Submerged Aquatic Vegetation Mitigation and Monitoring Workshop - An SAV Workgroup Report.

Chesapeake Bay Program
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Chesapeake Bay Program
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About the Chesapeake Bay Program's SAV Workgroup:

The SAV Workgroup serves the broader Chesapeake Bay community by guiding managers on the protection and restoration of SAV. The workgroup carries out its mission by providing technical expertise and applying research findings to issues impacting SAV in the Bay.

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Chesapeake Bay Program SAV Mitigation and Monitoring Workshop Summary

Introduction

Submerged aquatic vegetation (SAV) in the Chesapeake and Atlantic Coastal Bays is a vitally important habitat that provides numerous ecosystem services, including the provision of habitat and refuge for ecologically and commercially important finfish and shellfish, carbon sequestration and pH buffering, shoreline erosion control, and nutrient cycling. Regardless, due to their confinement to shallow, nearshore waters, they are immediately susceptible to the direct and indirect impacts of shoreline construction and coastal development. In recent years, Bay jurisdictions have documented a steady rise in shoreline alteration, dredging, and other near-shore activities that have resulted in measurable SAV losses, with impacts varying by region depending on development pressure and regulatory frameworks. It is anticipated that these shallow water use conflicts will only increase over time as sea level rise continues and SAV recovers with improvements in water quality associated with the Chesapeake Bay Total Maximum Daily Load (TMDL).

In the context of these increasing pressures, mitigation refers to the process of avoiding and minimizing impacts to SAV to the maximum extent practicable, then compensating for any remaining, unavoidable loss of SAV habitat through restoration or other approved mitigation mechanisms. Compensatory mitigation for aquatic resources—including SAV—is grounded in federal and state regulatory authorities such as the Clean Water Act Section 404(b)(1) Guidelines, the Rivers and Harbors Act, National Oceanic and Atmospheric Administration (NOAA), Environmental Protection Agency (EPA) and United States Army Corps of Engineers (USACE) habitat protection mandates, and state tidal wetlands laws and permitting programs. Chesapeake and Atlantic Coastal Bay jurisdictions currently employ several mitigation mechanisms, including permittee-responsible mitigation, mitigation banking, and in-lieu fee (ILF) programs. However, SAV-specific guidance has been limited, resulting in inconsistent mitigation requirements, variable ecological outcomes, and uncertainty among regulators and permittees.

On January 30, 2025, the Chesapeake Bay Program's SAV Workgroup hosted a compensatory SAV Mitigation Workshop. The purpose of the workshop was to respond to the rising number of near-shore projects and activities (i.e., shoreline alteration and stabilization, dredging, marina expansion) that impact SAV in the Chesapeake and Atlantic Coastal Bays and to develop standardized, non-binding guidance to regulatory agencies on appropriate compensatory SAV mitigation and monitoring requirements.

This document summarizes the workshop proceedings and the compensatory SAV mitigation recommendations developed. A separate document focused solely on specific compensatory SAV mitigation guidance was also developed. Our intent is to ensure that when SAV habitat is lost due to permitted activities, it is mitigated appropriately, meaningfully, and with the greatest chance of ecological success. The guidance emphasizes avoidance and minimization first and foremost; it is not our intent to promote or facilitate the allowance of additional SAV

impacts. Rather, the intent is to clarify expectations, improve consistency across jurisdictions, and strengthen ecological outcomes when mitigation is required.

Workshop Objectives

- Understand the current state of SAV mitigation requirements in the Chesapeake and Atlantic Coastal Bays.
- Identify appropriate triggers and methods for compensatory SAV mitigation.
- Define monitoring standards and success criteria for compensatory SAV mitigation.
- Recommend practical solutions to track and evaluate SAV mitigation outcomes.

Workshop Structure

The workshop brought together members of the SAV Workgroup and state and federal regulatory partners from the Chesapeake and Coastal Bays region responsible for permitting and environmental review. It was the intent of workshop leads to foster transparency, build consensus, and ensure SAV mitigation efforts are appropriate, ecologically meaningful, and implementable.

The workshop began with a series of presentations from state and federal regulatory agencies and SAV mitigation practitioners outlining current practices and challenges in SAV mitigation. This was followed by a group discussion to address specific questions and the development of compensatory SAV mitigation and monitoring guidance. The session concluded with consensus building for recommendations and documentation of needs for future research, policy development, and tracking. A workshop lead introduced speakers, presented questions, and guided discussions while a facilitator led activities and worked specifically to maintain focus and gain consensus.

SAV Restoration Guidance

In 2019, the Chesapeake Bay Program's SAV Workgroup published *Small-scale SAV Restoration in Chesapeake Bay: A Guide to the Restoration of SAV in Chesapeake Bay and its Tidal Tributaries*. This guidance document includes the latest available information and guidance on

- What native species should be used for restoration in each of the Bay's salinity zones
- When and how to harvest seeds from each species recommended for restoration
- How to process and store the SAV seeds collected
- How to test for viability and germination rates
- How to select sites appropriate for restoration
- SAV monitoring basics

Compensatory SAV mitigation projects required in the Chesapeake and Atlantic Coastal Bays should follow the guidance provided in this document or other, approved methods. Although the Small-scale Restoration guidance document includes guidelines for transplanting mature

plants for SAV restoration, only SAV seeds are recommended for mitigation purposes to minimize additional impacts to the Bay's SAV populations.

SAV Mitigation Questions and Consensus-Based Response Summaries from the Workshop and Comments after the Workshop

1. **What size impact should trigger in-kind SAV mitigation?**
    - First and foremost, 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 compensatory mitigation 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 Atlantic 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 mitigation ratio requirements to account for loss of function. For example, with the 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 recommends that any SAV impact greater than 300 square feet require in-kind SAV mitigation.

2. **How do we determine if in-kind SAV mitigation is appropriate at the time?**
    - If an SAV impact triggers compensatory mitigation efforts, considering if in-kind SAV mitigation is 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 the impact will occur, such that a loss in SAV acreage has been documented over the most recent three years of data, SAV mitigation should take place outside of the tributary and 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?**
    - 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 limited SAV seeds, 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 offset unavoidable SAV loss and to reestablish the lost ecosystem services. Therefore, to restore ecosystem services locally, 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 should be provided if the mitigation site is outside of the sub-watershed 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 should 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.

- Though there are instances when it may be advantageous for SAV seeds from populations far away from the impact site to be used in mitigation, in most cases, SAV donor beds should be as close as possible to the impact and mitigation sites. Using seeds from nearby populations ensures genetic adaptation to local conditions.
- 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?**
    - 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 count, and restored bed size.
    - In advance of the first monitoring effort, the permittee should 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 – is a form of systematic random sampling that 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 the edge of bed, disregard this step.
    - At minimum, the mitigation site should be surveyed once annually during peak biomass for the species in question. More frequent monitoring may behoove the applicant to ensure SAV presence is captured. Monitoring should occur for at

least 5 years post-restoration. See the table below for peak biomass monitoring timeframes.

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

- 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 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, 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.

9. **Who is responsible for mitigation site monitoring, and for how long?**
   - If financially feasible, mitigation and reference monitoring should be conducted by a qualified, third party and independent contractor for at least 5 years post-restoration.
   - 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 should be 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 should be 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 described in *Seagrass Restoration Handbook UK & Ireland* 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 natural variability and also ensures that the trajectory of the compensatory mitigation project is interpreted in the context of regional conditions.
    - Threshold Value and Quality Ratio:
        - Success each year will be determined using the Threshold Value and Quality Ratio, where:
            - Threshold Value = (average of parameter α – 1SD in reference bed) / (average of parameter α in reference bed)

              [Note: SD is standard deviation and parameter α can be any of the parameters measured (shoot count or SAV percent cover in this case). A threshold value is a point at which a significant change has occurred within a restored bed.]
            - Quality Value = (average of parameter α in the restored bed) / (average of parameter α in the reference bed)
            - Success is defined if the Quality Ratio exceeds the Threshold Value.
        - Monitor both restoration and reference sites for 5 years
        - If at Year 2 of monitoring the Quality Ratio is < the Threshold Value, the permittee should be required to reseed during the spring of Year 3.
        - After 5 years 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 the mitigation requirements should be reevaluated by the regulatory agencies.

Additional priorities and next steps identified during the SAV mitigation workshop included 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 measures 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

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