

## Quarterly Progress Meeting: Forage

### Step 1: Summarize your outcome.

#### Outcome:

Continually improve the Partnership's capacity to understand the role of forage fish populations in the Chesapeake Bay. By 2016, develop a strategy for assessing the forage fish base available as food for predatory species in the Chesapeake Bay.

#### Lead and Supporting Goal Implementation Teams (GITs):

The Sustainable Fisheries Goal Implementation Team (GIT 1) leads the effort to achieve this outcome. The Forage Action Team under GIT 1 directly supports the Forage Outcome.

#### Active Partners:

Active partners are defined as members who have attended at least one meeting since June 2016.

- Maryland Department of Natural Resources (*State of Maryland*)
- Maryland Department of the Environment (*State of Maryland*)
- Pennsylvania Fish and Boat Commission (*Commonwealth of Pennsylvania*)
- Virginia Marine Resources Commission (*Commonwealth of Virginia*)
- National Oceanic and Atmospheric Administration Chesapeake Bay Office
- National Park Service
- U.S. Geological Survey
- Atlantic States Marine Fisheries Commission
- Chesapeake Bay Ecological Foundation, Inc.
- Chesapeake Bay Foundation
- Chesapeake Research Consortium
- Mid-Atlantic Fishery Management Council
- Morgan State University Estuarine Research Center
- Omega Protein Corporation, Inc.
- Potomac River Fisheries Commission
- Smithsonian Environmental Research Center
- University of Maryland Center for Environmental Science
- Virginia Institute of Marine Science

#### Progress:

This outcome targets increasing understanding of forage populations in the Chesapeake Bay and developing a strategy to assess the forage base available as food for predatory species. In an effort to achieve this outcome, the following work has been completed:

#### ***Scientific and Technical Advisory Committee Workshop and Report***

- In 2014, forage experts met at a Scientific and Technical Advisory Committee (STAC) Forage Workshop, where they worked to develop a system-wide scientific synthesis of forage in the Chesapeake Bay and develop actionable recommendations for management. Workshop experts developed a [report](#), which included a prioritized list of recommendations to improve

understanding of Chesapeake Bay forage.

***GIT-Funded Studies – Forage Indicators, Predator Consumption Profiles, Forage Population Trends***

- The University of Maryland Center for Environmental Science (UMCES) conducted a [study](#) to develop a suite of forage indicators and consumption profiles for representative predators in the Chesapeake Bay. Types of indicators of forage status and trends included: 1) Relative prey abundance/biomass, 2) Diet-based indices, 3) Prey/Predator ratios, and 4) Consumption/Prey ratios. Data were compiled from multiple surveys and included diet-based indices from six predators. Researchers noted the variability through time and offered the recommendation to focus on invertebrates.
- UMCES has recently completed a study, which investigated environmental drivers of forage population trends at various spatial and temporal resolutions. Building on the results of the previous forage study (above), researchers utilized six surveys to develop models to analyze forage-environment relationships both Baywide and regionally. Environmental indices include climate indices, water flow, temperature, chlorophyll concentration, hypoxic conditions, and other water quality conditions. In addition, the study identified regional patterns in predator consumption and associated the environmental and biological correlations.
- Watershed Groups throughout the Chesapeake Bay are working with Forage Action Team staff to develop a citizen sampling project for forage in nearshore habitats. This pilot study will collect citizen science data from habitats such as riprap, SAV beds, and marsh.

***Communications Efforts***

- The Forage Action Team and the Chesapeake Bay Program Communications team collaborated to design and develop a [forage video](#) in the Chesapeake Bay Program’s “Bay 101” educational series. This effort utilized footage gathered throughout the Chesapeake Bay by videographer, Will Parson and included expert opinion by Dr. Ed Houde to explain the importance of forage in the Bay to a broad audience.

***Developing a Strategy***

- The Forage Action Team developed a strategy, which functions as a framework for achieving the Forage Outcome. The strategy was developed by team members, revised through recommendations from the Sustainable Fisheries GIT Executive Committee and Forage Action Team, and approved. It will be used as a foundational element of our present and future efforts.

***Partner Collaboration***

- The Forage Action Team has been reaching out to multi-state fishery advisory groups, such as the Atlantic States Marine Fisheries Commission and the Mid-Atlantic Fishery Management Council to learn about their [ecosystem approach to fishery management](#) and [forage amendment](#).
- Maryland Department of Natural Resources has developed striped bass indicators including a standardized index of bass-to-major forage.
- A [small-scale project](#) was developed with an undergraduate student to evaluate the accuracy and effectiveness of a cost-efficient benthic corer and citizen scientist effort for quantification of forage species in nearshore habitats with different substrates.

**Step 2: Explain the logic behind your work toward an Outcome.**

The attached logic table (available as an Excel spreadsheet) explains the reasoning behind our work toward an Outcome. The table indicates the status of our management actions and denotes which actions have or will play the biggest role in making progress.

### Step 3: Craft a compelling narrative.

#### *What are our assumptions?*

##### **(1) Are you on track to achieve your Outcome by the identified date?**

The Forage Outcome has two focuses, the first of which is to increase our understanding forage species in the Chesapeake Bay. As seen above from our progress, we have made great strides in increasing our understanding through the Chesapeake Bay Program and our partners. The STAC Workshop and two GIT-funded projects have identified important forage in the Chesapeake Bay, provided us with a suite of forage indicator options, analyzed predator consumption over time, and evaluated the impact of environmental stressors on forage population trends.

The second focus of the Forage Outcome is to evaluate the forage fish base available as food for predatory species in the Chesapeake Bay. Our next steps will be to determine if we have sufficient information to begin evaluating forage availability in the Chesapeake Bay. If available information is not sufficient, we plan to define what information we need to acquire to make a forage base availability assessment. If available information is sufficient, we will direct our efforts to design a thorough analysis of the forage and predator base. Two major factors impacting our ability to achieve the forage outcome that has been identified are the dearth of monitoring data in tidal shallow water habitats and the lack of understanding of the shoreline/forage relationship.

##### **a. What is your anticipated deadline? What is your anticipated trajectory?**

We completed development of a strategy to assess the forage base in 2017. Beyond that action, we do not have an anticipated deadline for achievement of our outcome as the outcome language states that we will “Continually improve the Partnership’s capacity to understand the role of forage fish populations in the Chesapeake Bay.” We aim to expand our current progress and to build off our current research. Our next steps will include addressing the data gaps that we have identified in tidal nearshore habitats as well as further analysis and continued monitoring of forage and predator species.

##### **b. What actual progress has been made thus far?**

Progress has been outlined above in response to Step 1. Main progress includes:

- STAC Workshop and [Workshop Report](#)
- UMCES study on [Forage Indicators and Predator Consumption Profiles](#)
- UMCES study on [Environmental Drivers of Forage Population Trends](#)
- MD DNR [development of striped bass indicators](#)
- CBP published [forage outreach video](#)

- Small-scale forage sampling projects with an [undergraduate](#) and with Watershed Organizations

**c. What could explain any existing gap(s) between your actual progress and anticipated trajectory?**

Challenges which may impact our Outcome achievement include:

Top Priorities:

- Need develop a threshold analysis for tidal shoreline throughout the Bay
  - Improve understanding of shoreline impacts on forage populations, diversity, health
  - Identify at what percentage of hardened shoreline do forage populations suffer
  - Work with local planners to establish this threshold beyond which shoreline hardening should not be approved
  - Potentially benefit other CBP outcomes such as land use, fish habitat, wetlands, forest buffers, SAV, blue crabs
- Lack of monitoring data for forage species in tidal shallow water habitat (especially invertebrates)

Additional challenges limiting Outcome achievement:

- Lack of predator diet data from tributaries and shallow waters
- Lack of zooplankton monitoring data.

***Are we doing what we said we would do?***

**(2) Which of your management actions have been the most critical to your progress thus far? Why? Indicate which influencing factors these actions were meant to manage.**

The STAC Workshop and [Workshop Report](#), UMCES study on [Forage Indicators and Predator Consumption Profiles](#), and UMCES study on [Environmental Drivers of Forage Population Trends](#) have provided the team with a foundation to build our future research and potential management efforts. These actions fulfilled gaps in science and understanding.

**(3) Which of your management actions will be the most critical to your progress in the future? Why? What barriers must be removed—and how, and by whom—to allow these actions to be taken? Indicate which influencing factors these actions will be meant to manage.**

Top Priorities:

- Identifying a shoreline hardening threshold at which forage populations are negatively impacted
- Conducting tidal shallow-water forage monitoring in valuable nearshore areas.

Additional Actions:

- The development of forage indicator(s) will be the most critical next step in our progress. We have identified priority species in the Chesapeake Bay and need a measure of progress. Team members have considered potentially having multiple indicators to measure forage

population relative to predator populations and if management action is taken, a measure of management action performance.

### *Are our actions having the expected effect?*

**(4) What scientific, fiscal or policy-related developments or lessons learned have changed your logic or assumptions (e.g., your recommended measure of progress; the factors you believe influence your ability to succeed; or the management actions you recommend taking) about your Outcome?**

We will need to consider the impacts of habitat loss/degradation, development, climate change and water quality on forage populations and how these factors may impact our current methods for monitoring forage in the Chesapeake Bay. Our future selected indicators will need to be adaptive to these factors.

**(5) What would you recommend changing about your management approach? What new content will you include in your updated work plan?**

- Continue working with citizen scientists to increase monitoring data
- Look for further funding opportunities to continue advancing our knowledge of forage species and increase monitoring data collection
- Sponsor research linking forage and habitat condition

**(6) What opportunities exist to collaborate across GITs? Can we target conservation or restoration work to yield co-benefits that would address multiple factors or support multiple actions across outcomes?**

- Fish Habitat, Stream Health, SAV, Wetlands
  - Collaborate with the above workgroups to conserve and restore valuable forage habitat in tidal nearshore areas, streams, SAV beds, marsh grasses
- Water Quality GIT
  - Identify connections between water quality and forage health/distributions/populations
  - Assess impacts of BMPs on forage populations
- Climate Change
  - Support efforts to minimize climate change impacts (Chesapeake Atlantis Model demonstrated a negative correlation between increasing temperatures and forage)

### *How should we adapt?*

**(7) What is needed from the Management Board to continue or accelerate your progress? Multiple asks of the Management Board should be prioritized where possible.**

- Recommend STAC develop a threshold analysis for tidal shoreline throughout the bay.
  - Task STAC with assessing tidal shoreline throughout the bay and evaluating development of shoreline condition thresholds or metrics. Thresholds or metrics could be a tool for planning officials to help guide shoreline development decisions and

implement protection or restoration where necessary. The NOAA funded [Predicting Impacts of Stressors at the Land-Water Interface in the Mid-Atlantic Region](#) project found that shoreline hardening significantly impacts fish, crabs and SAV. These near shore habitats are important to many forage species.

- Management Board members from MD, VA, DE, DC agree tidal shorelines are critical to many outcomes in the 2014 agreement and deserve greater focus.
- Management Board members from MD, VA, DE, DC commission development of a comprehensive strategy for tidal shorelines that includes an assessment of baseline condition and evaluates development of a shoreline condition target.
- Prioritize shallow water forage monitoring, including invertebrates.
  - Charge STAR with developing a shallow water forage monitoring strategy

### *What is our financial status? What are our future financial needs?*

**(8) What are the anticipated sources of funding/resources (monetary or non-monetary)/financing opportunities outside the CBPO that you anticipate would support this work? In other words, who else cares?**

#### **Current Funding:**

Staff Time	Forage Action Team, Fish GIT Executive Committee, Fish GIT staff, jurisdictional advisory bodies, Communications Workgroup, Maryland Department of Natural Resources, Virginia Marine Resources Commission, Potomac River Resource Commission, University of Maryland Center for Environmental Science, Fish GIT, Scientific and Technical Assessment and Reporting Team
GIT Funding	\$50K for study on forage indicators and predator consumption profiles (2015) \$60K for study on environmental drivers of forage population trends (2016)
MD DNR Funding	~\$83K for striped bass indicators

We have received funding from the EPA Chesapeake Bay Program Office for two studies, our MD DNR members used funding specifically allocated for striped bass indicator development to fund their research, and we have relied most heavily on staff time from the Forage Action Team members and Fishery Managers in Maryland, Virginia, and the Potomac River.

Apart from our Forage Action Team members, potential supporters of our work could include citizen scientists, commercial or recreational fishermen who would benefit from a more robust forage population/predators. We could also work with undergraduate(s) to study local trends in forage in the Chesapeake Bay. Wetland, SAV, and Waterfowl experts would likely be interested in our work with forage and may want to support our efforts.

**(9) How did those sources of financing work in concert with other financing mechanisms or funding sources?**

The Forage Action Team has not had experience with other forms of funding with the exception of those listed in the table above and a small collaboration with an undergraduate student.

**(10) What were the specific metrics used to determine project and/or funding success? Are those metrics currently incorporated into the current Management Strategy/Outcome/Workplan Action Item?**

As mentioned previously, the GIT-funded projects have been extremely valuable in providing increased understanding for Chesapeake Bay forage and the environmental drivers, which impact their populations. The results of these studies will be used to help direct our future efforts in assessing the forage base and potentially developing management options. However, there are no established metrics to measure project or funding success.