conducted by AGFC and UAPB in other Arkansas reservoirs has shown survival rates of < 1% (Rachels 2013, Buckingham 2020). Another key factor in making stocking decisions is that an occasional poor spawn can positively affect bass population abundance or size structure, and most reservoirs in Arkansas fall into this category (Daugherty and Smith 2012).

Fisheries agencies in states along and just north of the Gulf Coast and the Desert Southwest stock Florida Largemouth Bass with the rationale that this species grows faster and obtains a larger maximum size than Northern Largemouth Bass (Maceina and Murphy 1992). The AGFC Fisheries Division stocks Florida Largemouth Bass in numerous reservoirs throughout the southern two-thirds of the state. The goal of these stockings is not to increase the number of black bass in the reservoir, but to increase the trophy potential of that reservoir by introducing Florida Largemouth Bass genes. Biologists make the determination to stock Florida Largemouth Bass at a reservoir when the reservoir has characteristics conducive for producing trophy Largemouth Bass. For example, recent AGFC research indicates that reservoirs that are shallow, productive (high nutrient levels), vegetated, have a long growing season and are moderately turbid generally are most appropriate for Florida Largemouth Bass stockings (Buckingham et al., in review). Reservoirs that have some of these characteristics may also be considered for Florida Largemouth Bass stockings if there is public support for it through the reservoir management plan process.

The AGFC Fisheries Division stocks Northern Largemouth Bass and Florida Largemouth Bass as fingerlings (2 inches). In recent years, AGFC biologists have experimented with stocking advanced fingerlings (4 inches) on a limited basis. However, research has shown that advanced fingerlings have similar survival and population contribution as fingerlings in Arkansas reservoirs (Buckingham 2020). These advanced fingerlings are not cost effective as it generally costs about ten times more to produce one advanced fingerling Largemouth Bass than one 2-inch Largemouth

Bass. Largemouth Bass and Florida Largemouth Bass fingerling stocking rates vary by reservoir, but average about 30 fingerlings per acre. In most cases, biologists stock fingerlings by boat in quality nursery habitat to increase survival.

AGFC biologists stock a limited number of Smallmouth Bass in reservoirs to establish populations thought to have a high likelihood of success based on habitat quality (rock cover, deep water, etc.). Fisheries staff stock Smallmouth Bass as 2-inch fingerlings, typically stocking as many fingerlings as the hatchery system can produce. Broodfish used to create Smallmouth Bass fingerlings must come from within the watershed of the reservoir being stocked to insure genetic integrity, as Arkansas is home to three unique strains of Smallmouth Bass.

Biologists evaluate the success of Largemouth Bass stockings by analyzing abundance and survival of stocked fish as well as angler catch measured in creel surveys. In addition, Florida Largemouth Bass stockings are evaluated by analyzing genetic introgression data. Stocking strategies may need to be altered if genetics of the population do not change or if angler satisfaction is low. Smallmouth Bass introductions are considered successful when a self-sustaining population is established.

Forage Fish Management

Optimizing forage fish populations is an important component of managing black bass fisheries. The composition of forage fish in a reservoir can influence growth, condition, and survival of a black bass population. Examples of ways AGFC biologists can manage forage fish populations are to: 1) stock in order to increase numbers of forage fish or introduce a new forage species, and 2) drain or chemically treat a reservoir to decrease or eliminate overly abundant forage fish.

Fisheries biologists consider the goals for a black bass population, current composition of the fish community, and characteristics of the reservoir, to determine what species and how many forage fish to stock. Biologists stock forage for the purpose of establishing a forage base in a new reservoir or increasing growth and size structure of an existing sportfish population. The most common forage fish species the AGFC stocks for the purpose of black bass management include Bluegill, Threadfin Shad, Golden Shiners, and Fathead Minnows. Stocking each of these species has advantages and disadvantages (Table 3). Characteristics of forage fish species that can influence which is most appropriate given management goals include: 1) whether they can sustain their own population once established or maintained through annual stocking, 2) reproductive potential, 3) maximum length achieved, 4) if they feed on eggs, and 5) their water temperatures preferences.

Fisheries biologists may drain or chemically treat a reservoir with a product called rotenone in order to decrease or eliminate over-abundant forage fish. This is only done in instances where forage fish abundance is high enough to be a detriment to sportfish populations. The most common example is when Largemouth Bass reproduction is limited due to extremely high densities of forage fish that eat Largemouth Bass eggs. Examples include Bluegill, Golden Shiners, and non-native Yellow Bass. Biologists may also control forage fish populations that are dominated by individuals too large to be consumed by Largemouth Bass such as very large Gizzard Shad.

Table 4 – Characteristics of forage fish species that are stocked by the AGFC.

Species	Advantages	Disadvantages
Bluegill	<ul style="list-style-type: none"> • Self-sustaining • High reproduction rate 	<ul style="list-style-type: none"> • Can become too numerous (egg predators) • Can become too large for bass to eat
Threadfin Shad	<ul style="list-style-type: none"> • Self-sustaining • High reproduction rate • Very nutritious forage fish • Do not become too large for bass to eat 	<ul style="list-style-type: none"> • Die off at water temperatures < 39°F
Gizzard Shad	<ul style="list-style-type: none"> • Self-sustaining • High reproduction rate • Very nutritious forage fish • More resilient to cold water than Threadfin Shad 	<ul style="list-style-type: none"> • Can become too large for bass to eat and overpopulate
Golden Shiner	<ul style="list-style-type: none"> • Very nutritious forage fish • Do not become too large for bass to eat 	<ul style="list-style-type: none"> • Need vegetation to be self-sustaining.
Fathead Minnow	<ul style="list-style-type: none"> • Good for newly flooded reservoirs and supplemental forage. 	<ul style="list-style-type: none"> • Rarely can establish and be self-sustaining in high numbers. • Small maximum size.

Fish Health

AGFC staff monitor and incorporate fish health management in a number of ways to protect black bass.

AGFC hatcheries acquire brood stock from certified disease-free captive sources whenever possible. Hatchery staff utilize broodstock management plans, which incorporate genetic management, into hatchery protocols to avoid inbreeding and maintain adequate immune function, maintain reproductive capacity, and overall health. Hatchery staff follow biosecurity plans to prevent introduction and/or spread of pathogens and aquatic nuisance species. If brood stock is required from free-ranging populations, source populations undergo a wild fish health survey in the fall prior to spring collection when water temperatures are in the appropriate ranges to screen for pathogens. Wild caught brood fish are quarantined and held separately from captive-reared fish to prevent the possible introduction of a pathogen or aquatic nuisance species to an AGFC culture facility. Wild-caught brood stock are either returned to the original waterbody after spawning or euthanized for fish health sample collection, age and growth, and/or toxin screening with proper carcass disposal. All AGFC hatcheries undergo biannual fish health inspections to ensure pathogens or aquatic nuisance species have not been introduced to the facility or spread during fish stocking activities.

AGFC staff also monitor fish health across the state to identify pathogens and parasites of greatest concern for black bass species. Staff continually monitors for the emergence of new pathogens or

mutations of existing pathogens that could pose a risk to the quality and quantity of black bass species in wild fish populations. AGFC biologists conduct routine health surveillance in reservoirs where black bass species management is a high priority. AGFC animal health staff utilize the USFWS Wild Fish Health Survey protocol for pathogen surveillance and the Fish Health Assessment Necropsy (Goede and Barton 1990; Adams et al. 1993; Blazer et al. 2018) to assess individual fish health as an indicator of population health. Additionally, AGFC staff partner with other agencies and researchers on documenting and monitoring the spread of existing and emerging pathogens specific to black bass species, like Largemouth Bass Virus and Blotchy Bass Syndrome. Anglers and conservation agencies have noticed Blotchy Bass Syndrome for decades, but recent research has determined the cause to be viral. Agency staff strive to avoid translocation of fish from one reservoir to another while performing sampling and other agency activities to prevent introduction or spread of pathogens and parasites.

As part of fish health surveillance activities, AGFC staff also respond to fish kills involving black bass to identify the cause and assess the magnitude of the mortality event. Fish kills often challenge biologists to distinguish between causes of mortality (e.g., disease, water quality, stress from handling). Fish kills that occur over longer periods of time (e.g., days to weeks) and/or involve a single species or closely related group of species are more likely to be pathogen-related. Fish kills that occur in a narrow time frame and/or involve multiple species are likely caused by oxygen depletion. To prevent the spread of pathogens/parasites during work activities, agency staff clean and disinfect equipment between uses. Similarly, agency weigh-in facilities and agency equipment (live release trailers) that are utilized by agency personnel and the public are cleaned and disinfected between uses to prevent cross-contamination. AGFC encourages members of the public to practice “clean, drain, and dry” principles and avoid the translocation of fish between waterbodies to avoid the movement of pathogens and aquatic nuisance species.

In addition to fish health, agency staff also form partnerships to monitor aspects of black bass fisheries that could impact human health. AGFC biologists work with the Arkansas Department of Health and the Arkansas Department of Energy and Environment to conduct routine monitoring for mercury and other potential toxins in black bass species to ensure appropriate consumption advisories are in place when needed to protect at-risk populations. AGFC staff also partner with these agencies when harmful algal blooms emerge on public waterbodies as many of these algal blooms can be harmful to fish as well as humans and other animals. Agency staff also strive to educate the public about fish pathogens and parasites and their role in helping prevent the introduction or spread of these organisms in aquatic ecosystems. Most fish pathogens are not transmissible to humans or other mammals; nonetheless, observing them may raise concerns among consumptive anglers. AGFC staff encourage individuals and groups to report sick or dead fish (especially in large numbers) by emailing AGFC at agfc.health@agfc.ar.gov.

Staff conduct water quality assessments for elements and compounds that could adversely affect black bass survival, reproductive success, or health. When feasible, staff will focus active management strategies on reservoirs or portions of reservoirs where these substances are least likely to adversely affect fish health to maximize success and avoid creating ecological traps (i.e., attracting fish to environments that adversely affect their health, survival, or reproduction). Finally, partnerships and management activities will be developed to improve water quality through riparian management or watershed partnerships where issues are identified as a potential hindrance to population health when feasible.

Tournament Angling

Competitive bass angling tournaments are popular throughout Arkansas and the United States. The size of these events ranges from small club tournaments with just a few anglers to highly publicized national events with hundreds of boats and large cash prizes. As popular as bass angling tournaments have become in Arkansas, only 7.5% of all black bass anglers in the state indicated they participated in fishing tournaments (Hunt and Westlake 2019).

Studies from across the United States have identified both positive and negative potential impacts of bass tournaments (Schramm and Hunt 2007). Positive impacts include promoting fishing popularity, advancing conservation, injecting money into local economies, generating revenue for conservation agencies through license sales, and allowing biologists to collect data. Conversely, potential negative impacts may include tournament-induced bass mortality, bass displacement, and conflicts between tournament and non-tournament anglers.

The AGFC continues to recognize black bass tournament fishing as a legitimate use of the resource. No evidence exists to indicate that competitive fishing is reducing adult black bass abundance in Arkansas waters. Tournament anglers must follow the same harvest restrictions as non-competitive anglers. Despite their higher visibility, competitive anglers still represent a small percentage of the angling public.

AGFC biologists work cooperatively with tournament organizers to promote efficient weigh-in procedures, reduce mortality, and minimize bass displacement effects. The AGFC and partners provide weigh-in facilities throughout the state and have constructed live-release trailers to loan to tournament organizations for relocating fish. In addition, biologists will occasionally be onsite to work with tournament organizers to demonstrate techniques for proper fish care. The AGFC Black Bass Program also administers the Arkansas Tournament Information Program (ATIP), which collects voluntarily reported tournament data. ATIP information is useful for looking at long-term trends in black bass fisheries, determining if regulation changes have the desired effect, recognizing fisheries that could benefit from different management actions, and providing anglers with information on good fishing locations.

Research

AGFC biologists occasionally have specific management questions or data gaps within reservoirs that they cannot address through routine monitoring. AGFC biologists will conduct research projects to answer specific management questions in these cases. These projects often require extensive time and financial commitments. For more rigorous studies, the AGFC also funds universities to assist with research that can inform management decisions. Black bass research projects can cover a wide variety of topics in reservoirs. For example, biologists may be interested in evaluating black bass populations (e.g., genetic analysis) to better understand the impacts of management actions (e.g., stocking) and how black bass interact with other sport fish species (e.g., competition). Biologists may also evaluate how fish habitat (e.g., introducing, increasing, or removing) can affect black bass populations. Finally, biologists may conduct surveys to understand anglers' attitudes and preferences for a black bass fishery.

Here are examples of recent black bass research projects completed by AGFC biologists¹ or Universities², including a Florida Largemouth Bass stocking contribution study¹, DeGray Lake

Largemouth Bass and Hybrid Striped Bass interaction study², Lake Ouachita Largemouth Bass population genetics characteristics evaluation¹, statewide black bass genetics assessments^{1&2}, Norfolk Lake black bass exploitation study¹.

Uncontrollable Factors

Fisheries biologists often face the reality that factors outside of their control can influence black bass fisheries. Attributes such as soil type and productivity, watershed size and land cover, air temperature, reservoir aging, and water level control/management (e.g., USACE reservoirs) are just a few factors that can be outside AGFC control or jurisdiction. These influential characteristics can alter black bass populations. For example, the biological productivity of a reservoir, influenced by soil productivity, can profoundly affect black bass abundance and quality within a reservoir. Highly productive reservoirs tend to have better quality Northern or Florida Largemouth Bass, whereas, Smallmouth and Spotted Bass tend to thrive in less productive reservoirs. Fisheries biologists must understand the impacts of influential factors outside their control and consider them when managing black bass fisheries.

HABITAT

Aquatic Plants

Aquatic plants provide significant benefits to aquatic ecosystems. They provide valuable fish habitat (Dibble et al. 1997), stabilize shorelines, and bottom sediment (Bornette and Pujalon 2009). Aquatic plants may be floating, submerged, or emergent. Both juvenile and adult Largemouth Bass utilize aquatic plants for shelter and foraging. Biologists aim to maintain aquatic plants at an intermediate level (20-30% coverage), providing optimal habitat for young Largemouth Bass growth and abundance (Hoyer and Canfield 1996). Water level fluctuations, turbidity, water chemistry, and the presence of aquatic herbivores all play a role in the prevalence of aquatic plants in Arkansas reservoirs.

In cases where reservoir characteristics or biological factors limit the presence of aquatic plants, AGFC biologists may intervene and utilize establishment methods to create a source population with hopes that they spread to other parts of the reservoir. Biologists use a variety of species of floating, submerged, and emergent plants. Floating and emergent plants are more commonly used in shallow reservoirs with low water level fluctuations. Submerged plants are more commonly used in reservoirs that have higher water clarity. In certain cases, plants are placed in cages to protect against aquatic herbivores such as turtles. AGFC biologists acquire aquatic plants for these projects by harvesting them from healthy populations or propagating them at AGFC or US Army Corps of Engineers (USACE) facilities. AGFC biologists have completed or have ongoing projects to establish emergent plants (Waterwillow) at reservoirs such as Lake Monticello, Lake Pickthorne, and along the Arkansas River. In addition, AGFC biologists have ongoing projects at Lake DeGray and Greers Ferry Lake utilizing floating cages to establish submerged plants (Coontail, Eelgrass, and Pondweed). The AGFC opposes attempts to establish Hydrilla in Arkansas reservoirs to increase the prevalence of aquatic plants. However, in reservoirs where Hydrilla is already established, we recognize that an intermediate level (20-30% coverage) can benefit Largemouth Bass similarly to other submergent plants such as Coontail.

In some cases, aquatic plants can become overabundant and have detrimental effects on the fishery and recreation. Negative effects include slower sportfish growth, poorer water quality that increases the likelihood of fish kills, and the reduction of boating and angling access. Giant Salvinia and Water Hyacinth are the most common aquatic plants in Arkansas to become overabundant and are considered problematic at any abundance.

If aquatic plants such as Alligatorweed, Water Hyacinth, or Hydrilla become overabundant, AGFC biologists may utilize approved aquatic herbicides and/or triploid grass carp to reduce vegetation levels. Biologists typically do not use these methods to eradicate aquatic plants, but to manage their presence at an optimal level (20-30% coverage). The AGFC practices annual aquatic plant control at numerous reservoirs across Arkansas. For problematic aquatic plants that provide little benefit to an aquatic ecosystem, such as Giant Salvinia, more aggressive and early prevention methods are prescribed. Proactive measures using floating containment booms to reduce the spread of Giant Salvinia have been established at Lake Columbia and Lake Erling. It is responsible practice to prevent the spread of aquatic plants between reservoirs. Anglers should inspect their boats before and after trips to remove vegetation and drain all water from the boat, including livewells.

Fish Cover

Fish cover is a type of habitat that includes features that may occur naturally or artificially in a reservoir: woody debris, standing timber, aquatic plants, rocky shorelines, and artificial structures (e.g. docks, attractors, bridges, etc). This cover serves as important habitat for both juvenile and adult fish to hide from predators and forage on prey. When many Arkansas reservoirs were built, the reservoir bottoms were bulldozed and the trees either harvested for lumber or burned. In some instances, the trees and brush were left in place and flooded, providing abundant cover during the early life cycle of these reservoirs. Over time, the flooded trees have gradually decayed, reducing the amount of cover.

AGFC biologists add natural and artificial structures to reservoirs to improve the amount of cover. These structures also serve as fish attractors for anglers to target on a fishing trip. The AGFC Fisheries Division conducts at least two large-scale and ten small-scale habitat projects each year. Large-scale projects consist of utilizing personnel from multiple fisheries districts and programs and aim to improve cover in a large portion of a reservoir. Biologists complete small-scale projects within their districts without outside assistance. Past fish cover projects include using polyvinyl chloride (PVC) configurations, rock piles, wooden pallets, gravel beds, or combinations of these components. Cedar trees, where available, have been readily used as natural structures to provide cover. Biologists prefer cedar trees because they decay slowly, have complex branches, and their removal can improve wildlife habitat because cedar trees have invasive qualities on the landscape.



Figure 4 – Biologists sinking natural fish habitat in Bull Shoals Reservoir.

Liming and Fertilization

Liming and fertilizing of reservoirs are complementary management strategies that are similar in function to agricultural liming and fertilization. Biologists first apply crushed agricultural lime (CaCO_3), if needed, to create a water chemistry that maximizes the effectiveness of the nutrients already in the water or that are added through fertilization.

Biologists apply lime and fertilizer to increase the amount of usable nutrients in a reservoir, thus promoting improved phytoplankton blooms, which are the base of the food chain. A greater amount of phytoplankton allows for greater numbers of zooplankton that feed on phytoplankton. This increase continues up the food chain to produce greater numbers of baitfish. With this increase in available forage fish, a reservoir can produce more sportfish and increase their growth and condition.

Biologists collect water samples to determine the alkalinity of the water, as well as phosphorus and nitrogen levels. Biologists can then select an appropriate application rate of lime, phosphorus and nitrogen. AGFC biologists apply lime during fall or winter and fertilizer several times from May through July.

Liming and fertilizing is most suited for AGFC-owned reservoirs less than 1,000 acres with smaller watersheds relative to reservoir size. In these scenarios: 1) AGFC has the authority to lime and fertilize, 2) the amount of material needed to apply is achievable given budgets and staff time, and 3) water is retained in the reservoir long enough for fertilization to result in a phytoplankton bloom that benefits the food chain.

Drawdowns and Seeding

A reservoir drawdown occurs when the water level of a reservoir that is controlled by a dam, or other structure is lowered and held at a reduced level for a period of time. AGFC biologists may

implement a drawdown for several reasons, including reducing aquatic plant abundance; increasing reservoir depth; increasing reservoir fertility; increasing fish recruitment; improving growth, condition, and size structure of fish populations; and allowing landowners to make repairs to docks and seawalls. Conducting drawdowns can be a cost-effective means to achieve those objectives.

AGFC biologists often use drawdowns to reduce aquatic plant abundance. The effectiveness of drawdowns is species specific and is largely related to whether the plant species reproduces from fragmentation and regeneration (most perennials) or seeds (annuals). For perennial plants such as Milfoil, Waterweed, and Duckweed, drawdowns can reduce plant abundance if the drawdown occurs over a long enough period of time to dry them, and if extended periods of freezing temperatures occur to damage them. Annual plants, such as Hydrilla, Alligatorweed, and Smartweed are not negatively affected by drawdowns, because the drawdown does not significantly damage their seeds. Often, the abundance of those species increases as a result of a drawdown.

Drawdowns can be used to increase depth in reservoirs. When reservoir sediments are exposed to air, the reservoir bottom will dry and contract. In addition, organic matter on the reservoir bottom dries and oxidizes (composts). Both of those factors can result in an increase in reservoir depth. The extent to which depth increases in a water body is related to the time of year the drawdown occurs (summer drawdowns are most effective), the type of sediment on the reservoir bottom, and the length of time the sediment is exposed to air. Also, as water levels drop during the beginning of the draw down, fine sediments can be transported from the littoral zone (area where sunlight penetrates to the reservoir bottom) to deeper water, which can serve to increase mean depth near shore and expose more coarse sediments.

Drawdowns can increase reservoir fertility. Following a drawdown, the dried and cracked reservoir-bed releases nutrients into the water when it is flooded. In addition, terrestrial vegetation that has grown on the reservoir-bed will become submerged and decompose, which also release nutrients into the water. Those processes increase a reservoirs fertility, which can result in increased densities of phytoplankton, zooplankton, aquatic insects, and fish.

Drawdowns can increase black bass recruitment. During a drawdown, biologists often seed shoreline areas to provide habitat for young bass once the reservoir is reflooded. Biologists commonly use seeds from millet, sorgum-sudan, wheat, and rye. If the terrestrial vegetation is flooded before black bass spawn, increased recruitment of black bass often occurs, because the flooded terrestrial vegetation provides cover that juvenile bass can use to avoid predation. AGFC biologists use drawdowns to improve the growth, condition, and size structure of black bass populations. During a drawdown, fish are forced out of shallow water cover into deeper water as the water is drained. Once the drawdown is completed, prey species and black bass are in a confined area that is often lacking in cover. This significantly increases the susceptibility of prey species to black bass predation, which results in black bass having increased consumption rates. As a result, black bass growth, condition, and size structure improves.

HUMAN DIMENSIONS

Creel Surveys

Fisheries biologists utilize creel surveys to collect waterbody-specific data on the fishery as opposed to the fish population. The primary purposes of a creel survey are to gather data to: 1) estimate fishing effort, 2) estimate angler catch rates, 3) estimate the number of fish caught and harvested, 4) describe the size of fish caught and harvested, and 5) describe angler characteristics. Collectively, creel surveys provide crucial information for understanding the characteristics of a fishery. Biologists develop management decisions about regulations, stocking, and the amount of time and money allocated toward the management of a fishery using the creel survey data.

Fisheries biologists conduct creel surveys in two parts. First, anglers, boats, or trailers are counted on randomly selected days and times. Then, anglers are interviewed either on the water during a fishing trip or at an access area at the completion of a fishing trip. The counts are used to estimate the amount of fishing effort and interviews to estimate catch and harvest rates, measure the length of harvested fish, and angler characteristics (distance traveled and cost of that fishing trip, angling frequency, angler satisfaction, and angler opinions). Creel surveys range from three months to one year depending upon survey goals.

The AGFC conducts creel surveys on most public reservoirs in Arkansas. Survey frequency for specific reservoirs range from annually to once per decade depending on the size and amount of fishing effort. The AGFC may also conduct additional creel surveys when biologists detect significant changes in angler behavior or characteristics (e.g., increased use of forward-facing sonar or change in target species).

Angler Surveys

Angler surveys are becoming more widely used as AGFC seeks to better understand angler attitudes and opinions. Although there are a number of ways to connect with anglers, AGFC most frequently uses mail surveys to administer angler surveys. These types of surveys involve identifying a random sample of license holders who will receive a survey. Mail surveys allow AGFC to ask a lot of questions that provide critical input on angler's participation patterns, motivations, and socio-economic characteristics. Additionally, mail surveys allow AGFC to measure angler satisfaction and describe factors that influence satisfaction. These surveys are generally conducted every 5-8 years. Mail surveys allow AGFC to connect with many anglers in a short amount of time.

Similar to mail surveys, AGFC may also use email addresses from license holders to deliver angler surveys. While more cost-effective and easier to administer, not all anglers use email. This could potentially introduce bias when interpreting results. However, advances in technology and an increasing reliance on email as a mode of communication could make email-based surveys a future option.

AGFC also interviews anglers who are fishing. These on-site surveys differ from creel surveys because the objectives are not estimating angler effort and catch. Rather, these surveys allow AGFC to get valuable insight from active anglers at specific waterbodies.

Education and Outreach

Biologists utilize several avenues to inform anglers on black bass sampling, biology, stocking, habitat improvement, and fishing. The AGFC staff host or attend public meetings and events to provide anglers with information on management activities, regulation proposals, and educational materials. Biologists also provide information through handouts and brochures, radio programs, newspaper and magazine articles, and YouTube videos. Biologists utilize electronic communication to answer questions via AskAGFC, send out information from Constant Contact emails and the AGFC website and create posts for the AGFC Black Bass Management Facebook and Instagram pages. Additionally, biologists give information through webinars, podcasts, and other media outlets.

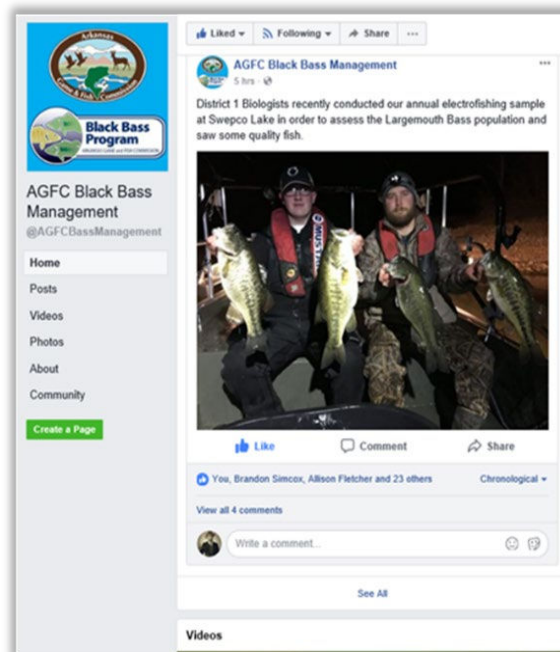


Figure 5 – The AGFC Black Bass Management Facebook page.

Public Meetings

Historically, formal public meetings represented the primary way for the public to provide information to the AGFC. The objectives of these meetings are to provide information to the public and gather stakeholder input on various topics. The AGFC hosts public meetings at locations and times that encourage a diversity of stakeholders to attend. These meetings provide stakeholders the opportunity to contribute their thoughts and opinions on fishing regulations and other management actions. AGFC biologists and Commissioners utilize this information to enact strategies that have received broad public input.

The public meeting process has evolved in two ways. First, AGFC biologists have used public meetings to inform stakeholders on fisheries management and activities. These meetings differ from the more formal public meetings because they are designed to be more interactive. Fisheries biologists not only seek to educate the public on specific resources but also to generate ideas and

better understand stakeholders' values. These meetings provide critical input from stakeholders that can assist biologists in setting fishery goals.

Technological advances have also provided the AGFC with new ways to host public meetings. Attendance at in-person public meetings can be low because it requires stakeholders to travel at a specific time. However, with the advances in computer technology, virtual public meetings give stakeholders an opportunity to view a recorded presentation at their convenience and then provide input. Fisheries staff have utilized this approach when seeking public input on the Lake Hamilton Fisheries Management Plan and a proposed regulation change for black bass at Norfolk Lake. The AGFC will continue to seek ways to utilize technology to compliment in-person public meetings to improve stakeholder input.

Public meetings provide biologists and stakeholders with an opportunity to meet in person to discuss values and technical decisions. Public meetings facilitate interaction among stakeholders and biologists, making it an integral part of the fishery management process. Biologists use public meetings to gather stakeholder input, provide feedback to stakeholders, and build working relationships.

ISSUES – VALUES – GOAL – OBJECTIVES – STRATEGIES

Key Area #1 – Diversify Black Bass Fishing Opportunities

Issues

Black bass anglers differ in a number of characteristics including why they fish, where they fish, and how they fish. Some anglers prefer high catch rates, while others seek opportunities for trophy-size bass. Most black bass anglers practice catch-and-release but some like to harvest their catch. Approximately 9% of black bass anglers enjoy the competitiveness of tournament fishing. Many anglers are extremely avid, fishing many days each year, while others just fish occasionally. Similarly, some anglers invest a great deal of resources pursuing black bass, while others may fish from the bank with less equipment.

Although black bass live in reservoirs throughout Arkansas, populations differ widely in terms of abundance and size structure. Additionally, the AGFC utilizes different management strategies to achieve different goals. Do these goals align with angler goals for specific reservoirs? The AGFC should diversify black bass fishing opportunities to meet diverse angler preferences.

Values

There is no “average black bass angler” in Arkansas because anglers fish for a variety of reasons. For example, some anglers prefer to catch trophy black bass because they value the challenge of seeking large fish. Additionally, anglers catching trophy black bass experience pride in their accomplishment. However, some anglers value the thrill of catching many fish, regardless of size. This is particularly true for new or young anglers who tend to value the thrill of the catch. Finally, some anglers value harvesting fish and providing wild-caught meals for themselves and their families. Although bass anglers fish for diverse reasons, all value healthy aquatic resources and fish populations.

Not only are Arkansas black bass anglers diverse, but Arkansas black bass fisheries are diverse. Stakeholders would like to see diverse black bass fishing opportunities (trophy, catch, and harvest) throughout the state. The AGFC should create destination locations for each category of fishery throughout the state.

Goal

Manage black bass in Arkansas' reservoirs to optimize the diverse fisheries (trophy, catch, and harvest) that anglers seek across the state.

Objective 1 – Identify at least five reservoirs > 500 acres and at least five reservoirs < 500 acres to manage for trophy Largemouth Bass by December 31, 2024.

- Intensively manage forage fish populations to maximize growth of Largemouth Bass.
- Manage water quality to improve primary production, utilizing techniques such as liming and fertilizing.
- Utilize length and creel limits to increase the number of trophy Largemouth Bass.

- Consider a variety of stocking options that promote trophy Largemouth Bass (all female populations, pure Florida Bass, and F1 Largemouth Bass).
- Create complex habitat using aquatic vegetation, hinge cuts, brush piles, and other natural and artificial structures.
- Use limited entry to limit the number of anglers at one of the ten trophy fisheries.
- Evaluate trophy fisheries using electrofishing and creel surveys to assess Largemouth Bass abundance, growth, and angler catch rates.
- Identify research opportunities that inform and improve trophy Largemouth Bass management.

Objective 2 – Identify at least ten reservoirs to manage for high catch rates of Largemouth Bass across Arkansas by December 31, 2024.

- Implement length and creel limits that promote high-density Largemouth Bass populations.
- Manage water quality to improve primary production, utilizing techniques such as liming and fertilizing.
- Create fish attractors that allow anglers to experience high catch rates.
- Collaborate with the Family and Community Fishing Program to improve catch rates of Largemouth Bass.
- Evaluate high-catch fisheries using electrofishing and creel surveys.

Objective 3 – Promote the diverse opportunities for black bass fishing in Arkansas by December 31, 2024.

- Use print, digital, and social media to increase awareness and create excitement about trophy Largemouth Bass fishing destinations.
- Use print, digital, and social media to increase awareness and create excitement about high-catch fisheries for black bass.
- Use print, digital, and social media to increase awareness and create excitement about black bass fishing opportunities in small reservoirs including Family and Community Fishing Program sites.
- Develop partnerships with communities, agencies, and other groups to promote the diverse black bass fishing opportunities in Arkansas.

Key Area #2 – Communication and Education

Issues

The AGFC utilizes a variety of communication tools to disseminate information to stakeholders. Using the AGFC newsletter and constant contact emails, AGFC fisheries staff share information on projects and developments on reservoirs across Arkansas. The AGFC Black Bass Management Facebook and Instagram pages share information with the public regarding black bass management. While popular, increased communication, especially using a broader array of social media platforms would improve information exchange with our diverse stakeholders. However, the AGFC does not know the effectiveness of current communication strategies. Additionally, opportunities for two-way communication are lacking but important to create an effective connection between the AGFC and black bass stakeholders, build trust, and improve transparency.

Values

Black bass stakeholders value communication because it builds trust and improves transparency. However, no one-communication strategy is effective to reach the variety of stakeholders interested in black bass fishing and management. For example, Facebook may be effective at reaching a certain demographic but it fails to reach a large percentage of people. Therefore, the AGFC should consider and evaluate various communication strategies. Stakeholders also value opportunities to become more educated on fish and fishing. Similar to communication, the AGFC should seek to develop diverse education strategies that will engage the public, build trust, and improve transparency.

Goal

Utilize diverse strategies to broadly connect with black bass stakeholders to inform and educate on black bass fishing, management, and conservation efforts.

Objective 1 – Each year, increase online educational materials on black bass management in Arkansas' reservoirs by 10%.

- Identify a list of educational topics on black bass management; and locate and share existing materials on these topics that are already publicly available.
- By December 31 of each year, develop a plan for the upcoming year that educates stakeholders on black bass management in Arkansas' reservoirs.
- Utilize a variety of print, digital, and social media to share that information.
- Strengthen relationships with media influencers to increase AGFC reach on social media platforms.
- Seek opportunities to create educational materials on black bass management by collaborating with black bass experts from other state fisheries agencies and non-governmental organizations (NGO's).
- Seek opportunities to create educational materials on black bass management by collaborating with black bass anglers and other stakeholders in Arkansas.

Objective 2 – Each year, increase educational materials on black bass fishing in Arkansas' reservoirs by 10%.

- By December 31 of each year, develop a plan for the upcoming year that educates stakeholders on black bass fishing in Arkansas' reservoirs.
- Identify a list of educational topics on black bass fishing; and locate and share existing materials on these topics that are already publicly available.
- Utilize a variety of print, digital, and social media to share that information.
- Create materials for new, experienced, and non-resident anglers.
- Strengthen relationships with media influencers to increase our reach on social media platforms.
- Seek opportunities to create educational materials on black bass fishing by collaborating with black bass anglers in Arkansas.
- Partner with counties and municipalities to promote black bass fishing in their local areas.

Key Area #3 – Access and Facilities

Issues

Anglers require adequate access and facilities to fish for black bass at Arkansas' reservoirs. Access includes more than boat ramps. Satisfactory access also includes courtesy piers and docks that are in good working condition and safe to use. Boat ramps should be constructed for high and low water levels so that anglers can safely launch a boat under a wide array of conditions. Access areas should also provide more ADA-approved opportunities.

Many reservoir access areas lack adequate facilities that could improve the angler experience. Other access areas have facilities that may require improvements. Anglers often seek access areas that have adequate parking, outdoor lighting, restrooms, trashcans, information kiosks, etc.

Finally, many anglers fish from the shoreline but access to bank fishing is often lacking. The AGFC should place greater attention on opening areas to bank fishing.

Values

Stakeholders value access for all bass anglers, including those anglers fishing from a boat, fishing from the shoreline, and those with disabilities. Additionally, stakeholders value facilities that allow for a safe and comfortable experience. Access and facilities that are updated, maintained, and safe instill a sense of pride in anglers and promote good ethics. Finally, these types of access areas encourage anglers to return to use them again.

Goals

Improve public access for boat, non-motor boat, and shoreline anglers to black bass fisheries. Provide safe access areas with facilities that improve stakeholder satisfaction.

Objective 1 – Construct or enhance seven mega-tournament facilities at major bass fisheries around the state by December 31, 2031.

- Install high-end lighting throughout each area.
- Ensure adequate parking for at least 200 vehicles and trailers.
- Construct a large courtesy dock.
- Paint ingress and egress lanes throughout parking areas.
- Maintain a minimum of six lanes of ramp (can be 1 or > 1 ramp).
- Consider sites at the following reservoirs: Lake Dardanelle, Beaver Lake, Lake Hamilton, Pool 6 of the Arkansas River, Millwood Lake, Bull Shoals Reservoir, and Lake DeGray.
- Develop partnerships with local communities, reservoir owners, industry, and the AGFC Operations Division.

Objective 2 – Conduct an access site and facility inventory assessment that provides site details and amenities at AGFC owned or managed reservoirs by December 31, 2023.

- Create a data form that allows staff to collect access area data on iPads.
- Collaborate with the AGFC Operations Division to incorporate current data.

- Visit each area and update information on boat access, shoreline fishing access, parking, and other amenities.
- Identify and prioritize areas to improve access and facilities.

Objective 3 – Increase or improve access at 75 locations for black bass anglers by December 31, 2029.

- Bring all existing boating access areas up to standards set by the AGFC Fisheries Division's Access Area standard operating procedures.
- Improve lighting and other amenities to the high use and high profile access areas.
- Add or improve 50 bank fishing access sites.
- Install 20 kayak ramps adjacent to current boat ramps.
- Construct 10 new kayak access areas where boating access is limited.
- Consolidate all signage at each access area into a kiosk. Start with high use and high profile access areas.

Key Area #4 – **Habitat**

Issues

Habitat is the most important component to having quality black bass fisheries in reservoirs. Habitat encompasses a number of features including aquatic vegetation, natural fish cover, artificial cover, water levels, water quality, and bathymetry. Having diverse and quality habitat is critical for creating high quality black bass fisheries in Arkansas' reservoirs.

An intermediate density of aquatic vegetation (20-30% coverage) provides the most benefit to Largemouth bass and anglers often enjoy fishing for black bass in or near aquatic vegetation. Most anglers would like even more opportunities to fish for black bass in reservoirs with aquatic vegetation. Maintaining aquatic plants at this level challenges fisheries biologists. Many Arkansas reservoirs lack aquatic vegetation and require AGFC intervention to help establish aquatic plants. Although beneficial, AGFC planting success can be short-lived if newly planted vegetation is stressed (e.g. water fluctuation and herbivore predation) relative to established aquatic plants grown naturally from the seed bank in the sediment.

Aquatic plants can also become over-abundant and have detrimental effects on sportfish growth, water quality, and boating and angling access. AGFC biologists may utilize approved aquatic herbicides and/or grass carp to reduce vegetation levels. Anglers differ in their opinions on if they should be controlled and how they should be controlled.

AGFC has a vibrant reservoir habitat improvement program that involves creating fish attractor sites from hardwood and cedar trees. However, many anglers are unaware of these projects, their benefits, and the locations of the fish habitat sites.

Values

Stakeholders understand the importance of habitat for having abundant and quality black bass fisheries. Additionally, anglers enjoy fishing a variety of habitat for black bass. Some anglers prefer fishing for black bass in aquatic vegetation. Anglers also like to fish in different types of natural and artificial cover. However, reservoirs vary in habitat quantity and quality. Not only should habitat be improved, AGFC should improve communication regarding habitat and fish attractors.

Goals

Increase the number of fish habitat sites using natural and artificial materials to improve black bass production and angler catch. Manage aquatic plant communities at an intermediate level (20-30% coverage) and aggressively control the density and spread of Giant Salvinia.

Objective 1 – Conduct a black bass habitat assessment at 50 reservoirs that summarizes fish cover and aquatic plant abundance by December 31, 2025.

- Establish a reservoir habitat committee that will identify parameters to assess and prioritize reservoirs to be included.
- Create an electronic data form that allows staff to use iPads to enter data.

- Identify and prioritize reservoirs with habitat needs and recommend actions for habitat improvement.
- Seek partners that can assist with habitat assessments (fisheries students at Arkansas universities, fishing organizations, high school and college fishing teams, etc.).

Objective 2 – Manage aquatic plant communities at an intermediate level (20-30% coverage) at 10 reservoirs by December 31, 2031.

- Initiate research to identify the best methods for growing aquatic plants, selecting the best species for introduction, establishing aquatic plants in reservoirs, and controlling overabundant plants.
- Per Objective 1, introduce and/or restore aquatic plants in areas lacking habitat utilizing volunteers.
- Per Objective 1, use approved control measures to manage overabundant aquatic plant species.
- Evaluate aquatic plant establishment projects by assessing growth and survival of new plants.
- Create outreach material that describes the benefits of aquatic plant communities and the potential negative effects of plant species that commonly become overabundant.

Objective 3 – Conduct 20 large-scale projects using natural and/or artificial materials to improve fish habitat by December 31, 2031.

- Identify areas devoid of fish habitat and use hardwood trees, cedar trees, or artificial material to create fish habitat sites.
- Work with anglers to determine the best areas for adding fish habitat.
- Quantify awareness and use of AGFC 'fish habitat sites' using creel surveys.
- Provide anglers the GPS coordinates of the fish habitat sites on the AGFC Mapper.
- Utilize a variety of communication strategies to inform anglers on the location of fish reefs.

Objective 4 – Conduct research to evaluate fish habitat using a variety of artificial and natural materials to create fish reefs at three reservoirs by December 31, 2027.

- Evaluate the effect of fish habitat type, depth, season, and time of day on fish use using electrofishing, telemetry, SCUBA, and/or forward-facing sonar (do fish congregate near fish habitat sites?).
- Evaluate black bass movement, habitat selection, and growth after a habitat enhancement project using electrofishing, telemetry, SCUBA, and forward-facing sonar (does adding fish habitat improve population parameters?).
- Estimate angler catch rates on different habitat types (does the addition of fish habitat improve angler catch rates?).

Key Area #5 – Reservoir Use

Issues

Black bass anglers identified several factors that can interfere with their use of reservoirs while fishing for black bass. Reservoirs are popular with recreational boaters and personal watercraft, which can compete with anglers for space and create excessive wakes that can disturb fishing.

About 8% of black bass anglers fish in tournaments. Generally, tournament anglers' fish in multiple tournaments per year and have fished for many years. Tournaments generate significant economic benefits to local economies throughout the state. Additionally, tournaments can be effective at promoting the popularity of black bass fishing. However, many black bass anglers believe that tournaments cause crowding at access areas and on the water. Non-tournament anglers would like to know when and where tournaments occur so they can plan accordingly to fish elsewhere. The information is also beneficial to reduce conflict between tournaments falling on the same date at the same reservoir.

Values

A variety of stakeholders enjoy Arkansas' reservoirs. However, many reservoir users do not fish at all. Conflict can occur between black bass anglers and recreational boaters (including personal watercraft) when groups are in the same area and do not respect each other's values. The AGFC should seek ways to help various individuals and groups that use reservoirs be respectful, safe, and ethical.

Black bass tournaments are very popular in Arkansas. Nearly one out of every ten black bass anglers in Arkansas fish in tournaments. Each year, thousands of tournaments occur across the state. Tournaments vary in size but some are large enough to cause crowding at access areas and sometimes on reservoirs. Many non-tournament anglers would avoid access and/or reservoirs if they knew when and where tournaments occur. The AGFC should seek ways to minimize conflict between tournament and non-tournament anglers.

Goal

Promote safe use and minimize conflict among all reservoir users.

Objective 1 – Utilize a variety of outreach strategies to create five public service announcements each year (May, June, July, August, and September) that promote wise and safe use of reservoirs for black bass anglers and recreational boaters.

- Create a public relations campaign to promote safe, courteous, and ethical boating.
- Create a new courteous/ethical boating video to be shown at all Boater Education Courses beginning in fall 2023.
- Provide information on safe, courteous, and ethical boating to boat retailers and boat-rental outfitters to share with their customers.
- Explore renaming the “Poaching Hotline” so that the public understands they can report boating or fishing violations.

- Coordinate with the AGFC Law Enforcement and Education Divisions on safe boating outreach efforts.

Objective 2 – Create a free, online, voluntary tournament registration program by December 31, 2023.

- Create an online process that allows tournament organizers to register their fishing tournaments and submit their ATIP data.
- Evaluate 2024-2025 voluntary tournament registration and consider a mandatory program in January 2027.
- Publish a publicly available calendar of tournaments as a reference for tournament anglers and non-tournament anglers. Information to share includes access point, number of boats and anglers, number of parking spaces at the access point, and a general overview of the facilities at the access area.
- Work with the Arkansas Game and Fish Foundation to provide incentives for tournament registrations and ATIP submissions.
- Provide monthly summaries of tournament data (catch rate, angler success, winning weights, number of 5-pound black bass caught, etc.) for each reservoir that receives five ATIP submissions.
- Provide educational material to tournament organizers on topics such as fish care and prevention of invasive species.

Key Area #6 – Promote Bass Fishing

Issues

A recent survey of Arkansas black bass anglers showed that most black bass anglers consisted of individuals who were older, Caucasian, male, and had higher incomes than the overall licensed Arkansas angler population. Additionally, there is a segment of black bass anglers who do not buy a fishing license every year. Therefore, the AGFC should seek ways to recruit new anglers to bass fishing, who better reflect the demographics of the general population in Arkansas. The AGFC should also seek ways to retain current black bass anglers, minimize lapses in license purchases, and increase participation.

Stakeholders recognize the importance of black bass fishing to tourism in Arkansas. However, does the AGFC adequately promote Arkansas as a black bass fishing destination?

Values

Many anglers fish for black bass in Arkansas' reservoirs, which provides a significant boost to local economies across the state. Fishing for black bass is a long-standing tradition in Arkansas. Arkansas anglers value black bass fishing for a variety of reasons. Not only are black bass challenging and fun to catch, but black bass fishing is an enjoyable way to experience nature. Black bass fishing provides anglers with a way to enjoy the outdoors while reducing stress in a technological society. Fishing for black bass teaches important values such as ethics and patience. Finally, anglers believe that black bass fishing provides Arkansas' youths with a pastime that teaches patience, perseverance, problem solving and connecting with nature.

Goals

Promote black bass fishing to attract younger and more diverse anglers and to retain those already engaged. Promote black bass fishing as a tourist attraction.

Objective 1 – Create Project Razorbass, a free angler recognition program for anglers catching Largemouth Bass > 8 pounds or 23 inches by December 31, 2023.

- Reward anglers who catch a Largemouth Bass that are at least 23 inches or 8.0 pounds. Largemouth Bass between 8.0 and 9.9 pounds are “Hogs” and Largemouth Bass at least 10.0 pounds are Trophy Hogs.
- Anglers must submit their application online through the AGFC app or the AGFC website.
- A photo of the fish is required. To certify by length (Hogs), anglers must submit a photo clearly showing the length next to a ruler. To certify by weight, the photo must clearly show the scale and the entire fish.

Objective 2 – Coordinate with AGFC marketing to create a brand and promote black bass fishing in Arkansas by December 31, 2023 with four print or video messages each year.

- Identify a target audience, which includes resident and non-resident black bass anglers, anglers of other species, boaters who do not fish, etc.

- Create messages using print, digital, and social media that describe fishing quality and fishing destinations.
- Create messages using print, digital, and social media on non-catch aspects of black bass fishing (scenic quality of the reservoir, fishing with friends and family, seeking solitude, and the challenges of black bass fishing).

Objective 3 – Increase the visibility of black bass fishing as a tourist attraction through partnerships with at least three state tourism organizations each year.

- Provide educational materials on black bass fishing and management to Arkansas Department of Parks, Heritage, and Tourism, the Arkansas State Chamber of Commerce, the Arkansas Governor's Tourism Conference, or the Convention and Visitor Bureaus (CVBs).
- Provide educational materials and build relationships with regional chambers of commerce and CVBs near popular black bass fisheries.

Objective 4 – Estimate the economic impact of black bass fishing in Arkansas by December 31, 2030.

- Develop studies estimating direct expenditures for tournaments and general bass anglers and determine their contributions to local economies.
- Provide economic numbers to local chambers of commerce.
- Compare economic impacts of popular fisheries statewide.

Objective 5 – Create a series of four popular articles/materials each year to promote black bass fishing.

- Create fishing forecasts for major black bass fisheries to be released January-March each year and share them using print, digital, and social media.
- Each January, create a fishing calendar that highlights seasonal information on black bass biology and fishing and share using print, digital, and social media.
- Every June, create sampling summaries to inform stakeholders of black bass population status on important fisheries across the state and share them using print, digital, and social media.
- Each year, promote black bass fishing for a variety of user groups (bank angling, kayak angling, fly fishing, traditional fishing gear, family-friendly locations, etc.) and share using print, digital, and social media.

Key Area #7 – Interactions with Other Species

Issues

The black bass present in Arkansas are Largemouth Bass, Smallmouth Bass, and Spotted Bass. Largemouth Bass are the most common and the most popular with anglers. Smallmouth Bass are less common and most anglers would like to see more opportunities to catch them. Spotted Bass are common in many reservoirs but have slower growth rates than Largemouth and Smallmouth Bass. Many anglers perceive that Spotted Bass compete with Largemouth Bass and that management should favor Largemouth Bass populations where both species occur.

The AGFC stocks certain reservoirs with Striped Bass and Hybrid Striped Bass to provide an open-water fishery. Many of these fisheries provide opportunities to catch trophy fish. While popular, many black bass anglers believe that these species compete directly with Largemouth Bass for food and habitat and this competition adversely affects black bass fishing.

Values

Largemouth Bass are the most common black bass species in Arkansas and are the most sought after species by anglers. However, most anglers would like more opportunities to catch Smallmouth Bass. Conversely, Spotted Bass are occasionally abundant in Arkansas' reservoirs but less popular with anglers. Black bass angler's value fishing for Largemouth Bass and Smallmouth Bass but many do not support programs that promote other species. Because of these values, the AGFC should seek ways to better understand the interactions of black bass with other species.

Goals

Manage populations of Largemouth Bass, Smallmouth Bass, and Spotted Bass to maximize angler satisfaction. Evaluate ecological and behavioral interactions between black bass populations with Striped Bass and Hybrid Striped Bass.

Objective 1 – Describe current Smallmouth Bass management in Arkansas reservoirs by December 31, 2025 using a variety of print and video platforms.

- Promote quality Smallmouth Bass fisheries in Arkansas using a variety of print, digital, and social media.
- Describe Smallmouth Bass genetics in Arkansas reservoirs and share using print, digital, and social media.
- Use recent genetics data to inform future stocking decisions that conserve Smallmouth Bass genetics in reservoirs.

Objective 2 – Optimize Largemouth Bass and Spotted Bass abundance and size structure by December 31, 2025.

- Utilize harvest regulations to restructure black bass populations where both Largemouth Bass and Spotted Bass occur.
- Monitor Spotted Bass genetics in Arkansas reservoirs to ensure that Alabama Bass are not found.

- Educate anglers on the risks of Alabama Bass to existing Largemouth Bass, Smallmouth Bass, and Spotted Bass populations.

Objective 3 – Describe interactions between black bass populations and temperate bass (Striped Bass and Hybrid Striped Bass) by December 31, 2027.

- Create non-technical summaries of the Lake DeGray telemetry study and share using print, digital, and social media.
- Conduct a literature review on black bass and temperate bass interactions and share using print, digital, and social media.
- Investigate the potential of collaborating in a multi-state evaluation of black bass and temperate bass populations.

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APPENDIX A – Results from an online poll in fall 2021 that asked stakeholders why they fished for black bass in Arkansas' reservoirs, what they liked about fishing for black bass in Arkansas' reservoirs, and what they disliked about fishing for black bass in Arkansas' reservoirs.

Why do you fish for Black Bass in Arkansas' reservoirs (motivations)?

Example response - "Generally for the love of it but I do fish several tournaments a year and will occasionally keep some for consumption."

Fishery Specific

- Harvest
- Catching fish is fun
- Challenging
- Tournaments
- Trophy fish
- Can bass fish almost anywhere

Fishery Independent

- To be with friends and family
- Solitude
- Relax – therapy
- Tradition
- To be outdoors, on the water, beautiful scenery

What do you like about Black Bass fishing in Arkansas' reservoirs? List as many things, if any that make your Black Bass fishing experience enjoyable.

Example response - "The variety of lakes are so different. Enjoy going to different types of lakes and the beauty they all have. Like catching bass and the challenge of figuring out where they are and what they are biting. Like eating bass occasionally. Like the chance to catch a large bass."

Fishery Specific

- Catching fish
- Fishing is challenging
- Fishing is fun recreation
- Fish to eat
- Bass fight hard
- I like catching all black bass
- Tournaments
- Trophy bass
- Fishing different habitats
- Fishing from a kayak
- Lots of opportunities
- Fishing small lakes

Fishery Independent

- Bass fishing is accessible
- I like clean water lakes
- I like everything
- I like being involved in the process
- I like teaching others to fish
- I like nothing
- I like being outdoors, beautiful scenery, on the water
- Relaxing
- To be with others
- To be by myself - escape

What do you dislike about Black Bass fishing in Arkansas' reservoirs? List as many things, if any that make your Black Bass fishing experience unenjoyable.

Example response - "Overall compared to surrounding states Black Bass Fishing in Arkansas is poor. Habitat Management is poor, stocking is low compared to other states and we have Stripped Bass which negatively affect all lakes in terms of Black Bass fishing. Our lakes are poor compared to surrounding states. We need better habitats in terms of aquatic vegetation and better stocking to catch up to Texas, Oklahoma and others."

Fishery Specific

- Management does not emphasize trophy fish
- Lack of trophy bass
- Hard to find bass
- Lack of bait fish
- Lack of decent bass populations
- Need Sharelunker Program
- Not enough bass
- Not enough Florida Bass
- Not enough Smallmouth Bass
- Overpopulated bass fisheries
- Poor catch rates
- Stock more bass
- Regulations
- Slot limits
- Striped bass/Hybrid stockings
- Too many small bass
- Too many Spotted bass
- Tournaments
- Overharvest
- Bass fishing is getting worse
- Lack of places to bass fish

Fishery Independent

- Need to promote bass fishing better
- Boat lanes not marked
- Crowding

- Few lakes in Northeast Arkansas
- Improve facilities
- Improve access
- Lack of fish cleaning stations
- Nothing
- Poaching
- Poor habitat
- Not enough habitat
- Recreational boats, jet skis, etc.
- Removing vegetation
- Rude people
- Stealing and vandalism
- Too much technology
- Too much vegetation
- Trash
- Water levels
- Other states better
- Invasive carp
- Poor management
- Lack of enforcement
- More ADA access
- Too expensive

APPENDIX B – Stakeholder Advisory Committee members.

Name	Interests	Location
Andy Benson	Habitat industry, avid angler	Springdale
Bradley Shell	Avid angler, local tournaments	Little Rock
Christie Graham	Local government	Russellville
Dallis Clarke	State Parks	Russellville
Gene Gilliland	Conservation Director, B.A.S.S.	Oklahoma
Jackson Braun	Boating industry, local tournaments	Mountain Home
Matt Hedrick	Avid angler, local tournaments	Fayetteville
Melinda Hays	Industry, tournament director	Hot Springs
Rebecca Baker	Avid angler, social media influencer	Morrilton
Steven Browning	Professional angler	Hot Springs
Stephen Tyson Jr.	Guide, avid angler	Camden
Tim Porter	Avid angler	Magnolia
Ward Gardner	Arkansas Bass Association	Little Rock

APPENDIX C – Priority rankings (1-22) for all objectives in the Reservoir Black Bass Management Plan by the Stakeholder Advisory Committee and AGFC staff.

Priority Level		Reservoir Black Bass Management Plan Objectives
SAC	AGFC	
DIVERSIFY BLACK BASS FISHING OPPORTUNITIES		
8	4	Identify at least five reservoirs > 500 acres and at least five reservoirs < 500 acres to manage for trophy Largemouth Bass by December 31, 2024.
7	8	Identify at least ten reservoirs to manage for high catch rates of Largemouth Bass across Arkansas by December 31, 2024.
19	20	Promote the diverse opportunities for black bass fishing in Arkansas by December 31, 2024.
COMMUNICATION AND EDUCATION		
2	10	Each year, increase online educational materials on black bass management in Arkansas' reservoirs by 10%.
16	12	Each year, increase educational materials on black bass fishing in Arkansas' reservoirs by 10%.
ACCESS AND FACILITIES		
12	9	Fully build out seven mega-tournament facilities at major bass fisheries around the state by December 31, 2031.
6	5	Conduct an access site and facility inventory assessment that provides site details and amenities at AGFC owned or managed reservoirs by December 31, 2023.
3	7	Increase or improve access at 75 locations for black bass anglers by December 31, 2029.
HABITAT		
1	3	Conduct a black bass habitat assessment at 50 reservoirs that summarizes fish cover and aquatic plant abundance by December 31, 2025.
4	1	Manage aquatic plant communities at an intermediate level (20-30% coverage) at 10 reservoirs by December 31, 2031.
5	2	Conduct 20 large-scale projects using natural and/or artificial materials to improve fish habitat by December 31, 2031.
10	6	Conduct research to evaluate fish habitat using a variety of artificial and natural materials to create fish reefs at three reservoirs by December 31, 2027.
RESERVOIR USE		
11	22	Utilize a variety of outreach strategies to create five public service announcements each year (May, June, July, August, and September) that promote wise and safe use of reservoirs for black bass anglers and recreational boaters.
18	16	Create a free, online, voluntary tournament registration program by December 31, 2023.
PROMOTE BASS FISHING		
9	11	Create Project Razorbass, a free angler recognition program for anglers catching Largemouth Bass > 8 pounds or 23 inches by December 31, 2023.
13	13	Coordinate with AGFC marketing to create a brand and promote black bass fishing in Arkansas by December 31, 2023 with four print or video messages each year.
14	14	Increase the visibility of black bass fishing as a tourist attraction through partnerships with at least three state tourism organizations each year.
15	15	Estimate the economic impact of black bass fishing in Arkansas by December 31, 2030.
20	18	Create a series of four popular articles/materials each year to promote black bass fishing.
INTERACTIONS WITH OTHER SPECIES		
21	21	Describe current Smallmouth Bass management in Arkansas reservoirs by December 31, 2025 using a variety of print and video platforms.
17	17	Optimize Largemouth Bass and Spotted Bass abundance and size structure by December 31, 2025.
22	19	Describe interactions between black bass populations and temperate bass (Striped Bass and Hybrid Striped Bass) by December 31, 2027.