MANAGEMENT STRATEGY POPULATED EXAMPLE
SUBMERGED AQUATIC VEGETATION
DRAFT 7/22/14
Based on 7/21/14 Key Elements of Management Strategies and 10/26/12 SAV Decision Framework

Executive Summary: Two to four page public-friendly summary that describes the content of the Management Strategy.

Outcomes and Baselines:
Vital Habitats Goal: Restore, enhance and protect a network of land and water habitats to support fish and wildlife, and to afford other public benefits, including water quality, recreational uses and scenic value across the watershed.
Submerged Aquatic Vegetation (SAV) Outcome: Sustain and increase the habitat benefits of SAV (underwater grasses) 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.
*Agreement

Importance: Underwater grasses provide significant benefits to aquatic life and serve critical functions in the Chesapeake Bay ecosystem. Underwater grasses add oxygen to the water; improve water clarity by helping suspended sediment settle to the bottom; provide shelter for young striped bass, blue crabs and other species; and reduce shoreline erosion. Increasing the abundance of grasses in the Bay and its rivers will dramatically improve the entire Bay ecosystem.
Current Conditions: In 2013, there were an estimated 59,927 acres of underwater grasses in the Chesapeake Bay, achieving 32 percent of the 185,000-acre goal.
How it was Derived: This outcome was derived from the Chesapeake Bay Program's Submerged Aquatic Vegetation (SAV) Workgroup and is based on the acreage recorded in certain regions during certain high-growth years.
Baseline: The baseline was generated from historical SAV abundance in the Chesapeake Bay.
*Outcome Justification

The Chesapeake Bay Program Submerged Aquatic Vegetation (SAV) Workgroup has reviewed the historic record and photographic evidence from 1930s to the present and determined that the Bay has historically supported approximately 185,000 acres of bay grasses, also referred to as SAV. In most cases, as water clarity improves, SAV will reestablish without the need for planting. However, there are places where the water clarity is sufficient, but there is no longer a seed source for SAV to naturally regenerate. Therefore, the workgroup endeavors to **plant or seed 20 acres of SAV each year** in order to provide seed sources and improve physical conditions for further SAV recruitment. This restoration target is intended to stimulate the natural bed growth required to eventually achieve the **bay-wide abundance goal of 185,000 acres**. Please refer to the maps below for the historic distribution used to set the bay-wide abundance goal and current status of bay grass abundance, both bay-wide and by segment.

SAV constitutes one of the most important biological communities in an estuary. SAV has historically contributed to the high primary and secondary productivity of the Chesapeake Bay, but increased nutrient and sediment inputs from development in the watershed caused bay-wide declines in the 1960s and 1970s.

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Since 1976, the workgroup has served the larger Bay community by providing technical expertise and applied research findings to resource managers in an effort to inform the restoration and protection agenda. Click here for more information on the SAV Workgroup membership.
*SAV Decision Framework

Jurisdictions and agencies participating in the strategy:
Who is participating in implementation? Role for each & level of partic.
Team Lead: Vital Habitats Goal Team
Workgroup Lead: Submerged Aquatic Vegetation Workgroup
Opportunities for Cross-Goal Team Collaboration:
- Fisheries Goal Team
- Water Quality Goal Team

Active Current Participation and Role:
Level of Participation: High:
- Maryland Department of Natural Resources
  - Staffs workgroup Chair
  - Direct involvement with SAV surveys, collaborates with VIMS
- D.C.'s District Department of the Environment
- Virginia Institute of Marine Sciences
  - Conducts research
  - Collaborates with MD DNR on SAV surveys
    - Matches EPA funding
- University of Maryland Center for Environmental Science
  - Conducts research
- U.S Environmental Protection Agency
  - Provides the majority of funding for SAV projects (about 80%)
- U.S. Army Corps of Engineers
  - Utilizes SAV data for permits required for mitigation if a project impacts existing SAV beds or historic SAV presence.

Level of Participation: Medium:
- U.S. Fish and Wildlife Service
- U.S. Geological Survey
  - Conducts aerial surveys
- National Oceanic and Atmospheric Administration

Likely Participating Jurisdictions:
- Maryland
- Virginia
- Washington, D.C.

Likely Participating Federal Partners:
- Fish and Wildlife Service

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National Oceanic and Atmospheric Administration
U.S. Geological Survey
U.S. Army Corps of Engineers
*Outcome Participation Matrix, 7-17-14

Lee Karrh
Review methodology for SAV aerial survey and work with EPA on new 5-year RFP.
Incorporate findings of STAC panel report into updated SAV restoration strategy.
Develop new research agenda and identify funding sources for research projects
Hold workshop on SAV & Global Change at Horn Point with invitation to researchers and managers

Peter Bergstrom
Work with Wetlands Workgroup and Fisheries Goal Team to identify areas where opportunities align for SAV, black duck habitat (intertidal mud flat), and fringe oyster reef restoration; communicate these priority living shorelines to coastal communities.

SAV Workgroup
Implement strategy document (more detailed version of 2012 decision framework)
***SAV 2012-2013 Draft Work Plan**

Local Engagement:
Non-profit groups, such as the Chesapeake Bay Foundation, historically have been involved in implementing local community SAV plantings in partnership with schools. However, recent shifts in acreage goals have resulted in a decreased focus on implementation, and an increase in research efforts instead.
***Staff statement**

Factors influencing ability to meet goal:

Many factors, with wide-ranging levels of importance and management potential, influence the attainment of SAV goals. A thorough understanding of these factors is essential to restoration success.

Habitat Conditions
High quality habitat conditions are vital to the success of SAV restoration and abundance goals. Good quality habitat conditions for SAV are defined by shallow (≤ 2m) water with an appropriate temperature range and salinity for the species being targeted for restoration. For example, eel grass grows in the high salinity waters of the lower Bay, while sago pondweed prefers the fresh and brackish waters of the upper Bay. Most importantly, high water clarity is necessary for good SAV habitat. While these factors are diffiicult to control directly, the Workgroup is able to target restoration projects to areas in the Bay with suitable habitat conditions. Please refer to the maps below for information on Bay salinity, depth, and sediment input, which plays an important role in water clarity.

The Chesapeake Bay is considered at high risk for sea level rise from climate change, which will influence SAV habitat conditions. Climate change and sea level have little management potential, however the

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Workgroup is able to favor heat-tolerant SAV species in planting and transplanting efforts if they anticipate that climate change and sea level rise will be an important factor for a restoration project. *SAV Decision Framework

Human Impacts

Physical interruption of SAV through anthropogenic activities (*e.g.,* dredging, propeller scarring, aquaculture facilities, introduction of invasive species) as well as the indirect effect of localized water quality degradation (*e.g.,*sedimentation from clam dredging or shoreline alterations) also influence the health of SAV beds. Human activities can be managed through education, outreach, and regulation. *SAV Decision Framework

Restoration Science

Even in ideal habitat conditions with limited human impacts, the availability of source seeds, plants, and propagules (laboratories, nurseries, wild collection), as well as survival rate of the SAV species influence the success of restoration projects. The table below describes the current understanding of planting and transplanting capabilities of several species of SAV found in the Chesapeake Bay and its tributaries. *SAV Decision Framework

Species	**Growth from Seed**	**Seed Collection**	**Growth from Cuttings/Micro-propagation**	**Planting Success**
***Zostera marina,*Eelgrass**	Moderate	Moderate	No	From seed and adult plants- 5-20 year survival from adult plants, 6 years from seed
***Ruppia maritima*, Widgeon grass**	Unknown	Easy	Yes	Unknown
***Stuckenia pectinata*, Sago pondweed**	unknown	Difficult	Yes	Low success rate
***Potamogeton perfolaitus*, Redhead grass**	Difficult	Difficult	Yes	Variable success rate; up to 9 years from adult plants grown in lab
***Vallisneria americana*, Wild celery**	Easy	Easy	No	Variable success rate; up to 12 years from adult plants grown from seed

***Heteranthra dubia,* Water stargrass**	unknown	Difficult	Yes	Few attempts, some survival

*SAV Decision Framework

Current efforts:

Successful restoration of SAV in the Chesapeake Bay is dependent upon improved water clarity conditions. Water clarity improvements are being made by meeting pollutant allocations set by the Chesapeake Bay TMDL, and through the work of the Water Quality and Maintain Healthy Watersheds Goal Implementation Teams. The SAV Workgroup focuses its efforts on planting SAV, where possible, in areas with high potential to benefit other living resources.

In 2011, an estimated 63,074 acres of bay grasses were present in the Chesapeake Bay based on preliminary data. Areas of the Middle, Upper and Western Branch of the Patuxent River; Middle and Upper Potomac River; Piscataway Creek; and Anacostia River could not be mapped due to excess turbidity following Hurricane Irene and Tropical Storm Lee. Based upon acreages mapped in 2010, it is estimated that an additional 5,119 acres could have been present in these areas during 2011.
*SAV Decision Framework

Gaps:

Both funding and capacity for bay grass planting will need to be increased dramatically to meet the SAV restoration goal. To date, the NOAA Chesapeake Bay Office (NCBO), the U.S. Army Corps of Engineers Research and Development Center (ERDC), MD, VA, and private foundations have funded almost all of the large scale plantings in the Bay, and no agency has been able to increase funding enough to meet the annual need. NCBO and ERDC have zeroed out funding for large-scale SAV restoration.

Additionally, significant investments in research must be made to improve the body of knowledge surrounding restoration techniques. Specific objectives for restoration and protection research should include:

- *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 plant survival.
- *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.
- *Size*. Define the ideal size of restoration plots to maximize success.
- *Density*. Determine at what density SAV should be planted to maximize success and restoration of ecological functions.
- *Pattern*. Determine whether the spatial arrangement of the plants matters, and whether checkered patterns or homogenous plantings are more successful.

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- *Exclosures*. Determine whether the protection of plantings and of sporadic populations resulting from natural recruitment results in significantly improved survivorship and the spread of individuals in a population.
  *SAV Decision Framework

Management Approach:

The following four strategies have been identified as critical to the success of SAV restoration goals.

- Restore water clarity in the Chesapeake Bay. In order to meet current and future SAV restoration goals, it is essential to meet water clarity standards in areas and at depths that are designated by Maryland, Virginia, and the District of Columbia for the application of those criteria (*i.e.,* SAV use). The water clarity standards reflect the light requirements that are necessary for the growth and maintenance of SAV populations throughout the shallow waters of the Chesapeake Bay and its tidal tributaries. This strategy is being implemented by meeting pollutant allocations set by the Chesapeake Bay TMDL and through the work of multiple Chesapeake Bay Program groups, including the Water Quality Goal Implementation Team and the Healthy Watersheds Goal Implementation Team.
- Protect existing SAV by characterizing threats and developing protection measures, establishing protection area criteria, minimizing the effects of invasive species, and increasing understanding of the potential effects of sea-level rise on SAV populations.

Currently, the Workgroup is focusing on the following two of the four strategies. With additional resources, the Workgroup will be able to implement all strategies.

- Restore SAV where possible, targeting sites with suitable water quality and high potential to benefit living resources.
- Enhance research, citizen involvement, and education.
  *SAV Decision Framework

Monitoring Progress:

Monitoring programs are critical to understanding year to year fluctuations in living resource distribution and abundance. SAV distribution is assessed using annual aerial surveys, and abundance acreage is derived from photographs taken during the aerial survey. The most recent SAV distribution data are displayed below. For additional information, please visit the Virginia Institute of Marine Science website.
*SAV Decision Framework

Assessing Progress:

In 2010, 12 acres of bay grasses were planted, 60% of the SAV Workgroup's annual restoration target, and there were 79,675 acres of SAV bay-wide, 43% of the 185,000 acre goal.

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Increased resources and capacity for bay grass and water clarity restoration are required to hasten progress towards this goal. Please refer to the map below for the current status of bay grass abundance by segment, and areas where the most progress needs to be made.
*SAV Decision Framework

Adaptively Manage:
Information needed.

Biennial Workplan:

Topic	Task	Lead POC	Timeline	Status
Submerged Aquatic Vegetation	Review methodology for SAV aerial survey and work with EPA on new 5-year RFP.	Lee Karrh		Completed
	Incorporate findings of STAC panel report into updated SAV restoration strategy.	Lee Karrh	December 2012	Complete
	Implement Strategy Document	Workgroup	Ongoing	In Progress
	Develop new research agenda and identify funding sources for research projects. • **Tech Syn III**	**Lee Karrh**	**December 2014**	**In Progress**
	Work with Wetlands WG and GIT 1 to identify areas where opportunities align for SAV, black duck habitat (intertidal mud flat), and fringe oyster reef restoration; communicate these priority living shorelines to coastal communities.	Peter Bergstrom?	January 2013	
	Hold workshop on SAV & Global Change at Horn Point with invitations to researchers and managers.	Lee Karrh	December 2012	Complete-waiting on proceedings from meeting

***SAV 2012-2013 Draft Work Plan, also outlined above in the participation and roles section.**