Fall QUARTERLY MEETING – December 10th, 2025

Chesapeake Bay Program

Submerged Aquatic Vegetation Workgroup Updates

Chesapeake Bay Program
Science. Restoration. Partnership.

1750 Forest Drive, Suite 130, Annapolis, MD 21401

SAV Workgroup Fall/Winter Meeting 2025 Agenda
12.10.25
10:00 am – 4:30 pm
Hybrid
Click here to join the Microsoft Teams meeting
Meeting ID: 270 034 440 704 9
Passcode: he9n4Fu2

10:00 Welcome and Introductions

10:15 SAV Workgroup Updates

11:00 Review of "SAV Workgroup Mitigation and Monitoring Requirements Recommendations to Regulatory Partners"

1:00 **LUNCH (on your own – there is a refrigerator and snack bar on site)**

2:00 Member Research, etc.
2:00 pm Katie Tanner – UMD Eastern Shore – Carbon Storage in Chesapeake Bay SAV
2:30 pm Chris Patrick – VIMS – Eelgrass Dynamics in the Lower Bay
3:00 pm Nicholas Thatos – Coastal Protection Technologies – Product Demonstration
3:30 pm Nate L'Esperance – Ulysses Ecosystem Engineering – SAV Restoration with AUVs

4:00 Open Discussion

4:20 Wrap up and Final Announcements

4:30 **Adjourn**

GIT-funded Project UPDATES

Shallow Water Habitat Sentinel Site Program Development

Project Members

Steering Committee
Brooke Landry, MD DNR, CBP SAV Workgroup
Peter Tango, USGS
Kathy Boomer, Foundation for Food & Agriculture Research
Taryn Sudol, MD Sea Grant
Joel Carr, USGS
Jeremy Hanson, CRC
Kenneth Hyer, USGS
Gina Hunt, MD DNR
Denice Wardrop, CRC
David Parrish, VIMS
Chris Patrick, VIMS
Ryan Woodland, UMCES

Green Fin Studio
David Jasinski
Lauren Huey
Macon Thompson
Allison Burbach

Project Outcomes

This project will include developing a comprehensive Shallow Water Habitat Sentinel Site Program for the Chesapeake Bay. We will gather multi-parameter, detailed data on a scale that is accessible and relevant to decision-making and information gathering. This effort will include creating a protocol for the monitoring of multiple living resources and water quality measures, as well as climate impacts on the functional value of shallow water habitats in the Chesapeake Bay and its watershed. The goal of this effort is to also develop a protocol to monitor the effectiveness of measures taken by the Chesapeake Bay Program Partnership beyond 2025. Developing a Shallow Water Habitat Sentinel Site Program will fill identified data gaps and provide the data necessary to track changes in response to climate change and management actions, assess environmental conditions, provide early warning signals for potential issues, and enhance modeling and forecasting capabilities in shallow water habitats.

Key Tasks

1. Creation and approval of a Quality Assurance Project Plan (QAPP) ✓
2. Literature and Existing Program Review ✓
3. Scoping Workshop →
4. Full Shallow Water Habitat Sentinel Site Program Development

Two Workshops.
Workshop 1: September 2025
Workshop 2: February 2026

Contracted to: Green Fin Studio

Chesapeake Bay Shallow Water Habitat Sentinel Site Program Development

Green Fin Studio

Poplar Island in Talbot County, Maryland - Will Parson/Chesapeake Bay Program

Project Overview

Project Goal: To develop a shallow water habitat sentinel site program which will provide a comprehensive understanding of shallow water habitat functionality and its response to environmental changes in the Chesapeake Bay and its watershed, including monitoring climate impacts and evaluating the effectiveness of management measures implemented by the Chesapeake Bay Program partnership beyond 2025.

Graham Creek in Calvert County, Maryland - Carlin Stehl/Chesapeake Bay Program

Scoping Workshop #1 Summary

- The first workshop was designed to crowdsource ideas from varied perspectives and experiences. As such, conclusive decisions were not prioritized by the facilitators.
- Presentations were given by several partners currently working on sentinel site programs in CB to better understand how they work, what is already being monitored and where, and challenges faced.
- Topics discussed over the two days included:
  - What management questions the program should hope to address
  - How the program could be designed
  - Parameters to monitor
  - Frequency of monitoring
  - Number of sentinel sites to establish
  - Sentinel Site locations
- A second workshop will be held in February 2026 to discuss specific courses of action defined by the conversations in September.

Some management questions this program will aim to answer:

- How do changes in climate-related variables (temp, salinity, SLR, species ranges, etc.) impact shallow water habitats?
- Does a location recover as expected where/when a Best Management Practice (BMP) is implemented?
- What are the drivers of shallow water habitat change, and how can BMPs affect them?
- Are changes in the Bay's shallow water environments impacting their essential habitat functions and services?

With management questions in mind, some parameters being considered for inclusion:

- The typical suite of water quality parameters
- Toxins
- SAV
- Substrate/bottom type
- Fish
- Shellfish
- Molluscs
- Macroinvertebrates
- Macrofauna
- Waterbirds

Sentinel sites location criteria:

- Diverse habitat characteristics should be reflected in the sites:
  - stressed and non-stressed systems,
  - structured and unstructured shoreline,
  - differing bottom types,
  - various habitats,
  - transitional habitats/migration corridors,
  - areas not highly managed and those targeted for management, including urban estuaries/sub-estuaries, and environmental justice considerations.

- Numerous locations to consider spanning from the Susquehanna down to the mouth of the Bay on both East and West shorelines. Many of these sites are locations where monitoring of some sort is already occurring, which will make for more feasible sentinel sites program implementation.

Guidance Document

A comprehensive guidance document to be referenced by internal and external stakeholders and monitoring program partners that includes site locations, parameters to be measured, protocols for each parameter, and data sheets.

Osprey at Poplar Island, Photo by Steve Droter/Chesapeake Bay Program

Chesapeake Bay Shallow Water Habitat Sentinel Site Monitoring Program

Guidance Document

Guidance Document

Potential Site Location Characteristics:

- Focus on tidal waters only
  - This guide can act as a template for a non-tidal shallow water monitoring program development.
- Twelve to fifteen sentinel sites
- Three to five in each Chesapeake salinity zone

Osprey at Poplar Island, Photo by Steve Droter/Chesapeake Bay Program

Chesapeake Bay Shallow Water Habitat Sentinel Site Monitoring Program

Guidance Document

Guidance Document

Parameters:

- Water quality
  - salinity, temperature, DO (surface and bottom), turbidity, chl a, pH, nitrogen, phosphorus, light attenuation, specific conductance
- Physical
  - substrate/bottom, shoreline type, land use, shellfish/fish habitat, grain size, continuous water depth, erosion, habitat heterogeneity, flow
- Living resources
  - SAV, presence/absence of other species (ex., oysters), fish diversity/species richness, macroinvertebrate assemblage, macroalgae, sediment cores, macrofauna, habitat shift and migration, phytoplankton, waterbirds

Osprey at Poplar Island, Photo by Steve Droter/Chesapeake Bay Program

Chesapeake Bay Shallow Water Habitat Sentinel Site Monitoring Program

Guidance Document

Next Steps

1. Make final decision on sentinel site locations (based on site characteristics) and parameters
2. Present findings at Workshop #2 (in February) and offer an opportunity for feedback

Questions

- Recommendations for site locations based on the given parameters?
- Do you have thoughts on potential partners and funding sources?
  - Public? Private? Corporate? State/federal?

https://docs.google.com/forms/d/e/1FAIpQLSdbv-ZMuXfiH9GqA1pGxwa8xEbSZd4aZwqRx89RZqJpiUgCSg/viewform

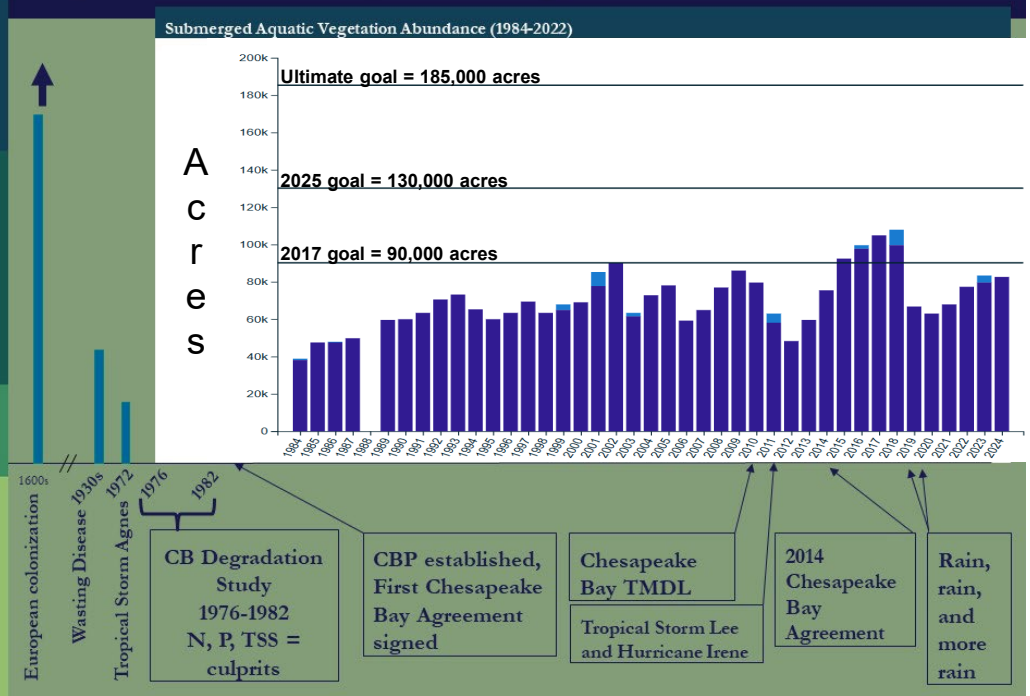
SAV Monitoring in Chesapeake Bay

https://www.chesapeakebay.net/what/programs/monitoring/sav-monitoring-program

Tier 1

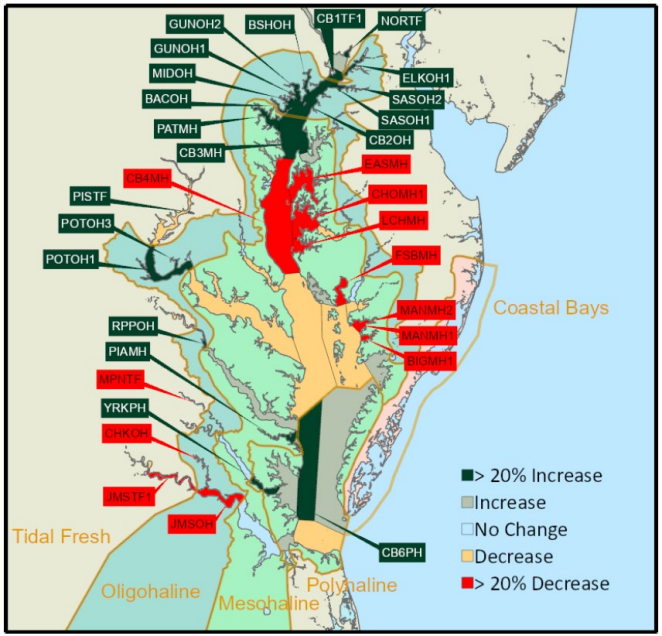
VIMS Bay-wide Aerial Survey

Progress towards the Bay-wide SAV goal



SAV #s were slightly down in 2024:

- 82,778 acres were mapped in 2024.
- 83,419 total acres of SAV estimated for 2023.
- This is 64% of the Chesapeake Bay Program's 130,000-acre restoration target and 45% of its 185,000-acre goal.
- It is a 112% increase from the 38,958 acres observed during the first underwater grass survey in 1984, but a 1% decrease from the 83,419 acres reported in 2023.



https://www.chesapeakeprogress.com/abundant-life/sav

https://www.vims.edu/research/units/programs/sav/access/maps/index.php

Tier 2

Subscribe to our Newsletter here:
https://forms.gle/yYwkDPShvBjFCiby5

Chesapeake Bay SAV Watchers Program

Seven SAV Watchers Trainer Events in 2025:

- Washington College
- Gunpowder Riverkeeper
- Virginia Institute of Marine Science
- Virginia Commonwealth University/TNC
- Annapolis Maritime Museum
- St. Mary's River Watershed Association
- Crisfield Resilience Academy

- 70+ New Trainers in 2025!
- 110+ new data points, 2,747 points total
- Held both 2-day and 1-day trainings

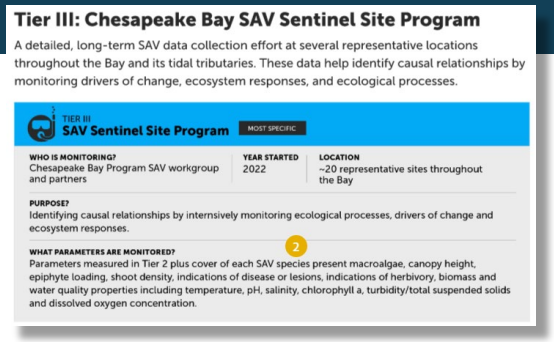
2025 Program Stats - Participating Organizations

TIMMONS GROUP
ST. MARY'S RIVER Watershed Association
EPA
OLD DOMINION UNIVERSITY
SHORERIVERS
Havre de Grace MARITIME MUSEUM and Environmental Center
James River ASSOCIATION
Severn River Association — America's Oldest River Group
WILLIAM & MARY VIMS Virginia Institute of Marine Science School of Marine Science
VCU
Magothy River Association
CRISFIELD RESILIENCE ACADEMY
MARITIME MUSEUM ANNAPOLIS
Baltimore County Public Schools
The Nature Conservancy
Arundel Rivers FEDERATION
Chesapeake Bay National Estuarine Research Reserve Maryland — Using Sound Science...Finding Solutions...Promoting Wise Decisions
Washington College
Accokeek Foundation at Piscataway Park

www.chesapeakebaysavwatchers.com OR https://www.chesapeakebay.net/what/programs/monitoring/sav-monitoring-program

Tier 3

SAV Sentinel Site Program – continuing in 2025!



Tier III: Chesapeake Bay SAV Sentinel Site Program

A detailed, long-term SAV data collection effort at several representative locations throughout the Bay and its tidal tributaries. These data help identify causal relationships by monitoring drivers of change, ecosystem responses, and ecological processes.

TIER III
SAV Sentinel Site Program MOST SPECIFIC

WHO IS MONITORING?
Chesapeake Bay Program SAV workgroup and partners

YEAR STARTED
2022

LOCATION
~20 representative sites throughout the Bay

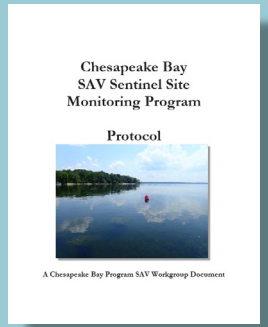
PURPOSE?
Identifying causal relationships by intensively monitoring ecological processes, drivers of change and ecosystem responses.

WHAT PARAMETERS ARE MONITORED?
Parameters measured in Tier 2 plus cover of each SAV species present macroalgae, canopy height, epiphyte loading, shoot density, indications of disease or lesions, indications of herbivory, biomass and water quality properties including temperature, pH, salinity, chlorophyll a, turbidity/total suspended solids and dissolved oxygen concentration.

2

SAV Sentinel Sites monitored in 2025:

- Severn River
- Susquehanna Flats
- Smith Island
- Marshy Creek
- Dundee Creek
- St. Mary's
- VIMS sites
- CB- NERR sites



Chesapeake Bay
SAV Sentinel Site
Monitoring Program

Protocol

A Chesapeake Bay Program SAV Workgroup Document

Tier III: SAV Sentinel Site Program

The SAV Sentinel Site Program is a monitoring effort conducted by Bay scientists

What is the Chesapeake Bay SAV Sentinel Site Program?

The Chesapeake Bay SAV Sentinel Site Program forms the third tier of the Chesapeake Bay SAV Monitoring effort. SAV sentinel sites are located in each of the Bay's four salinity zones (tidal fresh, oligohaline, mesohaline and polyhaline) and are monitored using a standardized, in-depth data collection protocol. These sentinel sites are a combination of existing, long-term sites and new sites where Bay scientists monitor changes in SAV habitat characteristics and resilience indicators. This program is coordinated by the Bay Program's SAV Workgroup. If you are interested in adopting and managing an SAV Sentinel Site, contact the program coordinator at brooke.landry@maryland.gov.

SAV Workgroup
News and Happenings

CBP Workforce Workgroup (Engaged Communities GIT)

Purpose

The Workforce Workgroup exists to strengthen and align efforts that build a skilled, informed, and connected workforce supporting the health and sustainability of the Chesapeake Bay watershed. We bring together educators, employers, training providers, and community partners to identify and remove barriers, elevate best practices, and coordinate strategies that expand access to environmental and watershed-related career pathways for all job seekers.

Outcome and Targets

Increase the ability of all job seekers in the watershed to understand, participate in and succeed in career pathways that positively support the Chesapeake Bay watershed.

By 2040, inform and grow implementation of strategies that help students, educators and job seekers to become aware of and understand environmental careers, in-demand skills, and pathways to access these opportunities. By 2040, increase the number of post-secondary institutions and training providers offering industry-recognized credentials that support Chesapeake Bay Watershed Agreement Goals and Outcomes.

By 2040, engage employers to support greater hiring and retention of workers trained in fields necessary to support Chesapeake Bay Watershed Agreement Goals and Outcomes.

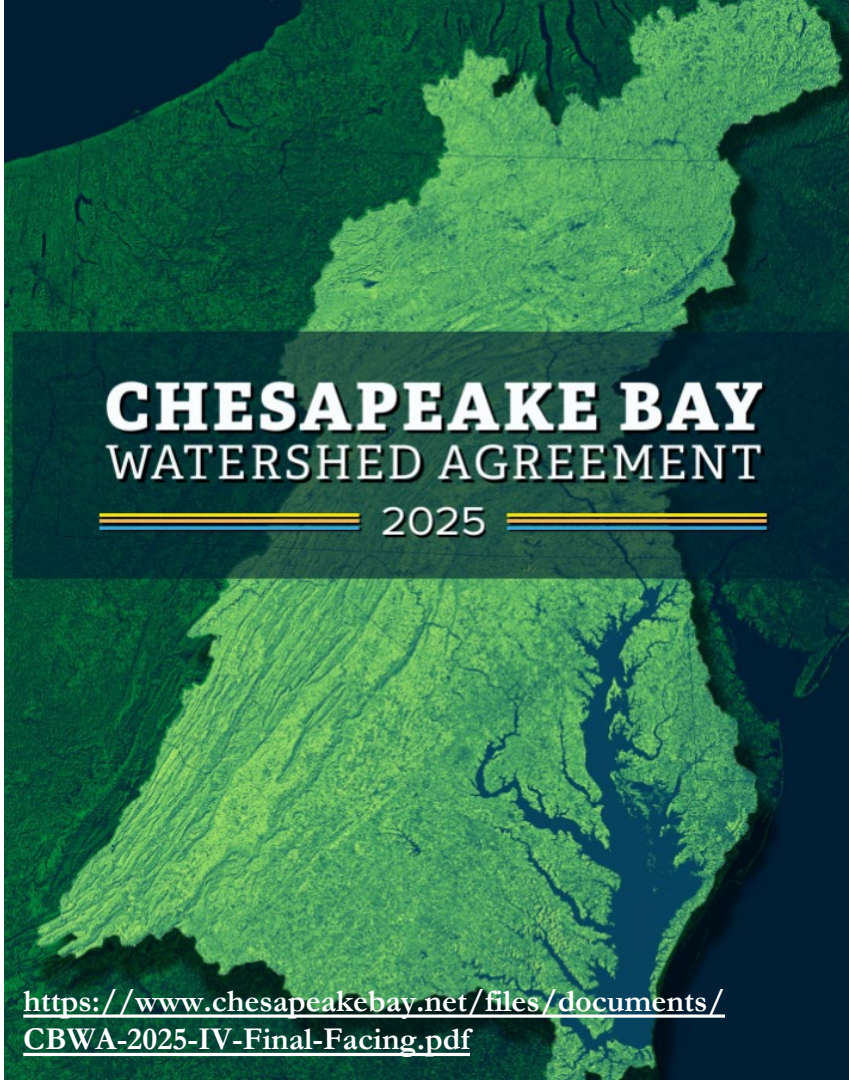
SAV Workgroup Involvement

- Serve in Workforce Workgroup development and technical assistance cohort
- Provide insight on workforce needs as they relate to SAV conservation and restoration
- Participate in monthly networking coaching sessions with Local Concepts
- Dedicate time each month to apply and practice tools and strategies
- Share knowledge and lessons learned with your workgroup and with CBP partners

Beyond 2025 and the Updated Chesapeake Bay Agreement

Vision

We envision a Chesapeake Bay region where clean water flows, wildlife thrives and farms, forests and fisheries are healthy and productive. It is a place where people from all walks of life feel connected to the land, to the Bay and local waterways, to their communities and to the rich cultural heritage that makes this watershed unique. Together, we are building a future that is environmentally and economically sustainable, resilient and full of possibility—where everyone can enjoy and help conserve the natural beauty of the Bay, and the lands and waters that surround it, today and for generations to come.



https://www.chesapeakebay.net/files/documents/CBWA-2025-IV-Final-Facing.pdf

Beyond 2025 and the Updated Chesapeake Bay Agreement

Principles

The Chesapeake Bay Program commits to operate under the following principles, which reflect the partners' collective, core values. The principles guide the work of the partnership in our governance and as we develop policy and take action to achieve the Chesapeake Bay Watershed Agreement's *Goals and Outcomes. The partnership will:*

Science

- Use place-based approaches, where appropriate, to target specific geographic areas and produce recognizable benefits to local communities while contributing to larger ecosystem goals.
- Maintain and enhance a coordinated watershed-wide monitoring, modeling and research program to support decision-making, track progress and assess the effectiveness of management actions.
- Integrate social science holistically throughout the partnership to support adaptive management, more effectively engage with communities and incentivize individual and collective behaviors that support partnership goals.
- Adaptively manage at all levels of the partnership to foster continuous improvement informed by the best available science and strong working relationships.
- Use science-based decision-making, consider Indigenous and local knowledge, and seek out innovative technologies and approaches to support sound management decisions in a changing system.

Restoration & Conservation

- Achieve Goals and Outcomes in a measurable and timely way and at the least possible cost to the public.
- Conserve working lands and support economically viable forests and farms to best position landowners to help protect the Chesapeake Bay.
- Acknowledge, support and engage local governments and other local entities in watershed restoration, conservation and protection activities.
- Anticipate and respond to changes in the landscape and environmental conditions, including long-term trends in sea level, temperature, precipitation, land use and other variables.

Partnership

- Represent the interests of all communities throughout the watershed fairly and effectively.
- Meaningfully engage the public to foster collaboration and grow the partnership to support and carry out the restoration, conservation and protection activities necessary to achieve the Goals and Outcomes of this *Chesapeake Bay Watershed Agreement*.
- Facilitate outreach to and welcome participation by all communities regarding the partnership's activities, decisions and implementation.
- Collaborate to achieve the Goals and Outcomes of this *Chesapeake Bay Watershed Agreement*.
- Operate with transparency and accountability in program decisions, policies, actions and reporting on progress to strengthen public trust and confidence in our efforts.
- Strive for consensus across the partnership when making decisions.
- Include tribal nations in the partnership in a manner that appropriately considers their unique status as independent sovereign nations and as original stewards of the land.

Beyond 2025 and the Updated Chesapeake Bay Agreement

Program Leadership

- Chesapeake Executive Council
- Policy Steering Committee

Program Implementation

Goal Teams

- Healthy Landscapes
- Clean Water
- Habitats, Fisheries and Wildlife
- Engaged Communities

Program Support

- Operations and Management
- Strategic Engagement Team
- Scientific, Technical Assessment & Reporting

Advisory Committees

- Stakeholders'
- Scientific & Technical
- Local Government
- Agricultural

Information in Slide Subject to Change

Beyond 2025 and the Updated Chesapeake Bay Agreement

Thriving Habitat, Fisheries & Wildlife Goal Team Purpose

The fisheries and wildlife of the Chesapeake Bay watershed are the backbone of the region's ecology, economy and heritage. However, impaired water quality, invasive species and habitat loss place pressure on fish and wildlife populations across the region. Our increasing use of natural resources can fragment and degrade the habitats on which they depend. Maintaining sustainable fisheries and restoring habitat for native and migratory species, while adapting to the challenges of changing environmental conditions, will support a strong economy, recreation and a resilient ecosystem.

Goal

Protect, restore and sustain fisheries and wildlife, as well as the network of land and water habitats they depend on, to promote a balanced and resilient ecosystem and support local economies and recreational opportunities.

Mummichogs thrive in Maryland's Severn River Sanctuary. Underwater grasses are the foundation of the Chesapeake Bay food web, supporting a range of forage species and predators.

Beyond 2025 and the Updated Chesapeake Bay Agreement

Thriving Habitat, Fisheries & Wildlife Goal Team Workgroups

1. Blue Crabs
2. Brook Trout
3. Fish Habitat
4. Fish Passage
5. Oysters
6. Stream Health
7. **Submerged Aquatic Vegetation**
8. Wetlands

Restoring headwater streams in places like Pendleton County, West Virginia, expands cold-water habitat for brook trout.

Blue crabs support commercial and recreational fisheries and are managed across state lines.

The oyster aquaculture industry supports local economies and contributes to clean water.

A wetland preserve in upstate New York connects visitors with wildlife and native plants.

Climbers Run flows through Pennsylvania to join the Susquehanna River.

Information in Slide Subject to Change

Beyond 2025 and the Updated Chesapeake Bay Agreement

Submerged Aquatic Vegetation (SAV) Outcome

Sustain and increase the habitat and ecosystem benefits of SAV in the Chesapeake Bay. Achieve and sustain the outcome of 196,600 acres of SAV Bay-wide necessary for a restored Bay.

- Measure progress against the following targets for each salinity zone:
    - Tidal Fresh: 21,700 acres.
    - Low Salinity: 13,100 acres.
    - Medium Salinity: 126,000 acres.
    - High Salinity: 35,800 acres.

- Measure progress toward this Outcome against interim targets of 90,000 acres by 2030, 95,000 acres by 2035 and 100,000 acres by 2040.

Beyond 2025 and the Updated Chesapeake Bay Agreement

Goal Team and Workgroup Leadership and Support

Chair: Brooke Landry (brooke.landry@maryland.gov)
Vice-chair: Search paused during federal shutdown and general chaos of structure and governance updates. More on this in early 2026.

SAV Workgroup Staffer: Nick Staten (statenn@chesapeake.org)
Goal Team Staffers: TBD

Goal Team Coordinator: Chris Guy (chris_guy@fws.gov)

Goal Team Chairs: Gina Hunt (gina.hunt@maryland.gov) & Bruce Vogt (bruce.vogt@noaa.gov)

SAV Mitigation and Monitoring Workshop

More Later…..

Workshop Purpose:

Convene the SAV workgroup and regulatory partners to identify in-kind SAV mitigation and monitoring requirements, success criteria, and performance standards for SAV mitigation projects.

2026 Meeting Schedule

Mark Your Calendars

Winter Meeting:
Tuesday Feb 24 (1-5 pm)

Spring Meeting:
Tuesday May 7 (1-5 pm)

Summer Fieldtrip to Susquehanna Flats:
July sometime, TBD

Summer Meeting:
Thursday August 13 (1-5 pm)

Fall Meeting:
Wednesday November 4

Questions?

SAV Mitigation and Monitoring Requirements Recommendations

BACKGROUND

- **Increase in MD projects where in-kind SAV mitigation is required.**
- **In MD, SAV mitigation currently based on MDE's Guidance on Tidal Wetland Mitigation, but performance standards and success criteria have been determined on a case-by-case basis largely.**
- **Regulatory agencies want consistency but flexibility for adaptive management and to accommodate regional trends.**

Request from Regulatory Agencies: Develop and recommend mitigation and monitoring requirements, success criteria, and performance standards for in-kind compensatory SAV mitigation.

SAV Workgroup Response #1: Attempt to figure it out ourselves without input from regulatory partners – Did NOT Work!

SAV Workgroup Response #2: Workshop that INCLUDED regulatory partners

- Convene the SAV workgroup **and regulatory partners** to identify in-kind SAV mitigation and monitoring requirements, success criteria, and performance standards for SAV mitigation projects.
- Use a Facilitator!

SAV Mitigation Workshop Agenda -January 30, 2025

9:00 Welcome and Introductions

9:15 Overview of Workshop Objectives

9:30 Presentations by state regulatory agencies and partners Part 1

10:30 Break

10:45 Presentations by state regulatory agencies and partners Part 2

11:25 Panel Discussion with Presenters

12:15 Lunch break

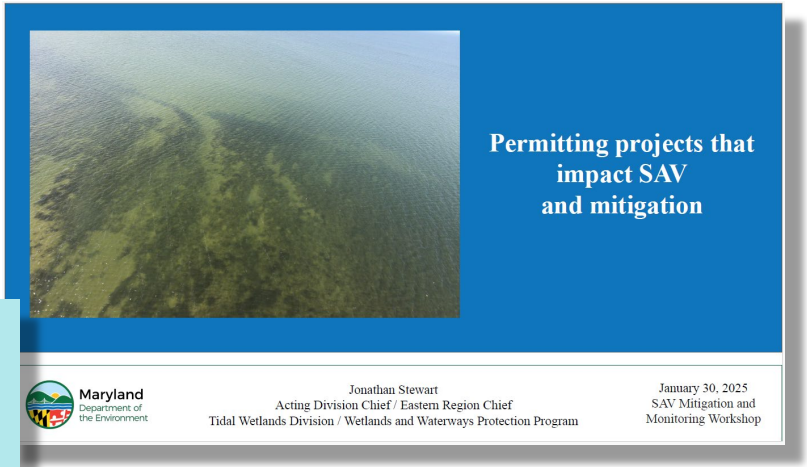
1:00 Discussion – Developing Answers to Many Questions

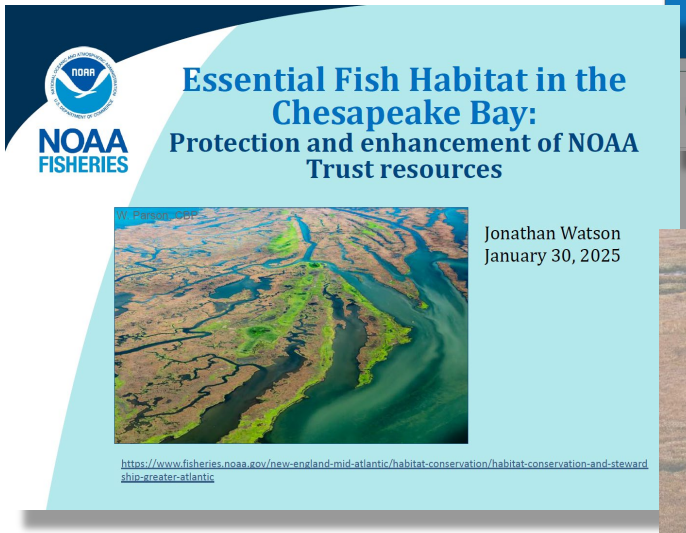
2:00 Break

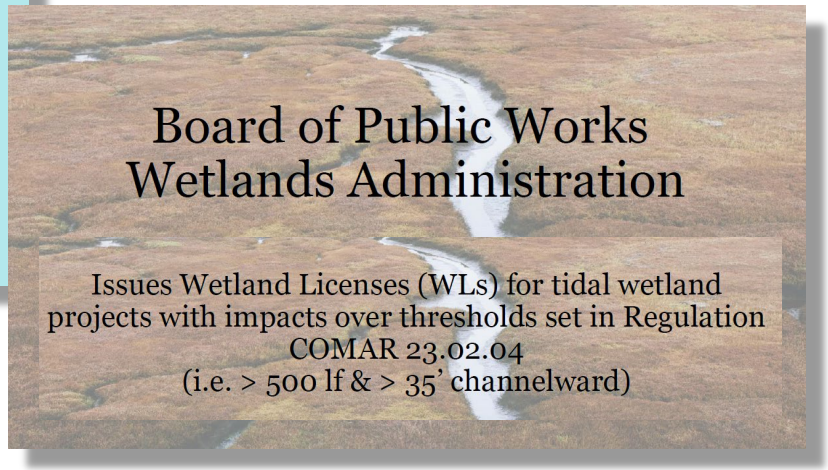
2:15 Consensus Building and Products

4:15 Wrap up and Adjourn

MD/Federal Regulatory Agencies – Presented how SAV mitigation works now







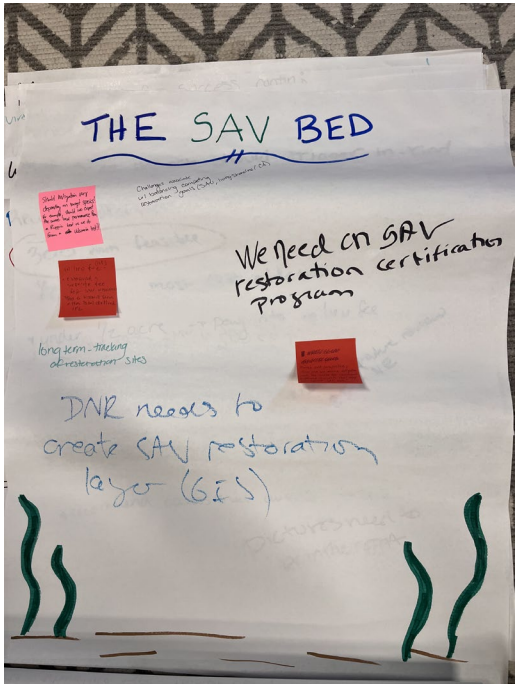
*The USACE also weighs in and is responsible for permitting. Representatives participated but did not present.

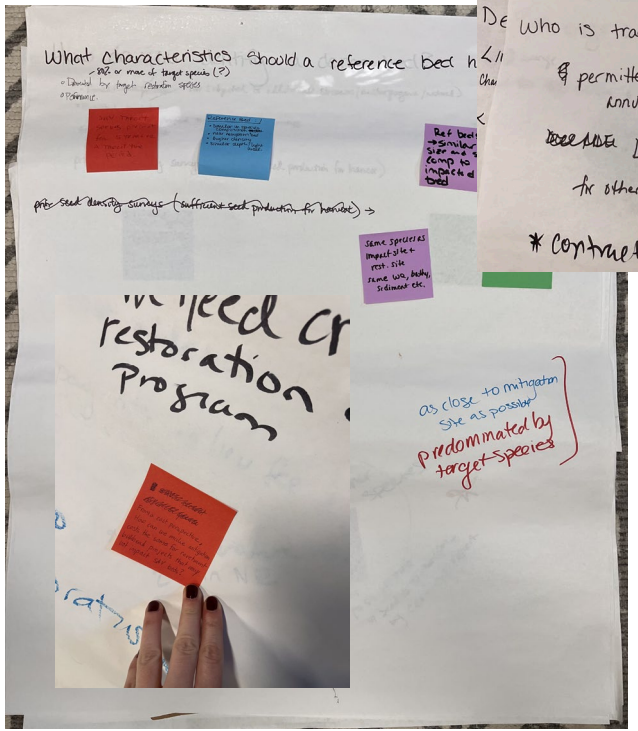
Presentation of Questions

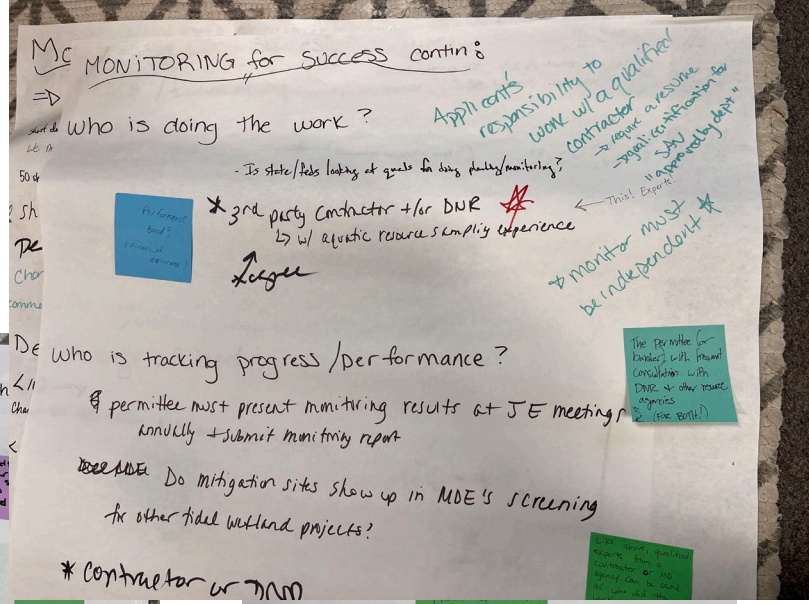
1. What size impact should trigger SAV mitigation?
2. How do we determine if in-kind SAV mitigation is appropriate at that time?

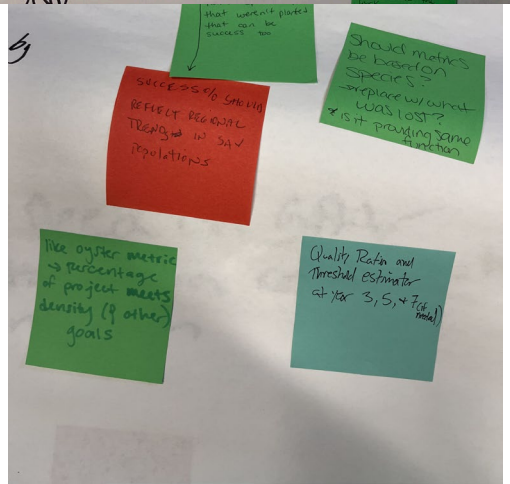
    Ie. If SAV is trending down in the area, should it be required, postponed?
3. What characteristics make for a suitable SAV mitigation project site?
4. How far away from the impact site is allowable for the mitigation site?
5. How far away from the mitigation site is allowable for a reference site?
6. What characteristics should a reference bed have?
7. How do you identify a donor bed?
8. Monitoring metrics and frequency?
9. How should mitigation projects be tracked and for how long, and who is responsible?
10. What should be required for long-term maintenance? Who is responsible?
11. How should we determine project success?
12. Should we require financial assurances?

Giant Post-it Notes for Responses









SAV Workgroup
SAV Mitigation and Monitoring Guidance Document

Submerged Aquatic Vegetation

Mitigation and Monitoring Guidance

Provided by
The Chesapeake Bay Program's SAV Workgroup
to
State and Federal Regulatory Agencies
overseeing the Chesapeake and Coastal Bays

2025

DRAFT

? 1. What size impact should trigger SAV mitigation?

- Follow the federal mitigation hierarchy: Avoid → Minimize → Mitigate
- There will be small impacts that will not be reasonable to require permittee-responsible mitigation, but any size impact to SAV should result in compensation to ensure that all SAV losses and loss of habitat function are discouraged and accounted for if unavoidable.
- SAV restoration efforts in the Chesapeake and Coastal Bays have ranged in size from several square meters to acres. Either end of the spectrum has resulted in both successes and failures, and there is practicality in restoring SAV at both small and larger scales. During the workshop, SAV restoration practitioners shared that some of their plots have been as small as 300 square feet, suggesting that relatively small impacts could still be meaningfully mitigated, particularly when considering the required 3:1 ratio to account for loss of function. With the established in-kind mitigation ratio of 3:1, a 300 square foot loss of SAV would require a 900 square foot compensatory mitigation effort. **The SAV Workgroup therefore recommends that any impact greater than 300 square feet require in-kind mitigation.**

? 2. How do we determine if in-kind SAV mitigation is appropriate at the time?

- If an SAV impact occurs that triggers compensatory mitigation efforts, considering if in-kind SAV mitigation is actually appropriate is an important first step in this process. Local, regional, or Bay-wide habitat conditions may be such that SAV restoration success is not likely at the time. In this case, our limited SAV resources should not be wasted.
- If SAV habitat conditions are declining in the tributary where impacts occur, such that a loss in SAV acreage has been documented over the most recent three years of data, mitigate in-kind in the broader region/salinity zone. If region-wide conditions are in decline and SAV restoration success is unlikely even in the broader area, we recommend an in-lieu fee* be applied.

  *In-lieu fees are currently the last option for mitigation. All other possibilities must be exhausted before an in-lieu fee is considered. The SAV Workgroup recommends a regulatory change that makes in-lieu fees the first option and that those funds are used for SAV restoration research, SAV restoration capacity building, and SAV restoration projects conducted by trained professionals.

3. What characteristics make for a suitable compensatory SAV mitigation project site?

TABLE 1. Recommended habitat requirements for growth and survival of submerged aquatic vegetation (SAV) in Chesapeake Bay and its tidal tributaries.

		Primary Requirements†		Secondary Requirements**(Diagnostic Tools)			
Salinity Regime#	SAV Growing Season*	Minimum Light Requirement (%)	Water Column Light Requirement (%)	Total Suspended Solids (mg/l)	Plankton Chlorophyll-a (µg/l)	Dissolved Inorganic Nitrogen (mg/l)	Dissolved Inorganic Phosphorus (mg/l)
Tidal Fresh	April-October	>9	>13	<15	<15	—	<0.02
Oligohaline	April-October	>9	>13	<15	<15	—	<0.02
Mesohaline	April-October	>15	>22	<15	<15	<0.15	<0.01
Polyhaline	March-May Sept.-Nov.	>15	<22	<15	<15	<0.15	<0.02

- The mitigation site is the site where the SAV restoration effort will take place. Ideal mitigation sites should meet or exceed SAV habitat requirements (e.g., light availability, low chlorophyll-a – refer to *Chesapeake Bay Submerged Aquatic Vegetation Water Quality and Habitat-Based Requirements and Restoration Targets: A Second Technical Synthesis* Table 1 for SAV Habitat Requirements), have low wave energy, limited boat traffic, suitable adjacent land use (i.e., avoid urban areas with hardened shorelines), and historical SAV presence. To maximize the use of the limited SAV seeds available, the site should not currently have any SAV present.
- Follow restoration site selection guidance in *Small-scale SAV Restoration in Chesapeake Bay: A Guide to the Restoration of SAV in Chesapeake Bay and its Tidal Tributaries*.
- For additional assurance that the site is appropriate for SAV restoration, the applicant should consider using *GrassLight*. *GrassLight* is a coupled model of 2-flow radiative transfer and photosynthesis in submerged plant canopies frequently used to determine if the water column light environment in a given area will support SAV productivity. GrassLight is available at no cost on GitHub at https://github.com/BORG-ODU/GrassLight.

? 4. How far away from the impact site is allowable for the mitigation site?

- The purpose of an SAV mitigation project is to reestablish the ecosystem services lost to an area with the loss of SAV at the project/impact site. Therefore, to restore ecosystem services, an SAV mitigation site should be as close as possible to the impact site without risk of impact from the project.
- Prioritize proximity: at site → near site → same tributary* → adjacent tributary → within salinity zone. Justification must be provided if the mitigation site is outside of the subwatershed where the impact occurred.

  *some tributaries are large enough that they have multiple salinity zones (i.e., the Potomac River extends from tidal fresh to upper mesohaline salinity). A mitigation site should remain in the same salinity zone even if outside of the tributary to maintain similar ecosystem functions to the impact site.

? 5. How do you identify an SAV seed donor bed?

- A donor bed is defined as an SAV bed where SAV seeds are collected for use in SAV restoration or mitigation efforts.
- SAV donor beds for seed harvest must be large beds (relative to the size of the SAV beds in the tributary in question) that are >5 years old, have a cover/density class 4 (70-100%) on the VIMS aerial survey, and approximately 75% of plants should be reproductive based on a visual assessment while scouting.
- Permittees must obtain a permit to harvest SAV seeds and/or plant material.
    1. In Maryland, refer to Maryland DNR's SAV regulations webpage at: https://dnr.maryland.gov/waters/bay/pages/sav/sav-permits-and-regulations.aspx ;
    2. In Virginia, refer to the Virginia Marine Resources Commission subaqueous permit information here: https://www.mrc.virginia.gov/regulations/hm-permits.shtm
    3. In Washington, D.C., refer to the SAV regulations here: https://doee.dc.gov/sites/default/files/dc/sites/ddoe/publication/attachments/submergedaquaticveg.pdf

? 6. How should the mitigation effort be monitored?

Survey Timeframe	Months	SAV Community Peak Biomass
Early-summer	May/June	*Zostera/ Zannichellia*
Mid-summer	July	Mesohaline/estuarine SAV community
Late-summer	August/September	Tidal Fresh/Oligohaline SAV community

- Mitigation site monitoring is essential to determine if the mitigation effort is successful or not. Monitoring should be non-destructive and in-situ. Measured parameters should include SAV percent cover, shoot counts, and restored bed size.
- In advance of the first monitoring effort, use mapping software such as ArcGIS to generate a grid matrix with approximately 30 grid cells over the restoration plot polygon (grid size changes based on the size of the mitigation site but the number of cells does not; tessellated hexagonal grid cells work best). Within each cell, generate a random point to survey.
- When conducting the survey, record percent cover and conduct a shoot count within a 0.25 m^2 quadrat at each randomly generated point. Surveying at random points inside grid cells – rather than simply surveying at randomly generated points within the restoration area polygon - guarantees that the entire planted area will be surveyed. ID all species observed (sometimes volunteer plants of a different species than the one planted recruit to an SAV mitigation site naturally).
- If possible, locate and map the edge of bed with a hand-help GPS device and determine the bed size. Edge of bed is where cover transitions from more than 10% cover to less than 5% cover. If SAV cover is too sparse to determine an edge of bed, disregard this step.
- At minimum, survey once annually during peak biomass for the species in question. More frequent monitoring may behoove applicant to ensure SAV presence is captured. Monitoring should occur for at least 5 years post-restoration. See the table above for peak biomass monitoring timeframes.
- Monitor SAV at a reference site as well as the mitigation site (see #7).

? 7. What is a reference site and what characteristics should a reference SAV bed have?

- A reference site is defined as a site similar to the mitigation site that can be monitored in conjunction with the mitigation site to determine if success or failure of the mitigation effort is due to factors associated with the mitigation effort itself or due to regional trends in water quality that are beyond the permittee's control.
- A reference SAV bed should be similar in SAV species composition (if the permittee is planting wild celery, the reference bed should be dominated by wild celery), and physical and water quality characteristics (salinity, substrate, fetch, depth, light, water clarity, etc.),

? 8. How far away from the mitigation site is allowable for a reference site?

- Reference sites should be as close as possible to the mitigation site while maintaining independence and the reference bed characteristics in #7 above.
- Prioritize proximity: near site → same tributary → adjacent tributary → within salinity zone. Justification must be provided if the mitigation site is outside of the tributary/subwatershed where the impact occurred.

? 9. Who is responsible for mitigation site monitoring, and for how long?

- If financially feasible within the project's funding, mitigation and reference monitoring should be conducted by a qualified, third party and independent contractor for at least 5 years.
- If not conducted by a third party, the responsible party should submit time-stamped pictures of the restoration and reference site(s) to the permitting agency to assure validity and accuracy of monitoring results.

? 10. What should be required for long-term maintenance? Who is responsible?

- The permittee is responsible for long-term maintenance, defined as 5 years of monitoring and adaptive management actions.
- If the project is considered a success at year 5, the permittee is free of obligation after that. If not successful after year 5, the mitigation requirements should be re-evaluated by the regulatory agencies and if deemed appropriate, a contingency plan determined by the regulatory agency should be enacted.

11. How should project success be determined?

- Success should be defined by the Threshold Value and Quality Ratio as defined by Gamble et al. (2021), p. 65.
- Gamble et al. compare restored beds to reference beds rather than to conditions at the impacted site. This takes into account regional trends and ensures that the trajectory of compensatory mitigation projects is interpreted in the context of regional conditions.

BOX 4.2: HOW TO MEASURE SUCCESS USING THRESHOLD VALUE AND QUALITY RATIO

For example, shoot density per m^2 in the restored bed can be compared with the reference bed(s) using a minimum of 10 randomly placed quadrats in each bed. Shoot density in the restored bed after five years was averaged to 515 shoots per m^2.

The shoot density of the reference beds was measured at an average of 560 ± 102 (mean ± SD) shoots per m^2. Thus, the quality ratio is 515/560 = 0.92. Threshold value = (560-102) / 560 = 0.82.

Quality ratio > threshold value (0.92 > 0.82). This means that the restoration was successful.

The threshold value can also be used to determine whether there have been increases in (i) biomass, (ii) maximum depth distribution (iii) sediment variables, and (iv) the abundance and diversity of fish and invertebrates.

A threshold value is a point at which a significant change has occurred within the restored bed:

Threshold value = (average of parameter *a* - 1 SD in reference beds) / (average of parameter *a* in reference beds). Note: parameter *a* can be any parameter (e.g. shoot density or extent).

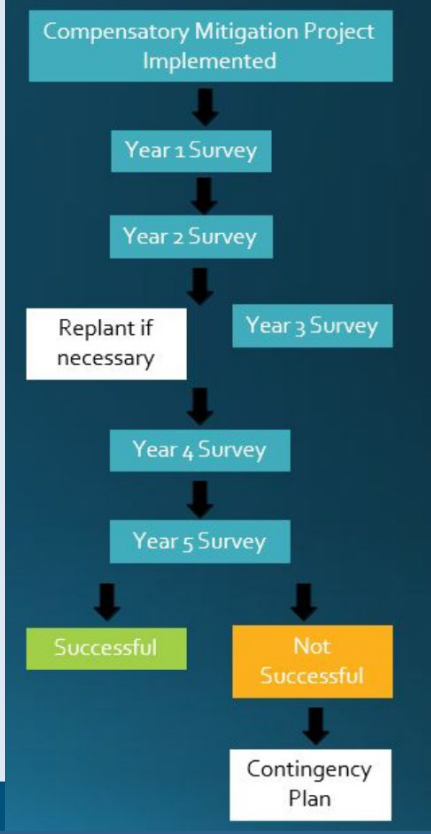
Where SD is the standard deviation.

Quality ratio = (average of parameter *a* in the restored bed) / (average of parameter *a* in the reference bed)

If the quality ratio is greater than the threshold value, the restoration project has been a success.

Quality ratio > threshold value. Project successful

Gamble et al. (2021)



- Monitor both restoration and reference sites for 5 years
- Success each year will be determined using the Threshold Value and Quality Ratio defined by Gamble et al. 2021.
  - If at Year 2 of monitoring the Quality Ratio is < the Threshold Value, the permittee may replant/reseed during the spring of Year 3
- After 5 year of monitoring:
  - If the Quality Ratio > the Threshold Value, the project is successful and no further monitoring is required.
  - If the Quality Ratio < the Threshold Value, the project is NOT successful and requires contingency.

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? The SAV Bed (aka the parking lot)

Additional priorities and next steps identified during the SAV mitigation workshop and review include the following:

- Establish SAV restoration certification program
- Create a GIS project tracking all mitigation and restoration sites and donor beds (this has been initiated at Maryland DNR)
- Consider regulatory measure that would prioritize compensatory SAV mitigation over other options (exception waivers, out of kind mitigation, etc.)
- Address cost barriers to mitigation
- Balance living shoreline implementation with SAV protection
- Consider target species biology when defining restoration success
- Advocate for funding and technical resources to support tracking and certification
- Foster continued coordination between restoration practitioners and regulatory/permitting agencies

Questions/Comments/ Suggestions