8.4 *Goal of the Plan*

To develop a management framework that enables the creation of policy decisions for conflicting user groups (i.e., stakeholders) and guides the protection, maintenance and improvement of largemouth bass fisheries in Maryland tidewater.

8.5 *Objectives Addressed by the Plan*

1) Assess current status of largemouth bass populations by using long-term surveys of tidewater areas in Maryland.
2) Develop biological reference points for assessing largemouth bass populations.
3) Identify, protect, promote, and improve quality habitats for largemouth bass.
4) Achieve stakeholder expectations that are within bounds of our management principles.
5) Incorporate ecosystem considerations in all aspects of largemouth bass management.

8.6 *Management Recommendations*

1. Assess current status of largemouth bass populations by using long-term surveys of tidewater areas in Maryland.

In order to develop the indices needed to assess the status of populations, MD DNR biologists must conduct annual surveys of tidewater largemouth bass. Additional data from directors of sportfishing tournaments should also be collected. Targeted tidewater areas will be surveyed as needed. The popularity of a largemouth fishery will determine whether a tidewater area is targeted and how often. Information related to abundance, health, and life history of largemouth bass will be collected. In addition, fishery-dependent data will be collected to assess angler impact on and use of the resource. These data are necessary for comparing catch rates among years and monitoring survivorship or longevity. Both fishery-independent and fishery-dependent data should ultimately be predictive of angler satisfaction with a fishery. Thus, measures of angler satisfaction via creel surveys are encouraged. Estimates of population parameters will be improved in precision through improved data collection techniques. Improved data collection techniques will improve overall population assessments, lead to effective management decisions, and ultimately, quality fishing experiences. Data will be stored within a statewide database (GIFS; Geographic Inland Fisheries Survey) or federal database (MARIS), which will improve data sharing across regions or states, respectively. Data are valuable for other programs within MD DNR, such as the Blue Infrastructure Initiative that targets the protection and restoration of habitats within Maryland.

Strategy 1.1 Annually conduct Tidal Bass Surveys on targeted rivers, critically evaluate indices that are used to describe changes in the abundance, health, and life history of largemouth bass within tidewater areas of the Chesapeake Bay watershed, and develop new indices as necessary.

> **Action 1.1.1** Coordinate with regional managers to survey tidewater areas and collect data needed to develop indices

Action 1.1.2   Share results with anglers, stakeholders, and the general public via a Federal Aid Report, one-page summary sheets, an annual information booklet, and other forms as requested.

Action 1.1.3   Discuss indices with members of partner agencies, organizations, and universities to evaluate causes or consequences of changes in the indices

Action 1.1.4   Develop new indices, such as angler satisfaction indices, or adjust existing indices as needed

Action 1.1.5   Improve sharing of data with other Department biologists and programs, such as the Blue Infrastructure Initiative and GIFS

Strategy 1.2   Annually assess data quality and effective usefulness of data collection.

Action 1.2.1   Conduct general assessments of variance within catch and other indices and ensure variance is considerably lower than the average point estimate.

Action 1.2.2   Discuss the scope of data collection with regional managers and directors within Inland Fisheries so that data collection is determined to be sufficient for meeting the demands of the Department.

Action 1.2.3   Allow internal and external peer-review of data collection and analysis to refine methods based on expert opinions

Action 1.2.4   Deliver technical reports to regional managers, other internal reviewers, and reviewers of refereed journals for review of methods and data analysis

Action 1.2.5   Assess and/or improve sampling equipment for efficiency

2. Develop biological reference points for population assessments.

Indices must be calculated using biological data collected during annual surveys of tidewater largemouth bass. The indices can be categorized by: catch, longevity or size structure, robustness or body condition, growth rates, and reproduction. Additional indices will be calculated using data collected from directors of sportfishing tournaments. These indices will be compared to biological reference points and will provide historical significance to current measures (see Table 7.3.1). The reference dataset should be of broad enough span to encapsulate substantial index variation attributed to natural, environmental and sampling variation. The reference dataset should be evaluated periodically and when other factors, such as habitat loss or spread of invasive species, demand it to determine whether it differs significantly from current trends in the indices. Additional reference points may be determined from the literature. Some indices may be derived from fishery-dependent data, such as those taken during creel surveys. One of these indices is fishing mortality, which includes harvested fish and those that die during catch-and-release fishing.

Fishing mortality will be measured in order to maintain levels that are sustainable for continued persistence of the population.

Indices will be compared with biological reference points in order to establish concern for the fishery and evaluate appropriate management actions (Table 8.6.2). If indices fall below average for a given year, then the population may be surveyed for the subsequent year and at the discretion of fishery managers, to determine if the index estimate is anomalous.

Strategy 2.1 Establish biological reference points for populations of tidewater largemouth bass and use them to assess population status

> **Action 2.1.1** Compute 25th and 75th Percentiles for each index from the reference dataset, which will be annual averages computed across a minimum of 10 years of data
>
> **Action 2.1.2** Obtain additional data for populations surveyed less than 10 years and develop reference points
>
> **Action 2.1.3** Use reference points from the peer reviewed literature, when possible, as comparisons to reference points, particularly for populations that do not have a reference dataset of at least 10 years
>
> **Action 2.1.4** Adjust reference points as additional data are acquired regarding their inter-correlations and importance in reflecting the status of populations

Strategy 2.2 Compare current indices to the reference points and assess significant differences between current indices and historical reference points

> **Action 2.2.1** Evaluate indices relative to all available reference points and historical data to determine which reference points informatively describe a problem with the fishery.
>
> **Action 2.2.2** Develop a management strategy for imperiled populations by constructing a framework of management actions (see Table 8.6.2) for improving indices
>
> **Action 2.2.3** Conduct population modeling to determine if and how management actions will influence indices and the population

Strategy 2.3 Establish reference points for angler exploitation of largemouth bass populations in tidewater

> **Action 2.3.1** Coordinate with directors of competitive sportfishing events to obtain information on catch and initial mortality of largemouth bass

Action 2.3.2 Promote registration and activity reporting of tournament directors to foster communication between MD DNR and bass tournament directors and compliance of tournament directors

Action 2.3.3 Report results during an annual or semi-annual bass roundtable meeting that includes participants from tournaments and the recreational angling community

Action 2.3.4 Perform angler creel surveys, as necessary, to determine angler satisfaction, catch, and harvest rates by recreational anglers

Action 2.3.5 Produce studies and provide guidance on live well operating procedures to reduce mortality of largemouth bass during tournaments

3. **Identify, protect, promote, and improve quality habitats for tidewater largemouth bass.**

In order to protect valuable habitat for viable largemouth bass populations, the habitat conditions that promote survivorship, longevity, and recruitment for largemouth bass will be identified. Specific negative effects to these habitat conditions should be prioritized according to risk and the sources of those effects, identified. Habitat conditions will be evaluated throughout river drainages and important habitats will be geospatially referenced. These data will be shared with other programs, such as GreenPrint (Office of Sustainability) that identifies and protects important and rare habitats within Maryland. Valuable habitats and habitat conditions will be protected and promoted through MD DNR's Environmental Review process, through watershed development plans, and through awareness campaigns for anglers and stakeholders. Where necessary, habitat conditions may be improved by advocating and enacting land use impervious values, limiting access, adding submerged structure, removing invasive species, or reconstructing habitat features such as wetlands, riparian forests, and other means that soften the impact of storm water in suburban and urban watersheds.

Invasive species occur throughout the Chesapeake Bay watershed. Invasive species may alter their environments in unpredictable ways over time, especially as they become abundant. Additional information is necessary on the interactions of potentially threatening invasive species to the largemouth bass fishery. The occurrence and abundance of invasive species that are potentially threatening to the largemouth bass fishery need to be identified.

Climate is expected to change the composition, distribution and abundance of aquatic species. Projected climate changes include increasing air temperature, increasing sea level, changes in precipitation, changes in the timing/amount of stream flow, and the potential for more extreme weather-related events. Steps should be identified to facilitate the resilience and response of the aquatic ecosystem. Current stressors like nutrient and sediment loads, thermal pollution, and habitat fragmentation need to be addressed as part of determining climate change adaptation strategies.

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Strategy 3.1 Identify valuable habitat and habitat conditions for largemouth bass and promote their protection.

Action 3.1.1 Refine the habitat suitability index using important habitat variables (e.g., impervious surfaces, nutrient loading) for identifying and prioritizing suitable habitat for largemouth bass

Action 3.1.2 Ensure that the most informative variables are being measured during the Tidal Bass Survey by conferring with MD DNR Fisheries Habitat and Ecosystem Program regarding adoption of new or alternative variables

Action 3.1.3 Use a habitat suitability index and consult anglers and regional managers to identify habitats important for the spawning success and growth of largemouth bass

Action 3.1.4 Consult published literature and experts to help identify valuable habitat for spawning success and growth of largemouth bass

Action 3.1.5 Generate and submit to GreenPrint the spatial data reflecting valuable habitats for largemouth bass and anglers

Action 3.1.6 Consider the effects of climate change on largemouth bass habitat and develop adaptive management to address possible changes

Action 3.1.7 Utilize the proposed Climate Sensitive Areas for use in land-use planning and increased protection of vulnerable habitats especially in regards to largemouth bass habitat

Action 3.1.8 Provide comments during permit review via MD DNR Environmental Review to help minimize ecological impacts on populations from tidewater of the Chesapeake Bay watershed and largemouth bass habitat

Action 3.1.9 Write letters on official letterhead to stakeholders or on behalf of stakeholders to acknowledge and promote the significance of the largemouth bass fishery

Action 3.1.10 Promote a level of imperviousness that is lower than 10% of the drainage to Counties, through outreach conducted by DNR Office of Sustainable Futures, through GIS tools, and through Environmental Review and MDP (Maryland Department of Planning), as feasible; high densities of impervious surfaces in a watershed can lower the water quality of tidewater and impair the growth or survival of adult largemouth bass

Action 3.1.11 Ensure that natural variability in stream discharge is maintained by encouraging "smart growth" and limiting channelization

Action 3.1.12 Encourage lower levels of nitrogen and phosphorus waste from entering waterways via non-point and point sources

Action 3.1.13 Proactively work through a comprehensive plan renewal process to identify and protect important habitat features

Action 3.1.14 Collect data on invasive species as habitat data is collected in order to better monitor changes in habitat conditions over time and evaluate how those changes would affect the largemouth bass fishery

Strategy 3.2 bass depend Improve habitat conditions for largemouth bass and species on which largemouth bass depend

Action 3.2.1 Identify and determine the need for protected areas (e.g., habitat sanctuaries) that are completely or temporarily closed to largemouth bass fishing either year-round or during the spawning season (to specifically improve reproduction) to prevent displacement or high levels of catch-and-release mortality

Action 3.2.2 Use ecosystem-based management to provide management options that protect growth or survival of largemouth bass and accounts for competition or predation by invasive species

Action 3.2.3 Tidal Bass Program staff may work with Artificial Reef Program staff (MARI and the Artificial Reef Committee) as needed to develop reefs and other artificial habitat for largemouth bass, when needed, using a combination of plastic and wood/brush materials (per guidelines within the Maryland Artificial Reef Plan; Lukens and Selberg 2004; Loftus and Stone 2007) and deposited in areas permitted by Army Corps of Engineers, Maryland Department of Environment, and U.S. Coast Guard Aids to Navigation Office.

Action 3.2.4 Develop innovative storm water management techniques, promote storm water management retrofits where applicable, creation of wet marshy conditions throughout watersheds, and reconnect streams to riparian areas

Action 3.2.5 Upgrade and improve semi-natural landscape elements, such as man-made wetlands, ponds, and recreated natural lands

Action 3.2.6 Promote low sedimentation of streams

4. **Achieve stakeholder expectations that are within bounds of our management principles.**

When appropriate, strategies to improve tidewater largemouth bass fisheries may be adopted. Examples of fishery problems and management strategies, with responsive indices, are given in Table 8.6.2. A Decision-Making Process will be developed to mitigate problems that arise when a combination of indices depart significantly from reference points or targets. Currently, there is not

a defined point at which corrective management measures will be taken because of departures of indices from reference points.

Strategy 4.1 Generate a decision making process to resolve identified problems with the population and fishery as they relate to significant departures of indices from reference points

> **Action 4.1.1** Hold public meetings to determine angler behavior and perceptions on the quality of the fishery

> **Action 4.1.2** Evaluate the adequacy of current regulations in supporting the sustainability and quality of the fishery

> **Action 4.1.3** Establish relationships between fishery independent data, angler catch, and angler satisfaction

Strategy 4.2 Enhance fish populations by releasing hatchery raised largemouth bass, when natural reproduction or recruitment is deemed insufficient for sustaining a fishery

> **Action 4.2.1** Target tidewater areas that require stocking of largemouth bass that are determined to be at risk and would be expected to suffer a decline in the quality of the fishery without stocking efforts.

> **Action 4.2.2** Generate a stocking strategy with an objective to either support or improve the fishery

Strategy 4.3 Promote the survival and abundance of older, larger fish

> **Action 4.3.1** Adjust creel limits or size limits for promoting survival of older fish when: a) there are few adults in the population for enabling sufficient recruitment that sustains the population; or b) catch rates for adults are too low to provide a quality fishery

> **Action 4.3.2** Improve and promote angler awareness that increases survivorship of largemouth bass during catch-and-release fishing, which is the dominate form of fishing for largemouth bass in Maryland: 1) limit the amount of time bass are exposed to air; 2) prevent excessive handling of largemouth bass; 3) if largemouth bass are contained in live wells, make sure live wells are clean and the recirculator is functioning; and 4) use a small amount of salt to reduce bacterial infections if bass are contained in live well.

> **Action 4.3.3** Engage in meaningful studies that benefit the angling community by informing them on methods to improve survivorship.

> **Action 4.3.4** Enforce restrictions on holding more than 5 bass/angler/day by specially permitted release boat captains; these restrictions are: 1) keep the density of the fish in holding tanks at most, 1 pound per gallon of water; 2) maintain a

water temperature at or slightly below ambient levels (± 5 – 7 °F); and 3) maintain dissolved oxygen at saturated or near saturated conditions (> 6 mg/L or > 100%).

Action 4.3.5 When necessary, discourage the transportation of largemouth bass among river systems or to an uninterrupted area greater than 30 km from its area of capture.

Strategy 4.4 Protect, enhance and improve important angler access points to the tidewater largemouth bass fishery

> **Action 4.4.1** As part of the Chesapeake Bay Watershed Access Plan (a product of Executive Order 13508), 300 public access sites will be developed in the watershed and important angler access points to the tidewater largemouth bass fishery should be provided.
>
> **Action 4.4.2** Determine crowding of angler access points and mitigate, when possible
>
> **Action 4.4.3** Encourage public or DNR Fisheries to identify potentially new access areas for motor boats and to pursue Waterway Improvement Grants for consideration by Boating Services
>
> **Action 4.4.4** Create and/or advertise new angler access points to the tidewater largemouth bass fishery, when possible
>
> **Action 4.4.5** Promote small craft and shore based angler access

5.   Incorporate ecosystem considerations in all aspects of largemouth bass management.

An ecosystem's components can function to promote the sustainability of top predators, such as largemouth bass. Some of these components include species composition, nutrient availability, watershed influences, and climatic phenomenon. These components inter-relate to yield a carrying capacity that supports a finite population size for largemouth bass. While many components of an ecosystem are not easily managed (e.g., climate), some components are. Management options include, but are not limited to: habitat enhancement, improvements to water quality, and invasive species control.

Strategy 5.1 Improve habitat for largemouth bass

> **Action 5.1.1** Control and manage invasive species that threaten the health or sustainability of largemouth bass populations
>
> **Action 5.1.2** Monitor, protect or enhance the availability of prey for largemouth bass by partnering with other agencies or other programs within MD DNR

Action 5.1.3   Control or limit pollution sources to impaired waterways in order to improve the sustainability of largemouth bass populations

Strategy 5.2   Maintain important aspects of ecosystem function to maintain habitat for largemouth bass

Action 5.2.1   Identify components of ecosystem function essential for the sustainability of largemouth bass populations

Action 5.2.2   Identify possible threats to the maintenance and functioning of an ecosystem that promotes the sustainability of largemouth bass populations

Action 5.2.3   Preserve ecosystem components that are essential and potentially threatened

8.7 Plan Revisions

The Maryland largemouth bass FMP provides a general framework for managing the largemouth bass resource. As strategies and actions are implemented, it may be necessary to change or adjust the actions based on how the resource responds or as new information becomes available. The basic tenet of adaptive management is to "learn from experience." This tenet is applied through a cyclic process that consists of setting goals and objectives that lead to implementing strategies and actions. Through time, the actions are monitored and evaluated for their effectiveness. Periodically, the management program is reviewed and the results of the evaluation are reported. The report may recommend changes to the management strategies and actions to enhance effectiveness. The changes are incorporated into the management framework through amendments and revisions which continues the adaptive management cycle. The review of effectiveness of this FMP may occur once or twice a year, depending on need and input from stakeholders.

9.0 SUMMARY OF MANAGEMENT PLAN

9.1 Background

Largemouth bass was first introduced to Maryland's tidewater in the 1800's and has quickly established itself as a dominant predator in many portions of tidewater. As the species increased in number and distribution, commercial and recreational fisheries rapidly developed. Regulations for the species were imposed over a century ago and have undergone an interesting history wrought with political influence and tempered with biological assessments. The regulations have been equally applied to Largemouth and Smallmouth Bass, but the latter species is far less abundant in tidewater. The proposed management plan is a two point approach led off by calculating indices that reflect population surveys and then by comparing indices to biological reference points. These comparisons may lead to management actions specified herein. The management framework may change based on newly acquired information.