SAV Workgroup Member Updates

Summer 2018 SAV Workgroup Meeting

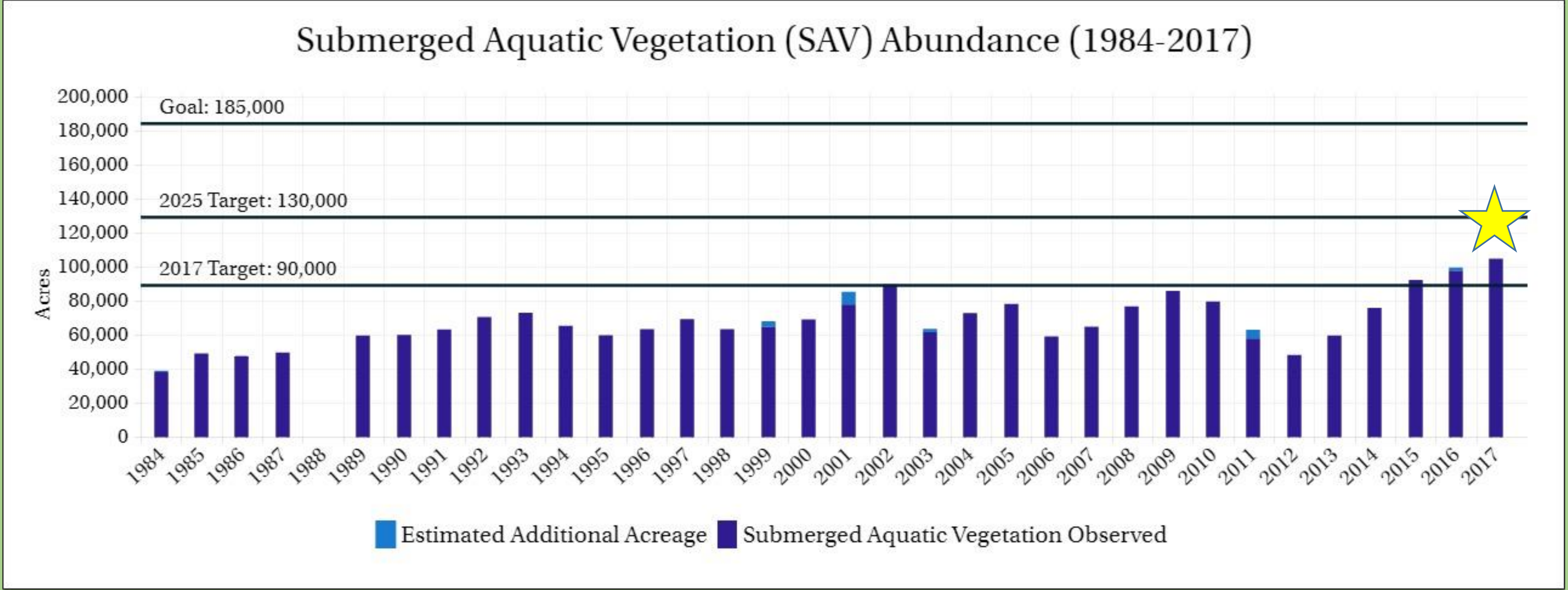
Chesapeake Bay Program

Annapolis, MD

June 26, 2018

Good News!!!

104,843 Acres of SAV in the Bay in 2017!!



Good News!!!


International Seagrass Biology Workshop 14
Maryland, 2020
‘Signs of Success’

SAV Financing Strategy

#10 in our 2-Year Work plan: Work with the Chesapeake Bay Program's Budget and Finance Workgroup (BFWG) to create a financing strategy/system for all aspects of the SAV Management Strategy and 2-Year Work plan. Having a financial strategy/system in place will increase likelihood of reaching our ultimate SAV acreage goal through the protection and restoration of SAV in the Chesapeake Bay.

a. Report and Guidance document will be written by BFWG for implementation of SAV Outcome Finance Strategy

The BFWG is working to support the CBP partners by facilitating the workgroups in development of specific finance strategy/systems for the Management Strategies, outcomes, and biennial work plan action items.

Status Update: We had our third dialogue session with the BFWG (lead by Julie Winters and Dan Nees) and several banker/financial types in March.

Three avenues for funding were discussed: 1. Full cost pricing, 2. Mitigation banking (proactive restoration), and 3. creation of a third party recovery fund or endowment.

Take home: The financial sector wants to know exactly how much SAV is worth based on its ecosystem services (~$220 million in 2016, Elliott Campbell). Need to relate nutrient sequestration capacity of SAV to TMDLs.

SAV Synthesis and Segment Analysis

Lead by JJ Orth and Bill Dennison

We assembled a diverse and talented scientific team

The Bay is changing, but SAV is an indicator and defender of water quality…a sentinel!

Multiple stressors threaten the imperiled coastal foundation species eelgrass (*Zostera marina*) in Chesapeake Bay, USA

Global Change Biology (2017), doi: 10.1111/gcb.13623

Submersed Aquatic Vegetation in Chesapeake Bay: Sentinel Species in a Changing World

ROBERT J. ORTH, WILLIAM C. DENNISON, JONATHAN S. LEFCHECK, CASSIE GURBISZ, MICHAEL HA… JENNIFER KEISMAN, J. BROOKE LANDRY, KENNETH A. MOORE, REBECCA R. MURPHY, CHRISTOPHER J. PATRICK, JEREMY TESTA, DONALD E. WELLER, AND DAVID J. WILCOX

Long-term nutrient reductions lead to the unprecedented recovery of a temperate coastal region

PNAS

High heat and low light is bad for Zm, and it's going to lose us a lot of $$

Reduces nutrient loads to the Bay is facilitating the natural recovery of SAV!

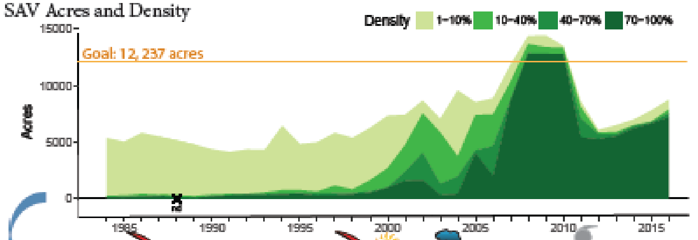
SAV Segment: Susquehanna Flats (CB1TF2 and NORTF)

Current expansive freshwater SAV beds in the Upper Chesapeake Bay near Havre de Grace.

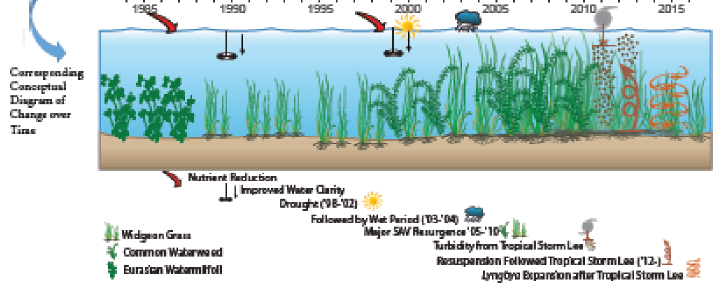
Executive Summary

Historic SAV beds that supported migrating waterfowl populations were decimated by 1972 through dominance of milfoil that outcompeted native species and Tropical Storm Agnes that resulted in large amounts of sediments and nutrients that smothered existing SAV. Following two decades of minimal to no recovery, SAV beds on the Susquehanna Flats began recovering due to reductions in total nitrogen and improving water clarity, achieving the restoration goals in this segment by 2008 and attained it through 2010. Tropical Storm Lee and the accompanying residual turbidity reduced the coverage below the restoration goal, but steady recovery has been facilitated by the dense, resilient SAV beds that persisted after Tropical Storm Lee.

SAV Acres and Density



Corresponding Conceptual Diagram of Change over Time



Take Home Points

1. Goal attainable
2. Historic coverage: Changing patterns
3. Key events: Tropical Storm Agnes, Resurgence 2005-2010, Tropical Storm Lee
4. Vulnerability/Resilience: Diversity and Resilience, Resuspension, Lyngbya
5. Management implications: Conowingo Dam, water clarity, nitrogen loads

Attainable: Goal has/had been reached | Attainable: Goal can be reached | Potentially Attainable: with water quality improvement | Potentially Attainable: with significant water quality improvements | Unlikely Attainable

2018 GIT Funded Projects

1. Development of Citizen Scientist SAV Monitoring Protocol/Manual and Training/Certification Program

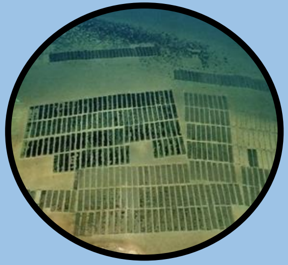
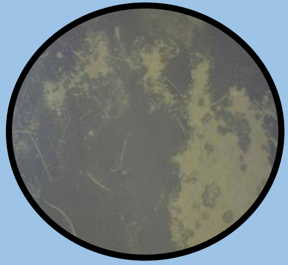
GIT Lead: Brooke Landry, Contracted to UMCES, IAN

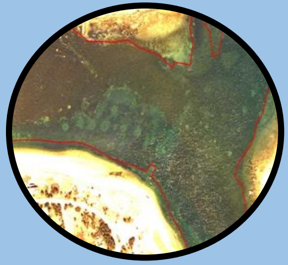




2. Review of Statutes and Regulations that Protect SAV in the Bay

GIT Lead: Becky Golden, Contracted to the Chesapeake Legal Alliance


Review of Statutes and Regulations that Protect SAV in the Chesapeake Bay

GIT Lead: Becky Golden, Contracted to the Chesapeake Legal Alliance

- **Funding requirement:** $25,000 for one year
- Objectives
  - Review statutes & regulations currently in place to protect existing SAV
  - Determine if these regulations are adequate to protect existing & expanding SAV
  - Recommend language to the CBP for new statutes and regulations and/or recommend language for changes to current regulations
- Deliverables:
  - Mid-point progress report and electronic copy of database on or before August 17th
  - Draft report w/ summary and recommendations, including draft legislative language on or before January 15th, 2019
  - Presentation of findings and recommendations at Spring SAV Workgroup

SAV Survey Design: Dave Wilcox

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March 2017. SAV Aerial & Ground Survey Design Workshop

Objectives: to reach agreement on…

- The collective management, regulatory and research needs for and uses of data and information generated by the SAV aerial and ground surveys
- A set of aerial and ground survey design options which maximize addressing the Partnership’s collective data and information needs
- A more diverse funding partners’ portfolio to recommend to the Partnership.

SAV Survey Design: Dave Wilcox

March 2017. SAV Aerial & Ground Survey Design Workshop

Design Options:

1. Existing survey design with no modifications
2. Existing survey design but upgrading to a semi-automated imagery processing routine
3. Collecting baywide annual imagery but only processing regions of the Bay annually with the entire Bay being mapped every three to four years
4. Collecting baywide imagery but only processing a statistically random subset

SAV Survey Design: Dave Wilcox

Statistical Subsampling Effort

- Dong Liang, UMCES CBL

- Evaluate statistical sub-sampling strategies to further improve the cost efficiency of the aerial survey design.
- Use the long term SAV database as ground truth to estimate the accuracies of the design options.
- Identify the most efficient sub-sampling procedure that maintains the core functions of the SAV data.

SAV Survey Design: Dave Wilcox

Statistical Subsampling Effort

- Dong Liang, UMCES CBL

- Sampling around 1,000 cells (10 m^2 in size) within a segment can estimate total cover within 1.5% - 2.5%.
- Sampling around 2,000 cells (10 m^2 in size) within a segment can estimate segment-specific SAV presence and absence with an accuracy of 85% - 92%.
- Cautions
  - Cost estimates undetermined
  - Accuracies are likely optimistic given implementation constrains
  - Large errors can occur with expansion of SAV into new areas

SAV Survey Design: Dave Wilcox

Researching and Implementing Remote Sensing Methods to Automate and Facilitate the Chesapeake Bay Annual SAV Monitoring Project

VIMS will employ a post doctoral associate to:

- Identify and implement automated aerial triangulation and orthorectification methods.
- Evaluate available benthic remote sensing tools and methods for classifying SAV in a turbid estuary using annual multispectral imagery and available ancillary data. Develop automated classification methods to facilitate and improve the annual Chesapeake Bay SAV monitoring project.

SAV Workgroup Research Prioritization

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#14 in our 2-Year Work plan: Prioritize research topics based on current gaps in knowledge regarding SAV restoration, recovery, and resilience. Use recent synthesis efforts and information (ie. TS III and SAV Syn) to guide discussion and prioritization.

a. Facilitate inter-agency working session to prioritize research topics

SAV Workgroup Research Prioritization

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But first, we need a list of things *to prioritize….*

SAV Workgroup Research Prioritization

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NOTE: GIT Funding proposals are due soon, so project ideas are welcome!

Gaps identified in the most recent MStrat

- *Watershed Impacts on SAV*. Determine the extent to which processes and impacts on adjacent watersheds influence SAV survival and growth. Assess impact of watershed improvements on SAV.
- *Succession*. Determine whether success rate increases if a primary colonizing SAV species is planted first, followed by a climax species (e.g., *Ruppia* followed by *Zostera*).
- *Species diversity*. Determine the conditions under which planting multiple species in the same location are likely to increase the chances of population survival.
- *Reconciliation ecology*. Identify and select species with characteristics that maximize ecological function.
- *Genetic Diversity*. Determine the condition under which planting multiple genotype and locally adapted genotypes are likely to increase chances of population survival.

Gaps identified in the most recent MStrat

- *Propagule choice*. For species that grow well from two or more types of propagules, such as seeds and whole shoots, determine which propagule choice is the most cost-effective under different conditions, comparing total planting cost to the survival rate.

- *Propagule transport modeling*. Determine connectivity among source beds that act as source of seed material over varying spatial scales.

- *Size*. Define the ideal size of restoration plots to maximize success (further understanding the role of small sub-pops).

- *Density and Pattern*. Determine at what density and spatial arrangement SAV should be planted to maximize growth and survival.

- *Exclosures*. Determine whether the physical protection of plantings (and naturally recovering populations) results in significantly improved survivorship and the spread of individuals in a population.

Gaps identified in Tech Syn III

SAV and feedback processes: Implications for restoration and resilience

- SAV habitat requirements were largely derived using data collected near existing beds. However, already established beds can, in theory, withstand worse conditions than a recovering bed because of self-stabilizing feedbacks. Therefore, recovering SAV beds may require more stringent habitat requirements than those established for existing SAV beds. Further analysis is needed to explore this possibility. **Research project: Determine habitat requirements for recovering SAV beds rather than existing beds.**

The role of genetics and connectivity in the restoration of SAV beds

- Regarding genetics, there are still important gaps in our knowledge: most studies have focused on marine species, and moreover most of those have focused on just a few species (particularly *Z. marina*). **Research Project: Genetic and connectivity studies on fresh and brackish water species.**

Effects of land use and shoreline armoring on SAV

- Further research is needed to understand the impacts of different living shorelines on SAV compared to riprap, bulkhead, and natural shoreline. **Research Project: comparison study similar to natural vs. riprapped study by Landry and Golden 2017** changes in SAV communities.

Gaps identified in Tech Syn III

21st century climate chance and SAV in the Chesapeake Bay

- If the current trajectory of climate change continues, warming may eliminate eelgrass populations and favor heat-tolerant species such as widgeon grass. A variety of subtropical plants and animals are likely to become more common in the region. **Research Project: transplant experiment using the sub-tropical species, shoal grass (*Halodule wrightii*)**

- Sea level rise will reshape our shorelines. Where they are permitted to migrate landward, suitable SAV habitat may persist. However, where shorelines are hardened, suitable SAV habitat is likely to be lost. **Research Project: We have requested that STAR work on an SAV habitat forecasting map which will combine SLR projections with current shoreline hardening and nearshore land use maps to determine how much soft bottom habitat will be available for SAV in the future. If they don't pursue this topic, we should…**

- Climate change predictions regarding SAV are limited by a poor understanding of the indirect effects of climate change on organisms associated with SAV die-offs (fouling organisms, grazers, microbes). These indirect effects may trigger abrupt, unforeseen changes in SAV communities. **Research Project: Several projects here.**

SAV Sentinel Sites

SAV Sentinel Sites

#6c in our 2-Year Work plan: Monitor SAV throughout the Bay.

c. Establish SAV Sentinel sites throughout the Bay for annual monitoring by CBP partners and volunteers. Sentinel sites may include current long-term monitoring sites. Sites will be established at next SAV Workgroup meeting.

Location - Partners - Protocol

SAV Sentinel Site - Locations

VIMS has about 23 long-term sites clustered in Mobjack Bay and vicinity, some on Eastern shore

DNR has about 10 sites throughout Maryland (4 on Smith Island)

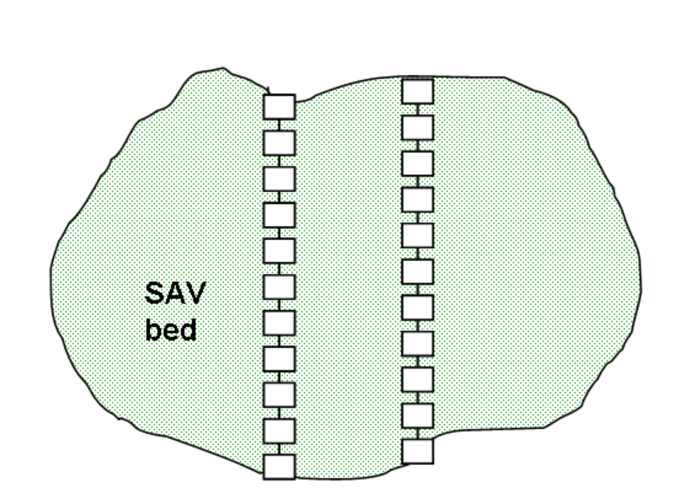
Others recommended:
Susquehanna Flats
Kent Island
Dundee Creek

Where else???

SAV Sentinel Site - Protocol

VIMS – SAV % cover (total and by species) every 10 meters for the length of the bed in a $1m^2$ quadrat.

DNR - SAV % cover (total and by species) in a $0.25m^2$ quadrat every X meters depending on length of bed. Also record shoreline type, canopy height, depth, and epiphyte presence at each quad. Paired transects.



SAV Sentinel Site – Adopt a Sentinel

We need partners and volunteers to commit to annual monitoring of the sentinel sites decided upon…..

VIMS ☑

DNR ☑

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