STAC Workshop

Evaluating an Improved Systems Approach to Crediting: Consideration of Wetland Ecosystem Services

March 22nd-23rd, 2022, Chesapeake Bay Foundation

Co-benefits of Submerged Aquatic Vegetation

Brooke Landry
Chair, SAV Workgroup

SAV inhabits the nearshore shallow waters of the Bay and its tributaries

As defined by the ASMFC (paraphrased)

[SAV refers to rooted, vascular, flowering plants that, except for some flowering structures, live and grow below the estuarine and marine water surface.

SAV habitat includes SAV beds and standing populations of various species and densities, including bare areas of sediment within a bed. SAV habitat is characterized by the current or historical presence of rhizomes, roots, shoots, or reproductive structures associated with one or more SAV species.]

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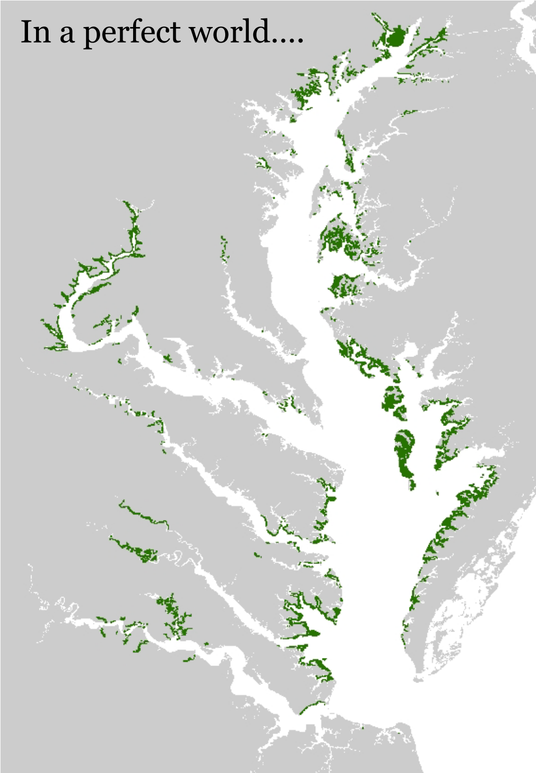
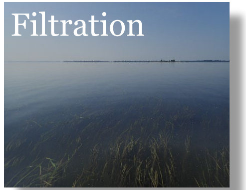
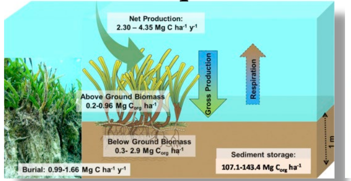
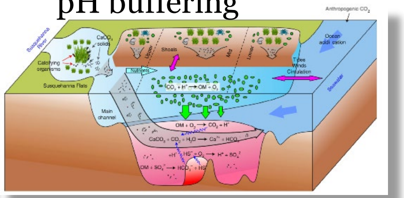




Carbon sequestration



pH buffering



Through the Chesapeake Bay Watershed Agreement, *the Chesapeake Bay Program has committed to…*

Goal: ***Vital Habitats***

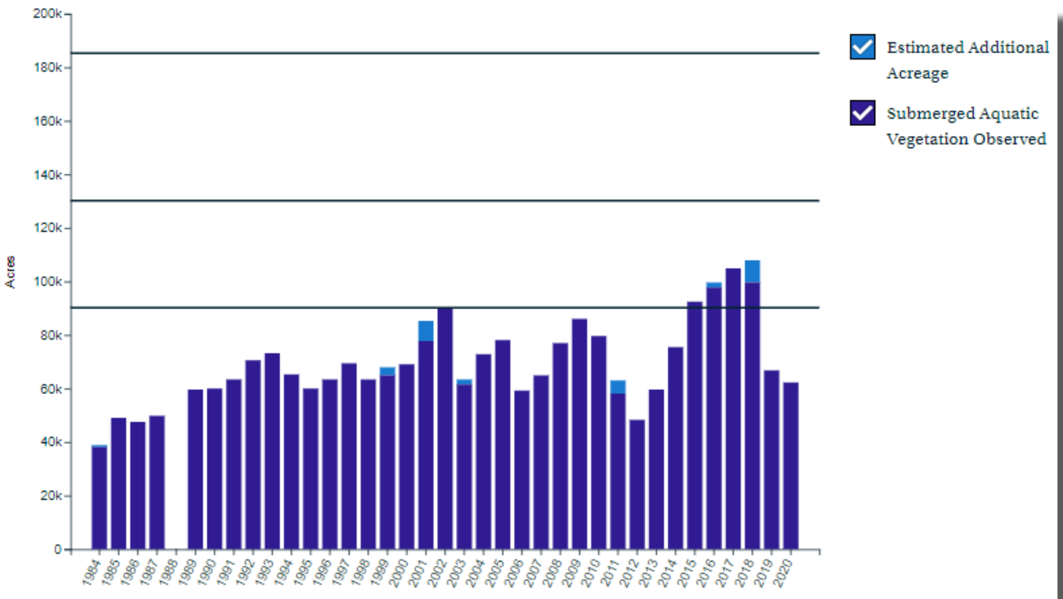
Outcome:

Sustain and increase the habitat benefits of SAV in the Chesapeake Bay. Achieve and sustain the ultimate outcome of 185,000 acres of SAV Bay-wide necessary for a restored Bay. Progress toward this ultimate outcome will be measured against a target of 90,000 acres by 2017 and 130,000 acres by 2025.

great at tracking our progress, no BMP though…

What is our Progress?

Chesapeake Bay SAV Abundance 1984-2020



62,169 acres of SAV in 2020

- 48% of the 2025 target of 130,000 acres
- 34% of the ultimate 185,000-acre goal

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The SAV Outcome is off course to achieving the target of 130,000 acres by 2025. Although the 62,169 acres mapped in 2020 is a 60% increase from the 38,958 acres observed during the first survey in 1984, it is a 20% decrease from the current 10-year average of 78,168 acres and a 7% decrease from 2019 when 66,684 acres of underwater grasses were mapped. https://www.chesapeakeprogress.com/abundant-life/sav

CBP Strategy Review System
SAV Management Strategy and Logic and Action Table/2-Year Workplan

Chesapeake Bay Program
Science. Restoration. Partnership.

Submerged Aquatic Vegetation Outcome
Management Strategy
2015–2025, v.4

Water stargrass (Heteranthera dubia) in the clear waters of the upper Potomac River, Maryland on July 28th, 2019. (Photo by Brooke Landry/Maryland Department of Natural Resources)

I. Introduction

Submerged aquatic vegetation (SAV), or underwater grasses, provide significant benefits to aquatic life and serve critical functions in the Chesapeake Bay ecosystem. Underwater grasses provide food, habitat and nursery grounds for a number of commercially and ecologically important finfish and shellfish, such as striped bass and blue crabs, and migratory waterfowl. They reduce erosion by slowing currents and softening waves, anchor bottom sediments and help keep the water clear by absorbing nutrients and trapping sediments. Through photosynthesis, underwater grasses act as a carbon sink by taking in carbon dioxide. This contributes to the reduction of greenhouse gas emissions and reduces the potential for climate change impacts. Likewise, underwater grasses also produce oxygen, which helps sustain other aquatic life. Increasing the abundance of underwater grasses in the Bay and its rivers will dramatically improve the entire Bay ecosystem.

BIENNIAL STRATEGY REVIEW SYSTEM
Chesapeake Bay Program

Logic and Action Plan: Post-Quarterly Progress Meeting

Submerged Aquatic Vegetation – 2022-2023

Long-term Target: Achieve and sustain the ultimate outcome of 185,000 acres of SAV Bay-wide; 130,000 acres by 2025
Two-year Target: To reach our 2025 goal of 130,000 acres, baywide SAV should increase by 16,000 acres per year. By 2023, we hope to achieve 98,000 acres of SAV, but a short-term target is not officially defined.

Factor	Current Efforts	Gap	Actions	Metrics	Expected Response and Application	Learn/Adapt
What is impacting our ability to achieve our outcome?	*What current efforts are addressing this factor?*	*What further efforts or information are needed to fully address this factor?*	*What actions are essential (to help fill this gap) to achieve our outcome?*	*What will we measure or observe to determine progress in filling identified gap?*	*How and when do we expect these actions to address the identified gap? How might that affect our work going forward?*	*What did we learn from taking this action? How will this lesson impact our work?*
Factor 1. Habitat Condition and Availability: SAV requires suitable water quality and clarity to recover and thrive as well as suitable shallow-water habitat in which to expand.	**Effort 1.1** The Bay TMDL was established to limit the amount of N, P and TSS entering the Chesapeake Bay. Reductions in N, P and TSS improve water clarity, which allows SAV to recover.	**Gap 1.1** Although SAV throughout the Bay has been shown to respond to improvements in water quality, it is also susceptible to degradation of water quality, particularly when impacted by multiple stressors, which we observed	**Action 1.1a** [Support WQ GIT in their efforts to improve water quality through the Bay TMDL and achieve water clarity/SAV standards in areas designated for SAV use.]	**Metric 1.1a** Acres of SAV mapped (Bay-wide aerial survey)	**Response 1.1a** Further improvements in water clarity will greatly affect the ability of SAV populations in the Bay to gain or maintain resilience against climate stressors; benefits of improved water	

Updated March 9, 2022

Management Approaches

Factors Influencing Success

1. Habitat Conditions and Availability
2. Protection of Existing and Recovering SAV
3. SAV Restoration Potential and Activity
4. SAV Research and Monitoring
5. Public Perception, Knowledge and Engagement

Management Approaches

1. Support Efforts to Conserve and Restore Current and Future SAV Habitat and Habitat Conditions
2. Protect Existing and Recovering SAV
3. Restore SAV
4. Enhance SAV Research and Monitoring
5. Enhance Community Involvement, Education and Outreach

SAV Habitat Requirements

Salinity

SAV occupies fresh, brackish, and salt waters, but each species of SAV has a particular range of salinities that it can tolerate. Changes in salinity can lead to changes in species distribution.

Clear water with light availability

Sunlight is needed for photosynthesis. Most Chesapeake Bay species are generally limited to waters no deeper than 2 meters. Light availability is determined by TSS, N, and P concentrations and loading, Chl a, macroalgae, and epiphytes

Substrate and water movement

Some species need sandy substrate, while others prefer muddy or silty areas. Most SAV do not tolerate peat-rich sediments associated with marsh substrates, nor do they tolerate strong waves or currents.

Water temperature

Temperature requirements differ between SAV species. Changes in temperature impact the ability of SAV to survive and persist in areas where they have historically thrived.

Wetland Ecosystem Services that Benefit SAV

Co-benefits:

- SAV beds provide forage for black ducks and other waterfowl that use wetlands as habitat

- SAV and wetlands provide co-mingled nursery and forage grounds for fish and inverts

- In a landscape-level analysis documenting shoreline impacts to SAV, Patrick et al. (2014) found that herbaceous wetland in the local watershed was the strongest positive predictor of SAV abundance explaining 16.3 % of the variation among subestuaries (Patrick et al. 2014)

Interestingly though….

“Marsh shoreline was negatively related to SAV in all three salinity zones, but the effect was strongest in the polyhaline zone (Fig. 3).”

“The amount of shoreline with marsh was the strongest single predictor (explaining 17.6 % of the variation among subestuaries), and it was negatively correlated with SAV abundance. The significant negative effect of shoreline marsh on SAV may seem counterintuitive, especially since herbaceous wetland in the local watershed was the strongest positive predictor of SAV abundance (explaining 16.3 % of the variation among subestuaries).”

That negative effect comes down to cDOM and sediment and the negative correlation between shoreline marsh and SAV abundance indicates that **not all natural ecosystems necessarily foster SAV**.

Patrick et al. 2014

Estuaries and Coasts (2014) 37:1516–1531
DOI 10.1007/s12237-014-9768-7

Effects of Shoreline Alteration and Other Stressors on Submerged Aquatic Vegetation in Subestuaries of Chesapeake Bay and the Mid-Atlantic Coastal Bays

Christopher J. Patrick · Donald E. Weller · Xuyong Li · Micah Ryder

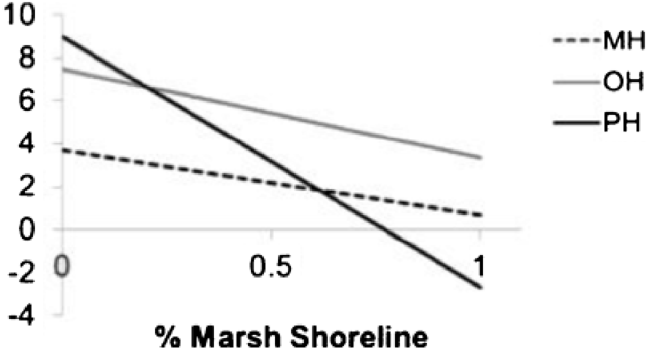
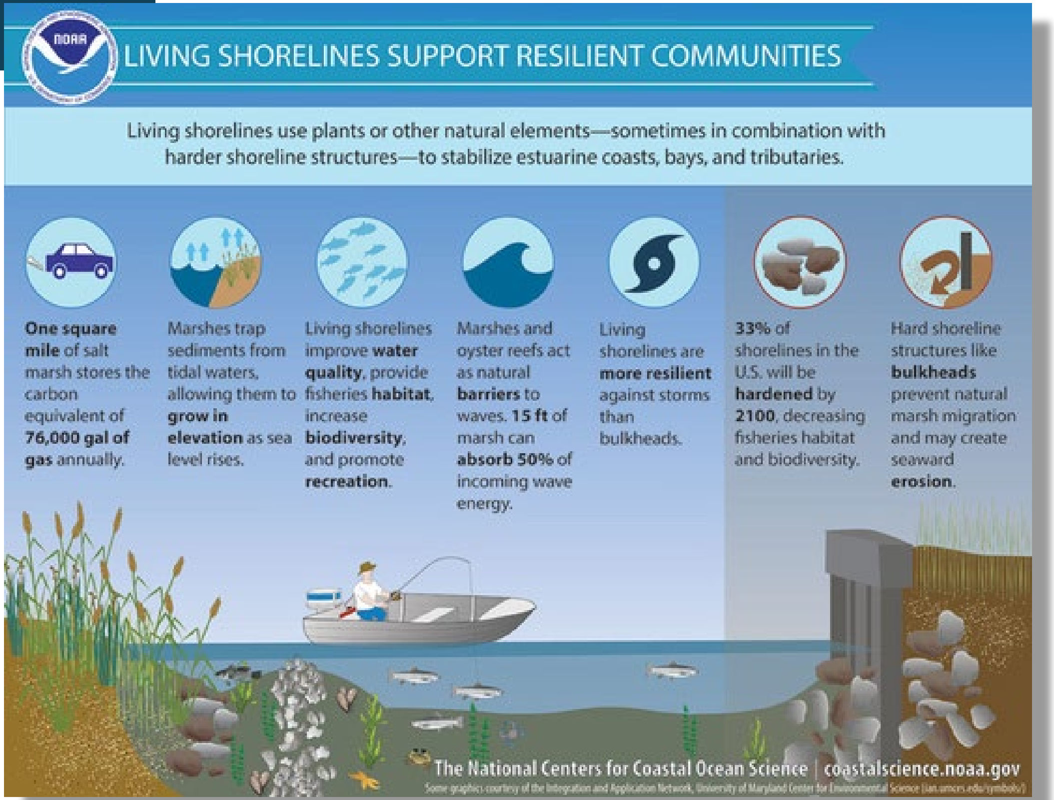


Fig. 3 Differences among salinity zones in the relationships of SAV abundance to shoreline variables. The *lines* are estimated from linear models with salinity zone as a categorical variable (Table 5). Salinity zones are polyhaline (*PH*), mesohaline (*MH*), and oligohaline (*OH*)

Barriers and challenges

- water clarity
- climate change impacts
- shallow water use conflicts
  - aquaculture
  - shellfish harvesting
  - SAV harvesting /removal for navigation
  - living shorelines**

**not straightforward and not always

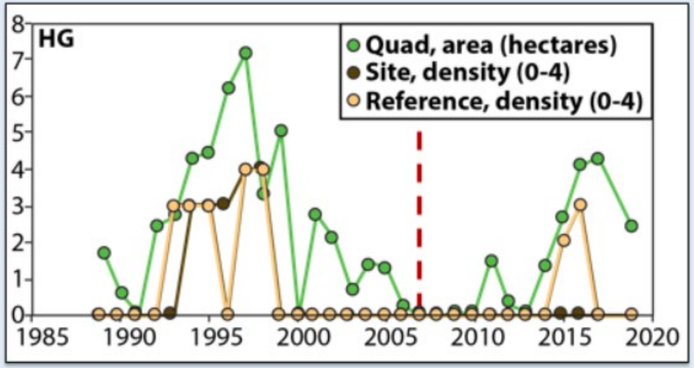


Armored Shorelines vs. Living Shorelines

SAV and Living Shoreline study by Palinkas and Staver, in prep

SAV generally **follows regional (quad) trends** except for some sites where more **local processes** affect both living and reference shorelines Living shoreline installation **does not appear to influence** SAV distributions!

SAV also disappears at reference site



Install 2007 (red line)

- Hardened shorelines negatively impact SAV at system and local scale (Patrick et al. 2014; Landry and Golden 2018)
- Living shorelines do not appear to impact SAV at system scale (Palinkas and Staver, in prep)

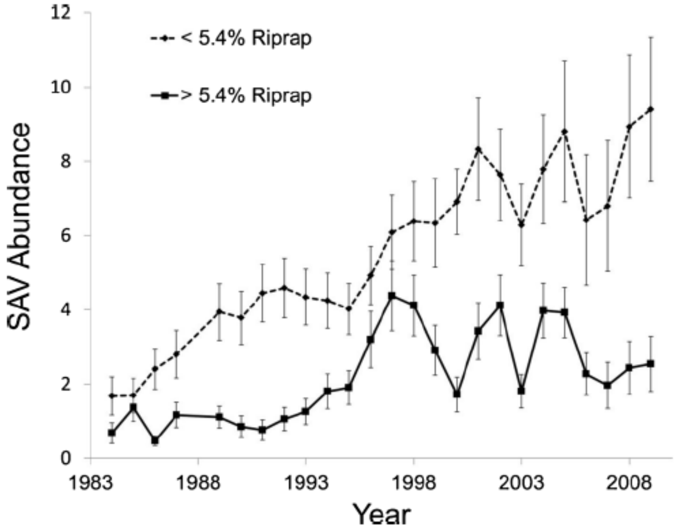
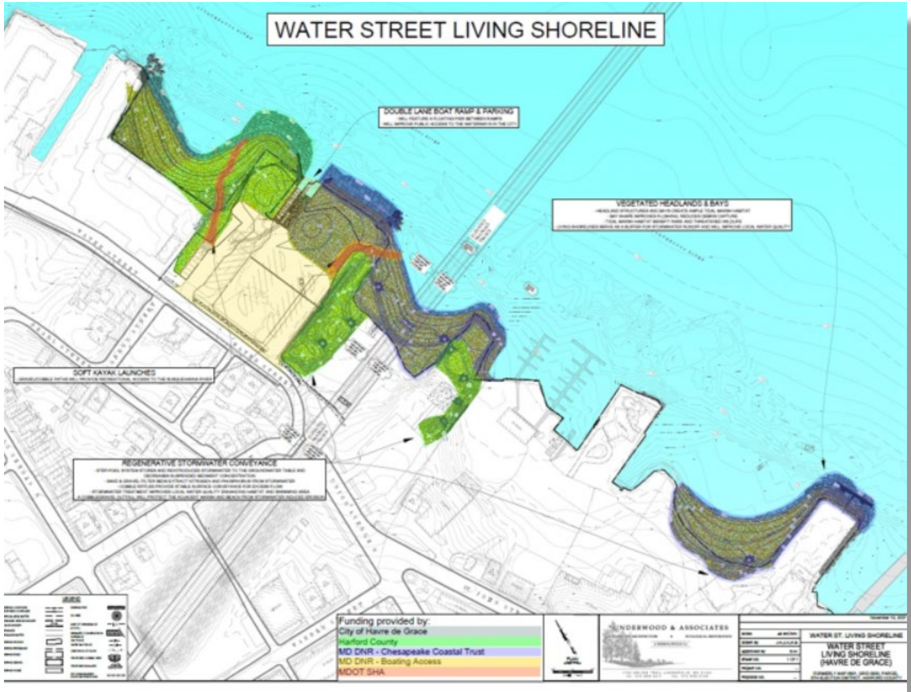


Fig. 5 Effect of riprap on SAV abundance over time. *Dashed black line with closed diamond points* shows the change in SAV abundance (mean±SE) for subestuaries with <5.4 % riprapped shoreline from 1984 to 2009. *Solid black line with closed squares* shows the change in SAV abundance (mean±SE) for subestuaries with >5.4 % riprapped shoreline from 1984 to 2009

Patrick et al. 2014

Case study of Living Shoreline Impacts: Water St. Project



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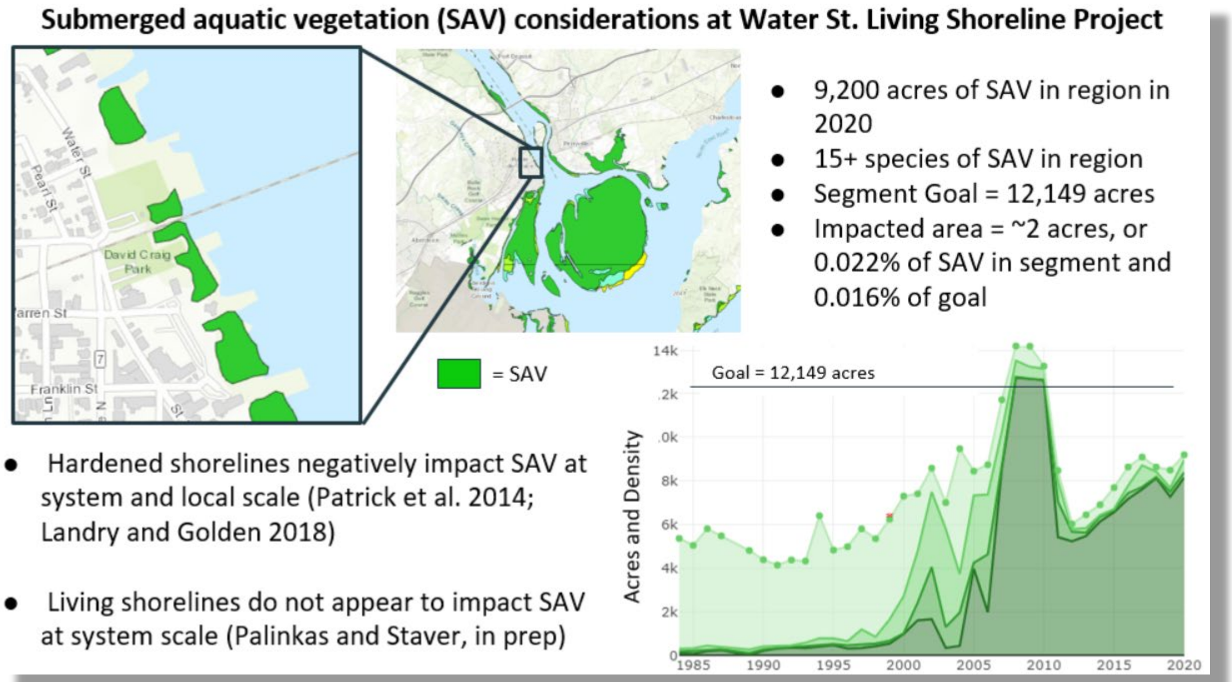

Problem:

The city will use the wetland creation in filled SAV area to fulfill TMDL credits.

At this time, there's no precedent to reject credits based on impacts to SAV.

So how do we balance this out? Should they get credit for one habitat when it destroys another?

This is something we should address....

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Questions?