Updates from the Plastic Pollution Action Team

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EPA's Trash Free Waters Program

Supporting Healthy Communities and Vibrant Ecosystems

Prevention

Reduce waste generation at the source and change behaviors that cause trash to get into the environment.

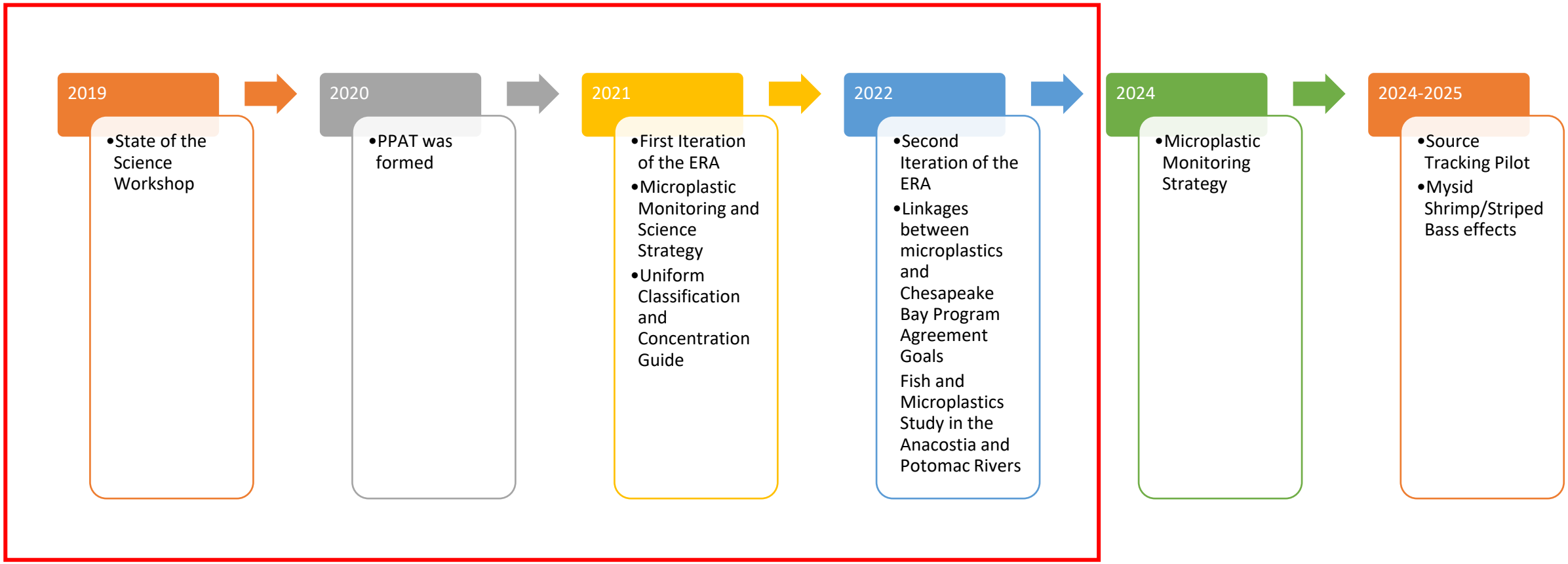
Removal

Remove trash from U.S. waterways by supporting trash capture solutions and other remediation efforts.

Research

Improve understanding of the sources, causes, pathways, and impacts of aquatic trash, including microplastics.

Timeline


2019
•State of the Science Workshop
2020
•PPAT was formed
2021
•First Iteration of the ERA
•Microplastic Monitoring and Science Strategy
•Uniform Classification and Concentration Guide
2022
•Second Iteration of the ERA
•Linkages between microplastics and Chesapeake Bay Program Agreement Goals
Fish and Microplastics Study in the Anacostia and Potomac Rivers
2024
•Microplastic Monitoring Strategy
2024-2025
•Source Tracking Pilot
•Mysid Shrimp/Striped Bass effects

Microplastics in the Chesapeake Bay and its Watershed: State of the Knowledge, Data Gaps, and Relationship to Management Goals

STAC Workshop Report
April 24-25, 2019
Woodbridge, VA

STAC Publication 19-006

PPAT at the Start

The Plastic Pollution Action Team is compromised of various stakeholders from Federal, State, Local, NGO and Academia

The PPAT was given a charge by the CB Management Board

1. Provide oversight of the development of preliminary ecological risk assessments of microplastics for one or more subwatersheds to the Chesapeake Bay (e.g., Potomac). For example, this oversight will include advising researchers on assessment endpoints for the ERA, such as restoration goals for species already being prioritized by the CBP and advising on the development of conceptual models in the ERA.
2. Use the components and results of the preliminary ERAs to develop a strategy that identifies and if possible, prioritizes gaps in information concerning the effects of microplastics pollution on the Chesapeake Bay ecosystem, and highlights future research questions that need to be answered. The strategy should highlight monitoring needs that are necessary to address information gaps.
3. Present results from ecological risk assessments to the MB to guide future action on addressing plastic pollution.
4. Monitor policy advances at the state and federal level that could potentially impact, advance or complement this work to inform the science strategy and to identify potential policy or management options that could be utilized for source reduction strategies.

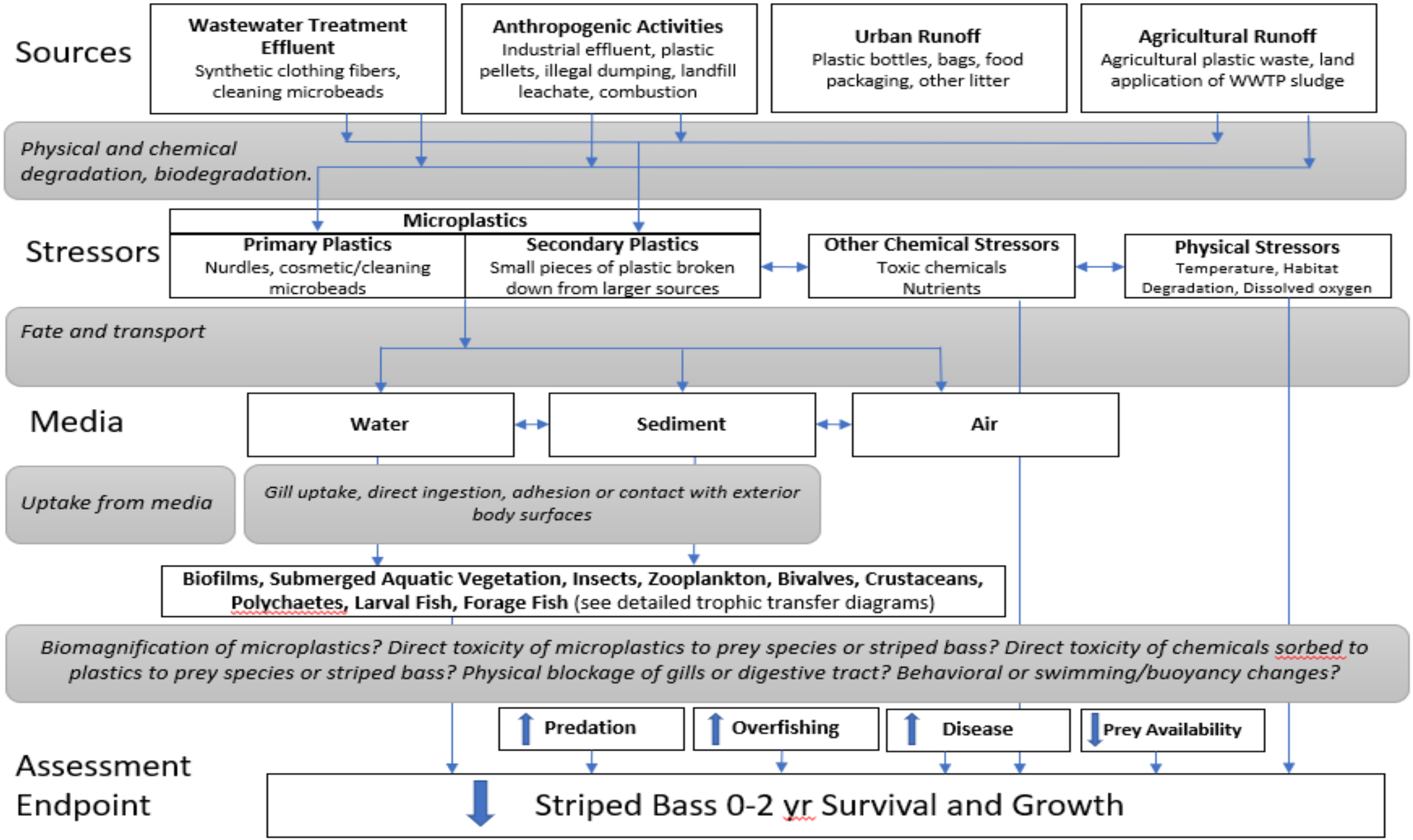
The PPAT is responsible for guiding the various deliverables in this project and providing expertise

Uniform Size Classification and Concentration Unit Terminology

- Setting concentration recommendations for various medias was also a part of this process to support standardized monitoring and broaden the capacity to share and utilize data.
- Media considered: Water Column; Sediment; Organisms & Submerged Aquatic Vegetation

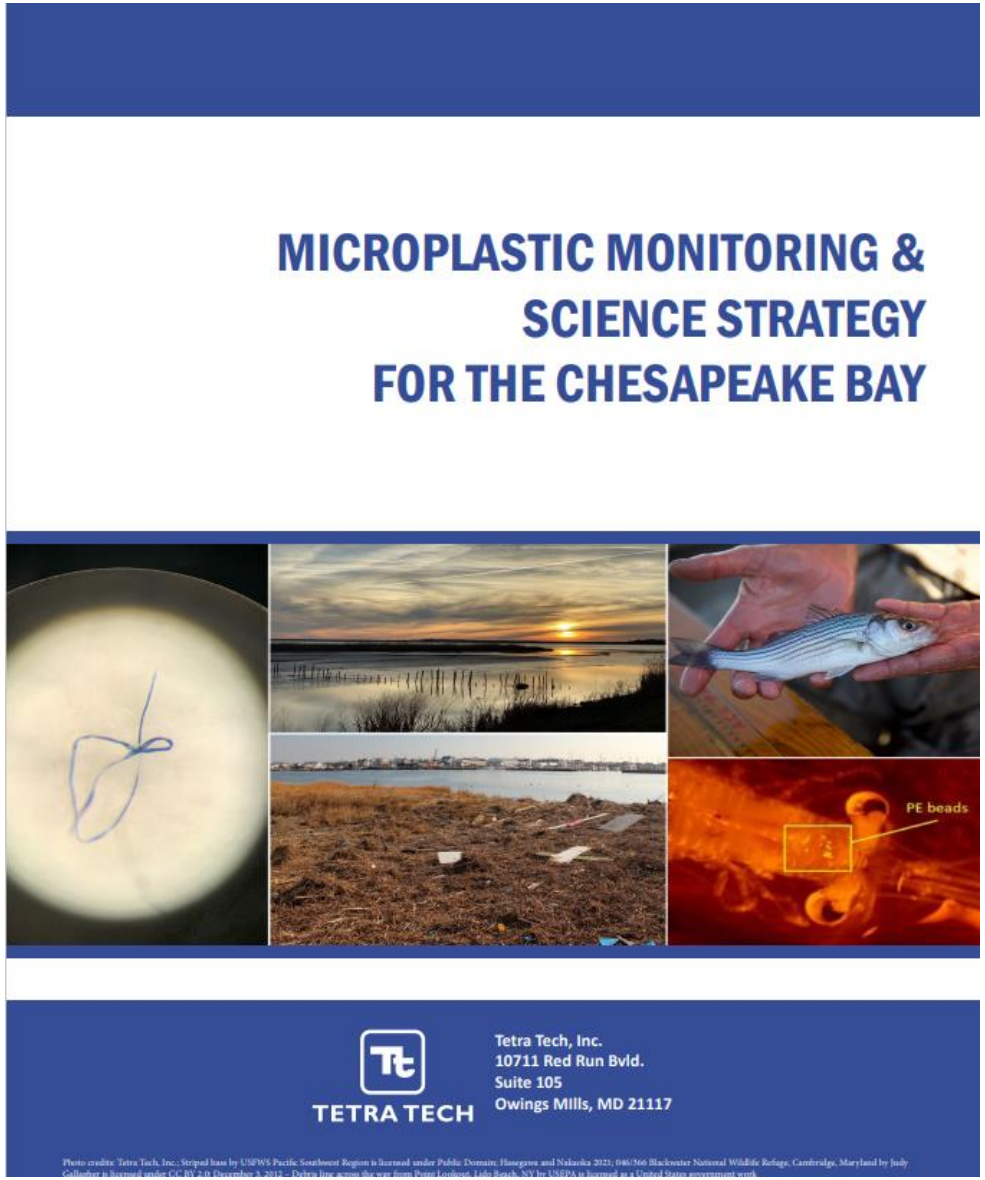
Classification	Size	Rationale
Microplastic	5 mm - 1000 nm (1µm)	--NOAA and GESAMP precedence --Upper size limit is consistent with previous monitoring studies in Chesapeake Bay and tributaries --Use of 333 µm as a lower bound potentially excludes the inclusion of laboratory or monitoring studies that include data below that value -- The lower size limit is consistent with the SI naming convention.
Nanoplastic	1 nm - <1000 nm (1µm)	--The upper limit is consistent with the SI naming convention. --Limit is inclusive of particles <100 nm as defined for non-polymer nanomaterials in the field of engineered nanoparticles -- The lower size limit is consistent with the SI naming convention.

Develop a Conceptual Preliminary Eco Risk Assessment for MP in the Potomac River



Monitoring and Science Strategy

- Modeled after San Francisco Bay's Microplastic Strategy
- This strategy document provides an overview of management needs regarding implementing policies to reduce plastic pollution, which would result in reduction in microplastics.
- This strategy is intended to be a starting point to develop research priorities, monitoring efforts, and policy development.
- It is expected to be updated in the future as more work and research is completed



	Age-0				Age-1	Age-2	
	Larval	Juvenile			SA	SA	
Prey category	OLIGO	TF	OLIGO	MESO	MAIN	MAIN	Priority-level
Insects		47.5	40	12.5			
Cladocerans	26.2						
Larval zooplankton	1						
Adult copepods	40.3						
Bivalves					0.9	1.2	
Mysids		0	24.5	27	4.5	21	
Amphipods		1.5	15	15.5	1.9	5	
Other crustaceans					2.8	4	
Polychaetes		12	5.5	25	4.4	9.4	
Bay Anchovy					57.8	15.6	
Fish larvae		35.5	10	14			
Atl. Menhaden					1.9	17.9	
Other fish					7.6	8	

ERA Results/2022 Updates to the ERA

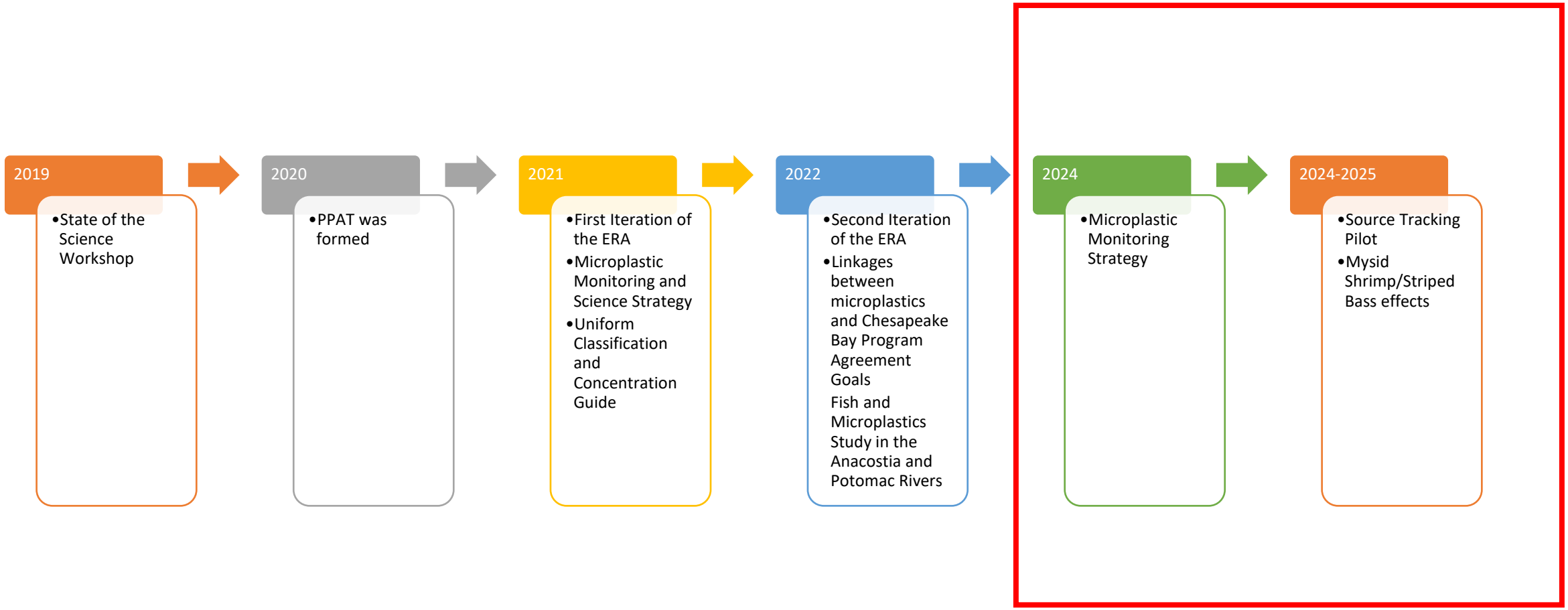
It is hypothesized the MP may contributed to decreased growth and survival by several mechanisms:

- Physical blockage of guts resulting in reduced feeding
- Behavioral changes such as swimming behavior increasing predation risk
- Toxicity to striped bass because organic contaminants adhere to plastics

Focus on Mysids, Amphipods, and Bay Anchovy
Include research on similar taxa from elsewhere around the globe
Investigate potential plankton regime shifts

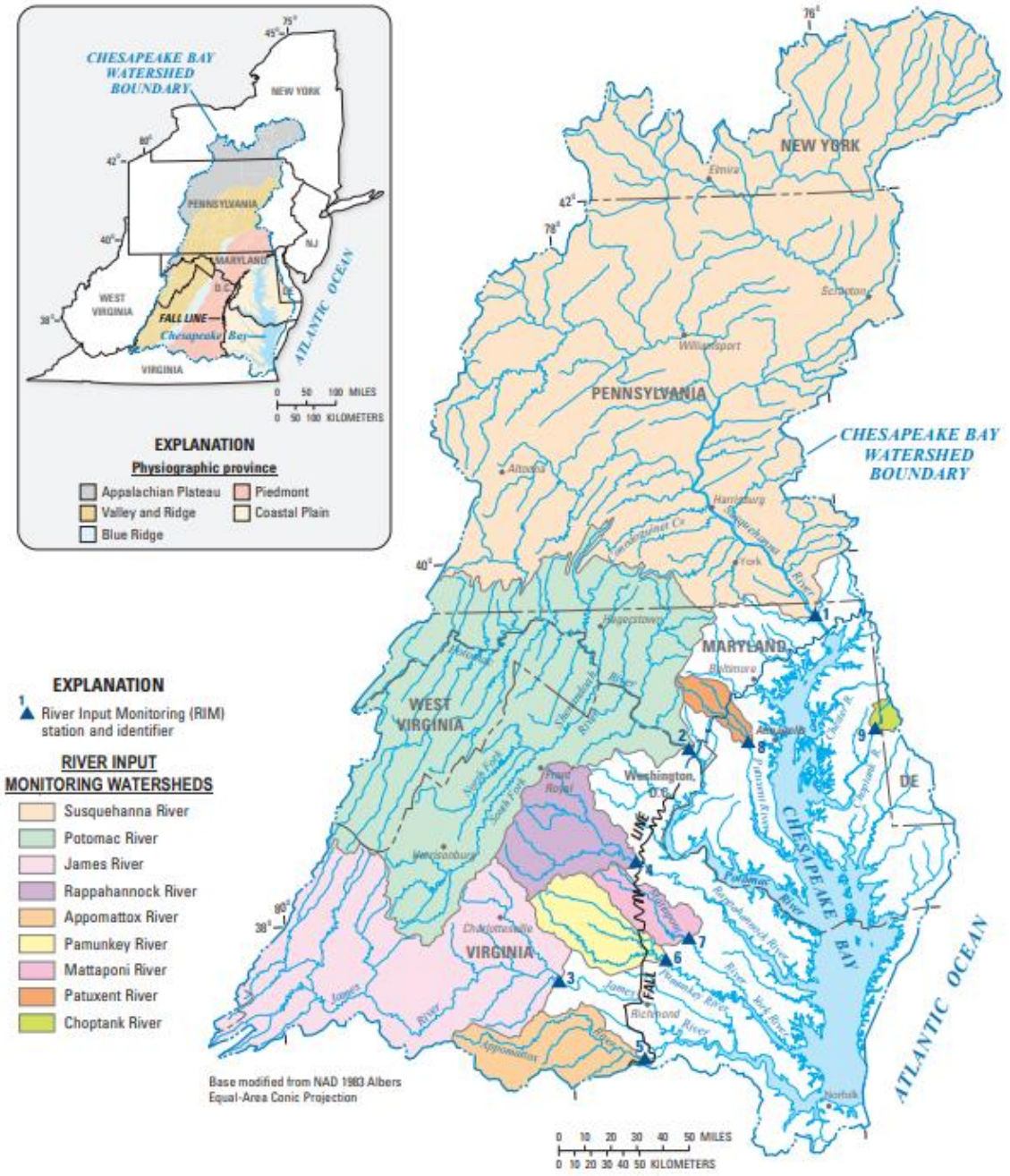
Supplemental Report: Linkages between microplastics and Chesapeake Bay Program Agreement Goals

PPAT New Updates



Framework for Monitoring Plastic Pollution in the Chesapeake Bay

- This framework makes recommendations on monitoring strategies across various media, such as surface water, sediment, and key living resources, as well as scale, frequency, and locations for broad application throughout the Chesapeake Bay and its watershed.
- The framework focuses on leveraging existing programs to limit the resources required.
- The Framework report includes a Field Sampling Reference Guide and a Laboratory Reference Guide as appendices.



Monitoring Framework Recommendations

- Consider adding the goal of no net increase in MP pollution to the Bay Agreement
- Institute & implement a monitoring program to measure attainment of goal and support related goals
- Add MP sampling and analysis of water & sediment to existing or new CBP monitoring networks
- Estimate bay loads of MP to Bay tributaries for annual status & trends reporting
- Facilitate incorporation of MP sampling into state & local monitoring programs
- Conduct focused sampling of known MP sources (ie wastewater)
- Monitor plastic type in 20% of samples to understand plastic products and sources
- Determine MP concentrations in select species of ecological and human health importance
- Conduct focused food web studies to better understand trophic pathways
- Undertake scientific studies of the degradation of plastics and their role as a vector of toxicity

Recommendation	Near-term Actions	Future-term Actions	Potential Program Partners
Consider adding the goal of no net increase in microplastic pollution to the Bay Agreement	Work with partners including identifying a champion jurisdiction to justify the no net increase goal in response to the Beyond 2025 effort and present to Management Board	Garner full support of CBP to achieve no net increase in microplastic pollution using this monitoring framework as a baseline	CBP Management; PPAT; GITs; Champsion jurisdiction
Institute and implement a monitoring program to measure attainment of this no net increase goal and support related goals, such as identifying controllable sources of microplastics	Ensure that adequate capacity and resources are available for field sampling, laboratory analysis, and data management of a robust monitoring program	Continue providing resources needed to answer long-term questions	EPA CBPO; PPAT
Add microplastics sampling and analysis of water and sediment to existing or new CBP monitoring networks	Add microplastic collections and analysis of 12 monthly water column samples and 8 storm-event samples annually at 9 RIM stations	Work with CB WQ monitoring network partners to sample about half of 126 stations for microplastics, evenly divided between bay and tidal tributaries	CB WQ monitoring network participants; EPA CBPO and MD and VA agencies conducting LTP and potentially zooplankton monitoring; ChesMMAP; NCEI
	Add microplastics analysis of sediment collected by LTB program at its 48 fixed sites annually	Add microplastics analysis to sediment collected by LTB at spatially balanced 40 of 166 random sites	
	Identify one or more institutions that will receive microplastic samples for analysis or archiving and Identify a central repository for microplastic data or submit data to National Centers for Environmental Information (NCEI) repository for multiple datasets of marine microplastics	Consider reinstating zooplankton monitoring program with microplastics sampling	
		Consider creating a bay-wide beach monitoring program for microplastics	
Estimate bay loads of microplastics from each of the major Bay tributaries for annual status and future trends reporting	Estimate annual loadings of microplastics using the CBP and USGS methods developed for existing nutrient and sediment loadings calculations	As years of monitoring accumulate, the trends estimation methods used for nutrients and sediment can also be applied to microplastics results	EPA CBPO; USGS
Facilitate incorporation of microplastic sampling into state and local monitoring programs wherever possible to build an increasingly complete picture of the spatial distribution of microplastics status and trends	N/A	Ask each state with a probabilistic non-tidal stream survey (e.g., MBSS) to collect a minimum of 40 water samples (and benthic macroinvertebrate samples if desired) from a spatially balanced random subset of sites. Future sampling designs will lessen sampling in areas of homogenous results and address apparent hotspots	WV DEP; MD DNR; VECOS; VA DEQ; state regulatory agencies; DWSPP; DC DOEE; MS4s; NGOs within CMC
		Ask each state with long-term fixed site network to collect a minimum of 20 water samples annually for future trends analysis	
Conduct focused sampling of known proximal (i.e., wastewater, stormwater, aerial deposition) and ultimate (e.g., land uses) microplastic sources in sufficient numbers to characterize variation across the Bay watershed	Support the Pennsylvania pilot study designed to sample (1) known microplastics sources, (2) upstream-downstream contributions, and (3) contributions from forest, urban, and agriculture land uses	Develop systematic monitoring of microplastics in wastewater, stormwater, and aerial deposition at 40 locations (or 10 locations as a pilot) each within the Chesapeake Bay watershed	EPA CBPO; PA DEP; MS4s; State health department; state agencies regulatring wastewater treatment facilities
		Work with local governments that monitor catchments of dominant land use to expand on the Pennsylvania pilot.	
		Ask state regulatory agencies to require wastewater treatment facilities to add microplastics sampling and analysis to their monitoring	
Implement plastic type (shape and composition) identification in 20% of randomly selected samples to develop an accurate picture of plastic products and ultimate sources leading to microplastic pollution, where possible	Expand on trash monitoring for local TMDLs (e.g., Anacostia) by adding microplastic sampling to these efforts as an opportunity to match trash types and microplastic amounts for a better understanding of plastic product sources.	Use consistent existing methods (see Appendix B Laboratory Reference Guide) or develop new comparable diagnostic polymer and fiber analyses to evaluate representative samples from the spatially extensive monitoring programs	CBP and academia; State agencies and local governments; NGOs
		Use reference sites as measures of background microplastics in the environment (e.g., MBSS sentinel and local reference sites)	
		NGOs may have specific designs to meet specific goals that can be related to microplastics for source identification	
		When possible, incorporate microplastic type identification into extensive non-tidal stream sampling programs to identify specific microplastic pollution hotspots to be controlled	
Determine microplastics concentrations in select species of ecological and human health importance in sufficient numbers to characterize variation across the Bay watershed	Add microplastics analysis to existing Chesapeake Bay fish monitoring programs (e.g., VIMS' ChesMMAP) that collect stomachs	Extend fish stomach collections and analysis for microplastics analysis to state and local governments that sample fish throughout their non-tidal streams	EPA CBPO; VIMs ChesMAPP; State agencies and local governments; NGOs
		Work with state and local governments to collect a subsample of the fish and invertebrates for microplastics analysis from regular non-tidal monitoring	
		As a first step to address human exposure, work with local governments and NGOs to add microplastics to regular or volunteer monitoring for bacteria at beach sites	
Conduct focused food web studies to better understand the trophic pathways leading to microplastics concentrations in these species	Conduct targeted sampling of selected species to identify presence of microplastics (e.g., brook trout, striped bass, blue crabs, oysters, and black duck)	Conduct systematic studies on the trophic pathways of microplastics through the food web, focusing on brook trout, striped bass, blue crabs, oysters, and black duck	CBP and academia
Undertake scientific studies of the degradation of plastics and their role as a vector of toxicity and other risk factors affecting the ecosystem and human health	N/A	Conduct laboratory studies of toxicity of microplastics and associated substances on brook trout, striped bass, blue crabs, and oysters.	CBP and academia
		Expand on VIMS study of impacts of microplastics on bacterial communities and the nitrification/denitrification process	
		Implement degradation studies and source-sink models for the Bay.	

FY25 Current Projects

Assessing Biological Effects of Plastic Pollution Exposure on Young of Year Striped Bass (*Morone saxatilis*) in the Chesapeake Bay and its Tributaries

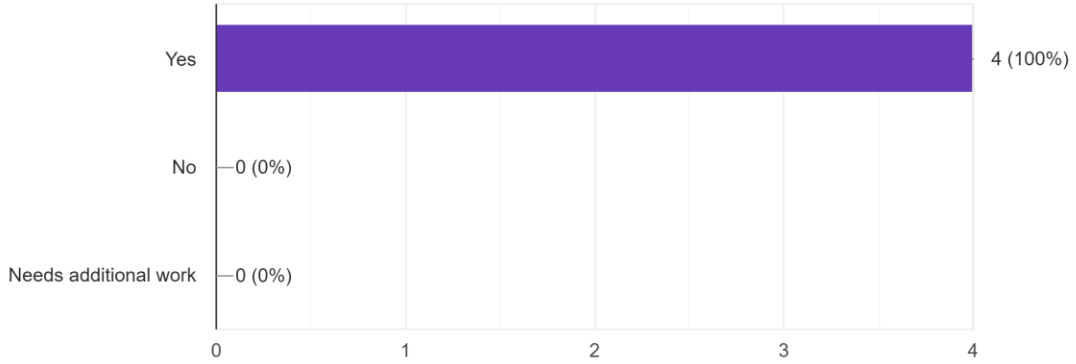
To develop a lab-based study examining biological impacts of microplastics on young of year striped bass fed with microplastic contaminated mysid shrimp coupled with field surveys sampling environmental concentrations of mysid shrimp in the CB watershed

Microplastics Source Tracking in the Chesapeake Bay (CB) Watershed

To source track plastics to understand the major conveyances and compositions of plastics entering the watershed.

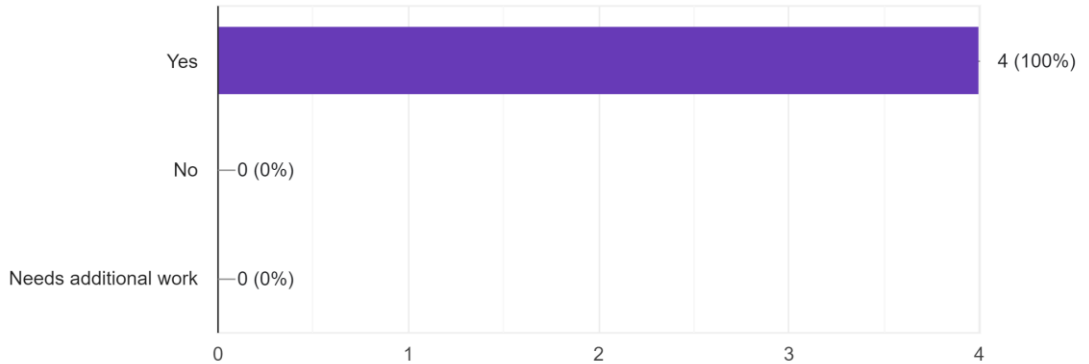
Charge 1: Provide oversight of the development of preliminary ecological risk assessments of microplastics for one or more subwatersheds to the...). Do you think we have accomplished this goal?

4 responses



Charge 2: Use the components and results of the preliminary ERAs to develop a strategy that identifies and if possible, prioritizes gaps in infor...tion gaps. Do you think we accomplished this goal?

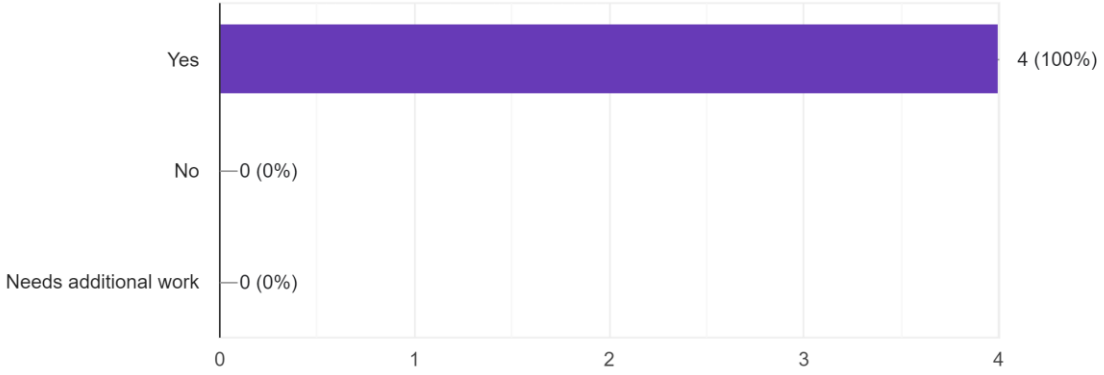
4 responses



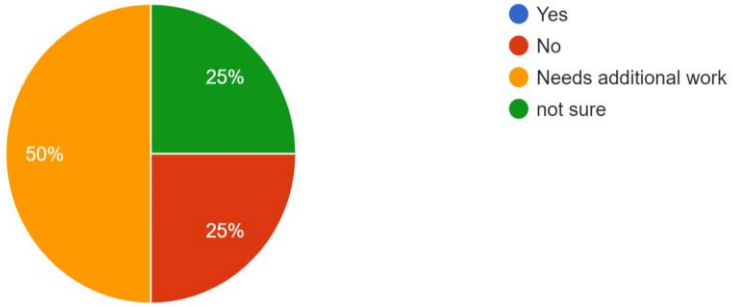
PPAT 5 Year Review Feedback Request

Charge 3: Present results from ecological risk assessments to the MB in order to guide future action on addressing plastic pollution. Do you think we have accomplished this goal?

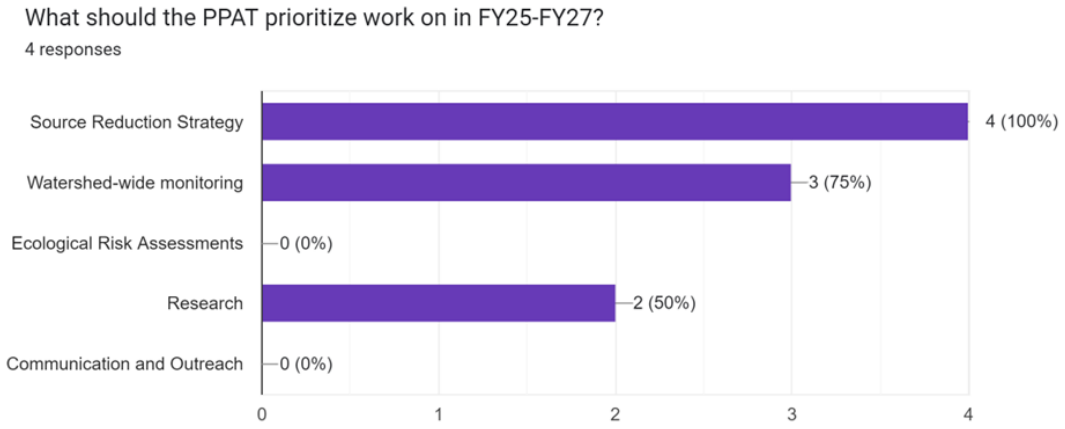
4 responses

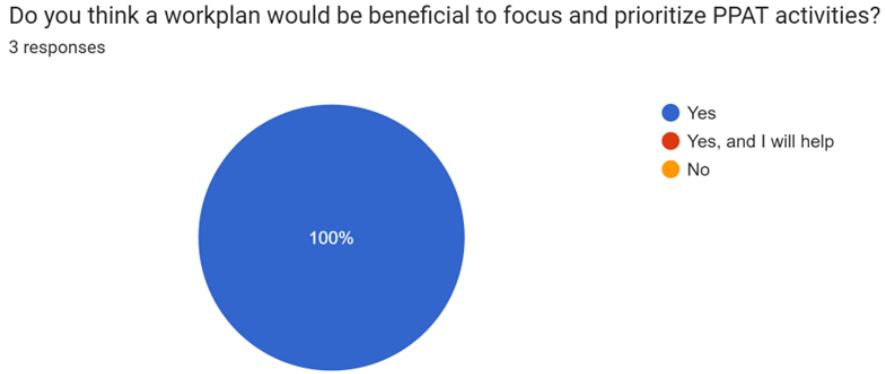


Charge 4: Monitor policy advances at the state and federal level that could potentially impact, advance or complement this work to inform the science strategy and to identify potential policy or management options that could be utilized for source reduction strategies.



PPAT Planning: FY25-FY27





PPAT Future Administrative Ideas

- Beyond 2025 Engagement
- Develop a Workplan

PPAT Future Project Ideas

- Monitoring Initiatives
  - Support UMCES Idea for Report Card Trial Indicator
  - Pilot recommendation #3 from Monitoring Framework
- Develop a Source Reduction Strategy

Thank you!

- All publications can be found at the PPAT website
  - https://www.chesapeakebay.net/who/group/plastic-pollution-action-team

- Contact me
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