# Plastic Pollution Action Team Updates

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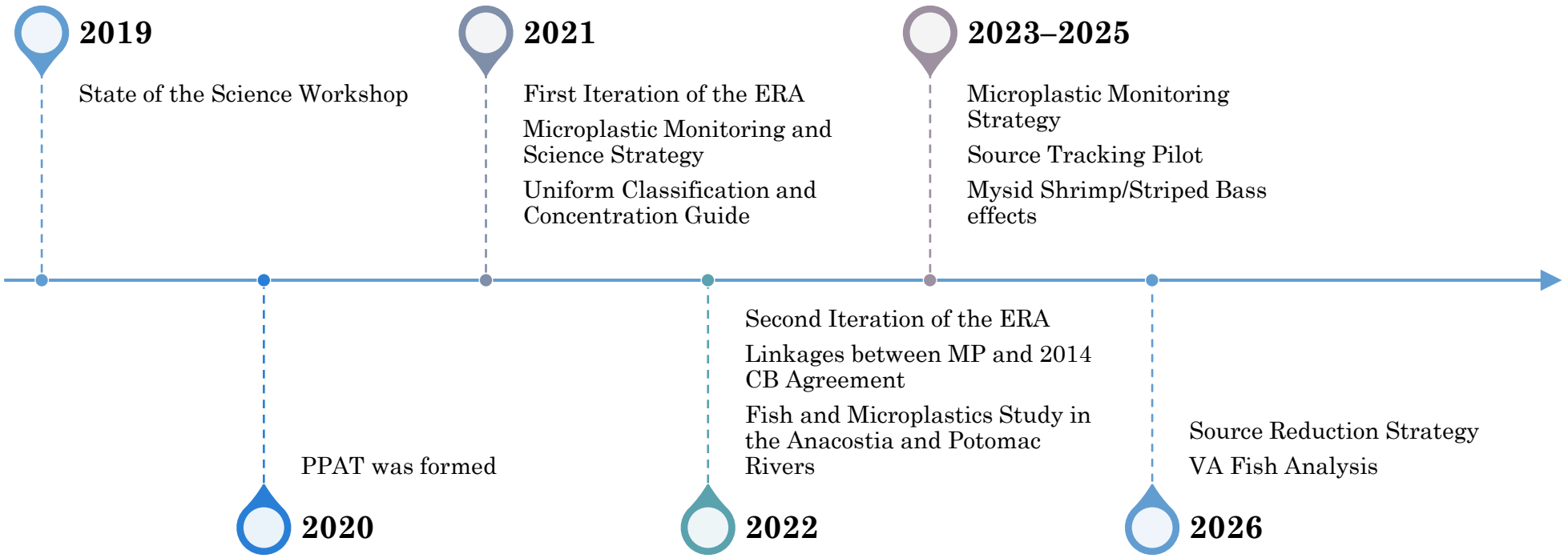
Collaborators: Matt Robinson, CBPO & Tish Robertson, VA DEQ

# Timeline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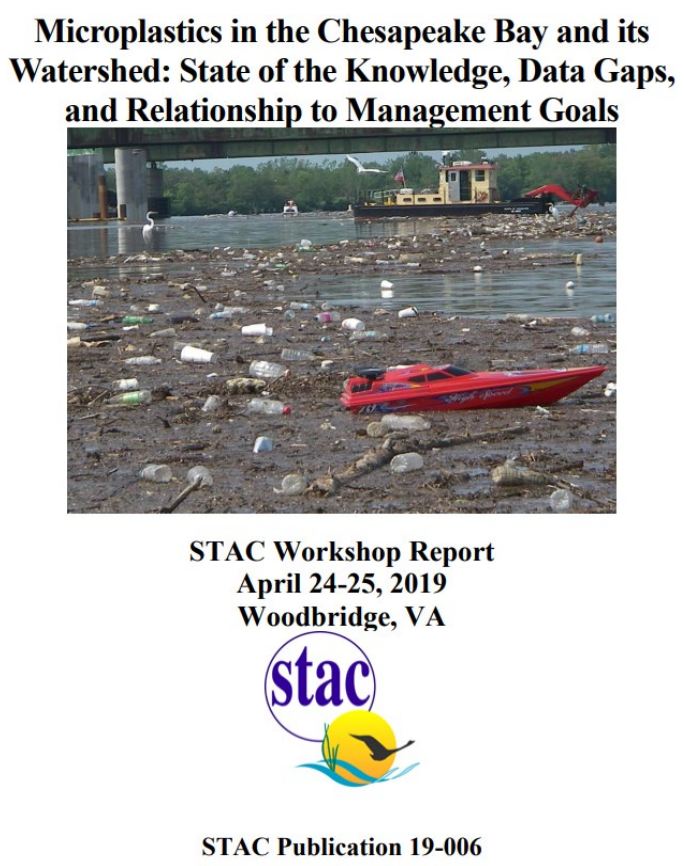
# 2019 Identifying the Problem: Workshop Goals

1. Assess the state of the knowledge on microplastic pollution in the Chesapeake Bay and its tributaries
2. Assess possible effects of microplastics on various habitats and associated living resources
3. Identify existing policy and management tools being used to address plastic pollution in the watershed and beyond, and their effectiveness
4. Identify research gaps moving forward, and develop recommendations for future studies or new tools

# Workshop Recommendations

- The CBP should create a cross-GIT Plastic Pollution Action Team to address the growing threat of plastic pollution to the bay and watershed.
- The Scientific, Technical Assessment and Reporting Team should incorporate development of ERAs of microplastics into the CBP strategic science and research framework, and the Plastic Pollution Action Team should oversee the development of the ERAs focused on assessment of microplastic pollution on multiple living resource endpoints.
- STAC should undertake a technical review of terminology used in microplastic research, specifically size classification and concentration units, and recommend uniform terminology for the CBP partners to utilize in monitoring and studies focused on plastic pollution in the bay and watershed.
- The CBP should develop a source reduction strategy to assess and address plastic pollution emanating from point sources, non-point sources, and human behavior.
- The CBP should direct the Plastic Pollution Action Team and STAR Team to collaborate on utilizing the existing bay and watershed monitoring networks to monitor for microplastic pollution.



# 2020: Establishing the Plastic Pollution Action Team

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

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

# Original PPAT Charge from the management board

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.

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.

Present results from ecological risk assessments to the MB in order to guide future action on addressing plastic pollution.

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.

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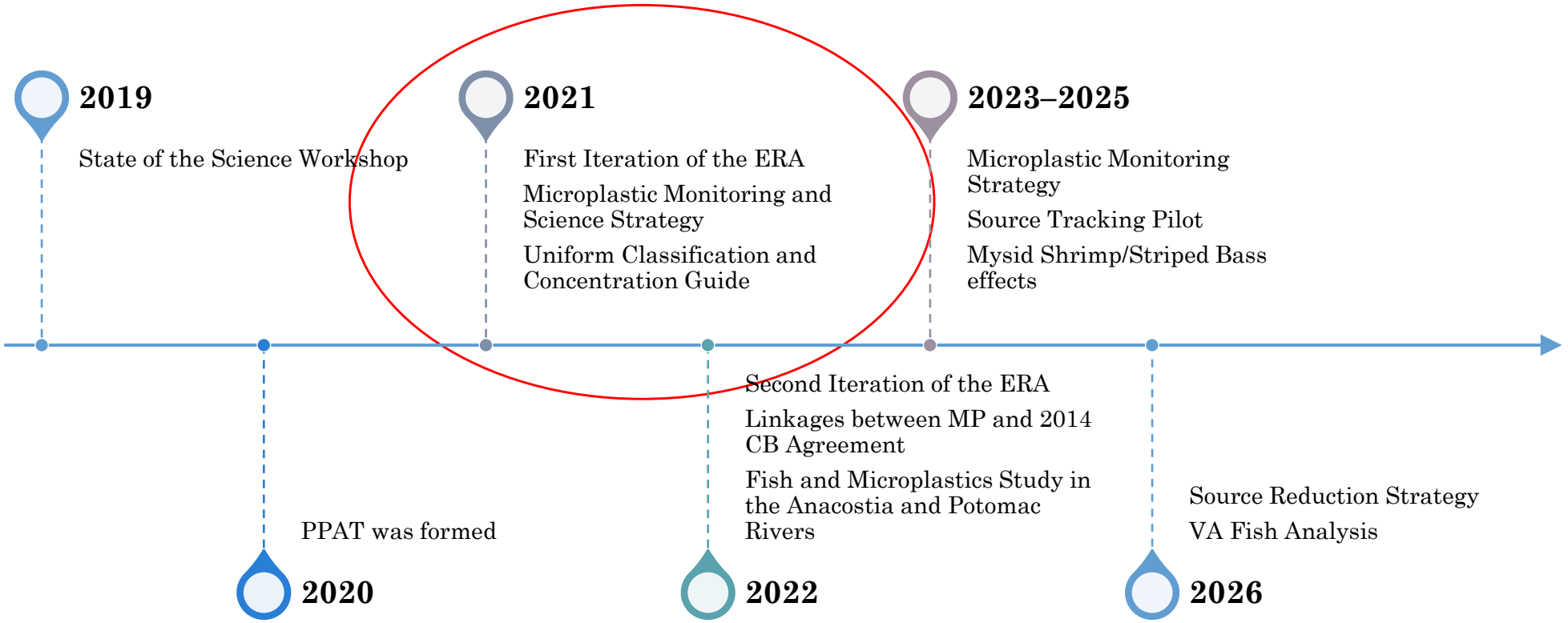
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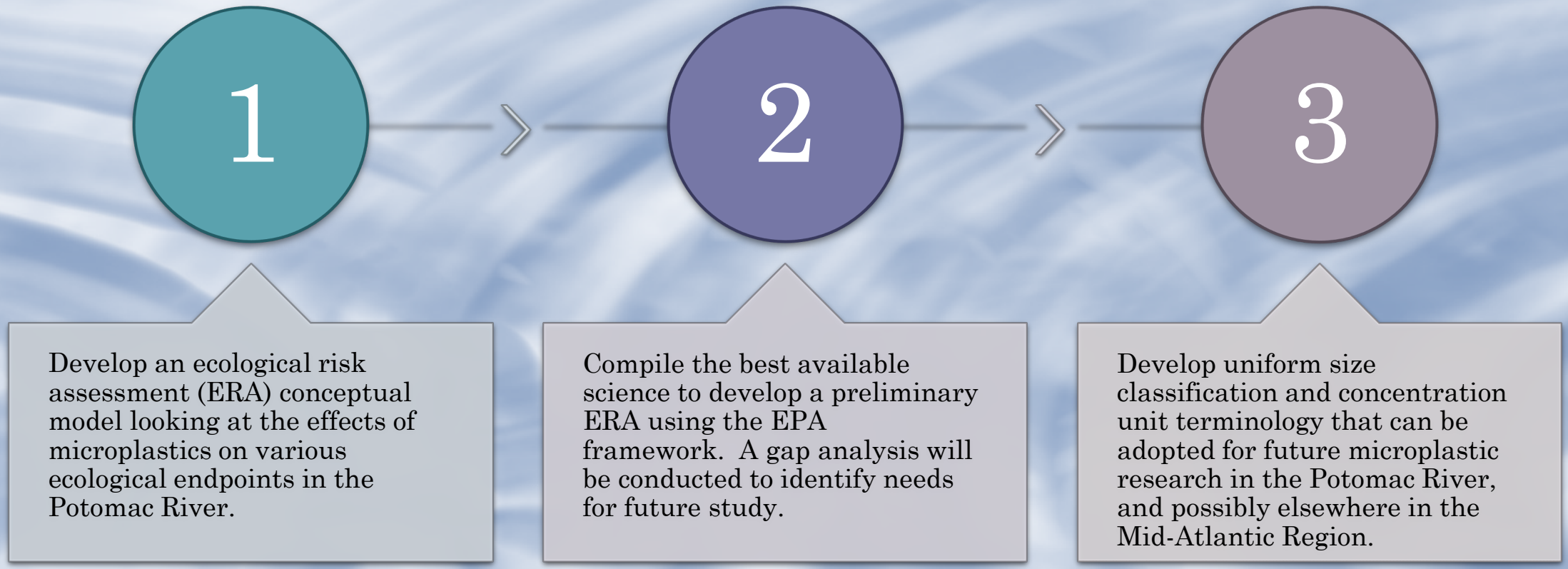
# 2021: Initial Projects and Deliverables



# 2021 Project 1: Uniform Size Classification and Concentration Unit Terminology

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

# Unit Concentrations

- Setting concentration recommendations for various medias was also a part of this process.  This will help encourage standard monitoring and broaden the capacity to share and utilize data from multi-stakeholders across the watershed
- Media Considered
  - Water Column
  - Sediment
  - Organisms
  - Submerged Aquatic Vegetation

# 2021 Project 2: Develop a Conceptual Preliminary Eco Risk Assessment for MP in the Potomac River

**Step 1**

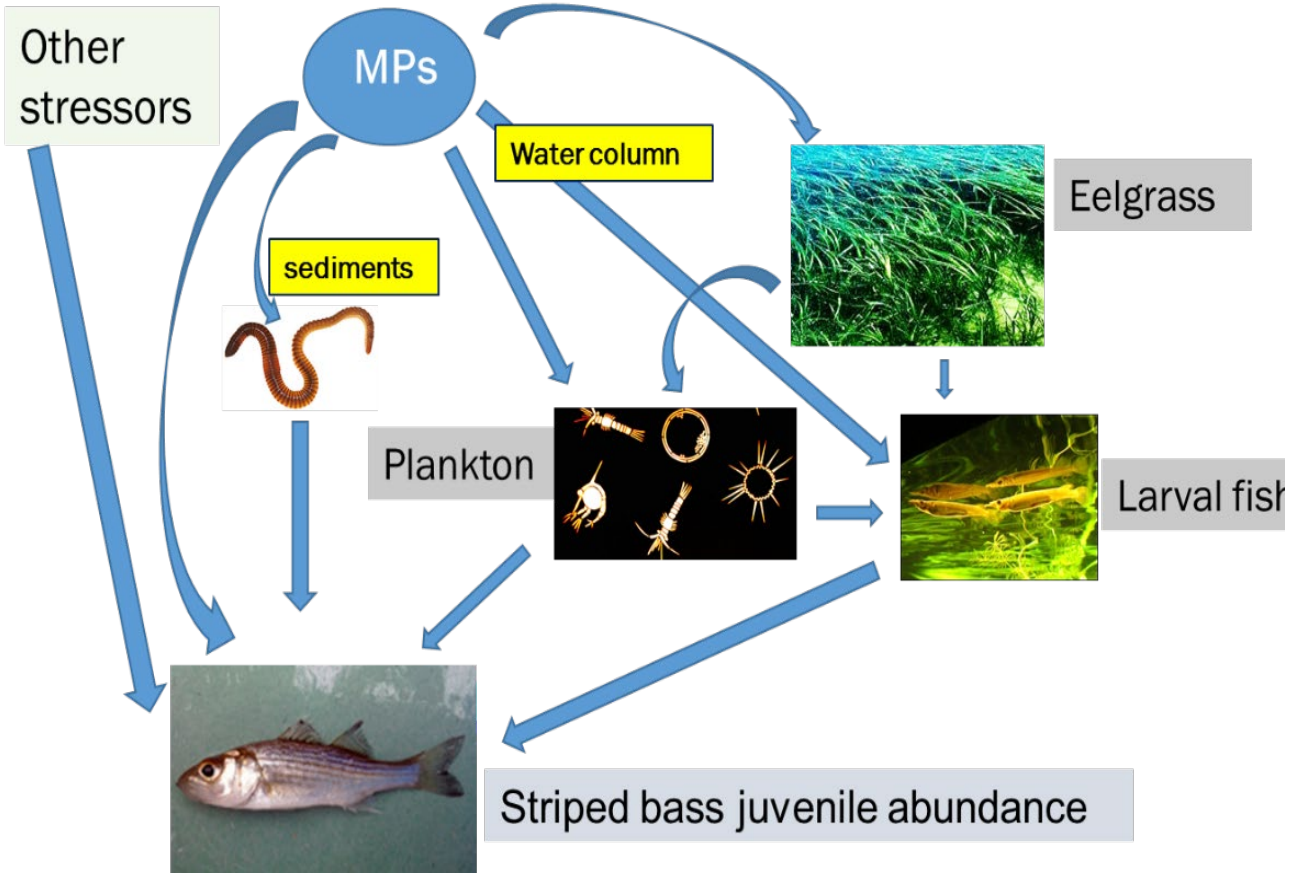
- Biological endpoints of potential interest

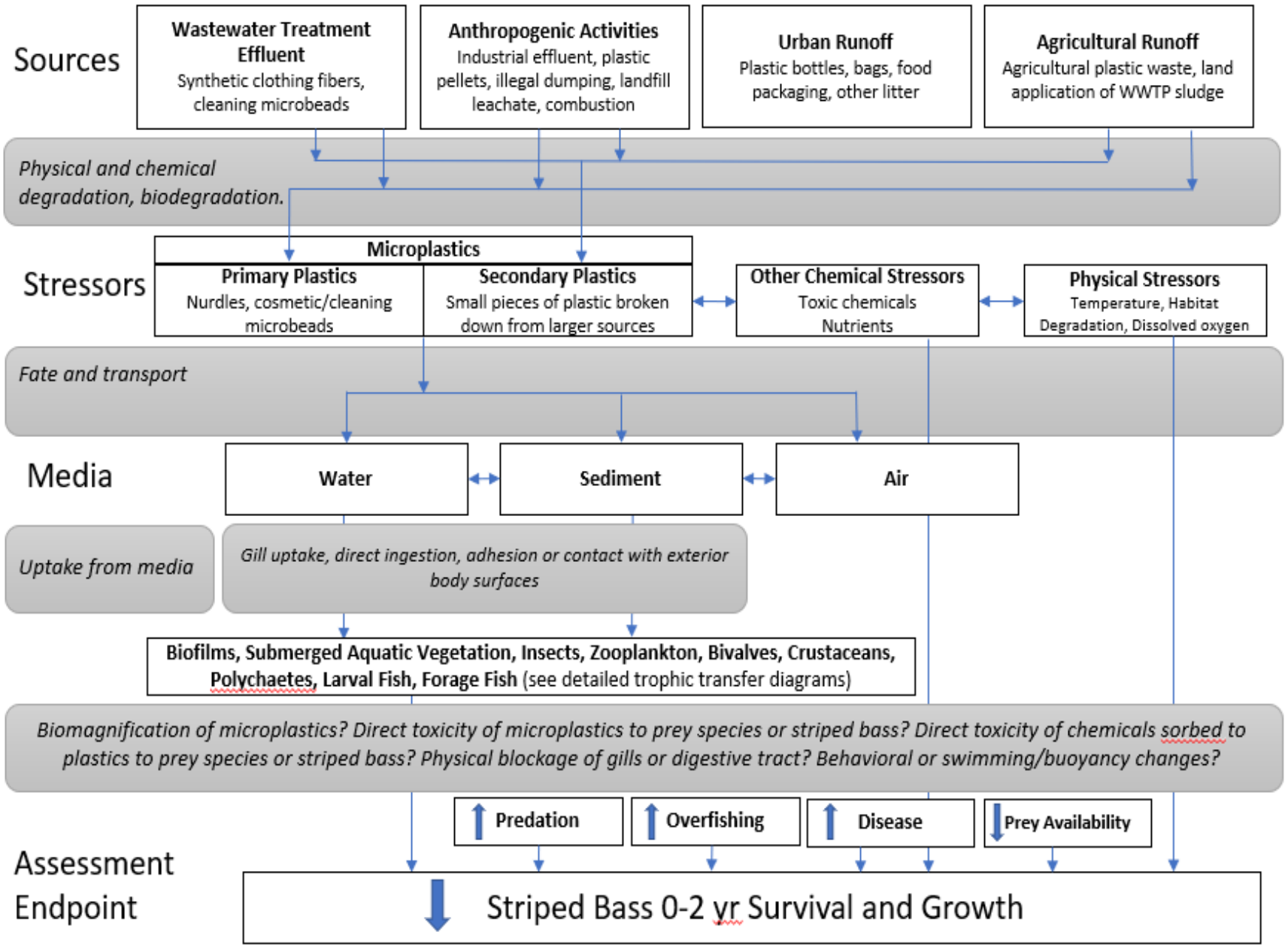
**Step 2**

- Qualitative food web interactions that could lead to microplastic intake by Striped Bass;

**Step 3**

- Semi-quantitative food web interaction scenarios for Striped Bass living in different salinity regimes.



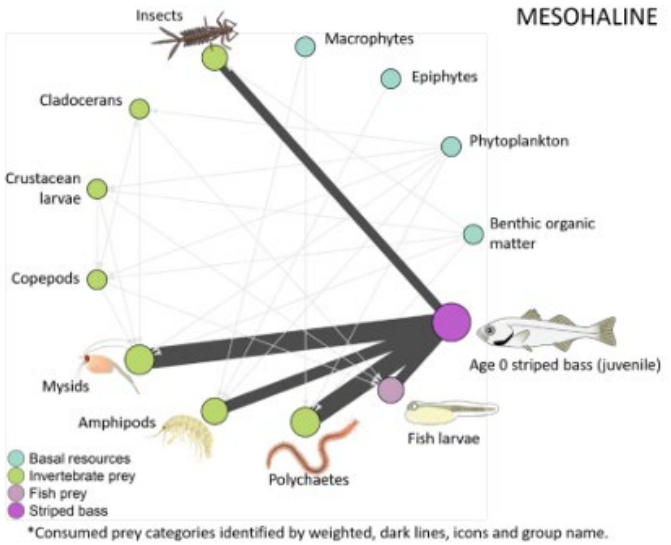



# Conceptual Model

Conceptual Model
Developed by Tetra Tech

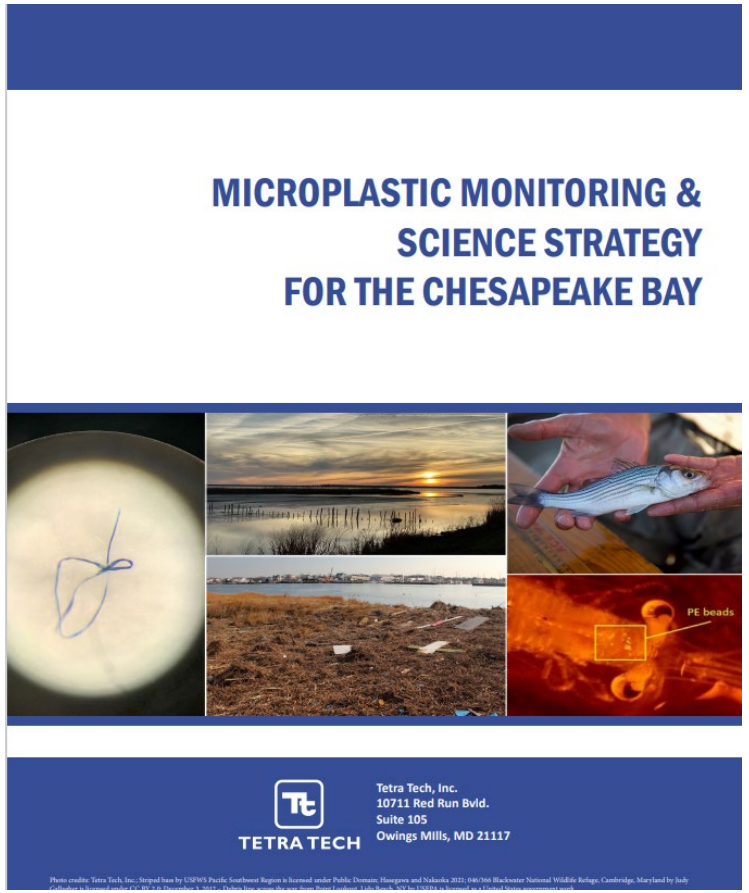
# Semi Quantitative Results

- 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



# 2021 Project 3: 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
- Results identified several data gaps including:
  - Lack of observational and experimental data on the types, sources, and fates of microplastics in the ecosystem
  - Need more understanding on trophic transfer
  - Need more direct studies on the prevalence, intensity and efforts of microplastics contamination on focal species, their prey and the environment



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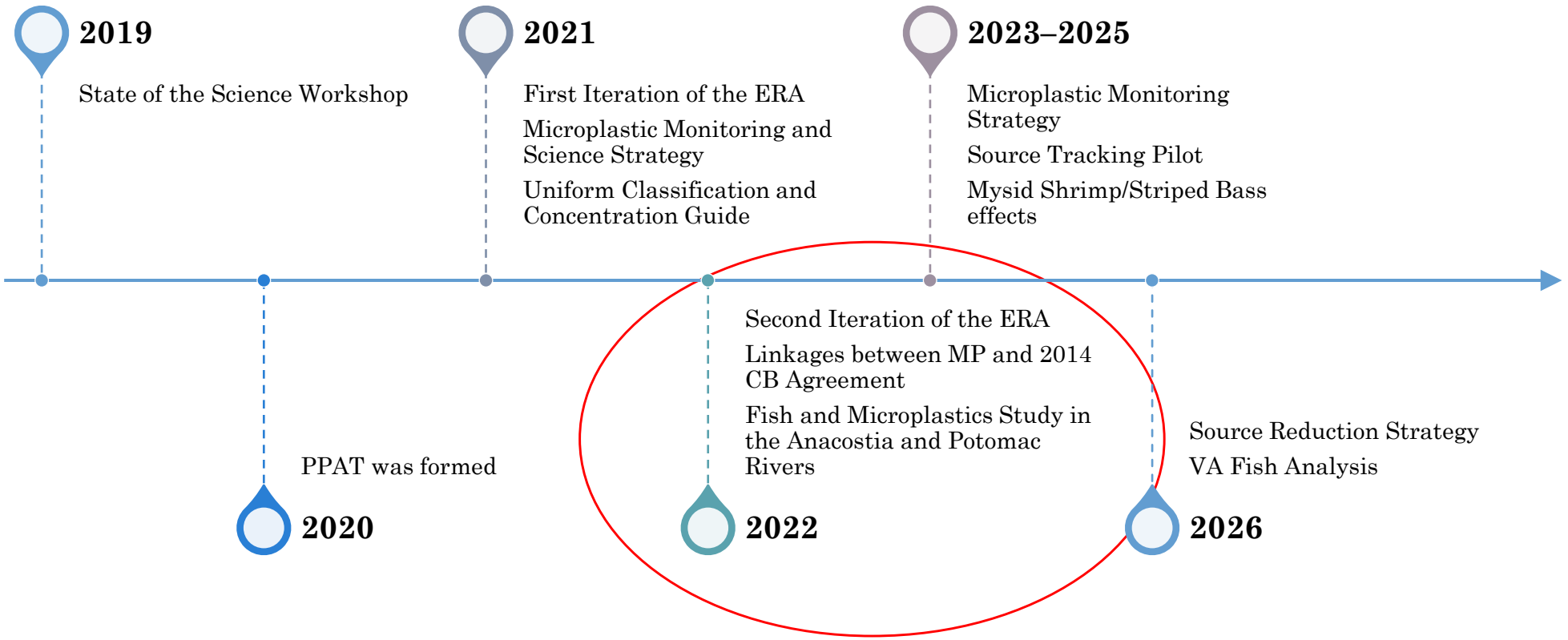
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# 2022: PPAT Projects and Deliverables

1

Second Iteration of the ERA: Focus on priority diet items identified in the semi-quantitative results from the first ERA

2

Linkages between microplastics and Chesapeake Bay Program Agreement Goals: report that summarizes potential areas where microplastics may impact 2014 CB Watershed Agreement Goals

3

Fish and Microplastics Study in the Anacostia and Potomac Rivers: multi-trophic level investigation of fish contamination

# 2022 Project 1: Update to the ERA

- Focus on Mysids, Amphipods, and Bay Anchovy
- Include research on similar taxa from elsewhere around the globe
- Investigate potential plankton regime shifts
- Recommended Next Steps
- Assess the loadings of microplastics within the prey community;
- Measure uptake of microplastics in these taxa;
- Conduct behavioral studies of prey taxa after microplastic consumption;
- Assess trophic transfer to YOY striped bass.

# 2022 Project 2: Linkages between microplastics and 2014 Chesapeake Bay Program Agreement Goals

A report was drafted that investigated the potential impacts microplastics may have on meeting various goals and outcomes of the 2014 Chesapeake Bay Agreement

Examples of some potential impacts include

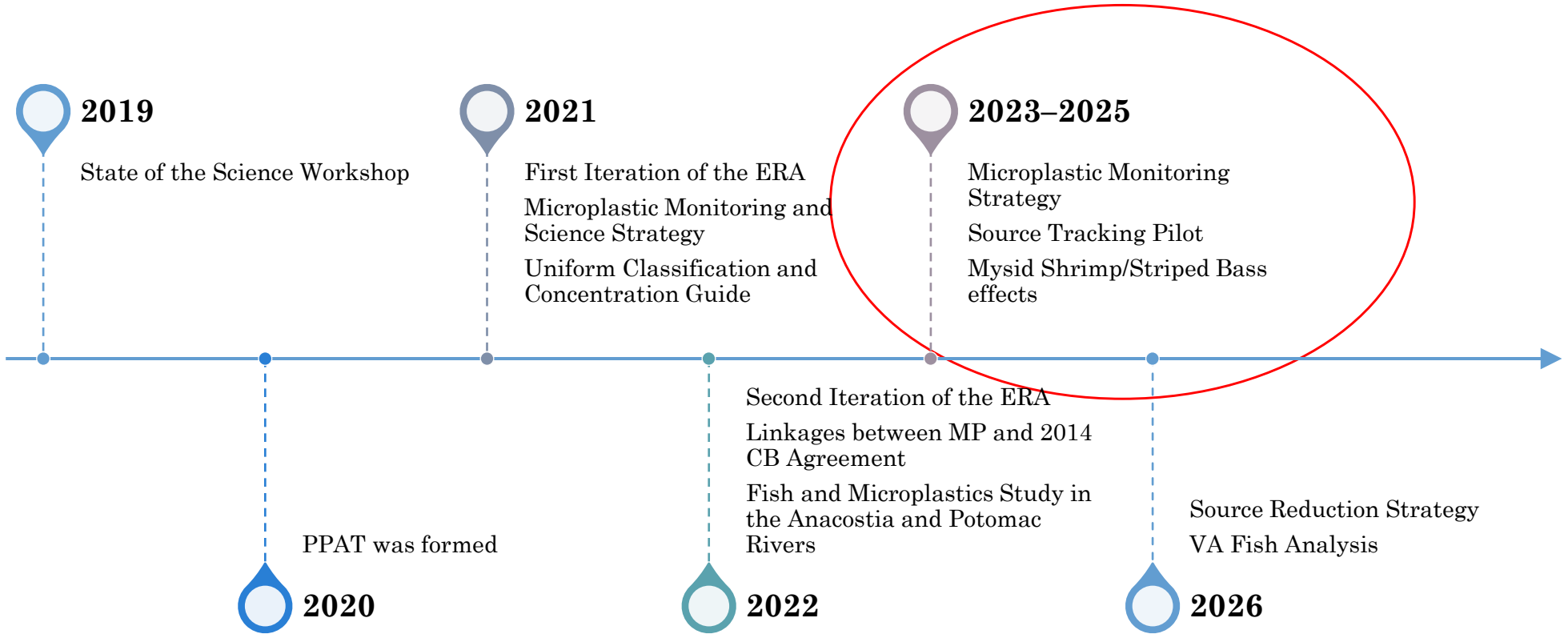
- Blue Crab Abundance
- Forage Fish Abundance
- SAV Health

This exercise might be something to consider in the future given the revised agreement

# 2022 Project 3: Fish and Microplastics Study in the Anacostia and Potomac Rivers

- This study sheds light on variation in microplastics among fish in the tidal freshwater portions of the Potomac and Anacostia rivers
  - 23% of fish collected in the Washington, DC, region contained microplastics in their stomachs.
  - **>25% occurrence of microplastics in young-of-year Striped Bass.**
  - More microplastics and higher frequency of occurrence in higher trophic positions
  - Regional differences only present in smallest, least mobile taxa (planktivore). Seasonal differences important for planktivores and piscivores.
  - Increasing number of microplastics with increasing body size among piscivores only.
- Study showed higher concentration of microplastics in piscivores (fish commonly consumed) therefore more studies are needed about human exposure in the watershed

# Timeline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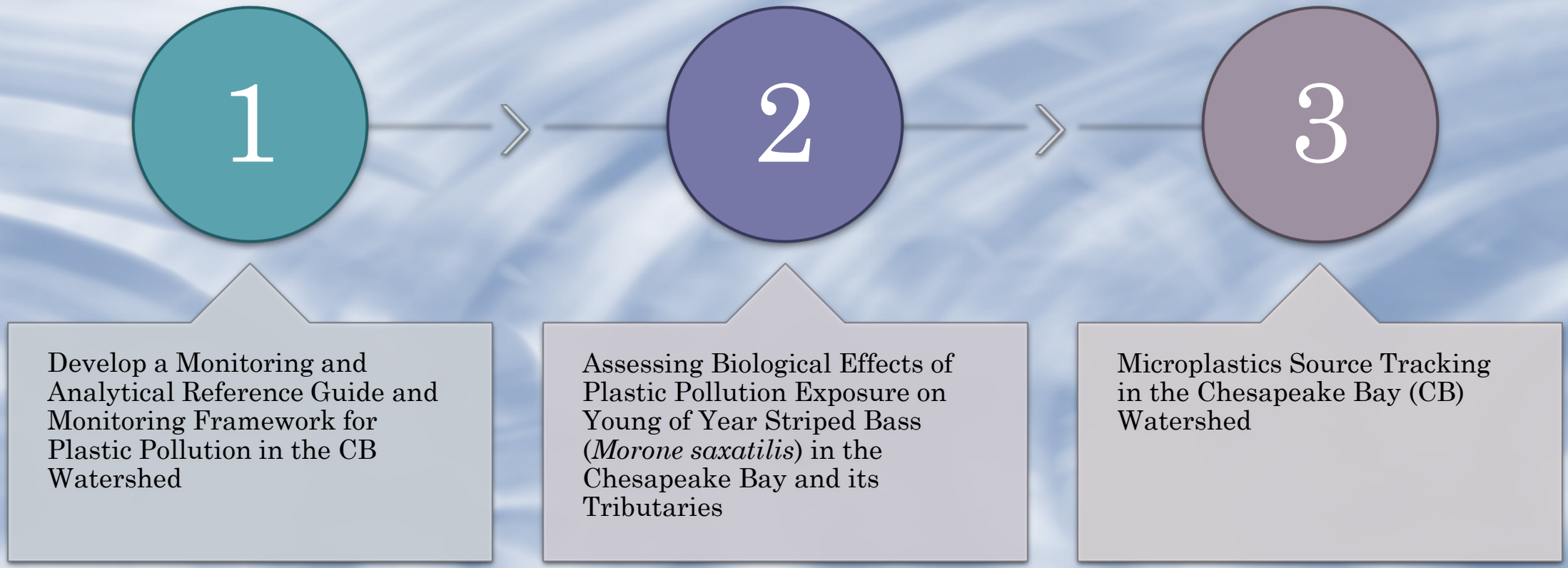
# 2023-2025: PPAT Project Tasks and Deliverables



## 2024 Project 1: 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

| |
|---|
| 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 including monitoring sources |
| Monitor plastic type in 20% of samples to understand plastic products and sources for polymer type |
| 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 |

# 2024 Project 2: Assessing Biological Effects of Plastic Pollution Exposure on Young of Year Striped Bass (*Morone saxatilis*) in the Chesapeake Bay and its Tributaries

GOAL: To develop a lab-based study examining biological impacts (such as hepatosomatic ratio, growth, stress response, and mortality) 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 Chesapeake Bay in one or more of its tributaries for microplastic contamination.

Field sampling was completed to capture current population loads in the Patuxent and Potomac.

The lab-based portion of the study was not completed prior to contract termination

# 2025 Microplastic Source Tracking: Preliminary Investigation Data Report Potomac River, Maryland

- The goal of this pilot project was to source track plastics to understand the major conveyances and compositions of plastics entering the watershed.
- Bulk Samples were collected at base and storm flows across different land use types along a riverine gradient
- Results from Pilot Study concluded:
  - Cellulose (cotton, Tencel, viscose, rayon) and blue anthropogenic particles were the most abundant groups across flow conditions and all land use types except for wastewater, where polyethylene was the dominant polymer followed by cellulose and blue anthropogenic particles
  - Microplastic particles were detected in each sample of Potomac River water, regardless of land use
  - Particle type (shape) was dominated by fibers, in contrast to other studies conducted in the Chesapeake Bay (Bikker et al., 2020, Yonkos et al., 2014). This is likely due to the different sampling techniques used.
  - This study suggests patterns of microplastic loadings are variable, dependent on flow (precipitation events). Lower concentrations during stormflow (>2cm precipitation in 24 hours prior to sampling) events are observations that likely reflect dilution of the river system with increased precipitation.
- This study was limited in sampling effort due to constrained resources. To improve resolution of land use and point source contributions :
  - Increased replication per station to improve statistical power and ability to detect differences between stations and conditions.
  - Increased number of stations.
  - Replace bulk samples with manta (neuston) net sampling or in-line pump filtration.

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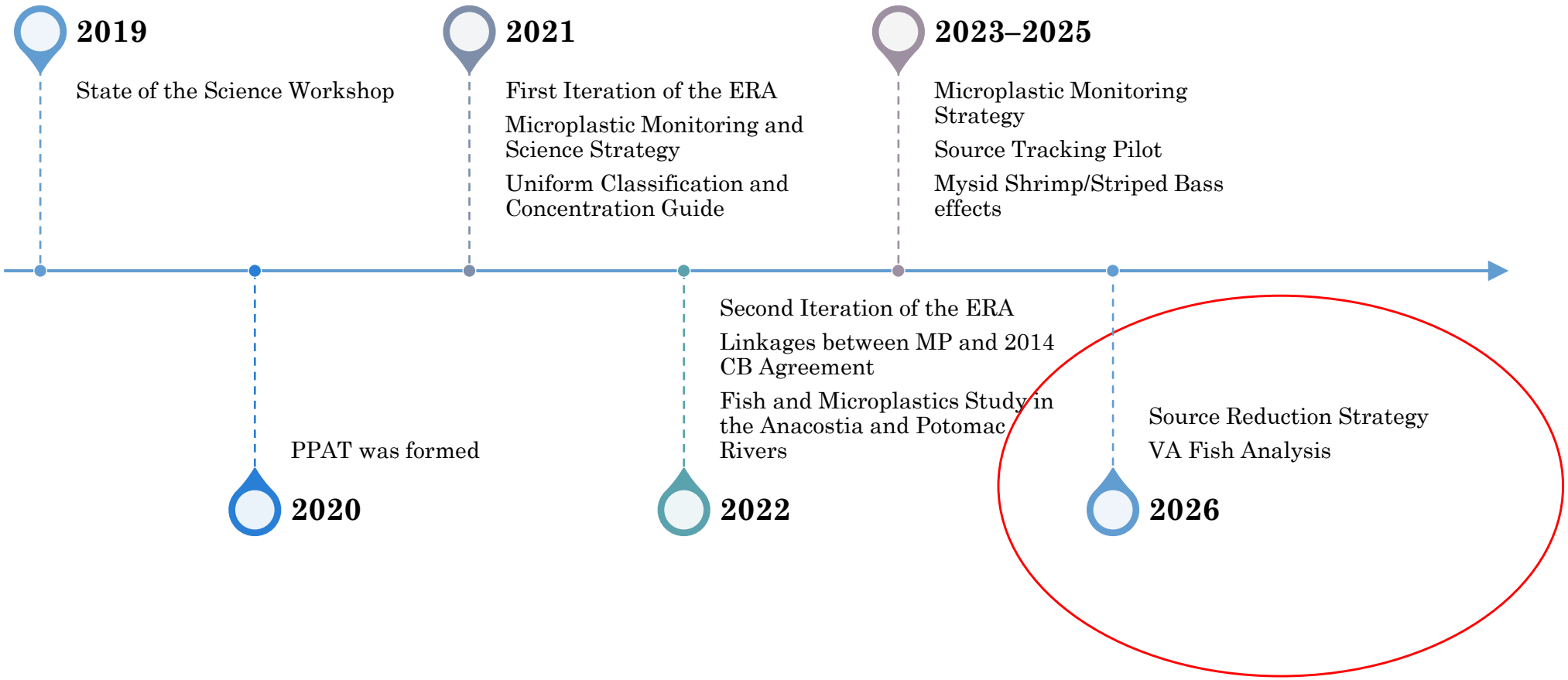
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# 2026 New Project: Develop a Source Reduction Strategy

- In 2026/2027, PPAT will collaborate with EPA and its contractor, RTI, to develop a source reduction strategy specific to the Chesapeake Bay Watershed.
- Deliverables for this project include
  - A literature review of plastic pollution source reduction strategies
  - A completed inventory of current plastic pollution source reduction activities in the CB Watershed
  - A priority action list table summarizing immediate and current management strategies for consideration
  - A final strategy that may include voluntary management actions, policy considerations, education and outreach campaigns and targeted single use plastic prevention. Producer responsibility may also be considered.

# 2026 New Project: Virginia Fish Analysis

- Virginia DEQ is developing a project with Dr. Meredith Seeley at VIMS, who will be working in collaboration with Dr. Bob Murphy at Tetra Tech, to quantify and characterize microplastics in the gut contents of approximately 60 fish samples collected in VA's tidal Bay waters through EPA's National Coastal Condition Assessment program.
- This study aims to shed light on the prevalence and characteristics of microplastic pollution in Bay fish species that are targeted by anglers.
- The results may also highlight spatial hot spots of microplastic contamination.
- The work is anticipated to start in the late spring/early summer, with a final report anticipated in summer 2027.
- **Opportunity: There are 102 archived frozen fish from MD's National Coastal Condition Assessment program that could be considered to also be analyzed leveraging the VA study.**