Fish Habitat Outcome

Management Strategy

2015–2025, v.2

I. Introduction

Fish and shellfish in the Chesapeake Bay and its watershed rely on a variety of important habitats. These habitats, which are key to sustaining fisheries, are being threatened by a suite of stressors such as increased urbanization, poor water quality and climate change. Successful fisheries management depends on knowing where these important habitats are and addressing the potential and realized threats to their integrity. This strategy targets habitats that are used by fish and shellfish species at critical points in their life history, including spawning, nursery and foraging areas.

II. Goal, Outcome and Baseline

This management strategy identifies approaches for achieving the following goal and outcome:

Sustainable Fisheries Goal

Protect, restore and enhance finfish, shellfish and other living resources, their habitats and ecological relationships to sustain all fisheries and provide for a balanced ecosystem in the watershed and Bay.

Fish Habitat Outcome

Continually improve effectiveness of fish habitat conservation and restoration efforts by identifying and characterizing critical spawning, nursery and foraging areas within the Bay and tributaries for important fish and shellfish, and use existing and new tools to integrate information and conduct assessments to inform restoration and conservation efforts.

Baseline and Current Condition

The quantity and quality of fish habitat is declining in the Chesapeake Bay as a result of several factors: poor water quality, human population increases and development pressure, energy development, shoreline hardening, toxic contaminants and rising sea level. Water quality is impaired by development and increased impervious surfaces, mineral extraction, loss of vegetated riparian buffers, livestock in streams, non-point sources of pollution, failing waste management systems and disturbances of riparian and upland areas.

Due to the various areas that comprise "fish habitat" (submerged aquatic vegetation (SAV), streams, water column, wetlands, shorelines, etc.), along with gaps in understanding of which provide the highest value in supporting fish reproduction, feeding, juvenile growth and refuge from predation, there is no established baseline for "fish habitat" at this time.

Existing information, such as *The Habitat Requirements for Chesapeake Bay Living Resources* (1991), state wildlife action plans and various spatial tools, include general maps showing habitat and fish distribution for many species, and include information on the water quality requirements of these species. However, the maps do not characterize the quality of these areas. A primary component of the management approach outlined further on in this document, is to build on existing efforts by developing criteria that describes "high quality" fish habitat. With this information, partners will work to identify areas that meet the criteria, quantify and prioritize the areas, and target them for management action.

This strategy adopts the definition of "fish habitat" from the National Fish Habitat Partnership (NFHP) Action Plan 2nd edition: "Any area on which an aquatic organism depends, directly or indirectly, to carry out the life processes of the organism, including an area used by the organism for spawning, incubation, nursery, rearing, growth to maturity, food supply, or migration, including an area adjacent to the aquatic environment if the adjacent area: (1) Contributes an element, such as the input of detrital material or the promotion of a planktonic or insect population providing food, that makes fish life possible; (2) Affects the quality and quantity of water sources; (3) Provides public access for the use of fishery resources; or (4) Serves as a buffer protecting the aquatic environment."

III. Participating Partners

All partners listed below will cooperate, to the extent their resources will allow, in building a coordinated approach.

Chesapeake Bay Watershed Agreement Signatories

- State of Maryland
- Commonwealth of Virginia
- District of Columbia

- Commonwealth of Pennsylvania
- State of Delaware
- State of New York
- State of West Virginia
- Chesapeake Bay Commission (CBC)
- National Oceanic and Atmospheric Administration (NOAA)
- U.S. Fish and Wildlife Service (USFWS)
- U.S. Department of Agriculture Natural Resources Conservation Service (USDA NRCS)
- U.S. Geological Survey (USGS)

Key Participants

The regulatory agencies within each jurisdiction that are responsible for fisheries are important to advance the fish habitat outcome in their jurisdiction. The following agencies are currently serving as key participants:

- Maryland Department of Natural Resources (MD DNR)
- Virginia Department of Game and Inland Fisheries (DGIF)
- Virginia Marine Resources Commission (VMRC)
- Delaware Department of Natural Resources and Environmental Control (DNREC)
- Pennsylvania Fish and Boat Commission (PFBC)

Federal partners including the National Oceanic and Atmospheric Administration (NOAA), U.S. Fish and Wildlife Service (USFWS), U.S. Department of Agriculture (USDA), Environmental Protection Agency (EPA), U.S. Army Corps of Engineers (USACE) and U.S. Geological Survey (USGS) are engaged in critical research, spatial tool development, data collection and restoration projects that support fish habitat in the Chesapeake Bay. Many projects are in collaboration with key state and non-profit partners.

The Atlantic States Marine Fisheries Commission is participating to address its goal to improve fisheries habitat conservation through partnerships, policy development and education.

The Atlantic Coast Fish Habitat Partnership (ACFHP) is a key partner that provides support for fish habitat restoration projects along the Atlantic Coast, including the Chesapeake Bay. ACFHP is a coast-wide partnership of fish habitat resource managers, scientists and communications professionals from 33 different state, federal, tribal and nongovernmental agencies who have established a commitment to work together for the benefit of aquatic resources.

Implementation of the strategy will also need to include regulatory agencies that address relevant water quality and permitting issues:

- Maryland Department of the Environment (MDE)
- Pennsylvania Department of Environmental Protection (DEP)
- Virginia Department of Environmental Quality (DEQ)

Local Engagement

Local engagement is critical to this outcome. Planning decisions are made at the local level and ensuring that fish habitat is a part of their planning process and considerations is a primary mechanism to stem

the decline of quality fish habitat. Stakeholders from local nonprofit organizations were engaged in drafting this strategy and provide local knowledge of specific habitats and fish species, as well as insight into local government and citizen stewardship. A representative from the local government of Queen Anne County, Maryland is currently an active member of the team.

IV. Factors Influencing Success

Partner Coordination

Working within a regional partnership, the Fish Habitat outcome cannot be achieved without coordinated efforts by a diverse group of partners. State government agencies are committed to different priorities and often work in isolation from other agencies, demonstrating the value of a regional-scale partnership working among jurisdictions to increase inter-agency cooperation. There is a need to improve multi-agency coordination to fully achieve fish habitat conservation and restoration goals. Making sure actions are directly meaningful to decision-making agencies is paramount to the success of the fish habitat goal.

Government Agency, Nongovernmental Organization and Local Engagement

Progress under the Fish Habitat outcome is limited by the level of engagement from Chesapeake Bay Program partners. Reflected in the list of *Key Participants*, four of the seven Chesapeake Bay watershed jurisdictions are considered active in regular Fish Habitat Action Team meetings and workshops. Broader participation is needed among state-level partner agencies to include representation by all jurisdictions in the watershed. This will fully integrate feedback reflecting the range of perspectives into efforts conserving and restoring fish habitat.

Strategic communication to increase and maintain partner engagement is critical. Improved communication to the public and involvement of local communities is another aspect of partner engagement. Opportunities to engage with diverse partner organizations, including state and local-level planning agencies, are necessary to the success of this outcome. Collaboration with planning staff and environmental review coordinators would aid in the protection of habitat through the regulatory process and be incorporated into local comprehensive land-use plans and master plans. Conveying the important role of fish habitat to these diverse groups is challenging when many fisheries regulations are species-specific, but essential for achieving a balanced ecosystem.

Scientific and Technical Understanding

Information needed to prioritize locations for fish habitat conservation and restoration is critical to inform effective action. For example, identifying where high-quality fish habitats occur to understand baseline conditions, and which areas are most at risk to degradation, are major needs influencing our ability to maintain productive fish habitat. Many habitats are under-sampled or underrepresented in fish and benthic surveys. New research could begin to close the gaps in these data-poor areas, and the research needs identified in the 2018 *Factors Influencing Fish Habitat Function in the Chesapeake Bay Watershed: Application to Restoration and Management Decisions* Science and Technical Advisory Committee (STAC) workshop (fish habitat workshop).

In terms of using existing data, many decision-support tools exist to inform management action but users are not always aware of the available resources. Large-scale assessments conducted by

organizations like the National Fish Habitat Partnership provide a high level view of existing fish habitat, but lack the spatial resolution to allow for effective decision-making at a local level. Integrating the most current regional data into a comprehensive user-friendly tool that can guide conservation and restoration specific to the Chesapeake Bay is a key to implementing the Fish Habitat outcome.

Natural and Anthropogenic Factors

Fish habitat is strongly influenced by a broad range of natural and anthropogenic factors. Water quality degradation through toxic contaminants, harmful algal blooms and hypoxia events reduce the health of fish habitats. Shoreline development has major impacts to loss of coastal habitat, and changing land use for inland parts of the watershed reduces habitat quality through sedimentation, erosion and runoff from agriculture and impervious surfaces in urban areas. Climate change impacts, including sea level rise, changing sea surface temperatures, changing weather patterns and ocean acidification, affect the availability of fish habitat and may cause shifts in distribution of suitable conditions for fish habitat. Improved understanding of how these environmental factors affect fish spawning, larval development and recruitment of adults can ensure that fish populations are resilient to stressors.

V. Current Efforts and Gaps

Existing information such as *The Habitat Requirements for Chesapeake Bay Living Resources* (1991), state wildlife action plans and various spatial tools include general maps of fish habitat for many species and include information on the water quality requirements of these species. However, the maps do not characterize the specific locations, quantity or quality of these habitat areas. Habitat programs throughout the watershed are limited in their capacity to advance habitat science, develop tools to address challenges to habitat and establish improved protections because the purview of fishery managers is limited to managing harvest. Without authority to influence land management policy, fishery managers are dependent on voluntary actions of land managers to promote policies that conserve viable habitat and target restoration where key ecological function is regained.

A primary component of the fish habitat management approach outlined further on in this document is to identify high quality areas that need conservation, and impaired areas that would benefit from restoration efforts, to build an understanding of the relationship between habitat stressors to habitat condition.

Gaps

Science

- There is a need to understand how habitats contribute to fisheries production. In other words, how much habitat yields how many fish.
- Improve understanding of how environmental factors affect fish spawning, larval development and recruitment of adults to the fishery.
- Identifying and quantifying areas of “high quality” fish habitat suggesting which waters are most important to critical life stages for fish.
- Integrating and synthesizing existing data into decision support tools and models. There is limited information available on fish distributions and habitat condition, but there is more extensive information in the watershed on factors and stressors of habitat. An inventory and

analysis of this information is needed to begin to understand the relationship of habitat condition on fish resources and identify the gaps in data and science.

- A list of research needs was developed at the Fish Habitat Workshop and remains a priority for the workgroup.
- An ecosystem services valuation study that quantifies the value of fish habitat would allow us to effectively communicate the economic benefits of restoration and conservation.
- Understanding the limits of restoration. Once a system has reached a state of requiring restoration it is already degraded and restoration may never fully recover what has been lost.
- Communication with practitioners and managers to inform design of support tools is necessary to assure we provide a resource that is not duplicative, but helpful in targeting management to enhance and maintain habitat.

Management

- Since fish habitat is affected by many different factors, effective management needs to include agencies addressing water quality, fisheries, planning and more. As such, multiagency coordination should be improved. This coordination also needs to cover different spatial scales from the watershed to the local level because the impacts of water quality are far reaching, and fish use many different areas of the watershed.
- There is a gap between current single-species focused management approaches applied by fishery managers, and the goal of moving toward a more ecosystem-based approach to management. This will require a commitment by Bay jurisdiction fishery managers to better incorporate habitat considerations into management. Movement from single-species to ecosystem-based management of fisheries will require fishery managers to consider approaches that account for habitat change (improvements and losses) into their assessments.
- Clear regional and local goals and metrics for fish habitat conservation and restoration.
- The public does not fully understand the consequences of habitat loss on fish and services they value. Improved communication on the effects of habitat loss and threats driving it are needed.
- Involvement of local communities, specifically inclusion of fish habitat protections in local planning efforts is necessary to advance this outcome. A fish habitat assessment tool would enable sharing of this information with local decision makers and the public for use in planning and protection of high quality areas.

VI. Management Approaches

The partnership will work together to carry out the following actions and strategies to achieve the Fish Habitat outcome. These approaches seek to address the factors affecting the ability to meet the goal.

Habitat loss and degradation have been identified as significant factors affecting the long-term sustainability of Bay and coastal fisheries. The challenge for fishery managers is working across conservation and restoration regulatory and management sectors to ensure maintenance of vital fish habitat. This calls for creative approaches to address the challenges of effectively integrating habitat

protection, restoration and enhancement not only into fisheries management programs and plans but more importantly into local planning decisions.

The primary goal of this Fish Habitat outcome is to maintain and increase the quality and quantity of fish habitat. The first focus of this strategy is to conserve the best of what is left. To accomplish this goal, the workgroup adopted a set of modified principles from National Fish Habitat Partnership:

- Conserve and maintain intact healthy tidal and non-tidal habitats.
- Prevent further degradation of already-impacted tidal and freshwater habitats.
- Reverse declines, where possible, in the quality and quantity of tidal and freshwater habitats to improve the overall quality of fish and shellfish habitat.
- Increase the quality of fish habitats that support a broad natural diversity and ecosystem resilience.
- Identify and apply approaches to incorporate habitat into strategies of managed fish species.

Several previous efforts, including *The Habitat Requirements for the Chesapeake Bay* (1991), provide maps and descriptions of areas in the Bay that support key species, based largely on presence and absence. However, these maps and descriptions do not adequately describe habitat suitability or quality for these areas.

Fish habitat is considered the core of ecosystem-based fisheries management as stated in the *Fisheries Ecosystem Plan for the Chesapeake Bay* (2006): "An important goal of ecosystem-based management is to maintain, and in many cases increase, the quality and quantity of habitat in the Chesapeake system as a whole."

The first step to maintain and increase the quality and quantity of fish habitat is to identify where these quality areas are and how they may change in response to multiple factors (e.g. land use, environmental variability, climate change and others). This effort has been furthered by the information and framework developed at the 2018 fish habitat workshop. Geographic information on stressors in the watershed was gathered for use at the workshop, but additional work is needed to analyze the information for scale and biological response. A further step is development of a regional fish habitat assessment to communicate the status of fish habitats, help visualize appropriate areas to conserve or restore, and facilitate conversations on management options. This will allow the focus to address the factors and stressors, rather than the symptoms, behind fish habitat decline.

The products of this work will support a range of management decisions aimed at achieving the Fish Habitat outcome. Potential decisions support improved regulatory protections for fish habitat including "fish conservation areas"; permits for in-water activities; riparian land use decisions; and prioritizing efforts aimed at curbing water pollution, restoring streams, or restoring in-water connectivity.

In general, the approach will include the five steps outlined below.

1. Compile and identify available data on habitats, habitat vulnerabilities and fish utilization at different life stages to develop a set of criteria for identifying areas of high-quality fish habitat.
2. Identify and prioritize stressors to fish habitat at the jurisdictional and Bay-wide scale and propose actions to manage the threats. This work was started at the 2018 fish habitat workshop. A list of stressors per habitat type that were identified at the workshop are listed below. This is

not an exhaustive list of stressors, but rather a list of stressors that were ranked as the most severe and with the greatest degree of certainty by the scientists participating at the workshop. Some stressors are listed more than once as they are attributed to more than one factor influencing fish habitat. (Note: evaluation of the most severe stressors was limited to the availability of stressor data for each factor.)

Habitat Type: Large nontidal rivers
Representative Species: Freshwater mussels, black bass, American shad, American eel, river herring

Variable/Stressor	***Factor***
Stormwater runoff, impervious surface	Human/urban
Sediment	Urban/pollution/agriculture
Nutrients/eutrophication	Agriculture/nutrient
Deforestation	Natural
Bank erosion	Habitat
Flow alteration	Dams
Habitat fragmentation, deforestation, population density, housing density	Human
Stormwater runoff, impervious surface	Human/urban

Habitat Type: Headwaters
Representative Species: Brook trout, trout (general)

Variable/Stressor	***Factor***
Sediment, water temperature, point source discharge	Pollution
Number, position, and size of dam, reservoir releases, culverts, thermal change from dam	Dams
Population and housing density, septic system density and age, population growth, commercial employment density, land use, waste water treatment plant, fishing pressure	Human
Land use, land use change, imperviousness, stream canopy cover, channelization, roadways/road density, road crossings, stormwater management, sedimentation, coal tar sealants (PAHs)	Urban
Sedimentation, manure management, nutrients, land and streambank erosion, ditching, lack of riparian buffers, temperature effects, agrichemicals (pesticides, EDCs, hormones)	Agriculture
Wetland loss, riparian buffers, sediment erosion, channel scour and fill	Habitat

Habitat Type: Tidal freshwater habitat Representative Species: Striped bass, Atlantic sturgeon, American shad, American eel, river herring, white perch, yellow perch	
Variable/Stressor	***Factor***
Water withdrawal	Water use
Fishing/boating activities, Land use change, Population density and change	Human
Impervious surface, wetland loss, road crossings, riparian habitat loss, shoreline change and armoring, stream channelization and ditching	Urban
Erosion, nutrients, toxicants, water use	Agriculture
Submerged aquatic vegetation	Natural
Woody structure, submerged aquatic vegetation, bottom substrate, channelization/dredging, invasive species, water temperature	Habitat
Nitrogen, phosphorous, eutrophication	Nutrient
Temperature change	Water quality/cimate
Invasive species, lack of or shift in benthic species or forage	Biological

Habitat Type: Tidal saltwater habitat Representative Species: Bay anchovy, Atlantic sturgeon, blue crab, oyster, spot, croaker, summer flounder, striped bass, forage species	
Variable/Stressor	***Factor***
Nitrogen, phosphorus/nutrients	Nutrient/pollution
Development, shoreline armoring, impervious surface, habitat loss	Human
Impervious surface, septics, stormwater discharge, wastewater treatment plants, habitat loss, development, shoreline hardening	Urban
Runoff, nutrients, sedimentation, land use	Agriculture
Submerged aquatic vegetation, oyster reef and wetlands loss	Natural
Dissolved oxygen, turbidity/light, chlorophyll-a/phytoplankton, water temperature	Water quality
Loss of feeding habitat and forage, harmful algal blooms, trophic effects, invasive species	Biological
Water temperature, sea level rise	Climate

Many of these are existing stressors, and the workgroup recognizes the need to watch emerging stressors as well. While the mitigation potential for each of the identified stressors was considered at the workshop, more work is needed to understand the extent mitigation compensates for ecological losses.

3. Map and identify fish habitat conditions and vulnerabilities for improved conservation and restoration. Partners will work with the science and management community to develop spatial

tools for priority habitats and species to inform management decisions. This process begins with an effort to gather geographic habitat information and analysis of the information for scale and biological response. This inventory of data started for the fish habitat workshop. A further step is the development of a regional fish habitat assessment to communicate the status of fish habitats, help visualize appropriate areas to conserve or restore, and facilitate conversations on management options. The team will also explore the development of thresholds and/or metrics (a minimum area of fish habitat by region) to set clear fish habitat conservation targets and goals.

4. Communicate importance of fish habitat to the general public and local community leaders by engaging in a conversation about the tradeoffs associated with competing uses of land and water. Planning decisions are made at the local level and ensuring fish habitat is a part of the local planning process and considerations is a primary mechanism to stem the decline of quality fish habitat.

5. Evaluate ways to enhance fish habitat protection by reviewing examples from other regions (e.g., the Puget Sound Partnership) and actively engaging with the Atlantic Coast Fish Habitat Partnership. One example the workgroup identified in the Chesapeake Bay watershed is Pennsylvania's designation of exceptional value streams and waters. This designation comes with additional anti-degradation protections for these areas.

The habitat stressors, species of interest and management approaches vary by habitat type, and throughout the watershed and jurisdictions. However for all habitat types, engagement, communication, and collaboration with local government and other outcomes is essential.

Approaches Targeted to Local Participation

Identifying high-value fish habitat areas will enable sharing of this information with local planners, policy makers and the public, and facilitate discussions on how best to ensure these areas are protected against development pressure and other threats.

Cross-Outcome Collaboration and Multiple Benefits

This outcome, while focused on identifying protecting, and restoring fish habitat, is still broad in scope and has connections to many other Management Strategies listed below, as well as with the Fisheries, Habitat, Healthy Watersheds and Water Quality Goal Implementation Teams. Collaboration with other outcomes will be necessary for success.

- Water Quality
- Climate Resiliency
- SAV
- Stream Health
- Land Use
- Forage
- Brook Trout
- Fish Passage
- Toxics
- Blue Crab
- Oysters
- Healthy Watersheds

VII. Monitoring Progress

Progress towards the Fish Habitat outcome is difficult to measure, given the lack of a quantifiable target. Improved effectiveness of fish habitat conservation and restoration efforts is accomplished through funded research projects, communication of scientific information to guide decision makers, and indirectly through other outcomes such as Water Quality. In contrast to some of the species-specific outcomes, which have well-defined metrics for achieving success (e.g., number of acres restored oyster reef), the Fish Habitat outcome is multifarious and reflects the challenges of accomplishing ecosystem-based fisheries management. One opportunity is to provide ecosystem-level guidance to fisheries managers which would focus on habitat requirements in terms of managed species that are not named under Fisheries GIT outcomes, including:

- Striped bass
- Menhaden
- Bay anchovy
- Black basses
- River herring
- Atlantic sturgeon
- Summer flounder
- White perch
- Yellow perch

Integration and synthesis of fish, benthic habitat, water quality, land-use parameters and stressor data can be used to develop spatial analysis tools to identify habitat condition and, to an extent, monitor the changes in stressors and condition. A regional fish habitat assessment could serve as a baseline to monitor progress with this outcome.

Monitoring Needs

Each jurisdiction participating in this strategy has active fish and habitat monitoring programs. However, shallow water fish monitoring, as suggested by the Chesapeake Research Consortium's 2006 Fish Stock Monitoring Report, Chesapeake Research Consortium, and early life stage monitoring are still needed to better understand habitat needs and impact.

Lessons Learned

Scientific understanding and communication with partners are significant factors influencing the success of the Fish Habitat Outcome. Filling the scientific gap has focused on:

- Identifying fish habitat threats and stressors among selected species, see the TetraTech stressor and threat literature review and analysis for adults and juveniles and egg and larval life stages.
- Synthesizing results from a multilayer Smithsonian Environmental Research Center shoreline impact study.
- Identifying critical spawning, nursery and overwintering areas for select species in Maryland and Delaware.
- Conducting a workshop that evaluated factors influencing habitat function. The workshop's objective was to identify the necessary scientific information, analytical approaches and decision support needs necessary to assess the condition and vulnerability of fish habitat in the watershed. The workshop report outlines the workshops' findings and recommendations.

The Fish Habitat team recognizes that the science must be communicated to decision makers and mangers. Prior to the fish habitat workshop, input was obtained from fishery managers and scientists, land use planners and non-governmental organizations interested in the conservation of fish and habitat services through an online questionnaire to determine their needs for fish habitat information and communication. The Regional Fish Habitat Assessment User Needs Report summarizes the responses from 148 individuals throughout the Chesapeake Bay watershed.

VIII. Assessing Progress

This outcome is new and still in a developmental phase. As such, progress will be measured by tracking implementation of jurisdictional habitat priorities and the four focal areas articulated in the Management Approaches section. The biennial workplan is developed around these four focal areas with specific actions and timelines.

IX. Adaptively Managing

The partnership will use the following approaches to ensure adaptive management:

- A key component of this strategy is to develop criteria and spatial tools to identify high-quality fish habitat and areas of concern using the best available science. Partners will convene the scientists and managers to evaluate what can be achieved with existing information. Partners will also meet with potential users of the spatial tools to ensure the utility of the spatial tools and clarify expectations.
- The Fisheries and Habitat GITs will review progress on a biannual basis as part of their regular meeting schedule and adjust course as necessary. This will include evaluation of what maps and guidelines have been produced, which agencies and jurisdictions are using these materials and how this strategy is being revised or updated to accommodate improved tools and lessons learned.

X. Biennial Workplan

A biennial workplan for this management strategy was first developed in 2016 and subsequently updated in 2018. The Fish Habitat Workplan is expected to be updated on schedule and include actions that advance the scientific understanding of fish habitat and communication materials and strategy.