Florida Fish and Wildlife Conservation Commission

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Black Bass Management Plan (2010-2030)

A long-term, science-based, and citizen-guided plan to establish Florida as the undisputed "Bass Fishing Capital of the World"

WORKING DRAFT

DRAFT

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EXECUTIVE SUMMARY

Goal: Establish Florida as the undisputed "Bass Fishing Capital of the World."

Vision: Florida Bass populations and fisheries in secure, good quality habitat that provide anglers with large numbers of trophy bass, plentiful locations and opportunities to seek trophy bass, a high probability of catching bass in many localities, increased numbers of anglers and angler effort and a high degree of angler satisfaction. As a result, the worldwide angling public recognizes Florida as the "Bass Fishing Capital of the World," based on great resources and responsible management.

INTRODUCTION

This long-term 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 are collectively creating the plan to engage the public and fishing-related businesses as well as other agencies and non-profit organizations to establish Florida as 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 period is described as 2010-2030, this document will be a living plan allowing adaptive management, public input, and new scientific breakthroughs to continually improve our results and allowing us to be as effective and efficient as possible.

Our purposes are: (1) create a scientifically justified document (with references and specific objectives) to guide FWC efforts, (2) ensure the public has open input into the objectives and priorities to create ownership and provide support for conservation efforts (e.g., vocal, volunteer, fiscal and compliance), (3) be proactive and open to new ideas.

To this end, a master document will be created with:

- An introduction explaining our goal, process of including public input, TAG review and other process-oriented information;
- A background including basic information on the current status of the fisheries (scope, use, trophies, economic value, habitat etc.);
- A section on basic black bass biology;
- An explanation of the management tools that are currently available;

- The action plan (divided into four sections: New Opportunities, Habitat, Fish, and People, each with scientific references and sidebars to explain complex facts--or pro/con choices and tradeoffs to the public;
- A conclusion (what we expect to get out of this and how it will be modified as new technology, public opinion, environmental conditions or politcal and fiscal realities occur);
- Appendices with Survey Results
- A literature review, and
- A glossary, including acronym definitions.

This plan is an evolving strategy that will incorporate all aspects of the FWC, such as regulation management, law enforcement, habitat restoration, aquatic plant control, boating access, fish stocking, education and outreach. It will also encourage better coordination of efforts with other partner agencies to focus resources to clearly establish Florida as the undisputed "Bass Fishing Capital of the World."

To optimize use of angler fishing license dollars and federal excise taxes on fishing tackle and motor boat fuels, we seek to hear from as many anglers as possible. Visit MyFWC.com/BlackBass_Survey to let us know what types of bass fishing opportunities you want and what tradeoffs you are willing to accept to create those options.

BACKGROUND

CURRENT STATUS: Florida is presently 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 Associated Recreation Survey (US Census Bureau, for the US Fish and Wildlife Service, 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% of all IGFA records in the USA come from Florida (Florida has 4,755 vs. No. 2 Alaska with 1,354, of 13,534 USA records, including line-classes). Florida even has more records than the next highest country with 18.5% of all IGFA records worldwide (Australia has 1,530 records, of 25,652 worldwide) come from Florida, as listed by the International Game Fish Association (Pers. Comm., Jack Vitek, IGFA World Records Department).

Of 2.8 million anglers fishing in Florida, 1.9 million were residents and 0.9 million were tourists. 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 (US Census Bureau, for the US Fish and Wildlife Service, 2006).

Florida produces many of the world's premier bass fisheries and bass anglers spend more than 14 million days each year here, which generates $1.25 billion for the state's economy (US Census Bureau, for the US Fish and Wildlife Service, Florida Edition, 2006). 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). Moreover, Florida has shoal (*M. cataractae*), spotted (*M. punctulatus*) and Suwannee bass (*M. notius*), each of which exist only in discrete areas and require specific habitat and prey to maintain their populations. Programs such as the Black Bass Grand Slam promoted in *BassMaster Magazine* are drawing more attention to these limited populations – necessitating greater attention to conservation practices to ensure their sustainability.

Florida's widely dispersed populations of largemouth bass are available within a 30-60 minute drive from anywhere in the state, except for the Keys. These are native bass thriving in natural habitats, which adds to the enjoyment. Every year a few thrilled Florida anglers report 13-15 pound trophy bass.

The fishing public perceives Florida to be among the top bass fishing states, but the fishery and trophy fish availability is depleted from historic levels in many localities, as documented in 'big fish' tournament records over the past several decades (unpublished, FWC records). Numerous pressures challenge fish management, including human population growth and development, declining water quality and current water management and fish management policies. Climate change effects including precipitation and sea level changes may create additional impacts. Preliminary opinion surveys of stakeholders indicates satisfaction with the fishery but some lack of confidence in FWC fish management and numerous concerns about negative impacts on bass populations and fishing opportunities (Appendix I).

This plan is action-based and will help FWC staff to develop solutions for management issues such as habitat enhancement, aquatic plant control, fisheries regulations and appropriate stockng 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, 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 engulf a variety of prey and help keep forage fishes in balance. All black bass species exhibit nesting behavior during the 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 thousands produced during each spawn, only a few adult survivors are required to keep adult population levels stable.

A world-renowned reputation for trophy-sized bass is based on the genetically unique Florida largemouth bass that is native only to peninsular Florida. Further north and west through the panhandle, "intergrade" largemouth bass populations exist that have genes from both Florida largemouth bass and northern largemouth bass (*M. s. salmoides*) subspecies. In addition, there may be some Alabama spotted bass (*M. henshalli)* in north Florida Rivers (Pers. Comm. John Knight). Because of rapid growth and top weights that exceed 12 pounds in warmer climates, Florida bass have been stocked in many states and foreign countries to enhance existing fisheries and create trophy-sized 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 the 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 they 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) and a non-certified 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 and were certified 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 by an angler catching a stocked Florida largemouth bass in Japan in 2009.

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 Ochlockonee 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 listed as a Species of Special Concern.

Suwannee bass are the most colorful of the black basses occurring in Florida and may be marked with dark, diamond-shaped blotches along bronze-colored sides and turquoise-blue coloring on the underside of the head and throat; 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 brushpiles that may provide foraging cover and protection. Crayfish are their most important food source, but their diet also includes fish and freshwater shrimp; even crabs are eaten in tidal areas. 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 river it was named after.

Spotted bass are often confused with largemouth bass, but have horizontal rows of dark spots running along their lower sides, and the jaw does not extend back beyond the eye. Somewhat

limited in its Florida range, the spotted bass is restricted to panhandle streams from the Apalachicola River system west to the Perdido River. Records indicate that Georgia biologists stocked them in Georgia rivers. Spotted bass are endemic to the lower and central Mississippi basin and extend northward to Illinois, eastward to the Ohio River drainage in West Virginia, south to the Gulf Coastal systems from the panhandle of Florida, and westward (excluding the Mobile basin) to the Guadalupe River in Texas (Boschung and Mayden 2004). Hubbs and Bailey (1949) recognized two subspecies of spotted bass, *M. p. punctulatus* and *M. p. henshalli,* with the latter being recognized as Alabama bass, a distinct subspecies found in the Mobile basin (Baker et al. 2008).

In Florida, spotted bass inhabit large creeks and river systems in the western panhandle including the Escambia, Blackwater, Yellow, Choctawhatchee, Econfina, and Apalachicola. Recent surveys by FWC biologists have identified spotted bass populations expanding into the Chipola River, which connects to the Apalachicola River system. Although this species of black bass thrives in reservoirs throughout the southeastern United States, none are found in reservoirs in the panhandle of Florida. There is limited data on the genetics, life history, and angler utilization of this species of black bass in the state. Spotted bass prefer a stream environment having moderate to swift flow with gravel bottoms, deep pools, and cover provided by snags and brush. Like Florida's other stream-oriented basses, their preferred forage includes crayfish and fish, but insects seem important as well. Although not well known to anglers and generally small compared to largemouth bass, they aggressively attack both natural and artificial baits presented along deep stream bends and fallen trees. The State Record spotted bass weighing 3.75 pounds was landed in the Apalachicola River in 1985. Having been introduced to California waters in the 1960s, the 10.25-pound All Tackle World Record spotted bass was caught there in 2001.

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, 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). They are now also found in the Chipola River, in Florida (Wheeler and Allen 2003). Additionally, the species was stocked into the Ocmulgee River, Georgia, a tributary of the Altamaha River, in the mid-1970s. However, 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-sized 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. However, shoal bass have lost their protected status in Florida due to changes in the state's classification system. Further hybridization with spotted bass, which was documented in 2009 by FWC biologists (Porak et al. 2009), could lead to extirpation of "pure" shoal bass. The FWC is currently 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*). Shoal bass are distinctively marked on their sides with a pattern of vertical bars resembling tiger stripes. Crayfish, fish, and insects are their primary food, and drift-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, water 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.

ANGLER USE AND HISTORY OF BLACK BASS IN FLORIDA: In Florida, black bass annually provide more than 800,000 anglers with nearly 15 million days of healthy outdoor recreation and generate substantially more than a billion dollars in economic impact for Florida (US Census Bureau, for the US Fish and Wildlife Service, 2006).

In March 2010, *BassMaster Magazine* (Mccormick 2010) summarized the first 12 years of their 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 percent) 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 includes 20 fish from California, two from Florida, two from Japan, and one from Georgia. In both California and Japan, the bass are non-native 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.

Texas has a thriving bass fishery in their manmade reservoirs that uses Florida bass genetics and hybrid vigor induced by crossing them with their northern cousins. Florida, Texas, and California are, therefore, the three prime contenders for the bass capital title, and each could currently claim a piece of the prize.

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 establishing Florida as 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 fish populations. Electrofishing is generally a non-lethal sampling method that passes controlled electric current through the water to temporarily immobilize fish. The effective range of

the electric field is about six-feet deep, limiting electrofishing to shorelines and other shallower areas. Stunned fish are collected with dipnets for a variety of reasons including documenting their length and weight and checking for tags. Some may be tagged and can then be released alive. 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 types of sampling, depending on the fish species sought or the information needed. Biologists use a wide variety of nets such as trawls, seines, gillnets, fyke nets, hoop nets, or blocknets to collect fish for specific research or monitoring efforts. Angler interviews (creel surveys) provide important information not available from other sampling, such as angler catch rates for certain species, which species in a given lake are most targeted, how much angler pressure or effort is focused on a resource, and how many fish are being removed from a system by harvest.

Using these various sampling methods, fisheries biologists can obtain important information regarding fish populations. For example, marking and releasing bass collected can provide an estimate of a lake's total bass population, based on the number of marked fish ("recaptures") caught on subsequent electrofishing runs. Similarly, blocknets of a known area (such as a quarter acre) can be helpful in estimating fish densities, such as the number of bass per acre in a given canal. Looking more closely at individual fish, an index comparing the weight of a fish to 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. 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.

Habitat Management: The primary tool of habitat management, where fish are concerned, is aquatic vegetation management. The most common forms of habitat manipulation are control or elimination of nuisance plant species (usually exotics from other countries such as water hyacinth and water lettuce), and introduction of desirable plants that provide good fish habitat (like native bulrush, spikerush, and eelgrass). Lack of desirable native vegetation, often coupled with high nutrient levels contributing to 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 or water level manipulations can 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 northern Florida lakes where plants can be exposed to freezing temperatures during the winter, a part of this practice may even include temporarily raising the water a few feet 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. Regulations are a primary tool, but stocking and concern for diversity of species present, ratios of predators to prey, and the fish's genetics are important. Regulations are one of the tools that come to mind when anglers think of fish management. Scientifically sound rules, backed by the 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) that concurs with local anglers and angling businesses preferences. Such rules must, however, ensure long-term sustainability of a quality fisheries resource, by preventing overfishing. Also note that by saying "use," we reflect the value of catch-and-release, as well as harvest, and the multiple recreational use concept. Fish populations are dynamic, however, and as they change primarily due to the ecosystem's ability to produce new "recruits" (see recruitment in glossary) and the affects of angling pressure regulations to protect them also need to adjust. In addition, fish kills, habitat alterations, droughts or hurricanes can all cause dramatic changes in a fishery that require 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 are 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 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 sportfish and forage fish to create a balanced fish population works well in new or renovated lakes that do not have established fish or aquatic predators yet. Hence 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 (*M.s. salmoides*).

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, 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) and 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, Flickr), television and radio shows, as well as being present at various events where anglers congregate to provide face-to-face dialogues about bass fishing. Marketing activities such as our five-year fishing license promotion, advertising the "Go Fishing" largemouth bass tag, designating 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 also fall into the category of "people management."

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. Some action items will be added or deleted based on continuing input we receive from the public, other partner agencies or as research and discussion continues among FWC staff. Once the final action items are determined and a plan established (Please remember this is a first draft and subject to major changes based on public input, the TAG advise, and further research), we will carefully assess each action item in terms of biological/scientific feasibility, costs, manpower, legal responsibility, and time to accomplish. We will then consider ways to efficiently accomplish the task (e.g., collaboration, volunteers, grants, sponsors, or new research innovations) and establish priorities and a timeline to implement the plan.

I. NEW OPPORTUNITIES.

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 water storage areas (WSA), reclaimed phosphate or rock pits, private water bodies, and 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, effort control, fish attractors), and habitat enhancement (e.g., aquatic plant management, dredging, scraping). Opportunities to affect FWC's workforce, culture, and structure to enhance effectiveness as well as external partnerships with other agencies and stakeholders will be sought. Action items will have clearly stated, time-specific, measurable objectives and identify research/information needs to evaluate the action items (where appropriate). Successfully implementing new opportunities will require an aggressive, proactive, science-based approach that involves local citizenry. These can also be categorized as habitat, fish or people management but those listed here emphasize new possibilities that don't currently exist or can't be specifically anticipated.

Action items:

1. Develop a comprehensive list of any newly created or planned WSAs that could potentially support a black bass fishery for each region and pursue partnerships with each water management district and the Corps of Engineers (COE) during the planning process for WSA creation to meet defined minimum habitat and water quality criteria for black bass, plus provide for angler access.

   a) Responsible parties: DFFM, WMDs and COE

   b) Supporting facts: Three Forks Marsh Conservation Area and Fellsmere Water Management Area are examples of newly planned reservoirs that could be filled in the next three years, and should provide an excellent largemouth bass fishery. Demand for expanding the water supply is leading to creation of new municipal water reservoirs that could lead to additional opportunities to create new bass fisheries. A formal partnership that encourages input from DFFM on design and management of new WSAs will improve black bass fishing. Establish minimum habitat (e.g., percent area covered [PAC] and percent volume inhabited [PVI]) and water quality criteria (e.g., water levels, nutrients, sedimentation) for black bass during WSA creation.

   c) Research/information needs: This could be accomplished with a comprehensive literature review of habitat availability, water quality parameters, and impacts on recruitment strength and adult bass abundance. Data from the FWC's long-term

monitoring program should be evaluated for bass catch rates and composition in various habitats.

2. Establish long-term management plans, including determining angler access, habitat enhancement and fish management on WSAs experiencing rapid changes in water levels (e.g. drought/flood conditions). This process would describe management actions that include muck removal, vegetation planting, fish attractors, stocking (forage and/or bass), regulation changes and processes to expedite administration or these actions. If an opportunity for habitat enhancement and fish management exists on a re-flooded lake following a manipulation project, it should be conducted and evaluated within the next five years.

   a) Responsible parties: FWC (including FWRI, HSC), WMDs, and COE

   b) Supporting facts: Ensuring public access to lands purchased with public funds whenever possible and managing them for multiple compatible uses is an important public trust consideration for WSAs. Natural lakes in Florida experience rapid changes in water levels (e.g., Johns Lake, Orange Lake, and Lake Jackson) during droughts and floods. These lakes often represent some of the most productive bass fisheries because of optimum habitat and strong year classes following re-filling after a drought. FWC has a unique opportunity to complete bottom manipulation (dredging, scraping, sculpting) and construction of fish habitat (brush piles, rock piles) during low-water conditions and fish management (stocking, special regulations to protect strong year classes) following flooding. The opportunity for habitat enhancement and fish management of naturally fluctuating lakes is a priority of the BBMP.

   c) Research/information needs: Conduct a project(s) to compare bass abundance, size structure, and angler success between lakes that received habitat enhancement during low-water conditions and fish management after re-filling, and control lakes that drain and re-fill without habitat enhancement or fish management.

3. 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.

   a) Responsible parties: FWC, WMD, and COE

   b) Supporting facts: It has been demonstrated in Florida (e.g., Lake Griffin, Rodman Reservoir) that short-term drawdowns can improve habitat, supplement terrestrial habitat growth, and substantially improve bass recruitment and adult bass abundance.

   c) Research/information needs: Selected systems that receive drawdowns should be evaluated to determine bass year-class strength pre- vs. post-drawdown and recruitment to the fishery 3–5 years post-drawdown.

4. Implement complete de-water renovations on aging reservoirs to stimulate trophy largemouth bass fisheries. A list of candidate lakes should be compiled and detailed evaluated plans created and executed.

   a) Responsible parties: FWC and WMD

   b) Supporting facts: Aging reservoirs and lakes with water control structures often lose habitat complexity, build up muck (sedimentation), and lose productivity of trophy-sized largemouth bass as they age. Florida fisheries staff pioneered the use of drawdowns

and Mississippi DNR has demonstrated that regularly scheduling de-watering reservoirs, scraping/sculpting the bottom, adding fish habitat, re-filling, and stocking stimulates rapid growth of bass and results in outstanding fisheries.

c) Research/information needs: Implement a "demonstration project" on the Stone Lake Commission-Managed Impoundment to evaluate growth, size structure, and angler success following a de-water renovation. The demonstration project will be part of the "Small Lakes Management Committee" effort.

5. Identify all available freshwater (ponds, lakes, rivers) public access points (e.g., concrete ramp, dirt ramp, hand launch, bank-only) and make the information readily available to the public (e.g., regulations handbook, website, etc.). FWC and partners should also provide available electrofishing data, creel summary, water quality data, tournament data, event schedules, boat ramp amenities, etc. via the Internet.

   a) Responsible parties: FWC (including LE, IT, FWRI and DFFM)

   b) Supporting facts: The Division of Law Enforcement has a "draft" of all public access points and is in being finalized following additional ground-truthing. It is available to the public at MyFWC.com (select boating). Plans are to integrate this into user friendly mapping software and link other important information to those points. DFFM regional staff will "error-check" the list and add/delete access points where appropriate and providing supplemental information. A partnership with TakeMeFishing.org to make this information available to a wider audience with less cost to FWC is also underway. There are also several grant programs that encourage public input and partnerships, which will be more broadly advertised.

   c) Research/information needs: Regional DFFM staff may need to "ground-truth" some access points on the ramp inventory to classify the status of the access prior to public availability. Current overview documents are online (Florida Boating Access Project, 2009). This information is also being shared with the TakeMeFishing.org website for collaborative publishing.

6. Identify potential partners (WMDs, federal, local, and state governmental agencies, and private landowners) and formalize partnerships to increase access points on lakes with existing access and lakes that currently do not have any access. Identify and minimize threats to existing access points. Expand on use of the FWC "Guidelines for designing and managing Florida ponds for recreation" publication (FWC 2009).

   a) Responsible parties: FWC (including LE, DFFM and Land-Use Planning Team)

   b) Supporting facts: Increasing access points (e.g., fishing opportunities) is the most direct way to increase fishing effort. The Small Lakes Management Committee has identified a list of candidate lakes in each region that are less than 1,000 acres, are without public access and adjoin public land where access could be provided. The committee has set goals on increasing access to small lakes, which will directly benefit the BBMP. Florida has 7,700 lakes, and there is only public access to approximately 550 lakes. There is a tremendous opportunity to increase access for anglers and increase fishing effort for bass. Many of the lakes in Florida are on private property, and a "Share-a-Lake" program that provides incentives (tax relief, land management, lake management, plant management) to private landowners in exchange for public access) is a special opportunity that should be explored.

c) Research/information needs: Evaluate local and statewide (e.g., license sales) fishing effort to determine the benefit of increased access.

7. Provide "special opportunity" limited-access (similar to special management hunt drawings) bass fisheries. Begin with one or more statewide, but seek to have a more widespread network of sites as venues become available and can come under proper management.

   a) Responsible parties: DFFM and public collaborators

   b) Supporting facts: Special opportunity fisheries with limited access can provide a higher quality experience and generate excitement. Special opportunity fisheries will create excitement in the short-term. Limited access/closed seasons might allow the WMD's, municipalities, counties, private landowners to be more willing to participate.

   c) Research/information needs: Identify venues and partner willingness.

8. Identify the best tournament facilities in Florida, what are key design elements and generate specifications for creating optimal ramp and adjunct facilities for major tournaments. Look into local business community support for access and tournament facilitities.

   a) Responsible parties: DFFM

   b) Supporting facts: BBMP and TAG members indicated the need for better, larger tournament friendly facilities on Florida's major systems.

   c) Research needs: Literature review and survey of tournament trail organizers to determine the assets needed by major tournaments and how they relate to scheduling tournament locations.

9. Identify FWC policy and process revisions, staffing hours, and funding requirements needed to accomplish BBMP management actions/strategies prior to BBMP implementation. This along with creating a communications strategy and marketing plan (see Appendix III) is an over-arching need for all actions and will be accomplished as part of establishing plan priorities and allocating resources.

   a) Responsible parties: BBMP team

   b) Supporting facts: The BBMP will not be successful without adequate labor, funding, and processes to implement action items and a communications/marketing plan. Thus, prior to implementation of the BBMP these need to be addressed to confirm objectives are obtainable and have public support.

   c) Research/information needs: Document projected costs in terms of dollars, man-power and time for each action item and the feasibility of effectively accomplishing them, including seeking sponsors, grants, volunteers, inter-agency cooperation and other resources prior to prioritizing action items and establishing attainable timelines.

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 general biological characteristics (Seaman Jr. 1985). These characteristics create a habitat that in turn supports fish populations. Different habitats strongly affect the resulting fish populations. Trophic status, plant coverage, and water quality are very important to fish populations. Knowing the acceptable and preferred ranges of parameters like these 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 the improvement and/or maintenance of black bass populations in the state. There are three main areas of focus where the FWC can have 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 must also plan 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 should 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. Revegetate lakes that have a high probability of successful expansion of aquatic plants.
   a) Responsible parties: DFFM, HSC, DEP, WMDs
   b) Supporting facts: 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 could be requested. The need for habitat improvement on various lakes that include revegetation should be identified and applications coordinated through the ARES to address funding of these projects.

c) Research/information needs: Identification of additional fisheries habitat needs. Comparative monitoring to determine the success or failure of the revegetation project.

2. Implement water level manipulations for fisheries enhancement purposes by improving bass habitat conditions (i.e. drawdowns, reservoir creation, and river channel restoration).

   a) Responsible parties: DFFM, HSC, WMDs, COE, DEP, and FWS

   b) Supporting facts: Drawdowns, with and without organic removal, have been used in Florida to enhance fish and wildlife habitat and mitigate for water level stabilization. Examples include the Kissimmee and Alligator Chain of Lakes, Lake Istokpoga and Lake Josephine. A drawdown in Lake Tohopekaliga was shown to have an immediate positive fish response (Moyer et al. 1995) 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. The correct native plant species need to be matched to the lake's soil type, or unwanted flora may out-compete more desirable plant communities and take over the lake. River channels across the country have been channelized (straightened) to provide for flood control or navigation. In some cases, the need for flood control has been eliminated through other means and in other cases navigation is no longer needed. Channelization provides for swifter currents and eliminates habitat. Woody debris can be added to provide habitat that has been lost as restoration proceeds. Increased water flow and decreased habitats have lead to diminished bass populations. Areas to restore need to be identified and prioritized.

   c) Research/information needs: Monitor and manage.

3. Create structural habitat in water bodies to improve, access and fishing opportunities (i.e., sculpturing bottom contours).

   a) Responsible parties: DFFM, DEP, COE, WMDs

   b) Supporting facts: Limited application but can be 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. Multi-use must be encouraged. Sculpturing recommendations for ponds have been made by the University of Florida and by the FWC (FWC 2009).

   c) Research/information needs: Review Texas' and other southeastern fisheries programs dealing with small lakes that have been acquired for mitigation.

4. Prevent habitat degradation in areas of healthy habitat.

   a) Responsible parties: DFFM, DEP

   b) Supporting facts: This is another partnering opportunity to provide protection for critical habitats. Staff will engage local, state government and affected parties on permittable 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.

c) Research/information needs: Monitor needs.

5. Explore potential fishery benefits of substrate enhancements and fish attractors to concentrate fish and increase fishing pressure, catch rates or angler satisfaction.

a) Responsible parties: DFFM, DEP, WMDs

b) Supporting facts: Adding substrates has been shown to improve fisheries habitat diversity, enhance spawning success 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 and spawning substrate primarily for bream and 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 shown to increase abundance of juvenile largemouth bass (Ratcliff et al. 2009). Adding artificial structure may also increase nest building and reproduction in bass (Hunt and Annett 2002). These structures can provide opportunities in lakes with little or no submersed vegetation. An artificial fish attractor program can be recreated with minimal funding and manpower and is suitable to increase engagement with volunteers and local groups. These are more visible to the public than other FWC activities and in the past served as excellent public relations tools. Habitat can be increased by placing attractors offshore, where it is too deep for submersed vegetation to grow.

c) Research/information needs: Habitat monitoring and comparisons. There may be research opportunities at Tenoroc FMA where crushed rock has been used extensively. Research could be done on fish and angler use of various attractor materials. Since fish attractors are generally expected to congregate fish for anglers, not to significantly increase fish production, we should document angler use, success and attitudes about attractors.

6. Manage native plants to achieve improved black bass fisheries.

a) Responsible parties: DFFM, HSC, DEP, WMDs

b) Supporting facts: Macrophyte removal can improve fish growth and size structure in lakes with high densities of plants and stunted fish populations (Olsen et al. 1998). 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. This is usually a group of biologists that work together to come up with a consensus management plan for individual lakes and lake systems. There are individual lake vegetation management plans that establish annual control objectives for each fiscal year. Plant coverage greater than 30% to 40% reduced growth rates and can skew populations toward abundances of smaller bass (Maceina 1999). Percent plant coverage also plays a vital role in juvenile bass diets and growth. In lower vegetative coverage areas bass fingerlings longer than 4 inches preyed mainly on fish and resulted in significantly faster first year growth (Bettoli et al. 1992). Fisheries

staff should be actively involved with this process to ensure it meets fisheries. Lakewide habitat enhancement for all local species is important (Allen et al. 2003).

c) Research/information needs: Determine what percent plant coverage is too much or not enough. These areas need to be monitored periodically to document their impact to the fishery and to trigger management responses when they go above or below target thresholds.

7. Identify all lakes that have an existing hydrilla population and develop a plan for best management for bass fisheries. Pros/Cons.

a) Responsible parties: DFFM, HSC, HGM, COE, WMDs, DEP, some local and county governments

b) Supporting facts: This operation occurs annually on many public water bodies. Hydrilla management can be improved to have a more positive impact on the bass fishery in some systems. This is a very controversial subject and deals with two major opposing philosophies on exotic plant management. The philosophy of maintaining hydrilla at the lowest feasible level versus some higher level. Each has its pros and cons that need to be thoroughly vetted before management decisions are made. Studies have suggested that 10% to 40% hydrilla coverage is beneficial to sportfish standing crops (Moxley and Langford 1982) and (Bonvechio and Bonvechio 2006). One of the primary considerations is the cost necessary to maintain higher levels of invasive exotic plants in some of these systems and the backlash the agency will get from other environmental agencies and groups. On the other hand it was reported that when hydrilla coverage exceeded 80% on Orange Lake there was a 90% loss in revenue on a sport fishery valued at 1 million dollars (Colle et al. 1987). The Invasive Plant Management Section has been chartered to have a special issue team to address the Agency philosophy for hydrilla management. The resultant agency policy will have a direct impact with respect to this plan and would need to be incorporated as such. Also impacts on other species (including snail kites and water fowl) will need to be considered case by case. A hydrilla summit in 2005 documented ideas to control hydrilla and suggested a policy be determined on a lake to lake basis (Hoyer 2005).

c) Research/information needs: Investigate whether we can cost effectively control hydrilla on a case-by-case basis, knowing it has been shown to have a positive effect on juvenile largemouth bass abundance (Tate et al. 2003; Hoyer 2005) and determine if using exotics as management tool rather than seeking to eradicate them is an acceptable policy.

8. Assist water management districts in development of water regulation schedules and minimum flows and levels.

a) Responsible parties: DFFM, HSC, WMDs, DEP

b) Supporting facts: Identify water bodies with established water schedules and review current research so staff can effectively argue for appropriate flows and levels at various interagency meetings and groups. 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 should be one of their priorities.

c) Research/information needs: Bass fisheries that are adversely affected by less than optimal water schedules should be identified. A study found bass were able to thrive at many different water levels (Pers. Comm., Eric Nagid, FWC). However, seasonal impact

of levels and flows 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 to each other.

9. Assist water management districts and the Corp of Engineers in developing new water regulation schedules where appropriate.

   a) Responsible parties: DFFM, WMDs, HSC, DMFM, COE, USFWS

   b) Supporting facts: 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.

   c) Research/information needs: Document flow and their impact on bass in areas that are not currently covered by a water schedule.

10. Identify areas to restore wetlands adjacent to potential fisheries.

   a) Responsible parties: DFFM, DEP, WMDs, HSC

   b) Supporting facts: Identify partners to pursue wetland enhancement and mitigation opportunities where appropriate. Need to list 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 is the wetland 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.

   c) Research/information needs: None Identified

11. Adhere to predetermined water quality standards to support black bass species.

   a) Responsible parties: DFFM, HSC, DEP

   b) Supporting facts: 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. Sometimes these water quality parameters, flows, and other monitored standards fall outside published levels. Staff should engage DEP early in the process of changing these standards, to ensure that fish needs are met. 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. 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, US EPA Office of Water 2009).

   c) Research/information needs: Record baseline water quality data in lakes where Phase-I or II largemouth bass are to be stocked prior to release.

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

    a) Responsible parties: DFFM, FWRI, HSC.

    b) Supporting facts: Protection of critical habitat is important for these species of black bass that occupy a smaller range than largemouth bass. These critical 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.

    c) Research needs: Compilation of data and/or identification of habitats if necessary.

13. Special Action Plan—Bass habitat classification and trophy bass documentation program. Pros/Cons.

    Part 1. Identify habitat and fishery characteristics of trophy fisheries (where there is a strong expectation of catching a bass over 10 pounds even if it must ultimately be released) and manipulate habitat in appropriate water bodies, where there is local support, to create trophy fisheries.

    Part 2. Identify habitat and fishery characteristics of quality fisheries (i.e., lakes with a good chance of catching and releasing three, 3-pound bass) and manipulate habitat in appropriate water bodies, where there is local support, to create such a fisheries.

    Part 3. Identify lakes where the public wants, and habitat and fishery use can sustain, high harvest rates (i.e., lakes with a possibility of taking five, 1-pound bass, but few really large bass).

    a) Responsible parties: DFFM, HSC, TBM (Trophy Bass Management Team not yet in existence)

    b) Supporting facts: Quality lakes are identified annually through the use of sampling data (i.e. electrofishing and creel data) but currently we do not quantitatively identify the quality habitat within these "quality" lakes. Determine how much quality habitat is needed on a particular lake to influence the fishery. The angling public is divided between the desire for trophy fisheries, quality bass fisheries and those that provide greater numbers of smaller harvestable bass. By working with local anglers and businesses we can identify local preferences, and then based on the habitat, fishery characteristics (e.g., amount, type and distribution of fishing effort) and fish populations present determine if it is feasible and what trade offs (e.g., limited entry, reduced harvest, shortened seasons) would be necessary. In addition to habitat considerations, this issue also involves new opportunities, fish management (e.g., regulations stocking) and people management (e.g., managing expectations, dealing with limited access issues). Quality and harvest-oriented lakes can be identified annually through use of sampling data (i.e. electrofishing and creel data) and habitat mapping. Special regulations and other fisheries management tools will need to be implemented to support such fisheries.

    Research/information needs: Compilation of data and/or identification and review of current "Trophy" lakes and what it takes to sustain them. Compile current data from biological sampling (FWC, university and other sources), tournament records, "Big Catch" and other (e.g., IGFA, BASS and Field and Stream) angler recognition records, tackle shops and taxidermists where possible. Define quality lakes for the purposes of the BBMP. Quantitatively identify the habitat within these "quality" lakes that presumably helps support the fishery and determine the type and quantity of habitat on

a particular lake necessary to maintain the fishery. Develop a program to gather additional detailed information on bass over 10-pounds, use this information for improving management and promoting Florida bass fisheries.

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 preventing overfishing (e.g., reducing fishing mortality) and/or increasing abundance of trophy-sized fish. Harvest regulations are typically 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 try to meet their expectations as best as possible. 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. Use science-based harvest regulations to effectively manage black bass populations based on a pre-determined objective of the fishery considering biological factors and angler expectations. Pros/Cons.

   a) Responsible parties: DFFM

   b) Supporting facts: The Division of Freshwater Fisheries currently selects harvest regulations from a tier-based system with pre-determined harvest alternatives for black bass. There are limited options for black bass (catch-and release only, slot limit, and minimum length limit) designed to give biologists an opportunity to manage fisheries for different objectives based on angler expectation while limiting the number of rules for anglers to be aware of. All black bass species are managed collectively and the state is broken into three regions with standard regulations for all water bodies within each region. Therefore, current black bass regulations do not account for potential differences in life history traits of the different black bass species or differences in lake size, trophic state, or angling behavior (e.g., effort, harvest rates, expectations). However, special regulations (e.g., slot limits, catch-and-release only) have been set on some water bodies that receive high angling effort. 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 moderation of the number of regulations should be considered.

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 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% 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 1970's to early 2000s. This temporal trend in largemouth bass voluntary release has resulted in declining fishing and total 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 well-known 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 (MCAR) 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.

c) Research/information needs: Some current 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. Protect existing critical habitat and enhance habitat where possible to ensure the long-term protection of shoal bass in the Chipola River.

   a) Responsible parties: DFFM, FWRI

   a) Supporting facts: These fish have limited ranges and restrictive habitat needs that make their population vulnerable to habitat degradation.

   b) Research/information needs: Identify shoal bass habitat utilization and existing available habitat in the Chipola River to determine if habitat enhancement is necessary. Any habitat enhancement project should be evaluated to determine effects on recruitment and abundance of shoal bass.

3. Promote genetic conservation, diversity, and fitness of populations of endemic Florida bass through law enforcement actions, educational campaigns, and responsible hatchery operation. Pros/Cons.

   a) Responsible parties: DFFM, HSC, FWRI, LE

   b) Supporting facts: 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. unpublished manuscript).

   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 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).

   c) Research/information needs: 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. Determine which species of spotted bass occurs within the Florida Panhandle lotic systems and ensure genetic conservation.

   a) Responsible parties: DFFM, FWRI

   b) Supporting facts: Determining which populations of spotted bass that occur in Florida are spotted bass or actually Alabama bass (*M. henshalli*) is important to the genetic integrity of these species. Of particular concern is maintaining genetic integrity of all black bass species in the state. The historic range of spotted bass indicated the species is sympatric with other black bass species. Alabama bass have been identified in several Florida panhandle streams (John Knight personal communication). It is well documented that centrarchid species will often hybridize. 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).

   c) Research/information needs: Determine the taxonomic status and genetic structure of spotted bass populations in the Florida Panhandle.

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

   a) Responsible parties: DFFM

   b) Supporting facts: Lakes with good water quality and habitat do not need to be stocked with largemouth bass, because reproduction and recruitment is adequate to sustain the population. Lakes that have dried up and then reflooded or new reservoirs can benefit from an initial release of hatchery 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.

   c) Research/information needs: There is an abundance of research on when and where Phase-I stockings work. Continue to document stockings.

6. Stock advanced-sized (Phase-II, 4-6 inches) largemouth bass fingerlings into water bodies where young-of-the-year survival failed or adult recruitment is limited.

   a) Responsible parties: DFFM, FWRI

   b) Supporting facts: 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 7 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 the supplemental stocking of advanced-size largemouth bass. Further research is needed to determine hatchery protocols that could increase short-term foraging efficiency and survival.

c) Research/information needs: Continue on-going research on benefits of conditioning hatchery fish to predators and prey prior to leaving the hatchery. Evaluate survival of pellet-reared vs. live-feed-reared hatchery largemouth bass stocked in additional lakes. Continue research to determine the effectiveness of supplemental stocking; including identification of resources where stocking is needed and a determination of whether stocked hatchery fish recruit into the fishery or not. 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). Understand limitations of zooplankton-reared bass and the vastly larger amount of pond space and predator induced mortality associated with that mode of production versus pellet-reared bass. Identify causes of 'bottlenecks' (e.g., food web, environmental parameters, fish kills, missing year classes) and assess their impact prior to restocking.

7. Stock supplemental prey species for bass into small water bodies where altered water quality or habitat can support a particular prey species that may improve growth rates.

a) Responsible parties: DFFM, HSC

b) Supporting facts: For bass to exhibit the fastest possible growth rates and highest possible population densities, ample forage must be available. 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.

c) Research/information needs: More research might be needed in the culture of prey species such as lake chubsuckers, threadfin shad, and golden shiners.

8. Minimize negative effects that non-native fish species may have on bass populations in Florida.

a) Responsible parties: DFFM, HSC, FWRI

b) Supporting facts: Non-native fish species have the potential to affect bass populations negatively through foraging on bass, direct competition for food, competition for habitat, and habitat degradation. 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 experimental lakes. Armored catfish species continue to expand their range to the north throughout the state with largely unknown impacts. Current research in Florida for the most part has shown an increase in overall carrying capacity as non-natives fill underutilized niches. Notwithstanding which, there is an important environmental and economic concern associated with the introduction and expansion of any unplanned exotic species.

c) Research/information needs: Determine potential impacts of armored catfish species on bass populations. Identify most likely avenues for introduction of flathead catfish into other river systems in Florida, such as the Suwannee, Chipola, and St. Johns River drainages.

9. Determine the effects of bed fishing on bass populations and take any necessary management actions based on these effects.

a) Responsible parties: FWRI, DFFM

b) Supporting facts: BBMP Public survey and TAG group both identified bed fishing as a concern. Schramm (1985) concluded that there were no differences in the 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 new studies are needed to address this issue.

c) Research/information needs: 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.

IV. PEOPLE MANAGEMENT STRATEGIES

Background:

As described above, human dimensions will be critical to the effective implementation of a black bass management plan. Plan developers identified the following topics to be addressed: communication, education, ethics, outreach, marketing, social marketing, partnerships, tournament management and promotion, user conflicts including personal water crafts (PWCs) and boating issues, significant catch records and documentation, data monitoring, imperiled species, and law enforcement. To that end, a communications plan (Appendix III) is presented and 11 specific actions described.

Action items:

1. Develop a comprehensive list of freshwater fishing clubs (e.g., BASS) and other anglers willing to volunteer within each region.

   a) Responsible parties: DFFM, CRO

   b) Supporting facts: BASS 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". Providing stakeholders with the opportunity to participate in management gives them ownership in the resource and provides them with satisfaction, as well as helps the BBMP meet its goals. Alabama has instituted a program where BASS clubs help install fish attractors. FWC has a newly revitalized "volunteer program".

   c) Research/information needs: Document use of volunteers and time spent managing their activities via the new agency volunteer coordinator.

2. Develop a comprehensive list of black bass guide services in each region and solicit them to help keep angler diaries during guided trips to monitor angler success (catch rates and size structure).

   a) Responsible parties: DFFM, CRO, IT

   b) Supporting facts: Helps FWC collect information on big fish and catch rates, as well as provides ownership in the resource to the guides (e.g., great public relations). An underutilized source for outfitters and guides exists on our website and is being updated.

   c) Research/information needs: Endeavor to create additional details on species sought and waters fished to provide a public information resource.

3. Organize at least one angler participation volunteer day per region/year to improve bass habitat, pick up fishing line/trash, install fish attractors, post information signs at boat ramps, etc.

   a) Responsible parties: DFFM

b) Supporting facts: BASS 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". Providing stakeholders with the opportunity to participate in management gives them ownership in the resource and provides them with satisfaction, as well as helps the BBMP meet its goals. Alabama has instituted a program where BASS clubs help install fish.

c) Research/information needs: N/A

4. Develop a trophy fish donation and breeding program (e.g., somewhat similar to the Texas ShareLunker program) that is science-based to document catches of trophy-sized fish (heavier than13 pounds) in Florida (this provides valuable economic, biological, and sociological data), identify variables that produce trophy-sized fish, measure differences in growth and survival between trophy and standard brood stock offspring, and promote the importance of catch-and-release of trophy-sized fish. Pros/Cons.

a) Responsible parties: DFFM, FWRI

b) Supporting facts: A committee is tentatively developing a program outline, based on the public interest from the previous survey, including an outline of objectives and plan implementation, proposed budget, analysis of existing trophy-sized fish data, and preliminary survey of bait shops. 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.

c) Research/information needs: There are many research components to the program that include economic, biological, and sociological components.

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

a) Responsible parties: DFFM

b) Supporting facts: FWC has accomplished more fishing and lake improvement projects by partnering with other groups, because they have combined resources and worked as a team. 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. 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.

c) Research/information needs: Research should be done on the effects of installing rock pile fish attractors in lakes, because rock piles should 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. Evaluate installation of gravel attractors covering signifcant areas to determine if they can increase suitable spawning areas where habitat is lacking.

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

a) Responsible parties: DFFM

b) Supporting facts: 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.

c) Research/information needs: Individual resources should be identified and addressed prior to stakeholder involvement whenever possible. New information needs may be suggested during stakeholder meetings.

7. Manage bass tournaments to minimize negative effects that bass tournaments have on bass fisheries. The BBMP public survey indicated that many people believe there are issues with tournament such as mortality of bass caught during tournaments, but it also indicated that many anglers believe that tournaments are good for bass fishing by promoting fishing, organizing anglers, and teaching ethics and stewardship. Pros-Cons.

a) Responsible parties: DFFM, FWRI

b) Supporting facts: 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, there are impacts on the fishery resulting from the catch, handling, and hauling of bass as well as transport of fish from one water body to another during the course of a tournament and weigh in.

Currently any group of anglers may conduct a bass tournament without any permit or other interaction with FWC as long as they abide by all regulations in place for the water body being fished. FWC issues Tournament Exemption Permits, which exempt the tournament anglers from size limits during the course of the tournament as long as permit requirements pertaining to handling and releasing of fish, etc. are followed. Potential options to manage tournaments include:

- Improved enforcement of tournament regulations and guidelines.
- Changing when tournament permits are needed and what they allow (permits for all tournaments or bag limit only exemptions).
- More data provided to FWC by tournament organizers.
- Specific requirements for bass tournaments under the current permit system.
  - More restrictions/better guidelines on handling fish.
  - Seasonal limits during hot weather (e.g., night tournaments only, restrictions mandating just a few hours per tournament day, restricted bag limits, or paper tournaments).
- Provide more education and outreach.
  - Provide the BASS Keeping Bass Alive brochure (**http://assets.espn.go.com/winnercomm/outdoors/bassmaster/pdf/b_con_keepingbassalive.pdf**) each time a bass tournament permit is issued.
  - Create a presentation on how to reduce tournament mortality and give the presentation to bass clubs around the state.
- Work with bass tournament anglers to decrease mortality by providing better equipment for weigh-ins—additional funding required for: tournament friendly weigh-in facilities, holding tanks, and release boats.

c) Research/information needs: Determine tournament mortality including "traditional" mortality (hooking, handling, etc) as well as removal of bass from one lake to another. Better and more data needs to be collected from tournaments to fully understand their impacts on bass fisheries.

8. 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.

   a) Responsible parties: DFFM, CRO

   b) Supporting facts: 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.

   c) Research/information needs: Reference BBMP Communications Plan (Appendix III) to determine the best way to communicate with stakeholders.

9. Promote Florida as a national angling destination for BASS Slam opportunities.

   a) Responsible parties: DFFM, CRO

   b) Supporting facts: Florida provides the greatest opportunity to catch multiple species highlighted by BASS in the BASS 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 BASS Slam could be caught within short drives of a central lodging point or on a 'BASS 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.

   c) Research/information needs: Identification of angler friendly lodging facilities in areas that provide unique angling opportunities in relation to the BASS Slam. Additional genetics work regarding spotted bass, shoal bass, and Alabama bass to determine what species occur where in Florida. Note: BASS does not differentiate between spotted bass and Alabama bass in the BASS Slam.

10. Create and promote a Florida Bass Slam.

    a) Responsible Parties: DFFM, CRO

    b) Supporting facts: See BBMP Action Item related to BASS Slam. The difference would be that this would be a program developed and supported by FWC rather than a third party. This would give FWC control over all aspects of the contest including rules and rewards. Rewards could be provided via a sponsor. FWC might be able to provide additional rewards such as a five year fishing license for the largest slam each year.

    c) Research/information needs: Identification of angler friendly lodging facilities in areas that provide unique angling opportunities in relation to the BASS Slam. Additional genetics work regarding spotted bass, shoal bass, and Alabama bass to determine what species occur where in Florida

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

    a) Responsible parties: DFFM, CRO

b) Supporting facts: Marketing of bass fishing and the BBMP is integral to success of the plan. See Appendix III (Marketing and Communications Plan).

c) Information/research needs: 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.

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 make Florida 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

APPENDIX I—Survey Results

(Available in a separate file)

APPENDIX II—Technical Assistance Group & Black Bass Management Team

(Available in a separate file)

APPENDIX III—Communications Plan

(Available in a separate file)

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

LITERATURE REFERENCES

(Available in a separate file)

GLOSSARY (and Acronyms)

(Available in a separate file)