

Black Bass

Management Plan



(2010-2030)

A long-term, science-based, and citizen-guided plan to ensure Florida is the undisputed **“Bass Fishing Capital of the World”**



Florida Fish and Wildlife
Conservation Commission

MyFWC.com

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EXECUTIVE SUMMARY

The Florida Fish and Wildlife Conservation Commission (FWC) recognizes that black bass (Florida largemouth, shoal, spotted and Suwannee basses) are tremendous natural resources enhancing the quality of life for citizens and tourists. In 2006, anglers enjoyed more than 14 million days fishing for this premier sport fish in Florida. Moreover, they generated approximately \$1.25 billion in economic impact for Florida communities and supported approximately 12,000 jobs. Trophy Florida largemouth bass are a huge draw to resident anglers, tourists from around the globe and tournaments, while fisheries with high catch rates of quality bass, and fisheries with relatively rare shoal, spotted and Suwannee basses have an appeal of their own. Properly managing black bass fisheries will provide profound ecological, economic and sociological benefits for Floridians.

Numerous pressures challenge fisheries managers, including human population growth and development, declining water quality and current water management and fish management policies. Climate change, including precipitation and sea level changes, may create additional impacts. Preliminary surveys of stakeholders indicated general satisfaction with the current fishery but expressed some concerns with the adequacy of FWC fish management to deal with increasingly negative impacts on bass populations and fishing opportunities from development and other pressures.


This long-term management plan was compiled based on science, augmented by the input of more than 7,500 people who completed one of two surveys (or both) or spoke with our biologists. A technical assistance group – comprised of a variety of public stakeholders, including avid anglers, tackle shop owners, lure manufacturers, tournament anglers, fishing guides, outdoor writers, university researchers and tourism destination marketers – helped to further refine the plan. The plan is now ready for implementation. However, public, corporate and angler support to help bring the vision to reality is essential.

Action steps have been divided into four sections: New Opportunities, Habitat Management, Fish Management and People Management. Among some of the innovative approaches promoted in the plan are a new high-profile TrophyCatch angler recognition program to document trophy catches by rewarding anglers for releasing and reporting bass weighing more than 8 pounds, including special categories for 12 pounders and bass greater than 13 pounds. Renewed aquatic habitat enhancement efforts, including modified

The North American Model of Wildlife Conservation

directs that throughout the United States, fish and wildlife are held in common ownership by the states for the benefit of all people. The key principles are:

- Markets for trade in black bass and other wildlife and sportfish are carefully restricted, removing a huge threat to sustaining those species.
- States allow sustainable use of sport fish and wildlife by law, not by market pressures, land ownership or special privilege.
- The public has input into how these resources are allocated.
- A democratic approach to fishing and hunting is emphasized. In North America, anyone in good standing may participate in legal recreational harvest of approved species.
- Hunters and anglers fund conservation, including protections for wildlife species that are not harvested and their habitats, by purchasing hunting and fishing licenses and paying excise taxes on recreational equipment.
- Many fish and wildlife species are international or multi-state resources. Species, such as migratory fish, transcend boundaries, requiring cooperative management.
- Science is the proper tool for developing fisheries policy.



aquatic plant management approaches, will enhance production of these fish. The Florida Bass Conservation Center, a state-of-the-art hatchery, will develop new stocking protocols to ensure effective and efficient stocking programs using both normal 1-inch fingerlings and larger, advanced fingerling bass (4-6 inches), both of which will meet stringent genetic and health standards. Another major focus will be expanding access to new waters (e.g., reservoirs, reclaimed phosphate pits and some private lakes) for Florida anglers. Boat ramps, fishing piers, fish attractors, fish spawning substrate and other infrastructure enhancements will allow additional fishing. Embellishing some ramps and marinas to host major tournaments and promote Florida bass fishing via national media will pay dividends for all bass anglers and local business communities, while helping encourage them to safely and sustainably enjoy this sport.

This will be a living document that we will refine as public opinions shift and new research and interim program evaluations merit changes.

This model is a key concept of fish and wildlife management emphasized by Theodore Roosevelt, Aldo Leopold and many other conservation leaders. It is being implemented throughout the nation and sets us apart from other countries, in which there is a general lack of conservation management, the resources are owned by private individuals or commercial interests, or the political elite control fish and wildlife recreational opportunities.

In accordance with this model, FWC uses various funding avenues to manage fish and wildlife resources for everyone. A major contribution comes through sale of hunting and fishing licenses and permits (all those fees go to FWC). Federal excise taxes are collected on equipment used for hunting, target shooting or fishing and on taxes on imported pleasure boats and motor boat fuel. Florida's share of the national pot is based on how many certified hunting and fishing license holders we have. Collectively, these "user pays-user benefits" fees are central to funding this plan. Florida also receives funding for research, conservation and management of fish and wildlife resources from other local, state and federal programs, sale of specialty tags for vehicles (e.g., the "Go Fishing" largemouth bass tag) and private grants. As part of this plan, we seek to develop additional partnerships and sponsor support from industry and tourism development groups to fund implementation without seeking additional state revenues. Due to diverse connections between economic benefits and jobs that are dependent on recreational fishing, this is a well-supported course of action.

We look forward to working with stakeholders to ensure Florida is undisputed "Bass Fishing Capital of the World."

Florida Black Bass Management Plan

Goal: Ensure Florida is the undisputed “Bass Fishing Capital of the World.”

Vision: The worldwide angling public recognizes Florida as the “Bass Fishing Capital of the World,” based on great resources and responsible management. Florida’s bass fisheries provide outstanding ecological, social and economic benefits to the state of Florida.

Black Bass Management Plan

The Florida Fish and Wildlife Conservation Commission (FWC)

created this Plan using public input

and a panel of experts. It is a living document that will be modified as needed to ensure Florida is the undisputed “Bass Fishing Capital of the World.”



INTRODUCTION

This Black Bass Management Plan for Florida incorporates widespread public input from surveys and public events/meetings (see Appendix I for a summary of survey results), a citizen’s Technical Assistance Group (TAG), and Florida Fish and Wildlife Conservation Commission (FWC) staff from multiple divisions and offices (see Appendix II, for participants). We collectively created the plan to engage the public and fishing-related businesses as well as other agencies and nonprofit organizations to ensure Florida is the undisputed “Bass Fishing Capital of the World.” The FWC will use the plan as a road map and for impetus in dedicating and acquiring the resources to ensure we fulfill the goal and realize the vision. Although the management plan time frame is 2010-2030, this “living” document will allow adaptive management, public input and new scientific breakthroughs to continually help us improve our results. Our purposes are to: (1) create a scientifically justified document to guide FWC efforts, (2) ensure the public has open input into the objectives and priorities to create ownership and to provide support for conservation efforts, and (3) be proactive and open to new ideas.

This plan involves all FWC divisions and offices, and covers a wide range of actions, from regulation management to law enforcement, habitat restoration, aquatic plant management, boating access, fish stocking, marketing, education and outreach. It will also encourage better effort and resource coordination with partner agencies to ensure Florida is the undisputed “Bass Fishing Capital of the World.”

BACKGROUND

CURRENT STATUS: Of 2.8 million anglers fishing in Florida, 1.9 million were residents and 0.9 million were tourists from virtually every state and numerous countries. Anglers averaged 17.2 days per year fishing in Florida, for a total of 46.3 million days of quality outdoor recreation. Of those, 24.4 million days were spent on fresh water by 1.4 million anglers, and 23.1 million days were spent on salt water.

Bass anglers spend more than 14 million days fishing in Florida each year, which generates \$1.25 billion for the state's economy (U.S. Department of Interior, 2006, Florida Edition). With 3 million acres of freshwater lakes, ponds and reservoirs, and 12,000 miles of rivers, streams and canals, Florida is a premier destination for bass anglers.

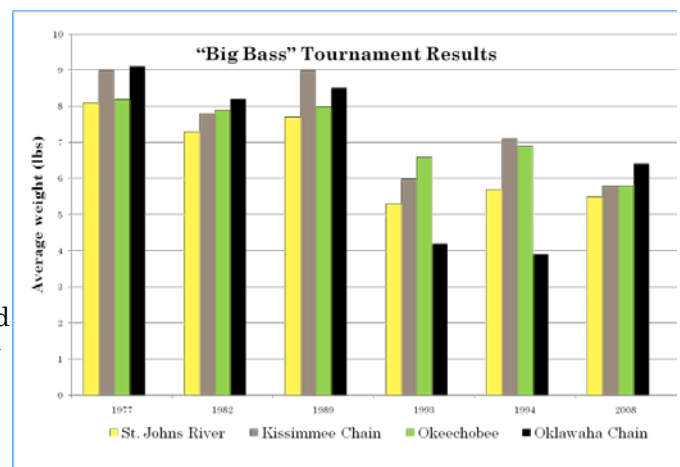
The Florida largemouth bass (*Micropterus salmoides floridanus*) is genetically unique and has been stocked worldwide because of its potential for rapid growth to trophy size (10 pounds or heavier). Every year, a few Florida anglers catch 13- to 15-pound trophy largemouth bass. Moreover, Florida has shoal (*M. cataractae*), spotted (*M. punctulatus*) and Suwannee bass (*M. notius*), each of which exists only in discrete areas and requires specific habitat and prey to maintain its populations. Programs such as the Black Bass Grand Slam promoted in BassMaster Magazine draw more attention to these limited populations – necessitating greater attention to conservation practices to ensure their sustainability.

The fishing public perceives Florida to be among the top bass fishing states, but the fishery and trophy fish availability are depleted from historic levels in many localities, as documented in big-fish tournament records over the past several decades (see graph). Numerous pressures challenge fish management, including human population growth and development, declining water quality and current water management and fish management policies. Climate change, including precipitation and sea level changes, may create additional impacts. Preliminary surveys of stakeholders indicate overall satisfaction with the fishery but some concerns about negative impacts on bass populations and fishing opportunities, and the need for an enhanced management strategy (Appendix I).

This plan is action-based and will help FWC staff develop solutions for



Florida is recognized as the “Fishing Capital of the World” based on the number of freshwater and saltwater anglers, amount of time spent fishing, economic impact, diversity of recreational species, international fishing records set here and tourists who use our resources. The most recent National Survey of Fishing, Hunting and Wildlife-Related Recreation (U.S. Department of Interior, 2006) again ranked Florida No. 1 in in-state anglers (2.8 million vs. No. 2 California with 2.5 million), angler expenditures in state (\$4.4 billion vs. No. 2 Texas with \$3.4 billion), economic impact (\$7.5 billion vs. No. 2 Texas with \$6.1 billion), angler-supported jobs (75,068 vs. No. 2 Texas with 59,938), and state and local taxes generated by sport fishing (\$440 million vs. No. 2 Texas with \$392 million). In addition, approximately 35 percent of all International Game Fish Association records in the U.S. come from Florida (Florida has 4,755 vs. No. 2 Alaska with 1,354, of 13,534 U.S. records, including line-classes). Florida even has more record catches than the next highest country, with 18.5 percent of all IGFA records worldwide. (Australia has 1,530 records, of 25,652 worldwide; Pers. Comm., Jack Vitek, IGFA World Records Department.)



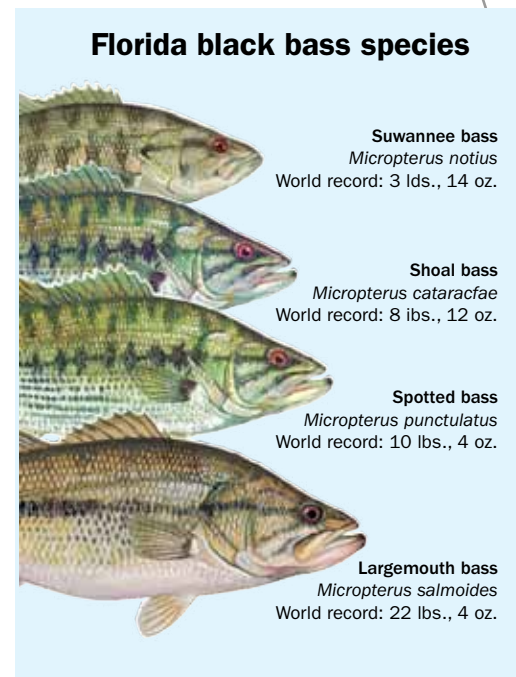
management issues such as habitat enhancement, aquatic plant management, fisheries regulations and appropriate stocking plans, while improving communications about angling ethics and opportunities, ensuring access, and reaching out to youth to keep them engaged in recreational fishing and conservation. The plan must be integrated with other local, state and federal programs. Effective implementation of the plan should also benefit fishing-dependent private businesses, including those that indirectly profit (e.g., gas stations, local grocers, motels and restaurants), and riparian land owners whose waterfront property values are affected by aesthetics and fishing quality.

BIOLOGY OF BLACK BASSES IN FLORIDA: Black basses are an important component of a complex aquatic ecosystem. Effective predators in both heavy cover and open water, their large mouths enable them to swallow a variety of prey and help keep forage fishes in balance. All black bass species exhibit nesting behavior during spring, with males fanning out an oval depression on a firm substrate and stimulating a female to deposit her eggs. Males fertilize the eggs and then guard them through hatching, and protect schooling bass fry until the young fish reach about an inch, at which time they begin to disperse and fend for themselves. Feeding first on tiny zooplankton (microscopic animals), they soon shift to live fish and other prey. The life of young bass is difficult, but of the tens of thousands produced by a female during her lifetime, only two survivors are required to keep adult population levels stable.

The genetically unique Florida largemouth bass, which is native only to peninsular Florida, is renowned worldwide for producing trophy-size catches. Further north and west through the Panhandle, “intergrade” largemouth bass populations have genes from both Florida largemouth bass and northern largemouth bass (*M. s. salmoides*) subspecies. Because of rapid growth and top weights that exceed 12 pounds in warmer climates, Florida largemouth bass have been stocked in many states and foreign countries to enhance existing fisheries and create trophy-size fish.

Unlike Suwannee, spotted, and shoal bass, largemouth bass are generally more abundant in lakes and slow-moving rivers, where they thrive in native vegetation. Largemouth bass can be separated from other black bass in Florida by the extension of the mouth well beyond the eye, as well as the lack of scales on the soft dorsal fin and lack of a strong connection between the dorsal fins (two traits that are common among other black bass). Their diet is extremely diverse, and may be composed of fish, crayfish, insects, reptiles and amphibians – even small mammals and an occasional bird. Where black bass occur in tidal areas, shrimp and crabs are also important foods. Millions of anglers pursue black bass using a wide variety of live baits and artificial lures that mimic prey. Florida’s certified State Record weighed 17.27 pounds (caught in 1986 from a central Florida pond). A noncertified 20.13-pound largemouth bass record was caught in 1923. Three other documented Florida catches of largemouth bass up to 18.82 pounds actually surpass the official State Record weight; these were documented by the IGFA. The ultimate benchmark for all subsequent bass fishing experiences occurred in 1932, when the All Tackle World Record weighing 22.25 pounds was caught in Georgia. More than 75 years later, that feat was matched in 2009 by an angler catching a stocked Florida largemouth bass in Japan.

Described by Bailey and Hubbs (1949), Suwannee bass might be the most geographically and ecologically restricted species of all the black basses (Ramsey 1975; Koppelman and Garret 2002). They are endemic to north Florida and south Georgia.





Suwannee bass inhabit the lower and middle reaches of the Suwannee River, its tributaries, and the Withlacoochee River (Bass and Hitt 1973, Bonvechio et al. 2005). Suwannee bass were first reported in the Ochlocknee River in the 1960s and 1970s (Hellier 1967; Keefer and Ober 1977). Suwannee bass have also been collected from the St. Marks and Wacissa rivers since the 1990s (Hoehn 1998). Biologists have speculated that these latter populations may have originated from unauthorized releases (Cailteux et al. 2002). In fall 2009, they were collected by biologists in the Upper Suwannee River and the Alapaha River. There are no known references from Okefenokee Swamp (Pers. Comm. Will Strong, FWC). Due to this limited range, as well as an intolerance of poor water quality, they are considered to be a species requiring special attention.

Suwannee bass are the most colorful of the black basses occurring in Florida and may have dark, diamond-shaped blotches along bronze-colored sides; turquoise-blue coloring on the underside of the head and throat; and eyes may be red. Suwannee bass are strictly stream dwellers, and prefer rocky bottoms with moderate to swift flows. They also have an affinity for brush piles that may provide foraging cover and protection. Crayfish are their most important food source, but their diet also includes fish and freshwater shrimp; in tidal areas, they even eat crabs. Despite their small size, “Suwannees” provide excellent sport on light tackle, with periods of low water the best time to fish. The state record and all-tackle world record Suwannee bass weighed 3.89 pounds and was caught in 1985 from the Florida river after which it was named.

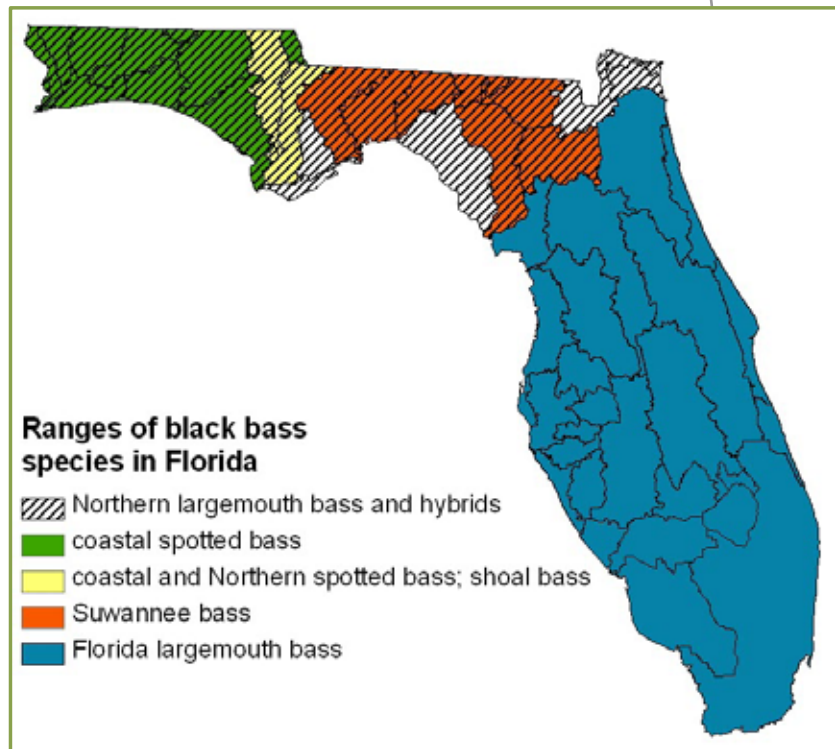
In Florida, spotted bass inhabit large creeks and river systems in the Panhandle, from the Apalachicola River system west to the Perdido River. Records suggest that spotted bass were stocked into the Flint River in Georgia and later migrated downstream into the Apalachicola River. The FWC has initiated a genetics study to determine whether all of the spotted bass inhabiting Panhandle streams are spotted bass or whether there might be more than one species present in the state. This research has determined that there are two distinct forms of spotted bass in Florida; spotted bass are only present in the Apalachicola River drainage but a second species inhabits the Apalachicola River system and the streams to the west. This appears to be the species of spotted bass that is native to Florida, and it has not yet been described by scientists. Scientists have proposed calling this species the coastal spotted bass (*Micropterus* sp. cf. *punctulatus*).

Recent surveys by FWC biologists determined that spotted bass have migrated into the Chipola River, a tributary of the Apalachicola River, and raised concern that this invasive species might be hybridizing with native shoal bass. FWC researchers are using genetics to determine whether fish captured in the Chipola River were shoal bass, spotted bass or hybrids of two species. To date, nearly 10 percent of the fish have been found to be hybrids of shoal bass and spotted bass, or shoal bass and largemouth bass. Biologists will continue to collect samples so that the FWC can monitor whether the number of hybrids is increasing, decreasing or staying the same through time.

There is very little information on the biology of spotted bass populations in Florida or how many anglers are interested in catching them. It is known that spotted bass prefer a stream environment that has moderate to swift flow, gravel bottoms and both deep pools and areas of cover provided by snags and brush. Like Florida’s other stream-dwelling basses, spotted bass diets include crayfish and fish, but insects are important as well. Spotted bass are not well known to anglers and do not grow as large as largemouth bass. However, they aggressively attack both natural and artificial baits presented along deep stream bends and fallen trees. The State Record spotted bass weighed 3.75 pounds and was landed in the Apalachicola River in 1985. The All Tackle World Record spotted bass was 10.25 pounds.

Almost 200 years after the largemouth bass was scientifically described, the shoal bass achieved official status as a separate black bass species in 1999 (Williams and Burgess 1999). Very little information exists on the biology of this newly recognized species. Shoal bass are endemic to the Apalachicola drainage basin, including the Chattahoochee and Flint river systems in Alabama, Florida and Georgia. In Florida, the majority of shoal bass are found in the upper Chipola River. Shoal bass have also been found below the Jim Woodruff Dam in the Apalachicola River (Wheeler and Allen 2003). Shoal bass are thought to be declining in abundance in many localities within their native range (Williams and Burgess 1999; Wheeler and Allen 2003; Boschung and Mayden 2004).

Shoal bass are habitat specialists. They are frequently found in shallow, rocky riffles and shoals in medium- to large-size streams and rivers, and shoal bass are intolerant of reservoir conditions (Wheeler and Allen 2003; Boschung and Mayden 2004). This species has been assigned a status of “Special Concern” by the Endangered Species Committee of the American Fisheries Society (Williams et al. 1989), mainly because of habitat loss and associated distributional declines. In Florida, shoal bass are not officially listed, but their need for special attention is well recognized. Further hybridization with spotted bass, which was documented in 2009 by FWC biologists (Porak et al. 2009), could lead to elimination of “pure” shoal bass. The FWC is studying shoal bass in the Chipola River to gain a better understanding of harvest and population dynamics, and the genetic structure of this species. Shoal bass should not be confused with the redeye bass (*M. coosae*) or the smallmouth bass (*M. dolomieu*), neither of which reside in Florida. Shoal bass are distinctively marked on their sides with a pattern of vertical bars resembling tiger stripes. Their primary food is crayfish, fish and insects. Fishing over and near rocky shoals with artificial lures that resemble these prey can provide excellent sport. No state record exists in Florida; however, current state and world record “redeye bass” from the Apalachicola River weighing 7.83 and 8.75 pounds, respectively, are likely misidentified shoal bass.



OVERVIEW OF BLACK BASS HABITAT IN FLORIDA: Habitat components that have been found to be important to bass and other freshwater fishes include water quality and quantity, structure, biota and location. Water quality includes factors such as toxic pollutants, water clarity, water color and the amount of nutrients and minerals in the water.



Water quantity addresses the overall size and depth of the water body as well as natural seasonal variations, or water schedules and minimum flow rates where man-made structures alter natural conditions. Structure includes such things as deep cuts in the bottom or irregular contours along the shoreline, the makeup of the bottom material (rocky, sandy, muddy or deep muck), and things like fallen trees, piers or artificial fish attractors. Biota is very critical and refers to not only the other fish and wildlife in the water body that are potential predators, competitors or prey, but also the aquatic vegetation. Vegetation can be microscopic algae, or submersed, emergent or floating plants. A proper combination of plants is essential to healthy aquatic ecosystems.

Location primarily refers to whether water bodies are coastal or inland, sit on karst topography that creates sink holes, and how far north-south they are in the state, which affects temperatures, rainfall and spawning seasons.

RECREATIONAL FISHERY STATUS OF BLACK BASS IN FLORIDA: In Florida, black bass annually provide more than 800,000 anglers with more than 14 million days of healthy outdoor recreation and generate approximately \$1.25 billion in economic impact for Florida (U.S. Census Bureau, for the U.S. Fish and Wildlife Service, 2006).

In March 2010, BassMaster Magazine (McCormick 2010) summarized the first 12 years of its Lunker Club applications, reporting that, “Considering the number of largemouth entries the Lunker Club has received over more than a decade, it’s not surprising that more entries have been caught in Florida (514 lunkers reported; 27.2%) than any other state; after all, Florida’s official state freshwater fish is the largemouth bass, which has ideal conditions and plenty of time to grow big and fat. Texas and California – the second (300) and third most commonly reported sources of lunkers – also offer ideal bass habitats.”

BassMaster’s top 25 bass (Ken Duke 2009) of all time now include 20 fish from California, two from Florida, two from Japan and one from Georgia. In both California and Japan, the bass are nonnative imports that came from Florida.



Ironically, in Japan they are generally considered a nuisance fish. In California, the few deep artificial reservoirs (typically with limited, gated access and entry fees) that yield these trophy bass are heavily stocked with trout, the preferred sport fish in the region, which are great forage for largemouth bass.

As the agency tasked with managing the Sunshine State’s aquatic resources for their long-term well-being and the benefit of people, we are creating an integrated, adaptive management plan for black bass, with the primary goal of ensure Florida is the uncontested “Bass Fishing Capital of the World.” The Black Bass Management Plan will entail a coordinated effort with other governmental agencies and stakeholders, as well as better focusing FWC resources on priority tasks.

FISHERIES MANAGEMENT TOOLS

Monitoring and Data Gathering: Fisheries biologists use a variety of sampling tools for studying bass populations. Electrofishing is a nonlethal sampling method that passes controlled electric current through the water to temporarily immobilize fish. The effective depth-range of the electric field is about 6 feet deep, limiting electrofishing to shorelines and other shallower areas. Stunned fish are collected with dipnets for a variety of studies, including documenting their length and weight, for overall health diagnostics and to check for tags. Electrofishing is one of the most efficient methods for quickly collecting fish or assessing a water body's fish populations.

Nets may be better than electrofishing for certain needs. Biologists may use a seine for quantitative estimates of young bass or forage along a shoreline. Blocknets are larger nets, varying from 0.1 to 1.0 acres in size. Along with a fish poison, rotenone, they may be used for documenting the most accurate quantitative estimates of bass and the total fish assemblage. Angler interviews (creel surveys) provide important information not available from other sampling, both about a fish population and about the anglers themselves. For instance, scientists can estimate angler catch rates for certain species that are used as an index of abundance; which species in a given lake are most targeted; how much angler pressure or effort is focused on a resource; how many fish are being removed from a system by harvest; and angler satisfaction.

Using these various sampling methods, fisheries biologists can obtain important information regarding fish populations. For example, marking (using various tags or fin clips) and releasing bass can provide an estimate of a lake's total bass population, based on the number of marked fish caught on subsequent electrofishing runs. Similarly, blocknets of a known area (such as a quarter acre) can be helpful in estimating fish densities – for instance the number of bass per acre in a given canal or lake. Looking more closely at individual fish, an index comparing the weight of a fish with its length will reveal whether fish in a particular lake are well-nourished or underfed. Using fish-length information, biologists can produce a length-frequency graph that shows the number of fish of various sizes in a given population. Biologists can tell the age of a bass from a set of “ear bones” in the fish. Marks, similar to tree rings are laid down each year. From samples of ages and sizes of fish, one can determine whether the “year-class” is strong or weak, and how well the fish has grown. Taking into account age data from the same fish can reveal clues about the fish population's rate of reproduction, growth, and mortality – all important factors for fisheries management. Biologists also tag fish with radio or acoustic tags. They can then track the fish with electronic receivers and determine more about their habits. Currently, biologists are using this technique to identify shoal bass spawning areas on the Chipola River, so they know which areas are important to protect.

Habitat Management: A primary tool of habitat management, where fish are concerned, is aquatic vegetation management. Aquatic plant management includes the encouragement of plant growth, which is usually accomplished by improving water clarity, or by fluctuating water levels. Additionally, biologists have been successful planting species such as eelgrass and bulrush.



The most common type of aquatic plant management for nuisance plant species (usually exotics from other countries such as water hyacinth and water lettuce) is spraying with approved herbicides. Lack of desirable native vegetation, often coupled with high nutrient levels that stimulate exotic plant growth, is probably the most common problem in Florida lakes.

Other tools for habitat improvement include muck removal, fish attractors, water quality management, and aeration systems. Drawdowns, complete dewatering of small lakes, or water level manipulations can also be very effective in rejuvenating older lakes by allowing oxidation and decomposition of muck on the exposed lake bottom, and stimulating rapid aquatic plant growth when water levels are raised back up. Drawdowns can also be utilized to control excessive vegetation in north Florida lakes, where plants can be exposed to freezing temperatures during winter. A part of this practice may even include temporarily raising the water a few feet and then rapidly dropping it to strand floating plants. Similarly, important Florida waters such as the Everglades and Lake Okeechobee are healthiest – along with their fish populations – when subjected to periodic water level fluctuations and dry periods that mimic naturally occurring water level fluctuations.



Fish Management: In a large natural setting, dealing with an individual fish's health is impossible, so population management is the focus. Fish management should be thought of as any action taken to

achieve a pre-determined outcome with regard to the fish population or fishery. Regulations and stocking are important tools that take into account concern for species diversity, predator:prey ratios, and fish genetics. Scientifically sound rules, backed by law enforcement expertise and personnel to implement them, allow FWC to manage Florida's freshwater fisheries for "optimum sustainable use." Optimum means that harvest and gear regulations are adjusted to local conditions to a practical degree (without becoming too complex) and to concur with local anglers and angling business preferences. Such rules must, however, ensure long-term sustainability of a quality fisheries resource by preventing overfishing. Also note that by referring to sustainable "use," we reflect the value of catch-and-release and/or harvest. The multiple recreational use concept also must be considered in management decisions. For example, besides bass anglers, we need to consider bream, crappie and catfish anglers, duck hunters and paddlers. However, fish populations are dynamic, and as they change, primarily due to the ecosystem's ability to produce new "recruits" (see recruitment in glossary) and the effects of angling pressure, regulations to protect them also need to adjust. In addition, fish kills, habitat alterations, droughts or hurricanes can cause dramatic changes in a fishery, requiring adaptive management.

Stocking fish is another important fisheries management tool. Many anglers see this as a cure-all; however, if habitat and the food base are not adequate to ensure natural recruitment, and there is an abundance of natural predators, stocking even large numbers of small bass (Phase-I) may do little good. Efforts to grow larger (Phase-II) bass and to learn to stock them at appropriate times and locations to take



advantage of abundant natural prey (e.g., after shad spawn) are being evaluated and refined. Stocking a mix of sport fish and forage fish to create a balanced fish population works well in new or renovated lakes that do not yet have established predators. Therefore, biologists usually use other tools, such as habitat manipulation and regulations, to manage lakes with established bass populations. An abundant bass population in a lake can also crop small sunfish, so remaining sunfish have adequate forage to grow quickly and to larger sizes. Manipulation of fish genetics also plays a role; a good example is protection of the Florida largemouth bass gene pool, because the Florida bass are better adapted to our subtropical environments and grow larger than the northern subspecies.

People Management: People management encompasses education, outreach, information distribution and marketing efforts. Educational activities, such as fish camps that teach conservation stewardship along with fishing skills and safety, can have a long-term impact on participants' appreciation for nature and enjoyment of a lifetime of fishing and outdoor recreation. Outreach events provide opportunities for a large number of people to learn about FWC activities and the importance of conservation management, and perhaps to experience fishing for the first time. Communicating a wide variety of information about current regulations, fishing sites and forecasts, useful fishing tips, handling methods for effective catch-and-release (including photographing your catch), alternatives to skin mounts and live weigh-in tournaments are all important management activities. FWC uses printed materials, the Internet, social media (e.g., Facebook, Twitter, YouTube, and Flickr), television and radio shows, as well as its presence at various events where anglers congregate, to provide face-to-face dialogues about bass fishing. "People Management" also includes marketing activities such as our five-year fishing license promotion, advertising the "Go Fishing" largemouth bass tag, designating a Free-Fishing Weekend in April, and working with local communities and businesses to explain the social and economic value of recreational fishing and the need for access and fishing facilities.



BLACK BASS MANAGEMENT ACTION PLAN DETAILS

The following sections contain the action items that are being collectively proposed to manage black bass fisheries. The four categories: New Opportunities, Habitat Management, Fish Management and People Management were derived from public input, as described above, and recommendations of the TAG. As you read through this section, remember there is a glossary, including definitions for acronyms, at the end of this publication, along with a bibliography that includes links to many important reference papers. Also included in the appendices is a summary of the public input that helped generate this plan and a table listing each action item in terms of priority, anticipated costs, manpower needs, legal or administrative issues that need to be addressed, and time to accomplish. FWC will work with our partners and stakeholders to consider ways to efficiently accomplish the plan (e.g., collaboration, volunteers, grants, sponsors or new research innovations). Prior to implementation, these action items will be incorporated into agency work plans using more detailed SMART objectives (Specific, Measurable, Achievable, Relevant and Timely).

I. NEW OPPORTUNITIES STRATEGIES

Background: These action items will help identify new or special opportunities to create or substantially enhance black bass fisheries, and ensure FWC is proactive about opening new public fisheries and managing them for the public. New opportunities include newly created reservoirs, reclaimed phosphate or rock pits, private water bodies, water-level management (e.g., drawdowns, renovations), improving angler access (e.g., new boat ramp construction, boat ramp renovation/maintenance and creating fishing piers/boardwalks), fish management (e.g., stocking, special regulations, controlling the amount of fishing pressure, fish attractors), and habitat enhancement (e.g., aquatic plant management, dredging, scraping). The FWC will seek external partnerships with other agencies and stakeholders while exploring new opportunities within its own agency to enhance the effort. Successfully implementing new opportunities will require an aggressive, proactive, science-based approach that also involves local citizenry. These can also be categorized as habitat, fish or people management but those listed here emphasize new possibilities that do not currently exist or cannot be specifically anticipated.

Action items:

1. Pursue public access to reservoirs during their planning phase, and develop management plans and agreements with water management districts and the Corps of Engineers (COE) to produce appropriate trophy black bass fisheries.

Three Forks Marsh Conservation Area and Fellsmere Water Management Area are examples of planned reservoirs that could be filled by 2014 and provide an excellent largemouth bass fishery.

There is a growing understanding that there will be an increased need for municipal, agricultural and commercial water supplies. Florida's five water management districts, the U.S. Corps of Engineers and the Department of Environmental Protection should balance these needs with the ecological needs of fish and wildlife. FWC staff is continuing to engage these managers to help ensure fish and wildlife are protected and to optimize recreational opportunities.



2. Make it easy for the public to find places to fish and freshwater public access (e.g., ramps, piers, shoreline access) using electronic and print media.

FWC and partners can also provide via the Internet additional information such as available electrofishing data, creel summary, water quality data, tournament data, event schedules, and boat ramp amenities. FWC is currently developing a “Google Earth” database map of all public access points and visually verifying the information. Plans are to integrate this program into user-friendly mapping software and link other important information to those points. FWC is partnering with TakeMeFishing.org and “VISIT FLORIDA” to make this information available to a wider audience with less cost and via mobile applications (apps).

3. Formalize partnerships with WMDs, federal, local, and state governmental agencies, and private landowners to enhance public access.

Increasing and enhancing freshwater fishing access is the most direct way to increase fishing opportunities and thus fishing effort, which was identified as a high priority by our stakeholders (DFFM Vision Document, 2009). The Small Lakes Management Committee (FWC) has identified a list of candidate lakes in each region, which are less than 1,000 acres that are without public access and have adjoining public land where access could be provided. The opportunity to secure public access is vital in providing future anglers access and increase fishing effort for bass. Florida has 7,700 lakes, but there is only public access to approximately 550 lakes. Many of the lakes in Florida are on private property. A “Share-a-Lake” program that provides incentives (e.g., tax relief, land management, lake management, and plant management) to private landowners in exchange for public access could provide new opportunities for black bass anglers.

4. Help local communities to attract major bass tournaments by enhancing ramps and associated facilities that will benefit local economies and anglers.

Identifying and incorporating vital design elements into a “Bass Tournament Facilities Plan” will provide the blueprint for tournament friendly facilities on Florida’s major systems and benefit anglers by providing greater access, facilities and parking.

5. Implement complete de-water renovations on aging reservoirs and lakes with water control structures to stimulate trophy largemouth bass fisheries.

Reservoirs and other water bodies with stabilized water levels often lose habitat complexity, suffer sediment build-up and produce less trophy-sized largemouth bass as they age. Florida fisheries staff pioneered the use of drawdowns on lakes with water control structures, and the Mississippi Department of Natural Resources has demonstrated that regularly draining reservoirs, scraping/sculpting the bottom, adding fish habitat, re-filling, and stocking stimulates rapid growth of bass and results in high quality fisheries.



6. Create contingency plans to enhance fisheries on water bodies that naturally experience rapid water level changes to provide long-term benefits.

After refilling, lakes such as Johns Lake, Orange Lake, and Lake Jackson in Tallahassee, which occasionally drain rapidly, offer new opportunities by providing optimum habitat and producing strong largemouth bass year classes. If prepared in advance, FWC has a unique opportunity to respond to natural events, such as sink hole lakes draining, or low-water conditions caused by droughts to enhance fisheries. Plans that can be implemented when needed will be prepared to dredge, scrape or sculpt substrates, to construct brush or rock pile fish attractors and to create fishing fingers or other shoreline fishing access. Biologists will draft plans for fish management actions such as stocking fish or special protective regulations to create and protect strong year classes of bass.

7. Develop a network of special-opportunity trophy bass fishing areas, on water bodies not currently open to the public.

Special opportunity fisheries (similar to special-opportunity hunts on FWC's wildlife management areas), with limited access can provide a higher quality experience and generate stakeholder excitement. Incorporating limited access and/or closed seasons may help entice the WMDs, municipalities, counties or private landowners to be more willing to participate in the program. This would open new water bodies to the public on a restricted basis, and with intensive bass management protocols could result in special trophy fisheries.

II. HABITAT MANAGEMENT STRATEGIES.

Background: Florida has close to 7,700 lakes that cover 3 million acres. Each lake has its own hydrological, thermal, visual, chemical, and biological characteristics (Seaman Jr. 1985). These characteristics create a habitat that in turn supports fish populations. Differing habitats strongly affect the resulting fish populations. Trophic status, plant coverage, and water quality directly affect fish population health. Knowing the acceptable and preferred habitats for sportfish populations is very valuable in creating sustainable sport fisheries. Habitat management is the most important component of maintaining good fisheries. Proper habitat is critical for improvement and/or maintenance of black bass populations. There are three main areas of focus where FWC has a positive impact on habitat. First, FWC creates short- and long-term plans and projects to enhance and maintain black bass populations. Second, the FWC plans for the long-term health of our black bass populations by dedicating staff and utilizing resources to engage stakeholder groups, other agencies, and non-governmental groups to help shape management decisions. Lastly, biologists develop individual monitoring programs associated with proposed action items to: 1) Make sure the intended action is having the desired result on the black bass population, and 2) Identify actions items that need additional research and planning before it can become a viable management option. Providing appropriate research and monitoring within the context of this program will ensure that actions taken are science based and supported by an active research program.

Action items:

1. Prevent habitat degradation in areas of existing healthy habitat in collaboration with other agencies as needed.

Staff engages state and local regulatory agencies and affected parties on permissible



actions that may negatively affect significant areas of bass habitat. Additionally, FWC staff should be engaged in the state Comprehensive Planning process as Developments of Regional Impact (DRIs) are being discussed. An example of this was the recent formation of the Lake Toho DRI interagency team (FWC, Osceola County, East Central Florida Planning Council, various planners and developers, SFWMD, DEP, USFWS, USACE, EPA, etc.) that met and worked with the planners of five DRIs and the East Central Florida Planning Council to develop a plan for the shoreline of Lake Toho (around 20 miles of shoreline). Amenities may be added like a fishing pier to serve all residents instead of individual lot owners building private ones. Planners

and developers benefitted by streamlining permit processes. The lake environment benefitted by protecting littoral zone habitats and the floodplain, thus protecting fish and wildlife needs.

Monitor water bodies that have had robust healthy vegetation and newly revegetated water bodies to compare fisheries. By partnering with other agencies, an action plan

will be created to reduce anthropogenic effects on quality habitat to address problems before damage becomes irreversible.

2. Manage native plants to create and maintain a symbiotic relationship between plants, fish, and people that will improve and sustain black bass fisheries.

Aquatic macrophytes are important to the function of a lake ecosystem and provide valuable fish and wildlife habitat, improves water quality and clarity, and reduces shoreline erosion resulting in resuspension of sediments (Smart et al. 1998). For largemouth bass aquatic vegetation provides structural habitat for refuge and food resources (Moxley and Langford 1982). Additionally, largemouth bass anglers often prefer to fish in or around aquatic vegetation (Wilde et al. 1992). However, if aquatic vegetation becomes too dense, largemouth bass growth and condition has been shown to decline (Colle and Shireman 1980; Maceina and Shireman 1982) possible the result of reduced foraging efficiency (Bettoli et al. 1992). Macrophyte removal can improve fish growth and size structure in lakes where high densities of plants have resulted in stunted fish populations (Olsen et al. 1998).

One of the major factors contributing to the proliferation of aquatic vegetation in the littoral zone of many Florida lakes is water level stabilization. Natural flows and levels have been altered primarily for flood control and have had adverse affects on native plant communities (Moyer et al. 1995; Allen and Tugend 2002). Water stabilization on Lake Kissimmee has lead to dense stands (percent coverage of 100%) of pickerel weed *Pontederia cordata*, cattail *Typha* spp., smartweed *Polygonum* spp., and water primrose *Ludwigia* spp. in the littoral zone (Moyer et al 1995). These species create monocultures and where plant biomass was more than 50 kg/m², dissolved oxygen levels were less than 2 mg/L, centrarchid species were absent and species richness was low (Allen and Tugend 2002). Additionally, natural shedding and leaf litter from these species can increase the amount of organic sedimentation and decrease plant diversity through competition. For example, cattail produces a dense rhizome mat and the clustered leaves cause litter. Dense cattail growth and litter may reduce the opportunity for other plants to establish or survive (Apfelbaum 1985). Mineralized substrates necessary for many plants to germinate are buried by this litter. Beneath the litter, substrates are cool and moist, optimal conditions for survival of a seed bank but not for seed germination (van der Valk and Davis 1978). Periodic herbicide applications are necessary to reduce biomass of many of these invasive species, promote species diversity and expansion, open areas to allow for wind and wave action to reduce organic buildup, provide better fish and wildlife habitat, and open access to anglers.

The scientific literature suggests that intermediate levels of aquatic macrophyte coverage provides quality habitat for largemouth bass; however, defining what level constitutes intermediate coverage varies between lakes and lake managers. For example, Bonvechio and Bonvechio (2006) recommended an intermediate level of aquatic vegetation on Lake Tohopekaliga of 20-40 percent to meet the needs of anglers and non-anglers. Conversely, Hoyer and Canfield (1996) found no significant relationship between macrophyte abundance and estimates of adult largemouth bass abundance and standing crop (kg/ha). However, Maceina (1996) reanalyzed the data of Hoyer and Canfield (1996) based on lake size and found in lakes greater than 54ha sub-adult and adult largemouth bass densities (N/ha) had a parabolic relationship with percent area coverage of vegetation with an asymptote at around 40-60 percent. These results as well as others suggest a lake specific approach to determine the level of aquatic plant management is needed to maintain or enhance largemouth bass populations. There are current operations in place to control nuisance native vegetation in particular water bodies to obtain a desired future condition. Plant control varies highly from lake to lake and between individual managers. Lake specific management plans should be developed for specific waterbodies when managing for largemouth bass.

3. Implement FWC's new hydrilla-management position on specific waterbodies to improve largemouth bass fishing.

Hydrilla management occurs annually on many public water bodies. In the past its status as an invasive exotic plant meant it was controlled at the lowest feasible level, but hydrilla may be able to be utilized to have a positive impact on bass fisheries in some systems where native plants are not able to sustain healthy growth. In Florida lakes, hydrilla at low to moderate coverage can provide a benefit to fish populations when native submersed vegetation is limited or absent. Like all submersed vegetation, hydrilla provides substrate for high densities of macroinvertebrates as a food source for



fish and cover from predation (Moxley and Langford 1982). Juvenile sport fish (e.g., largemouth bass, bluegill) production and survival has been positively correlated to increased coverage of aquatic macrophytes (Hoyer and Canfield 1996; Maceina 1996) including hydrilla (Moxley and Langford 1982; Tate et al. 2003; Sammons et al. 2005). Similarly, sub-adult and harvestable largemouth bass abundance on large Florida lakes (more than 55 ha) increased with increasing vegetation and reached an asymptote at 40-60 percent coverage but declined when coverage exceeded 60 percent (Hoyer and Canfield 1996; Maceina 1996). Studies have indicated that hydrilla infestations (e.g., >60% coverage) can adversely affect growth and condition of sport fish species (Colle and Shireman 1980; Maceina and Shireman 1982; Sammons et al. 2005). Thus,

intermediate levels of aquatic plant coverage (20-40%) have been suggested to meet the needs of anglers and non-angling groups (Bonvechio and Bonvechio 2006). Anglers often prefer to fish in or near aquatic plants (Wilde et al. 1992; Slipke et al. 1998). Hydrilla has the ability to grow with limited sunlight (1%) in depths up to 15 m (Langland 1996) allowing it to provide offshore habitat in areas where native vegetation may be limited or absent. In Florida, many anglers prefer to fish within or around the edges of offshore stands of hydrilla. Angler catch rates for largemouth bass and harvest of black crappie have been positively correlated to hydrilla coverage (Maceina and Reeves 1996; Bonvechio and Bonvechio 2006). However, when coverage limits access, angler effort and catch have been shown to decline resulting in economic loss to the community (Colle et al. 1987; Slipke et al. 1998). Conversely, hydrilla at intermediate levels on Lake Okeechobee accounted for \$4 million in recreational value (Furse and Fox 1994). Fisheries managers must also consider the angler use of the resource. Species-directed effort may shift with increasing hydrilla coverage because largemouth bass anglers prefer higher levels of aquatic vegetation and others (e.g., catfish, sunfish anglers) prefer less vegetation (Slipke et al. 1998). Careful consideration by fisheries managers must be given when determining the level of hydrilla management to meet the needs of the anglers that use the resource.

While many largemouth bass anglers desire hydrilla in the waterbodies they fish, resource managers must also consider the broad diversity of stakeholders who utilize Florida's public waterbodies, and each has their own preference for how aquatic plants should be managed. For example, fisherman and duck hunters may desire hydrilla at some level where lake front homeowners, swimmers, and water skiers may not want any hydrilla. Additionally resource managers may have concerns with allowing hydrilla to grow due to its fast growth rates, reproductive capabilities, ability to grow in depths up to 15m, having the potential to completely cover a waterbody within a growing season, and limited cost effective methods for control (i.e., herbicides). At high levels hydrilla can interfere with the use and function of a waterbody by adversely affect native plant communities, reducing recreational use, and creating potential health risks such as interfering with flood control. Because of the challenges managing

this exotic species the FWC Invasive Plant Management Section with input from the various FWC guilds have developed an agency positions statement which will guide the agency in managing hydrilla in the future:

It is the position of the Florida Fish and Wildlife Conservation Commission (FWC) that native aquatic plant communities provide ecological functions that support diverse native fish and wildlife communities in Florida water bodies. FWC considers hydrilla to be an invasive, non-native aquatic plant that can, at high densities, adversely impact native plant abundance, sportfish growth, recreational use, flood control, and dissolved oxygen. Once established, hydrilla has proven difficult if not impossible to eradicate with current technology and is expensive to manage. Therefore, FWC opposes the deliberate introduction of hydrilla into waterbodies where it is not currently present. The FWC prefers to manage for native aquatic plants, but recognizes that in water bodies where native submersed aquatic plants are absent or limited, hydrilla at low to moderate densities can be beneficial to fish and wildlife. FWC will manage hydrilla on a water body by water body basis using a risk-based approach to determine the level of management.

In water bodies where hydrilla is well established, it will be managed at levels that are commensurate with the primary uses and functions of the water body and fish and wildlife. FWC will determine the level of hydrilla management on each public waterbody using a risk-based analysis that considers human safety issues, economic concerns, budgetary constraints, fish and wildlife values, and recreational use, with input from resource management partners and local stakeholders. Factors such as available control technology (e.g. herbicides), current waterbody condition, and activities occurring within the watershed will also influence the timing and level of hydrilla management.

Thus, future hydrilla management will be considered on a waterbody by waterbody basis using a risk-based approach with input from FWC and other state and local government resource managers and local stakeholders. (Visit the following link for a more detailed discussion about this controversial topic: Pros/Cons.)



4. Partner with water management districts and the Corps of Engineers to develop new water regulation schedules and to monitor and recommend minimum flows and levels to help maintain healthy black bass populations.

Stabilization of water levels have caused problems with muck build-up and water quality as well as disrupted the dynamic ecology that Florida's aquatic dependent species have evolved around. Increasing the fluctuations in water level where they have previously been stabilized is occurring throughout the state. Probably one of the most well known examples is the restoration of portions of the Kissimmee River. The restoration of the Kissimmee River by the U.S. Army Corps of Engineers along with the South Florida Water Management District is considered one of the largest restoration projects of its kind in the world, and will allow the floodplain to flood and dry according to the amount of rainfall. Low water allows organic material to dry up and consolidate, allowing emergent vegetation to begin growing. High water strands floating vegetation and decreases density and areal coverage of submersed and emergent aquatic vegetation. Low water begins the cycle again.

Water regulation schedules are used on many lakes in Central and South Florida to reduce the impact of flooding caused by excessive tropical rains mainly in summer months. The FWC does not have direct authority with respect to schedule management

but can influence the agencies responsible for implementing these schedules to consider adequate levels are maintained for black bass populations. Fisheries impacts are in many cases already documented, and FWC staff can use this data to persuade other interests about the value of natural flow regimes. Freshwater fisheries staff should engage WMDs and stakeholders when water schedules are being adapted. Biologist will continue to document flow and their impact on bass in areas that are not currently covered by a water schedule.

There is a growing understanding that there will be an increased need for municipal, agricultural and commercial water supplies. Florida's five water management districts and the Department of Environmental Protection need to balance these needs with the ecological needs of fish and wildlife. FWC has a team that is prioritizing important water bodies on which they will work with WMDs to establish minimum flows and levels. Important bass fisheries will be one of their priorities.

Bass are able to thrive at many different water levels. However, seasonal impact of flows and levels needs to be better understood. WMDs use different methods to set flows and levels making it difficult to compare strategies. There is an action plan and studies are on tap to use several approaches at one location to see how close each district's methods are for reliable data comparison .

5. Improve bass habitat conditions by manipulating water levels for fisheries enhancement purposes.

Drawdowns, with and without organic removal, have been used in Florida to enhance fish and wildlife habitat and mitigate for water level stabilization. Examples of drawdowns with organic material removal include the Kissimmee and Alligator

Chain of Lakes, Lake Istokpoga and Lake Josephine.

A drawdown on Lake Tohopekaliga was shown to have an immediate positive fish response (Moyer et al. 1995). Collaborate with WMDs and COE to implement short-term drawdowns of priority water bodies to benefit black bass populations. Create a list of priority water bodies that are eligible for drawdown (e.g., have a water control structure) based on existing habitat coverage, recruitment strength, size structure, and angler success. Lakes with stabilized water levels experience accelerated lake succession and require drawdowns and mechanical removal of organics to maintain quality habitat. Lakes with unregulated water levels experience natural high- and low-water levels and less restoration efforts over time.



Unfortunately due to political, permitting, and other socio-economical reasons these management tools are not always available. Muck removal is important to the success of reemerging plant life. River channels across the country have been channelized (straightened) to provide for flood control or better navigation. Channelization provides for swifter currents and eliminates habitat. Increased water flow and decreased habitats have led to diminished bass populations. In some areas, the need for flood control has been eliminated through other means and in other cases navigation is no longer needed. Woody debris can be added to provide habitat that has been lost as restoration proceeds to restore slow current river channels.

It has been demonstrated in Florida (e.g., Lake Griffin, Rodman Reservoir) that water level manipulation for fisheries enhancement can improve habitat, supplement terrestrial habitat growth, and substantially improve bass recruitment and adult bass abundance. Evaluate lakes/reservoirs that are able to undergo hydrologic

manipulations. The information can then be used by managers to justify future water level manipulations to cooperators and stakeholders. Effects both positive and negative to other wildlife, including birds, reptiles, and amphibians, will be considered. These projects are dynamic and usually long standing, therefore research will take time to produce valuable insight, but it will be invaluable to managers and the wildlife communities.

6. Revegetate lakes where a high probability of successful expansion of native aquatic plants exists.

Revegetation projects have been quite successful in many lake systems at reestablishing native plants along lake shores. Bass are drawn to properly vegetated areas to forage and to reproduce, therefore anglers target these areas. Bass spend varying amounts of time between inshore and offshore habitats, and it has been shown that inshore bass prefer habitats with vegetation (Colle et al. 1989). Not all lakes support quality vegetation, so small test plots are recommended first. Then, if the plants are successful, a major effort will be requested. The need for habitat improvement and/ or expansion on various lakes will be identified regionally and applications coordinated through the ARES to address funding of these projects.



Identify characteristics of additional fisheries habitat that help create or maintain healthy bass populations and maintain or increase these forage and spawning grounds. Monitor revegetation projects to determine their success or failure related to individual lake parameters, like soil type and trophic level, to help in planning for future revegetation projects.

7. Restore wetlands adjacent to potential fisheries to promote healthy lake waters and protect wetland wildlife communities.

Wetlands act as a natural biological filter that uses plants and algae to removal harmful excess nutrients that can cause adverse water conditions that in time can lead to massive fish kills. To accomplish this we will partner with municipal groups that provide critical education on upland management and their impact on lakes and water quality (e.g., Lakes Education/Action Drive in Polk County; www.le-ad.org). An example of a restored wetland is adjacent to Lake Griffin. Wetland restoration and enhancement has also been conducted on the Kissimmee Chain of Lakes in cooperation with SFWMD; many more opportunities still exist around the Kissimmee Chain on SFWMD lands.

8. Create structural habitat in water bodies to increase/improve fishing opportunities in new water bodies.

Limited application but applicable in future planning. Water treatment and storage areas will only increase in number in the future, along with some ponds being created specifically for education/ outreach purposes, or even new golf course ponds. Becoming involved with other agencies during the design phase may lead to more desirable fish habitat in these water bodies, better shoreline access, and refuges for fish that anglers can target. Sculpturing recommendations for ponds have been made by the University of Florida and by the FWC (FWC 2009). Creating structural habitat on shoreline areas will allow more anglers to enjoy the resource by creating quality fisheries that are accessible by shoreline anglers. Examples of such shoreline



modifications include creation of large gravel beds on Lake Eustis and enhanced access on several Tenoroc Lakes.

Document changes in angler use and success on water-bodies where structural habitat has been created. This information will provide biologists with justification for future enhancement activities on additional water-bodies.

9. Create a substrate enhancement program that incorporates a FWC/volunteer run project to construct fish attractors to concentrate fish, and improve catch rates and angler satisfaction.

Adding substrates (e.g., trees, rock, block) has been shown to improve fisheries habitat diversity and congregate fish to improve angling success or satisfaction, but requires additional research and alternate approaches to justify costs. Crushed rock

or oyster shells have been used to serve as fish attractors for bream. Other artificial substrates have been introduced into water bodies for a variety of reasons. (Tugend et al. 2002; Wilbur 1978). Rip Rap or concrete and rock structures have been shown to hold bass. Fallen trees can provide favorable bass habitat in both flowing and static waters. Floating feeders have also been used to concentrate forage species, which in turn attracts bass. Native plants like bulrush and eel grass also make excellent fish attractors where applicable, and natural or artificial grassbeds have been attractors shown to increase abundance of juvenile largemouth bass (Ratcliff et al. 2009). Another potential positive is that adding artificial structure may also increase nest building and reproduction in bass (Hunt and Annett 2002).

These structures provide opportunities in lakes with little or no submersed vegetation. An artificial fish

attractor program will require minimal funding and manpower. These are more visible to the public than other FWC activities and in the past served as excellent public relations tools. Habitat can also be increased by placing attractors offshore, where it is too deep for submersed vegetation to grow.

Research should be done on the efficacy of installing rock pile fish attractors in lakes, because rock piles last for decades as opposed to brush, which only lasts a few years. Rock-pile fish attractors are currently being installed in the Harris Chain of Lakes in a cooperative project with Florida LakeWatch. There are research opportunities at Tenoroc FMA where crushed rock has been used extensively. Data generated from this program will show tendencies of different fish species and angler use of various attractor materials. Since fish attractors are generally expected to congregate fish, not to significantly increase fish production, we should document angler use, success, and attitudes about attractors.

10. Adhere to and promote appropriate water quality standards to support black bass species.

The Department of Environmental Protection monitors water quality standards (set by the Environmental Protection Agency) to ensure water bodies are maintained within designated levels tested safe for human populations. These standards have also been used to help set standards for healthy fish populations. Largemouth bass can tolerate a wide range in some parameters and narrow ranges in others. Many of these parameters have direct effects on each other and can fluctuate greatly in a 24-hour period, but over the course of a year closely fall within seasonal historical data. The main parameters are temperature, oxygen, pH, total ammonia nitrogen, alkalinity, and hardness (Cech J.R. 1979, Seaman Jr. 1985, Stuber R.J. et al. 1982, U.S. EPA Office of Water 2009).



Record baseline water quality data in lakes where Phase-I or II black bass are to be stocked prior to release. Data may lead to an answer for why the population has diminished and a solution to the problem could be implemented allowing for acceptable water quality to be restored.

11. Identify, protect and repair damaged habitat that is critical to sustain shoal and Suwannee bass populations.

Shoal and Suwannee bass are both habitat specialists that frequently inhabit moderate to swift current in rocky areas (Bass and Hitt 1973; Schramm and Maceina 1986; Wheeler and Allen 2003; Boschung and Mayden 2004). Specific critical habitats need to be identified for these species; particularly spawning habitat for shoal bass. Protection, maintenance, and restoration of critical habitat are important for these species of black bass that occupy a small range. Critical habitats and threats to these habitats should be identified and mapped for their respective river systems. The importance of these habitats should be communicated to stakeholders and championed by managers. Shoal and Suwannee bass are rare and only found in Florida, Georgia and Alabama. Proper habitat is vital for their continued existence and for future fisheries.

Threats to shoal bass habitat, degraded habitats, and habitat protection and restoration solutions have been identified for the Chipola River watershed in the Business Plan for the Conservation of Native Black Bass Species in the Southeastern U.S.: A Ten Year Plan (National Fish and Wildlife Foundation 2010). Managers should work with landowners, municipalities, and other government agencies to provide oversight, protection, and restoration of shoal bass habitats in this watershed.

Threats to Suwannee bass habitat and degraded habitats need to be identified and mapped in the Suwannee River watershed, so that a plan could be developed for habitat protection and restoration. Suwannee bass habitat concerns include water quality impairment from urban development, nitrogen loading in springs, agriculture, and unpaved roads. Stream bank destruction by livestock and road crossings can increase sedimentation and degrade Suwannee bass habitat. Water withdrawals may be the most eminent and long term threat to the conservation of Suwannee bass (Warren and Nagid 2008).

Compilation of data and/or identification of habitats if necessary. Start researching/writing hatchery Standard Operating Procedures for the collection and spawning protocols for these species to be prepared for future stocking requests created to help retain wild populations.

III. FISH MANAGEMENT STRATEGIES

Background: A black bass population is governed by the rates of recruitment, growth, natural mortality, and fishing mortality, and thus black bass fisheries management generally involves actions that attempt to manipulate these rates. Length-based regulations coupled with daily bag limits are commonly used to manage black bass fisheries with the intent of reducing fishing mortality to increase the abundance of trophy-sized fish. Harvest regulations are set based on a pre-determined objective for the fishery. Angler expectations are a critical factor in determining the objective of a fishery, but expectations often vary between anglers, water bodies, and geographical regions. The guiding principal for the development of this BBMP is to work closely with stakeholders to provide



a diversity of fishing opportunities. Therefore, we strive to make our management actions flexible to meet angler expectations, and to allow managers to adjust to changes in angler expectations and biological conditions.

Action items:

1. Establish customized harvest regulations to manage black bass populations at selected water bodies.

To optimize the effectiveness of harvest regulations to meet angler expectations, specific regulations need to be established for each species of black bass on specific water bodies based on the best biological and sociological data available. The ability to use lake or river specific regulations for individual species of black bass is critical to effectively manage fisheries, but moderating the number of regulations is important to prevent confusion or discouraging participation.

Harvest regulations have been used across the country in attempts to improve bass fishing (Wilde 1997; Allen et al. 2002; Carlson and Isermann 2010). However, the success of length limits to increase abundance and influence size structure of largemouth bass populations has been inconsistent. For example, Wilde (1997)



concluded that minimum length limits generally improved angler catch rates but did not influence size structure, whereas protective slot limits had some ability to increase both variables. Length-based harvest regulations are typically initiated under the assumption that exploitation (measured as the percent of the population that is harvested) is negatively affecting abundance and size structure (Carlson and Isermann 2010), and thus the success of length limits to increase abundance and size depends on the fishing mortality rate, as well as the natural mortality rate, rate of recruitment, and growth (Wilde 1997; Allen et al. 2002). However, approximately 95 percent of state fish and wildlife agencies reported an increase in voluntary release of legal-sized largemouth bass in the mid-1990s (Quinn 1996). Myers et al. (2008) documented large increases in the voluntary release rate of legal-sized largemouth bass from the late 1970s to early 2000s. This temporal trend in largemouth bass voluntary release has resulted in declining mortality rates of largemouth bass since the mid 1970s, which lessens the response of fisheries to regulations and makes it more difficult to detect the effects of regulation changes (Allen et al. 2008). Nevertheless, even when overall mortality is relatively low, exploitation of the largest fish can be much higher (Henry 2003) indicating that size-selective mortality could still negatively affect largemouth bass fisheries, particularly when management goals include trophy fisheries (Allen et al. 2008). Voluntary release rates and exploitation rates of largemouth bass in small lakes (less than 1,000 acres) is an important consideration,

since most studies evaluating this have been on large water bodies that receive a high percentage of fishing effort from tournament anglers.

Despite increased voluntary catch-and-release by anglers, exploitation can still be an important factor regulating size structure. There is evidence that more restrictive regulations such as high minimum length limits, large protective slots, and mandatory catch-and-release regulations may increase the number of trophy-sized fish (Hughes and Wood 1995; Wilson and Dicenzo 2002; Myers and Allen 2005; Carlson and Isermann 2010). Data on population dynamics (e.g., growth, recruitment, and mortality), habitat, and angler expectations should be considered for harvest

regulations to maximize their effectiveness at reaching objectives. Additionally, for harvest regulation to be effective there must be adequate presence of law enforcement.

Some of the current black bass harvest regulations were not set for a specific objective based on biological and/or sociological data. Regulations have not always been evaluated to fully determine their effectiveness, particularly since it is difficult to separate changes in a fishery resulting from a regulation and changes due to environmental conditions (Buynak et al. 1991). Therefore, we must attempt to evaluate past regulations with existing data, and continue to collect population dynamics data on lakes and rivers to identify potential candidates for regulation changes through use of age-structured population modeling (e.g., stock assessment). Exploitation studies should be conducted on priority water bodies for all black bass species to determine if overall and/or size-specific exploitation is having population-level effects on small and large lakes. Any regulation changes should be evaluated for 10 years after implementation to determine success based on stated objectives (e.g., increased abundance, increased size structure, increased angler satisfaction or catch rates).



2. Determine the potential effects of bed fishing on black bass populations.

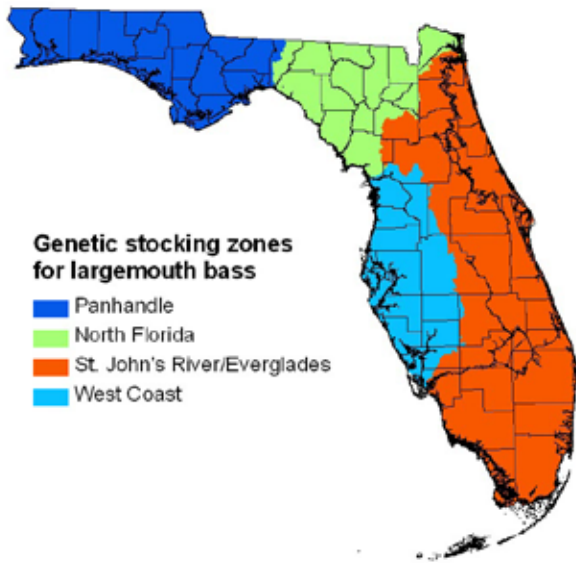
The BBMP public survey and the BBMP TAG both identified bed fishing as a concern. Schramm (1985) concluded that there were no differences in abundance of spawning adults and young-of-the-year largemouth bass in protected spawning areas and unprotected areas of Lake George, Florida; however, the experimental design and other confounding factors prevented definitive results. Model simulations have suggested that bed fishing in Florida does not likely have population-level effects (Gwinn and Allen 2010). However, fish could be more vulnerable during spawning than the model considered. There is a paucity of field studies on this topic in Florida and a comprehensive study to determine the effects of bed fishing on bass populations in Florida is needed. Human dimensions studies are also needed to determine what portion of anglers would support regulation of bed fishing either in general or in site-specific areas, should science tell us that protection of spawning fish would make a noticeable difference.

3. Ensure genetic diversity, fitness, and conservation of Florida largemouth bass.

Florida largemouth bass are endemic to peninsular Florida and are the foundation of Florida's world famous trophy bass fishery. Agency studies revealed that some bass populations in south and central Florida were contaminated with northern largemouth bass alleles (i.e., genes) by historical stocking practices. Private fish producers continued to import northern largemouth bass and their hybrids into Florida and private citizens stocked them into ponds and lakes in the southern and central part of the state during the 2000s (Porak et al. 2007). Intergrade largemouth bass populations were found farther south than previously recognized (Barthel et al. 2010).

There are many management practices that will help conserve the genetic integrity of Florida largemouth bass. These include: 1) educate private hatcheries and the public about a new rule that made northern largemouth bass and their hybrids conditional species (requiring a permit) south and east of the Suwannee River and develop appropriate enforcement strategies, 2) test and certify brood fish at the Florida Bass Conservation Center (FBCC) to ensure that only pure Florida bass are stocked in their native range throughout peninsular Florida, 3) use high numbers of hatchery brood fish to guarantee genetic diversity of hatchery fish that are released into public waters, 4) use only wild-caught hatchery brood fish to avoid domesticated hatchery fish that would be less fit to survive in the wild after they are stocked, and 5) minimize

out breeding among genetically divergent groups of populations by only stocking fish that had parents obtained within the same geographical area designated by FWC as a Genetic Management Unit (GMU).



Austin et al. (unpublished manuscript) determined the current raceway breeding practices at the FBCC maintain substantial portions of genetic diversity of the breeding stock and support continuation of current breeding protocol used at this hatchery. Establishment of four or five GMUs (Porak et al. 2007) is supported by black bass genetics research (Barthel et al. unpublished manuscript) and FWC's genetics policy for release of fish (Tringali et al. 2007). In the short term, continue research on hatchery brood fish genetics, genetic structure, and diversity of Florida bass populations, and genetic composition of bass that are privately produced and stocked into Florida ponds and lakes. In the long term, evaluate the potential for selective breeding of trophy bass or production of triploid or gynogenetic triploid bass for select trophy bass management lakes. Evaluate and if possible prevent further hybridization of shoal bass with other black bass species. Determine genetic makeup of Florida population of Suwannee bass to monitor and prevent, if possible, hybridization with other black bass species.

4. Ensure the genetic integrity, fitness, and conservation of endemic black bass within Florida panhandle river systems.

More than half of the recognized black bass species (*Micropterus*) are present in Florida Panhandle streams, including the two species with the most restricted ranges, i.e., shoal bass (*M. cataractae*) and Suwannee bass (*M. notius*). Although habitat degradation is the most serious threat to panhandle bass populations, there is potential for interspecific hybridization to pose a more immediate threat in some cases. In other states, introductions of non-native species have led to introgressive hybridization and genetic swamping of populations of endemic species. Of all the black bass species, spotted bass appear to be the most opportunistic and hybridization has occurred between redeye X spotted bass (Barwick et al. 2006), largemouth X spotted bass (Godbout et al. 2009) and smallmouth X spotted bass (Pierce and Van Den Avyle 1997; Koppelman 1994). Recently in Florida, shoal bass X spotted bass hybrids were discovered in the Chipola River (Porak and Tringali 2009). The FWC has implemented a genetic study to help conserve native black bass species by (1) determining which species are present in panhandle streams and (2) monitoring populations for evidence of hybridization between species. Thus far, these investigations have uncovered two genetically distinct forms of spotted bass (*M. punctulatus* and *M. sp. cf. punctulatus*) in panhandle streams, one of which was previously unrecognized and has yet to be described (*M. sp. cf. punctulatus*). Members of this provisional taxon appear to be more closely related to Guadalupe bass (*M. treculi*) than northern spotted bass (*M. punctulatus*) and may be native inhabitants of western panhandle coastal lotic systems. Genetic studies have also documented that Chipola River shoal bass are



hybridizing with *M. sp. cf. punctulatus*, *M. punctulatus*; and *M. salmoides*. During the course of three sampling years, nearly 10 percent of the presumptive shoal bass collected from the Chipola River were hybrids. To determine whether the genetic integrity of this important population of shoal bass is threatened by introgression, genetic samples must continue to be collected at regular intervals and additional work needs to be devoted to identifying factors that are responsible for hybridization. This includes gathering information on previously unrecognized forms of spotted bass, *M. sp. cf. punctulatus*.

5. Stock fingerling (Phase-I; about 1-inch long) largemouth bass into new reservoirs and into lakes following major fish kills or droughts.

Lakes with good water quality and habitat do not need to be stocked with largemouth bass because recruitment is adequate to sustain the population. Lakes that have dried up and then reflooded or newly constructed reservoirs can benefit from a stocking of hatchery produced largemouth bass. Stocking fingerling largemouth bass should be successful during the first year after flooding due to tremendous production of small prey and low numbers of large predators. Restocking fingerling largemouth bass following a significant fish kill can expedite recovery of a fish population.

6. Stock advanced-sized (Phase-II, 4-6 inches) largemouth bass fingerlings into water bodies where recruitment is limited.

Supplemental stocking of advanced sizes of hatchery fish should be more successful than stocking fingerlings in certain situations, because larger hatchery bass should be able to eat a greater variety and size of prey (Loska 1982). From an ecological standpoint, larger sizes of hatchery fish should also have fewer predators that eat them (Wahl et al. 1995). Although some early attempts at stocking advanced sizes of hatchery largemouth bass in Florida lakes were not successful (Porak et al. 2002) new handling and nutrition protocols have been developed at Florida hatcheries. Larger sizes of hatchery largemouth bass (2.7-3.5 inch TL) fed on prey fishes and grew faster than their wild counterparts during their first year of life after being stocked in Lake Talquin, Florida (Mesing et al. 2008). Conversely, diet comparison of stocked advanced-size fingerlings and early-cohort age-0 wild largemouth bass at Lake Seminole, FL revealed that stocked fish had significantly higher rates of empty stomachs and wild fish had significantly more fish in their diet at seven days post-stocking (Pouder et al. 2010). Fingerlings stocked at Lake Talquin were raised on live prey in ponds, and fingerlings stocked at Lake Seminole were raised on pellets in artificial raceways, suggesting that rearing methods may play a critical role in supplemental stocking of advanced-size largemouth bass.

Further research is needed to determine hatchery protocols that could increase short-term foraging efficiency and survival. Research topics include 1) the potential benefits of conditioning hatchery fish to predators and prey prior to leaving the hatchery, and 2) evaluating the survival of pellet-reared vs. live-feed-reared hatchery largemouth bass. If it is determined that supplemental stocking of pellet-reared largemouth bass is not successful, alternative approaches should be considered for use of cultured bass in fisheries management (e.g., genetic stock enhancement – see genetics section).

7. Stock supplemental forage into small water bodies to improve growth rates of largemouth bass.

Ample forage must be available for bass to exhibit the fastest possible growth rates and highest possible population densities. For example, lake chubsuckers are a critical prey species for trophy-sized largemouth bass (Porak et al. 2002). Some water bodies may support a population of prey species that is not currently present, or augmentation



of a prey species that is present at low densities. Examples of such cases include restoring the population of a prey species following habitat restoration projects or following cultural eutrophication that results in increased plankton production.

8. Manage impacts caused by exotic fish species on bass populations in Florida.

Past research in Florida has shown that non-natives generally increase overall carrying capacity as they fill underutilized niches without negatively impacting native black bass. However, introductions of new exotic species have the potential to affect bass populations negatively through foraging on bass, direct competition for food, competition for habitat, and habitat degradation. There is an important environmental and economic concern associated with the introduction and expansion of any unplanned exotic species. Flathead catfish have the potential to impact riverine species such as shoal bass and Suwannee bass. Although stocking triploid grass carp has proven cost-effective and environmentally sound in ponds, overstocking of grass carp has led to bass fishery declines through habitat degradation in some lakes. Armored catfish species continue to expand their range to the north throughout the state with largely unknown impacts. FWC will continue to educate the public about the importance of minimizing new introductions and further spread of existing non-native populations. Future research will be conducted to determine any potential negative impacts of exotic species.

IV. PEOPLE MANAGEMENT STRATEGIES

Background: As described above, human dimensions inquiries will be critical to the effective implementation of a black bass management plan. Plan developers identified the following topics to be considered: communication, education, ethics, outreach, marketing, social marketing, partnerships, tournament management and promotion, user conflicts, trophy bass documentation, data monitoring, imperiled species, and law enforcement. To that end, a communications plan (Appendix III) is presented and nine specific action items are described below.

Action items:

1. Implement a trophy fish documentation and release program.

FWC recognizes the importance of managing for trophy largemouth bass. Currently, FWC has very little information available to quantify the catch of trophy bass in Florida. Gathering information about trophy-sized fish is especially difficult due to their rarity in fish populations, and their use of deep water habitats that may preclude collection via conventional sampling with electrofishing gear (Bayley and Austin 2002). We propose to initiate a fishery dependent trophy-fish documentation program to quantify trophy fish catches. TrophyCatch is a conservation-minded program that documents catches of trophy fish and promotes catch-and-release. It also is geared to educate anglers about the importance of trophy fish to fish populations in Florida lakes. Data collected on the catch occurrence of trophy fish is critical for fisheries managers to identify trends in abundance and identify critical factors that contribute to the production of trophy-sized fish and to marketing efforts to promote Florida fisheries. This program will help document and promote the social, economic, and ecological value of these trophy fish. The Big Catch angler recognition program includes a trophy-pin for bass over 10-pounds, but is not adequately advertised, funded, or documented to achieve the desired results.



2. Involve stakeholders early in the process of major, resource-specific management actions such as new regulations and major habitat renovations.

State fish and wildlife agencies across the country have learned that management of resources is more successful if stakeholders are involved in the process from the beginning. This can be accomplished in a variety of ways from online surveys to traditional public meetings. Public meetings (either open or by invitation) involving stakeholders, researchers, and managers at the beginning of the process have great potential to help build stakeholder relationships, and ensure the FWC is managing a resource for stakeholder preferences by using the best available science. Individual resources should be identified and addressed prior to stakeholder involvement whenever possible. New information needs may be suggested during stakeholder meetings.

3. Design and implement a complete marketing plan for the BBMP and Florida's bass fishing.

Marketing of Florida's bass fishing and the BBMP is integral to success of the plan. See Appendix III (Marketing and Communications Plan). Greater refinement of economic impact of freshwater fishing on local economies, including indirect benefits, is needed to accurately promote fishing to traditional and non-traditional stakeholders.

4. Build partnerships with bass anglers, other stakeholders, government agencies, institutions, and private industry to complete fishing and lake improvement projects.

FWC has accomplished more fishing and lake improvement projects by partnering with other groups, because they have combined resources and worked as a team, than when operating independently. Economic shortfalls at all levels of government have reduced resources, which makes it even more important to develop strong partnerships with other groups to achieve FWC's goals. Other agencies and organizations might provide staff, funds, in-kind services, and/or lakefront property for fishing access.

5. Cooperate with the bass tournament industry and citizens to effectively manage bass tournaments to minimize negative perceptions.

The BBMP public survey indicated that many people are concerned with potential tournament impacts such as bass mortality, crowding at boat ramps and poor boating and angling ethics by some tournament anglers. This survey indicated that other anglers believe tournaments are good for bass fishing by promoting fishing, organizing anglers, and teaching ethics (catch-and-release specifically) and stewardship. (Visit the following link for a more detailed discussion about this controversial topic: Pros/Cons.)



Bass tournaments are very popular and generate a large amount of revenue for the fishing industry, the state of Florida, and local economies. Despite most tournaments being catch-and-release events, mortality occurs as a result of stress from catching, handling, and hauling of bass. Wilde (1998) summarized 25 years of studies of bass tournaments and indicated that tournament-association mortality averaged 28.3 percent during the 1990s when he estimated all sources of mortality. Tournament mortality increases with water temperature and can be very high during summer water temperatures (Schramm et al. 2006). Displacement of bass is another concern, especially when bass are transported from one water body to another during the course of a tournament (Wilde 2003).

Currently, any group of anglers may conduct a bass tournament without a permit or other interaction with FWC, unless they want a Tournament Exemption Permit. This permit exempts the tournament anglers from size limits during the course of the tournament, as long as permit requirements are met. These permit requirements

pertain to the handling and releasing of fish, and reporting of tournament results. This includes the requirement that all fish (even those which could be otherwise legally harvested) must be released, or if any bass perish, they must be donated to charity or research. FWC biologists will work with stakeholders to develop a direction for managing bass tournaments. Potential options to manage tournaments include: enforcement, regulation, education/outreach, research, and infrastructure.

6. Educate anglers and other stakeholders about where and why bass are stocked by meeting with stakeholder groups, recognizing stocked lakes with news releases and signs at boat ramps, and capitalizing on other promotional opportunities as they arise.

Stocking fish is not the solution to all fisheries problems, as many stakeholders believe. Educating stakeholders will help dispel this myth and help them understand when stocking is a useful tool. Promoting stockings will help with stakeholder education and promote the positive fisheries work done by FWC. Reference BBMP Communications Plan (Appendix III) to determine the best way to communicate with stakeholders.

7. Promote conservation of endemic black bass.

The diversity of black bass species (genus *Micropterus*) in Florida is second only to Georgia. Of nine described species of black bass, three are endemic to Florida: largemouth bass (including the Florida and Northern subspecies and an intergrade or hybrid version), shoal bass, and Suwannee bass. The north and northwestern portions of Florida are also home to the introduced northern spotted bass. Recent investigations indicate that a newly described provisional species of coastal spotted bass (*Micropterus* sp. cf. *punctulatus*) may also exist in streams in the Florida panhandle (Bagley et al. 2010; Tringali et al. 2010).



While populations of some species of black bass in Florida are robust, others are in need of conservation due to their extremely limited geographic range, their fragmented populations or threats to their genetic integrity resulting from hybridization with non-native species (Dakin et al. 2007; Koppelman and Garrett 2002; Tringali et al. 2010).

But one of the greatest conservation threats to all these species is environmental degradation of the watersheds and rivers where they exist (National Fish and Wildlife Foundation 2010).

People are often surprised to find out that these unique black bass species exist in Florida; this is simply because they were unaware that there are more than one species of bass in Florida. There is an urgent need to build stakeholder support for the conservation of these endemic black bass species through education and outreach efforts targeting both anglers and non-anglers. Further, there is a need to educate stakeholders about each species' biology, life history, habitat requirements, distribution, status and threats to the viability of their populations. The stakeholder support gained through these educational efforts will in turn build partnerships for the conservation needs of these unique bass species. It is imperative to discourage anglers to not move fish around due to negative impacts on these endemic species, particularly hybridization with non-native northern spotted bass.

Studies suggest that endemic species of black bass are not currently at risk to overharvest by recreational anglers. Promoting fishing opportunities to catch these unique species of sport fish can build stakeholder support; while promoting their conservation needs at the same time. Catch-and-release should be promoted and practiced when informing anglers where and how to fish for these endemic species.

It is recommended that magazine articles, brochures, posters, websites, news releases and fishing shows be utilized not only to promote fishing opportunities but also build support and partnerships for the conservation of these unique species of black bass.

8. Create, maintain and utilize a comprehensive list of freshwater fishing clubs and other anglers willing to volunteer within each region.

This list will serve as the foundation for developing volunteer participation in fisheries management, whether it is workdays to accomplish discrete habitat manipulations, constructing approved fish attractors, angler diary programs to document catch rates, or sampling for biological data collection. Use of volunteers and time spent managing their activities will be documented via the new agency volunteer coordinator and FWC's newly revitalized volunteer program. Providing stakeholders with the opportunity to participate in management gives them ownership in the resource, provides them with satisfaction, helps the BBMP meet its goals, and leverages agency resources. Alabama has instituted a program where clubs help install fish attractors. B.A.S.S. has a comprehensive list of current members in Florida willing to participate in volunteer days, and other anglers provided contact information during the BBMP stating that they want to help. FWC should also attempt to increase volunteerism with bass angler groups to work on projects that directly affect their fishing success, such as fish attractor installation. For example, currently more than 1,000 B.A.S.S. members in Florida are on a volunteer list to work on fishing improvement projects.

9. Promote Florida as a national angling destination for B.A.S.S. Slam opportunities.

As a program of another organization, FWC's role will be secondary to that of B.A.S.S. in the promotion of this program. Florida provides the greatest opportunity to catch multiple species highlighted by B.A.S.S. in the B.A.S.S. Slam, including the Florida largemouth bass that is only found in the Florida peninsula. There are locations in north Florida where five of the eight species of the B.A.S.S. Slam could be caught within short drives of a central lodging point or on a 'B.A.S.S. Slam Tour'. Information packets could be compiled and disseminated that provide information about lodging, access points, usable equipment (i.e., kayak vs. bass boat), species specific angling techniques, and peak angling seasons.

Identify angler friendly lodging facilities in areas that provide unique angling opportunities in relation to the B.A.S.S. Slam. Additional genetics work regarding spotted bass, shoal bass, and Alabama bass are needed to determine which species occur where in Florida. However, B.A.S.S. does not differentiate between spotted bass and Alabama bass in the B.A.S.S. Slam.



CONCLUSION

Florida has outstanding natural resources and our black bass play an important role ecologically and economically as they are enjoyed by both Floridians and tourists. When coupled with responsible conservation management plans and an engaged citizenry that understands the benefits of managing for healthy freshwater fisheries, we can ensure Florida is the undisputed “Bass Fishing Capital of the World.” Public input into this plan and innovative thinking will continually enhance our ability to reach our goal and adapt to new technological, environmental, political, and social issues. However, fisheries management is a complex issue and many seemingly straight forward tasks (see Appendix IV, Pro-Con issues) must be examined from multiple viewpoints and are not always within the power of one agency to implement. Therefore, the plan will be a working document that will drive applied research, adaptive management, public involvement, partnership development, and effective marketing. This is an ongoing effort to reach out and connect with our anglers and fishing-related businesses as well as to become more relevant to non-traditional stakeholders.



APPENDICES (See MyFWC.com)

APPENDIX I—Survey Results

APPENDIX II—Technical Assistance Group & Black Bass Management Team

APPENDIX III—Communications Plan

APPENDIX IV—Pro/Con Discussion of Complex and Controversial Actions

APPENDIX V—Table of Priorities, Costs, Authority, Manpower & Timeline

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GLOSSARY *(and Acronyms)*

Adaptive management: A method of natural resource management that integrates design, management, and monitoring to systematically test assumptions in order to modify and adapt the activities in response to the observed effects.

Age-structure: A breakdown of the different age groups of a particular fish species. For fishes, ages are commonly determined by counting annual rings associated with bony hard parts, such as fin spines and otoliths (ear bones).

Angler diaries: Records kept by anglers detailing their fishing trips. These diaries often contain details about the number and size of fish caught, weather and lake conditions, techniques used to catch fish (lure type, color of lure, speed of retrieve, etc.) and any other details the angler feels are important

Angler Ethics: Actions practiced by anglers that promotes safe and responsible enjoyment of fishing resources.

Angler-hour: A measure of fishing pressure. One angler-hour is equal to one angler fishing for one hour.

Angler success: The rate at which fish are caught by anglers. It is expressed in number of fish caught per angler-hour of effort.

Anthropogenic: Conditions that result from human activities. “Anthropo-” meaning human and “-genic” meaning produced from.

Aquatic habitat enhancement: Projects designed to improve or create new habitat in a body of water. Examples of aquatic habitat enhancement include but are not limited to replanting of native vegetation, removal of muck sediments, installing brush piles, and fish attractors.

ARES (FWC/Aquatic Resource Enhancement Section): The section of HSC within the FWC responsible for aquatic plant restoration projects.

Bag limits (creel limits): The legal number of fish an angler may possess in a given day.

B.A.S.S.: The Bass Anglers Sportsman Society’s goals are to create a credible and honorable tournament trail, to improve our environment by uniting and amplifying the voices of anglers and to secure a future for our youth.

BBMP (Black Bass Management Plan): A long-term management plan for all black bass species in Florida that will ensure their survival and sustainable use. This plan’s focus is to ensure Florida’s recognition as “The Bass Fishing Capital of the World.”

BMP (Best Management Practices): A set of standards designed to bring consistency, effectiveness, and efficiency to various programs, based on research and the practical learning of others. The suite of best available technologies or processes is intended to be practical and achieve the desired goal or objective.

Bed fishing: Angling for fish while they are preparing a spawning bed or protecting eggs and fry. Often done by sight fishing and sometimes using a ladder or other high platform to locate breeding fish and target them.

Benthic: The bottom of rivers, lakes, or oceans; can also refer to organisms that live on the bottom of water bodies.

“Big Catch”: An angler recognition program that encourages fishermen with a memorable catch (based on minimum length) of one of 33 different species of Florida freshwater fishes.

Biodiversity: The number of different species inhabiting a specific area or region.

Biological productivity: The rate at which biomass is produced.

Biomass: The total weight or volume of a species in a given area. Some research, for instance, shows that total biomass may increase when new species (exotics) are introduced if they find a new niche; otherwise, they may replace native species.

Biota: Animal or plant life of a region considered as a total ecological entity.

Black bass: The group of freshwater sunfish, belonging to the Family Centrarchidae and Genus Micropterus, in Florida they include at least largemouth bass, shoal bass, spotted bass and Suwannee bass.

Blocknet: A net that is set to surround a tenth to a full-acre (depending on the size of net) of water from the water surface to the substrate (bottom). All of the fish in it are then killed normally using a toxin (rotenone) or percussion (explosive) so that all the fish can be collected, identified, counted, weighed and other detailed information may be recorded. It is the most comprehensive method of evaluating a freshwater system, but seldom used because of its lethality.

Bream: A generic term frequently used to describe the smaller sunfishes or panfish, such as bluegill, redear and spotted sunfish.

Camps: Fish camps are normally conducted as week-long day camps or overnight weekend camps. Research shows that the students' commitment to attending and the greater exposure to conservation issues and angling skills results in more measurable long-term behavioral changes—the goal of education efforts.

Carrying Capacity: The maximum number of organisms that can be supported in a given area or habitat.

Catch-and-Release: The practice of immediately releasing fish caught by an angler.

Catch-per-unit-effort (CPUE): The number of fish or invertebrates caught per unit of effort (e.g., hour or day; see definition of effort below). Catch-per-unit-effort is often used as a measure of relative abundance for a particular fishery species.

Climate change: The change in global weather patterns that are the result of human activities.

Clinics: Short educational programs (less than one day) designed to expose individuals to recreational fishing and to teach fishing skills and ethics.

Closed seasons: A period of time where harvest of a species is prohibited.

CMI (Commission-Managed Impoundment): Impoundments managed as public fishing opportunities by the FWC.

COE (U.S. Army Corps of Engineers): The federal agency whose mission is to provide vital public engineering services in peace and war to strengthen our Nation's security, energize the economy, and reduce risks from disasters.

Communication: Ideally communication is a two-way flow of information that allows parties at both ends to agree to a given set of facts and understand each other's positions and their feelings about them.

Conditional species: The importation and introduction of non-native species is regulated under Florida Administrative Code 68-5.001. Conditional species are defined as non-native species that may only be possessed with a permit from the FWC. More information can be found online at: myfwc.com/RULESANDREGS/Rules_Nonnative.htm

Conservation: The protection, improvement, and use of natural resources according to principles that will assure their highest continued economic or social benefits.

Creel (and Creel Survey): An angler study designed to gather information about angler effort for and the harvest of fish species in a given fishery.

CRO (FWC/Community Relations Office): The office within the FWC responsible for ensuring effective communication with the public.

DEP (Department of Environmental Protection): The state agency in Florida responsible for protecting our air, water, and land resources and enforcing the environmental laws protecting the state.

Derbies: One day fishing events hosted by the FWC or other third parties, where the public is invited to fish at a given location. These events are often staged to introduce individuals to the sport of fishing who might not otherwise have the opportunity to go fishing.

DFFM (FWC/Division of Freshwater Fisheries Management): The division of the FWC responsible for managing the freshwater fisheries within the state of Florida.

Discard Mortality: Fish that cannot be kept because of regulatory constraints (size limits, bag limits, etc.) must be released. Some percentage of these may die and estimates of this mortality are included in fishing mortality estimates.

DJ—Dingell-Johnson Act: see SFR-Federal Aid in Sportfish Restoration Act

Drainage: The entire surface area of land that a flowing body of water drains.

Drawdown: The intentional lowering of a body of water to a level substantially lower than its typical water level. Managers employ drawdowns for a variety of reasons including: manipulation of aquatic plant and animal populations, and to aid in the removal and consolidation of muck sediments.

DRI—Development of Regional Impact: Chapter 380 of the Florida Statutes directs Regional Planning Councils to coordinate review of large-scale development projects which, because of their character, magnitude, or location, could have a substantial effect upon the health, safety, or welfare of the citizens of more than one county. Such projects are designated as DRIs and typically require input from many reviewing agencies.

Ecosystem: A community of organisms and the physical environment they live in interacting as an ecological unit; the entire biological and physical content of a biotope; biosystem.

Education: A process, by which skills, attitudes, knowledge and behaviors are established, enhanced and supported through a planned series of experiences that enable the individual to make informed decisions.

Effort: The amount of time and fishing power used to harvest fish. Fishing power includes gear type, size or efficiency, boat size, and horsepower. In recreational fisheries it is often expressed in angler-hours.

Electrofishing: A generally non-lethal method of sampling fish where an electrical current is passed through the water to immobilize fish. Stunned fish are collected using a dip net and biological data can be collected on the fish sampled.

Emergent plant: Aquatic plants that are rooted in the bottom, extend above the surface of the water and are self-supporting.

Endemic: Native to, and restricted to, a particular geographical region.

Eutrophication: The process by which nutrients, mostly nitrogen and phosphorus, important to biological productivity accumulate within a body of water. This process can be both naturally occurring and caused by human activity.

Exotic: Introduced species not native to the place where they are found.

Fecundity: A measurement of the egg-producing ability of a fish. Fecundity generally increases with age and size of the fish.

Fingerling: Loosely speaking fingerlings are young finger-sized fish. However, in hatchery settings Phase-I fingerling bass are typically about $\frac{3}{4}$ -1 $\frac{1}{2}$ " long and historically were raised in outdoor ponds on zooplankton.

Fish Attractors: Generally speaking fish attractors are objects placed in the water to provide structure and habitat that concentrate fish in a given area. Fish attractors can be made of many different materials including: brush piles, rock piles, and PVC pipes.

Fisheries biology: The study of aquatic resources that include species of cultural and economic importance, the other organisms that they interact with, the environment they live in and the people that use the resource.

Fisheries recruitment: see Recruitment.

Fishery: A specific aquatic resource that include a species of cultural and economic importance, the other organisms that they interact with, the environment they live in and the people that affect the important species.

Fishing pressure: The amount of fishing activity on a given body of water. Fishing pressure by recreational anglers is most often measured in angler-hours.

Floating plants: Aquatic plants that float on the surface of the water and are not attached to the bottom.

Floy tag: An external tag attached to a fish that is used to identify a fish in a tagging study.

FMA (Fish Management Area): Water bodies that are specifically managed by the FWC using special regulations specific to that body of water.

Forage: The organisms that make up the diet of a fish species. In short, forage refers to all the "bait" fish species a bass eats.

Fry: Juvenile fish that have recently hatched. Yolk-sac fry are the young fish that still have a visible yolk sac providing them with nutrients until they are capable of feeding.

FWC (Florida Fish and Wildlife Conservation Commission): The agency responsible for managing Florida's fish and wildlife resources for their long-term well being and the benefit of people.

FWRI (FWC/Fish and Wildlife Research Institute): The division of the FWC responsible for coordinating and conducting research within the agency. They provide technical knowledge to the rest of the agency.

FYCCN (Florida Youth Conservation Center): Youth outdoor education centers established throughout the state, with the goals of exposing children to outdoor recreational activities, teaching children outdoor recreational skills and ethics and instilling an appreciation of the outdoors.

Genetic stock: see Stock.

Genetic tags: A method of genetically identifying fish from a particular stocking by determining the genetics of the parent fish that produced them.

Gillnets: A method of sampling fish, where a net is set in the water typically overnight. Fish are caught when they swim into the net and become entangled in the mesh of the net.

GIS (Geographical Information System): A computerized system of organizing and analyzing any spatial array of data and information.

Growth: Change in fish length or weight over time. We typically use change in length to describe growth in bass.

Harvest: The removal of fish from a body of water. Often measured as the total number or pounds of fish caught and kept from an area over a period of time.

HSC (FWC/Habitat and Species Conservation): The division of the FWC responsible for maintaining stable or increasing populations of fish and wildlife and managing the habitat they inhabit.

Hybrid: The offspring produced from the crossing of two distinct genetic strains or species.

Hybrid vigor: The production of genetically superior offspring through the crossing of genetically different parents. Crossing Florida and Northern largemouth bass provide some of this enhanced genetic benefit in fish stocked in some other states. However, since when they reproduce you lose many of the benefits, they are not desirable in Florida where they could contaminate pure Florida stock.

Hydrilla: An exotic aquatic plant that was first discovered in Florida in 1959. It has caused problems for aquatic plant managers because it can spread quickly, crowd out native vegetation and can be difficult to control.

Ichthyologists: Biologists that study fish.

Imperiled species: A species found on the state's consolidated list of the official state and federal lists of endangered species, threatened species, and other species designated in some way by the respective jurisdictional agencies as meriting special protection or consideration.

Impoundment: A body of water or sludge confined by a dam, dike, floodgate, or other barrier.

Intergrade: A hybrid population that possesses the genes of at least two other distinct subspecies or species.

Introduced Species: A species that has been spread to areas outside of its natural range by the actions of humans.

Invasive Species: Non-native species that have been shown to cause damage ecologically or economically.

IPMS (FWC/Invasive Plant Management Section): A section within the FWC responsible for directing and operating Florida's invasive plant management program.

Karst topography: A region underlain by limestone rock and typified by caves, sinkholes, springs, and distinctive water chemistry.

Length-Weight: The relationship between length and weight of a fish. This relationship is often used to determine the health or well being of a fish.

Lentic: A term used to describe standing water systems like lakes and ponds

Limited Entry: A management control used to reduce fishing pressure and effort by reducing the number of vessels or fishermen in a fishery. Tenoroc is an example.

Limnology: The study of freshwater systems.

LMB (Largemouth Bass): A highly regarded sport fish belonging to the family Centrarchidae and Genus Micropterus.

Lotic: A term used to describe flowing water systems like rivers and streams.

Macrophyte: Aquatic plants or algae large enough to be seen by the naked eye

Mark recapture: A method of determining the size of a population, where individuals are collected and marked. The marked individuals are then released and allowed to disperse. A sample is then collected from the population and the ratio of marked individuals versus non-marked individuals is compared.

Marketing: Implementing an array of activities designed to ensure that we continually meet our customers' diverse needs and in return are able to accomplish our mission and establish a brand. Classically, marketing involves product, price, placement and promotion, for us it involves the efforts necessary to see Florida recognized as the "Bass Fishing Capital of the World."

Maximum size limit: The maximum size of a regulated species that may be harvested.

MSY (Maximum Sustainable Yield): The largest average catch that can be harvested continuously (sustained) from a stock during typical environmental conditions that will not destroy a stock's ability to renew itself. Historically used to manage marine commercial fisheries, but not currently used in Florida's fresh waters, compare to Optimum Sustained Use.

Media Relations: Developing support and trust with major media (e.g., newspapers, periodicals, radio and television stations, and increasingly with web and social media outlets) to enhance information dissemination via media channels and crisis management.

Microwire tags: A small length of wire encoded with a number that is injected into a fish in order to identify the fish in a tagging study.

Minimum flow: The minimum water flow rate necessary to prevent harm to an aquatic system.

Minimum size limit: The minimum size of a regulated species that may be harvested.

Mitigation: Compensation activities required to make up for the alteration of natural resources or habitat pivotal to the survival or well-being of listed species.

Monitoring: The systematic measurement of environmental characteristics over an extended period of time to determine the status or trends of some aspect of environmental quality to detect any changes that may occur.

Mortality: The rate of death in a population or section of the population. It is often expressed percent loss, loss per unit of time (per day, per year) or a combination of both.

Muck: The loose layer of decaying organic matter often found on the bottom of bodies of water with extensive aquatic vegetation.

NGO (Non-Government Organizations): Examples in conservation are B.A.S.S., Florida Wildlife Federation, and National Audubon Society.

Niche: The position or function of an animal in the community or ecosystem in which it resides.

Non-native: Species that do not occur naturally in an area.

OBW (FWC/Office of Boating and Waterways): A section of FWC Law Enforcement that manages and promotes use of state waterways for safe and enjoyable boating, oversees and coordinates waterway markers on state waters, provides boating education and boating safety programs, improve boating access and many waterway safety programs.

OIT (FWC/Office of Information Technology): An office of FWC that is responsible for developing and implementing information technology for the agency. They provide the agency with: network, computer, internet/intranet web, and telecommunications services.

Optimum sustained use: The use of a species that achieves the greatest overall benefits, including economic, social, and biological considerations. Maximum sustainable yield only considers biological and economic benefits. Optimum sustainable use allows less harvest than maximum sustainable yield and typically provides more of a buffer against overharvest ensuring sustainability for future generations. It leaves more fish in the water. The term includes both commercial and recreational use and recognizes the value of catch-and-release and other uses that do not necessarily result in removal of the fish.

Outreach: Recruiting and retaining participants by reducing barriers and providing them with the how-to, where-to and confidence to be involved in outdoor activities in a safe and ethical manner that ultimately reflects their stewardship role in conserving fish and wildlife resources. Increasing participation in fishing by reaching out to underrepresented groups (e.g., youth, women, minorities) is an important aspect of outreach.

Overfishing: Harvesting at a rate exceeding the rate at which fish can replenish themselves through reproduction.

PAC (Percent area covered): A measure of the percentage of the bottom area of a water body with aquatic macrophytes growing on, or over it. Aquatic scientists use PAC to assess the abundance and importance of aquatic plants in a water body.

Phase-I fingerlings: In a hatchery, young fry are traditionally placed in ponds that have been prepared and fertilized to have an abundance of zooplankton. Once the zooplankton are consumed, bass fingerlings are typically about one-inch long. At this point, they need more food and hence historically were harvested and stocked in public waters to fend for themselves. Research has shown that relatively few survive if they are placed in waters with existing bass and other predators. Hence Phase-I bass fingerlings are generally used only in new ponds or reservoirs, or other unusual circumstances leading to a near absence of predators.

Phase-II fingerlings: Modern hatcheries are now able to produce Phase-II fingerlings that are often 4 to 6 inches long and thus much more capable of avoiding predation and finding a wider diversity of prey. To be cost effective, Phase-II production requires the use of artificial fish feed—something bass fingerlings typically would not accept until some pioneering research by FWC biologists and development of a specifically formulated feed by FWC hatchery biologists and UF scientists. Research is still needed to optimize use of these fish, for instance current work is developing strategies to retrain the bass to hunt and consume live prey and to avoid predation.

Phytoplankton: Microscopic plants. A bloom can occur when there are adequate or excess nutrients in the water and abundant sunlight. Like other plants they give off oxygen when there is adequate light for photosynthesis (which allows them to convert energy and grow) but in the dark they use oxygen. Hence, when dark rainy days occur a large bloom can deplete dissolved oxygen from the water and cause a fish kill.

Population dynamics: The interactions of recruitment, growth, and mortality that determine the abundance, age structure, and sizes of individuals in a population.

Predator: Any organism that exists by preying upon other organisms.

Prey: An animal that is a source of food for another animal, esp. by a carnivorous animal.

Publications: Generally a one-way flow of information that is part of a communications, marketing, education or outreach effort. Publications typically include all forms of printed information, but generically can also include audio-visual publications, materials published in digital form and the web.

PVI (Percent volume inhabited): a measure of useable habitat. In measuring aquatic plants it relates to the amount of the water column that has plants, thus adding a third dimension to Percent Area Covered (PAC).

Recruitment: A measure of the number of fish entering a specific phase of a fish stock during a given period (e.g., how many bass survive to be 12" long each year).

Relative Weight (Wr): An index of condition calculated by dividing the weight of a fish by a length-specific standard weight for that species.

Restoration: Management actions to return a vegetative community or ecosystem to its original, natural condition.

RFA (Regional Fisheries Administrator): FWC divides the state into five regions. The DFFM has a regional fisheries administrator in each region that supervises the other freshwater fisheries biologists and interacts with the public, other agency personnel and other agencies on behalf of the Division Director.

Riparian: Areas along or adjacent to a river or stream bank whose waters provide soil moisture significantly in excess of that otherwise available through local precipitation. Riparian land owners (either individual or corporate) have an important influence on fisheries management activities and can benefit directly from well-maintained aquatic resources, including rivers, lakes and other water bodies.

Sedimentation: The settling out and accumulation of sediments on the bottom of a body of water.

Seine: A length of netting (usually 3-10 feet deep) with weights at the bottom and floats at the top that is pulled from both ends through the water to sample fishes.

SFR (Federal Aid in Sport Fish Restoration Act): A federal program that provides grant funds to state fish and wildlife agencies for fishery projects, boating access and aquatic education. The program is authorized by the Sport Fish Restoration Act (Dingell-Johnson DJ) of 1950. The SFR Program was created to restore and better manage America's declining fishery resources and was modeled after the successful Wildlife Restoration Program. Through the purchases of fishing equipment, motorboat and small engine fuels and import duties the SFR Program is one of the most successful user pay, user benefit programs.

Size structure: The relative number of fish of different sizes in a population.

Slot limit: A special size regulation that is placed on certain lakes to improve the fish population. Fish that measure within the protected slot limit must be released immediately, while fish that are either shorter or longer than the protected range may be kept. Slot limits are commonly used to protect large fish, promote harvest of smaller fish and increase growth rates in lakes.

Social marketing: The methodical application of marketing along with other concepts and techniques, to achieve specific goals for a social good. A major component is developing community support to create a new social norm (e.g., anti-littering campaigns).

Species: Organisms of the same kind that classically interbreed and produce fertile offspring including any subspecies of fish or wildlife or plants, and any distinct population segment of any species or vertebrate fish or wildlife which interbreeds when mature.

Species of Special Concern: A species, subspecies, or isolated population of a species or subspecies which is facing a moderate risk of extinction or extirpation from Florida in the future, as determined by the FWC Rule 68A-1004 (27).

Standard Weight (Ws): A weight established by a standardized regression calculation of weight on length for a particular species. “Standard weight” equations usually include fish throughout a species’ range and are based on a 75th percentile weight rather than average weight in a length-class.

Stakeholder: Any person or organization having an interest in the actions discussed or who is/are affected by the resulting outcomes of a project or action.

Standing Crop: The total number or weight (biomass) of fish in a water body at a given time.

Stock: A managed unit of fish. A stock is based on genetic relationships, geographic distributions, and movement patterns. For instance, the FWC manages largemouth bass as four separate stocks. These stocks are genetically different, and are somewhat geographically separated by water basins.

Stocking: Releasing fish into a water body to create a new fish population or, less often, to supplement an existing population. Stocking is most effective in new or renovated waters that do not already contain fish populations. In such waters, stocking a specific ratio of predator to prey fish should result in a balanced population. Stocked fish are usually raised in hatcheries but may also be transplanted from other water bodies.

Stewardship: Taking personal responsibility to sustain, and enhance natural resources, while accepting the obligation to the environment and future users.

Submersed plants: Aquatic plants that grow completely below the water and are supported by the surrounding water.

Subspecies: A group of interbreeding natural populations differing taxonomically and with respect to gene pool characteristics, and often isolated geographically, from other such groups within a biological species.

Sunfish: A group of freshwater fishes (Family Centrarchidae) including black bass, black crappie, bluegill, redear sunfish and many others.

TAG (Technical Assistance Group): A group of knowledgeable Florida residents representing diverse stakeholder groups affected by the FWC’s black bass management decisions.

Threatened Species: Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Or as designated by the FWC in Florida, a species, subspecies, or isolated population of a species or subspecies which is facing a very high risk of extinction or extirpation from Florida in the future, as determined by the FWC Rule 68A-1004 (27).

TMDLs (Total Maximum Daily Loads): A tool for implementing state water quality standards that is based on the relationship between pollutants and in-stream water quality conditions.

Tiered regulations: The tiered system is a current set of regulations that FWC biologists can use to manage a sport fishery. There are three tiers of regulation: Statewide, Quality and High Quality. There are two special tiers for urban ponds. It was developed as a compromise between the desire to manage each lake optimally based on changing conditions and trying to keep rules simple.

Trawl: A net with a triangle shaped pocket that is pulled through the water by a boat to collect aquatic organisms. The net opening has a weighted bottom and a float line on the top that help keep the net open while being pulled.

Triploid: An animal with three sets of chromosomes rather than the normal two (one from the mother and one from the father). The third set prevents their chromosomes from dividing equally during the production of eggs and sperm, which renders them functionally sterile. This also can cause them to grow faster throughout more of the year since energy isn't diverted to gamete (egg/sperm) production. In the Florida BBMP, this plays a role for special use fisheries where rapid growth is desired but minimizing reproduction (competition for food and energy diversion) is desirable. Moreover, it helps alleviate issues with genetic stocks or artificial selection, since the triploids won't reproduce and adversely affect native basses.

Trophic: Refers to the amount of nutrients (fertilizer) and productivity of a system. Hypoeutrophic systems lack nutrients and typically have clear water but relatively few fish. Hypereutrophic systems have too much nutrients tending to cause algae blooms or other excessive plant growth.

USFWS (U.S. Fish and Wildlife Service): A federal government agency dedicated to the nationwide preservation and management of fish, wildlife, and habitat.

Water schedule: An artificial hydroperiod (the temporal pattern of water level fluctuation that occurs naturally with seasonal changes) implemented on impounded waters. Biologically it is important that these mimic natural hydroperiods to which the biota is adapted as much as possible. This is often contrary to the water managers' needs (such as to retain water for potable or irrigation needs during droughts, or conversely to move water away to prevent riparian flooding during wet seasons).

WB (Wallop-Breaux): A federal grant fund also known as Federal Aid in Sportfish Restoration (see SFR).

Wildlife 2060: A report written by the FWC to inform the general public about changes that may face Florida's fish and wildlife and our own lifestyles if the population of the state doubles. The report is based on projections and analysis by FWC's 2060 team as well as many scientists in the agency. The report can be found at myfwc.com/wildlife2060.

WMD (Water Management Districts): There are five regional water management districts that are charged with the responsibility of managing the state's water resources.

WSA (Water Supply Areas): Areas that are designated and managed for their ability to recharge the surrounding aquifer, to further protect the state's water supply.

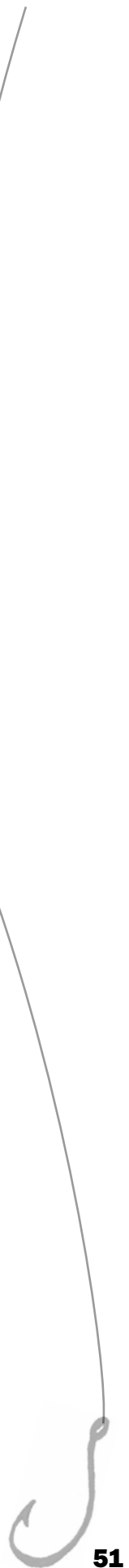
Youth fish/hunt programs: Programs or summer camps that introduce youth to the skills of hunting and fishing. These programs are designed to involve youth with community-based outdoor activities in order to strengthen their bond with nature and wildlife.

Zooplankton: Microscopic animals that float in the water. They typically feed on phytoplankton (microscopic plants) and are important food for fry and fingerling sunfish.

Appendix V. This is a summary of all the action items, indicating an average importance score from the BBMP Team and TAG group (High to Low). Timeline (s=short, m=medium, l=long to begin working). Authority indicates if we can do independently (Yes), or need to work through other agencies or get rule/policy changes made before implementing. Cost and man-power indicate if we can divert existing resources to complete the action or need to solicit additional funds or staff (this may be via volunteers, partnerships, donations, grants etc.). Responsible parties indicates divisions or other groups that must work together to accomplish the action.

ACTION ITEMS	SCORE	TIME-LINE	AUTHORITY	COST	MAN POWER	RESPONSIBLE PARTIES
New Opportunities						
1. Pursue public access to reservoirs during their planning phase, and develop management plans and agreements with water management districts and the Corps of Engineers (COE) to produce appropriate trophy black bass fisheries.	2	S	Y	Y	Y	DFFM, WMDs and COE
2. Make it easy for the public to find places to fish and freshwater public access (e.g., ramps, piers, shoreline access) using electronic and print media.	2	S	Y	Y	Y	LE, IT,FWRI and DFFM
3. Formalize partnerships with WMDs, federal, local, and state governmental agencies, and private landowners to enhance public access.	1	M	Y	Y	Y	LE, DFFM and FWC Land-use Planning team
4. Help local communities to attract major bass tournaments by enhancing ramps and associated facilities that will benefit local economies and anglers.	3	S	Y	Y	Y	DFFM
5. Implement complete de-water renovations on aging reservoirs and lakes with water control structures to stimulate trophy largemouth bass fisheries.	2	L	N	Y	Y	DFFM, WMDs
6. Create contingency plans to enhance fisheries on water bodies that naturally experience rapid water level changes to provide long-term benefits.	3	M	Y	N	Y	DFFM
7. Develop a network of special-opportunity trophy bass fishing areas, on water bodies not currently open to the public.	4	L	Y	Y	y	DFFM and Public collaborators

HABITAT Management						
1. Prevent habitat degradation in areas of existing healthy habitat in collaboration with other agencies as needed.	1	L	N	N	N	DFFM, DEP
2. Manage native plants to create and maintain a symbiotic relationship between plants, fish, and people that will improve and sustain black bass fisheries.	1	L	Y	Y	Y	DFFM, HSC, DEP, WMDs
3. Implement FWC's new hydrilla-management position on specific waterbodies to improve largemouth bass fishing.	1	MS	Y	Y	Y	DFFM, HSC, HGM, COE, WMDs, DEP, some local and county governments
4. Partner with water management districts and the Corps of Engineers to develop new water regulation schedules and to monitor and recommend minimum flows and levels to help maintain healthy black bass populations.	2	L	Y	Y	N	DFFM, HSC, WMDs, DEP
5. Improve bass habitat conditions by manipulating water levels for fisheries enhancement purposes.	2	L	N	N	Y	DFFM, HSC, WMDs, COE, DEP, and FWS
6. Revegetate lakes where a high probability of successful expansion of native aquatic plants exists.	2	ML	N	Y	Y	DFFM, HSC, DEP, WMDs
7. Restore wetlands adjacent to potential fisheries to promote healthy lake waters and protect wetland wildlife communities.	2	L	Y	Y	Y	DFFM, DEP, WMDs, HSC
8. Create structural habitat in water bodies to increase/improve fishing opportunities in new water bodies.	3	M	Y	N	Y	DFFM, DEP, COE, WMDs
9. Create a substrate enhancement program that incorporates a FWC/volunteer run project to construct fish attractors to concentrate fish, and improve catch rates and angler satisfaction.	2	M	Y	Y	N	DFFM, DEP, WMDs
10. Adhere to and promote appropriate water quality standards to support black bass species.	3	L	Y	Y	Y	DFFM, HSC, DEP



11. Identify, protect and repair damaged habitat that is critical to sustain shoal and Suwannee bass populations.	2	L	N	Y	Y	DFFM, FWRI, HSC
FISH Management						
1. Establish customized harvest regulations to manage black bass populations at selected water bodies.	2	M	Y	Y	Y	DFFM
2. Determine the potential effects of bed fishing on black bass populations.	1	L	Y	Y	Y	FWRI, DFFM
3. Ensure genetic diversity, fitness, and conservation of Florida largemouth bass.	1	S	Y	Y	Y	DFFM, HSC, FWRI, LE
4. Ensure the genetic integrity, fitness, and conservation of endemic black bass within Florida panhandle river systems.	3	M	Y	Y	Y	DFFM, FWRI
5. Stock fingerling (Phase-I; about 1-inch long) largemouth bass into new reservoirs and into lakes following major fish kills or droughts.	1	M	Y	Y	Y	DFFM
6. Stock advanced-sized (Phase-II, 4-6 inches) largemouth bass fingerlings into water bodies where recruitment is limited.	3	M	Y	Y	Y	DFFM, FWRI
7. Stock supplemental forage into small water bodies to improve growth rates of largemouth bass.	4	L	Y	Y	Y	DFFM
8. Manage impacts caused by exotic fish species on bass populations in Florida.	4	L	Y	Y	Y	DFFM, HSC, FWRI
PEOPLE Management						
1. Implement a trophy fish documentation and release program.	1	L	N	Y	N	DFFM, FWRI
2. Involve stakeholders early in the process of major, resource-specific management actions such as new regulations and major habitat renovations.	1	S	Y	Y	Y	DFFM
3. Design and implement a complete marketing plan for the BBMP and Florida's bass fishing.	1	S	Y	Y	Y	DFFM, CRO

4. Build partnerships with bass anglers, other stakeholders, government agencies, institutions, and private industry to complete fishing and lake improvement projects.	2	M	Y	Y	Y	DFFM
5. Cooperate with the bass tournament industry and citizens to effectively manage bass tournaments to minimize negative perceptions.	2	M	Y	Y	Y	DFFM, FWRI
6. Educate anglers and other stakeholders about where and why bass are stocked by meeting with stakeholder groups, recognizing stocked lakes with news releases and signs at boat ramps, and capitalizing on other promotional opportunities as they arise.	3	S	Y	Y	Y	DFFFM, PICs
7. Promote conservation of endemic black bass.	1	L	Y	Y	Y	DFFM
8. Create, maintain and utilize a comprehensive list of freshwater fishing clubs and other anglers willing to volunteer within each region.	4	S	Y	Y	Y	DFFM
9. Promote Florida as a national angling destination for B.A.S.S. Slam opportunities.	3	ML	Y	Y	Y	DFFM



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