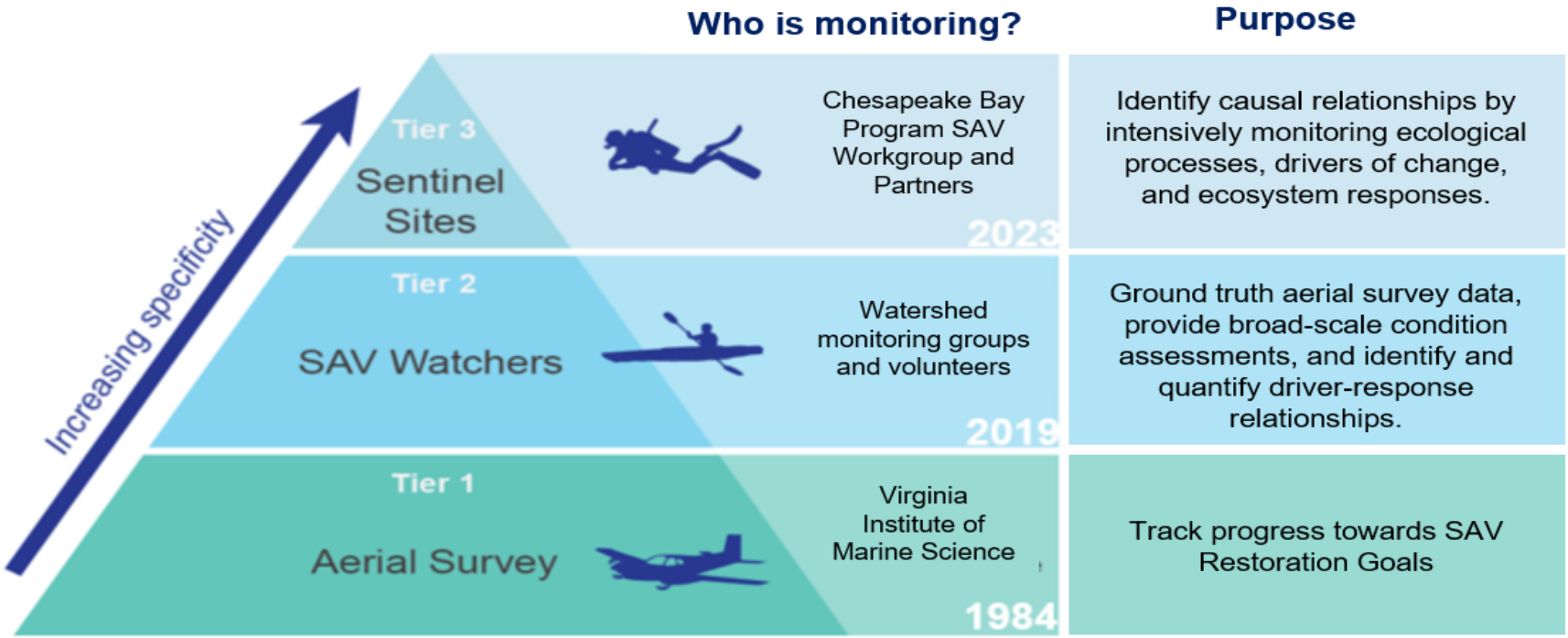
Enhancing the CBP Monitoring Networks

Kick-Off Meeting; January 11, 2023

Submerged Aquatic Vegetation

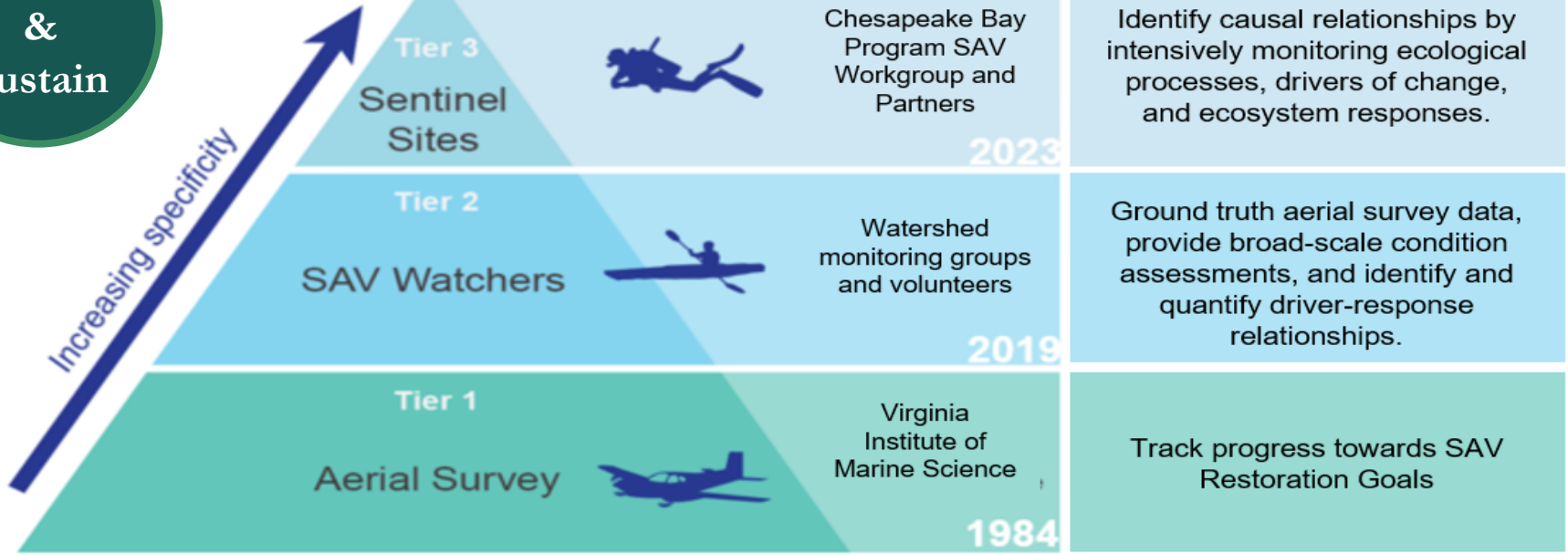
Brooke Landry
Maryland DNR and
Chair, SAV Workgroup

Monitoring SAV in Chesapeake Bay: A 3-Tiered, Hierarchical, Integrated, and Coordinated Monitoring Approach



Monitoring SAV in Chesapeake Bay: A 3-Tiered, Hierarchical, Integrated, and Coordinated Monitoring Approach

Enhance & Sustain



SAV Program Evolution

Driving Force

Needs identified concurrently through SRS:

Educational and Outreach Opportunities Centered on SAV

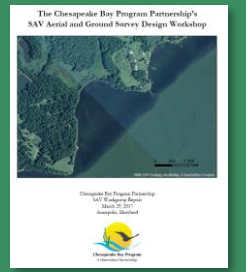
Insight into Climate Impacts on SAV

SAV Aerial Survey

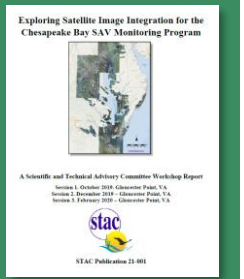
SAV Sentinel Site Program

Chronic Aerial Survey Budget Shortfalls

2017 SAV Survey Design Workshop



2019-2020 SAV/Satellite workshop



Aerial Survey: Essential to reaching and tracking progress toward the ultimate goal of 185,000-acres of SAV Baywide.

Maintain Program Funding

Annual Total Cost = $1.06M
VIMS Salary Match and Waived IDC = $268,000
Total External Program Cost = $790,000

Annual Partnership Contributions
EPA = $350,000; **Va CZM** = $68,000
Va Shellfish Initiative = $268,000
MDE = $50,000; **Md DNR** = $45,000
Total = $780,000

Aerial Survey: Essential to reaching and tracking progress toward the ultimate goal of 185,000-acres of SAV Baywide.

Maintain Program Funding

Annual Total Cost = $1.06M
VIMS Salary Match and Waived IDC = $268,000
Total External Program Cost = $790,000

Annual Partnership Contributions
EPA = $350,000; **Va CZM** = $68,000
Va Shellfish Initiative = $268,000
MDE = $50,000; **Md DNR** = $45,000
Total = $780,000

Programmatic Vulnerability: The Aerial Survey is subject to turbidity and increasingly erratic weather associated with climate change, funding partner decline, and increasing program costs.

Aerial Survey: Essential to reaching and tracking progress toward the ultimate goal of 185,000-acres of SAV Baywide.

Maintain Program Funding

Annual Total Cost = $1.06M
VIMS Salary Match and Waived IDC = $268,000
Total External Program Cost = $790,000

Annual Partnership Contributions
EPA = $350,000; **Va CZM** = $68,000
Va Shellfish Initiative = $268,000
MDE = $50,000; **Md DNR** = $45,000
Total = $780,000

Programmatic Vulnerability: The Aerial Survey is subject to turbidity and increasingly erratic weather associated with climate change, funding partner decline, and increasing program costs.

Recommendations to Enhance Efficiency: Incorporating the use of Satellite imagery will allow us to access daily Bay imagery (via Next View License Agreement) and automate SAV detection from that imagery; eventually reduce program costs.

<u>Aerial Survey</u>: Essential to reaching and tracking progress toward the ultimate goal of 185,000-acres of SAV Baywide.

Recommendations to Enhance Efficiency: Incorporating the use of Satellite imagery will allow us to access daily Bay imagery (Next View License Agreement) and automate SAV detection from that imagery; eventually reduce program costs.

Gap: AI used for automated detection of SAV beds from satellite imagery is not fully developed and does not mimic the hand delineation methods historically used.

Recommendations:

- Support field data collection (Sentinel Sites) necessary to develop algorithms for automated SAV detection.
- Support effort to develop automated methods that mimic historic hand-delineation methods.
- Support effort to map *Zannichellia palustris* with satellite imagery throughout mesohaline as proof-of-concept for satellite data use.

SAV Watchers: The volunteer-based Chesapeake Bay SAV Watchers program supplements the aerial survey by providing detailed species data, and provides outreach and education.

Programmatic Vulnerability: The SAV Watchers program is dependent on volunteer recruitment and retention, and requires sustained coordination that is not currently funded.

SAV Watchers: The volunteer-based Chesapeake Bay SAV Watchers program supplements the aerial survey by providing detailed species data, and provides outreach and education.

Programmatic Vulnerability: The SAV Watchers program is dependent on volunteer recruitment and retention, and requires sustained coordination that is not currently funded.

Recommendations to Enhance Efficiency:

The CB SAV Watchers is an important tool for Bay-wide SAV species data collection and outreach, but volunteer recruitment, retention, and training is time-consuming and the program is not currently funded. **The SAV Watchers program is 100% volunteer-based at this time.**

Funding is recommended for:

- SAV data entry portal construction
- SAV database development
- SAV database management
- SAV Program Coordination (including funding for volunteer groups)

SAV Sentinel Sites: **The SAV Sentinel Site Program will help scientists and managers understand impacts from climate change and other stressors, determine carbon sequestration of Bay SAV, and will provide the data necessary for automated SAV detection from satellite imagery.**

Programmatic Vulnerability: The SAV Sentinel Site Program is dependent on site adopter recruitment and retention, and requires sustained program coordination that is not currently funded.

SAV Sentinel Sites: **The SAV Sentinel Site Program will help scientists and managers understand impacts from climate change and other stressors, determine carbon sequestration of Bay SAV, and will provide the data necessary for automated SAV detection from satellite imagery.**

Programmatic Vulnerability: The SAV Sentinel Site Program is dependent on site adopter recruitment and retention, and requires sustained program coordination that is not currently funded.

Recommendations for Program Implementation:

The Sentinel Site Program Monitoring Protocol was developed by a sub-group of SAV Workgroup members and is described on Chesapeakebay.net. Participation is currently 100% voluntary.

Funding is recommended for:

- Program Oversight and Coordination
- Site Adoption / Monitoring costs associated with fieldwork and sample processing

Where we stand

Where we stand

Submerged Aquatic Vegetation (SAV) Monitoring Network [1]

CBP NETWORK	Project	CATEGORY	Award Entity	FUNDING				
				Year 1	*Year 2*	*Year 3*	*Year 4*	*Year 5*
SAV	Satellite imagery	Infrastructure		Included as line item but theoretically,				
Funder				imagery will be available at no cost				
SAV	AI interpretation of diverse satellite imagery	Infrastructure	NA	$240,000				
Funder				NASA/ODU				
SAV	Calibrate/align historical and new assessments	Operation & Maintenance	NA	Accidental remnant - ignore				
Funder								
SAV	Sentinel Site network	Operation & Maintenance	MD DNR	Need ~ $100K annually to **fully** support				
Funder				program [20 sites, $5K/site/yr]				

Where we stand

Submerged Aquatic Vegetation (SAV) Monitoring Network [2]

CBP NETWORK	Project	CATEGORY	Award Entity	FUNDING				
				Year 1	*Year 2*	*Year 3*	*Year 4*	*Year 5*
SAV	Computer science SAV area polygon drawing with AI output of SAV	Infrastructure	RFA (2 year)	$70,000	$70,000			
Funder				EPA	EPA			
SAV	Proof of concept: Test AI satellite-derived assessment on spring *Zannichellia* survey	Operation & Maintenance	RFA			$150,000	$150,000	
Funder						EPA	EPA	
SAV*	SAV program COLA	Operation & Maintenance	VIMS		$35,525	$54,090	$73,213	$92,909
Funder					EPA	EPA	EPA	EPA

Where we stand

Community Science (CS) Monitoring Network

CBP NETWORK	Project	CATEGORY	Award Entity	FUNDING				
				Year 1	*Year 2*	*Year 3*	*Year 4*	*Year 5*
CS	Under-represented community (5) monitoring equipment	Infrastructure	RFA		$10,000			
Funder					EPA			
CS	SAV data portal construction	Infrastructure	RFA		$50,000			
Funder					EPA			
CS	SAV Watchers database development	Infrastructure	RFA		$30,000			
Funder					EPA			
CS	Volunteer/Community Science SAV Watchers & Nitrate Monitoring program	Operation & Maintenance	RFA		$211,150	$217,485	$224,010	$230,730
Funder					EPA	EPA	EPA	EPA
CS	SAV Watchers database management	Operation & Maintenance	RFA		$10,300	$10,609	$10,927	$11,255
Funder					EPA	EPA	EPA	EPA

Our only “ASKS”

1. SAV Sentinel Site Program Funding - ~$100K/yr [$5K/site for 20 sites]

2. Long-term consideration for program sustainability – continued funding for all programs after 2027

Questions?

brooke.landry@maryland.gov

Chesapeake Bay SAV Monitoring webpages are live on www.chesapeakebay.net

Chesapeake Bay SAV Monitoring: A 3-Tiered Hierarchical, Integrated and Coordinated Monitoring Approach

WHAT WE DO > PROGRAMS & PROJECTS > MONITORING

SAV Monitoring Program

The Chesapeake Bay Program takes an integrated, three-tiered approach to monitoring Submerged Aquatic Vegetation.

SAV Monitoring Program

- SAV Monitoring Program
- Tier I: Chesapeake Bay-wide Aerial Survey
- Tier II: Chesapeake Bay SAV Watchers Program
- Tier III: SAV Sentinel Site Program

Programs & Projects

- Modeling
- Monitoring

Tier I: Chesapeake Bay-wide Aerial Survey

Since 1984, the Chesapeake Bay Program has worked with the Virginia Institute of Marine Science (VIMS) to conduct an annual, Bay-wide aerial SAV survey. The data collected are used to report SAV acreage and density throughout the Bay and its tidal tributaries.

TIER I **Aerial Survey** SPECIFIC 1

WHO IS MONITORING?	YEAR STARTED	LOCATION
Virginia Institute of Marine Science (VIMS)	1984	Bay-wide

PURPOSE? Tracking progress towards SAV restoration goals

WHAT PARAMETERS ARE MONITORED? SAV acreage and density

Tier II: Chesapeake Bay SAV Watchers

Volunteer scientists observe and report SAV habitat characteristics (e.g., species present, Secchi depth, sediment type) at sites throughout the Bay and its tributaries. These data are useful for a broad-scale condition assessment and for identifying and quantifying cause-effect relationships.

TIER II **SAV Watchers** MORE SPECIFIC

WHO IS MONITORING?	YEAR STARTED	LOCATION
Watershed monitoring groups and volunteers	2019	Tributaries throughout the Chesapeake Bay

PURPOSE? Ground-truthing aerial survey data | Broad scale condition assessments | Identifying and quantifying driver-response relationships

WHAT PARAMETERS ARE MONITORED? SAV species composition and total density | Presence/absence of seeds, flowers, epiphytes and filamentous macroalgae | Indications of human impacts, water column and Secchi depth | Sediment type and shoreline type

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?	YEAR STARTED	LOCATION
Chesapeake Bay Program SAV workgroup and partners	2022	~20 representative sites throughout the Bay

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

WHAT PARAMETERS ARE MONITORED? 2

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.

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

Chesapeake Bay SAV Watchers Program

Chesapeake Bay SAV WATCHERS

Chesapeake Bay SAV Watchers – Tier 2 Participation

SHORERIVERS

Havre de Grace MARITIME MUSEUM and Environmental Center

James River ASSOCIATION

SRA Severn River Association
America's Oldest River Group

Magothy River Association
Saving our river for future generations

THE GUNSTON SCHOOL 1911 CENTREVILLE, MD

TEAM BCPS Baltimore County Public Schools
Raising the bar. Closing gaps. Preparing for our future.

Arundel Rivers FEDERATION

Chesapeake Bay National Estuarine Research Reserve Maryland
Using Sound Science...Finding Solutions...Promoting Wise Decisions

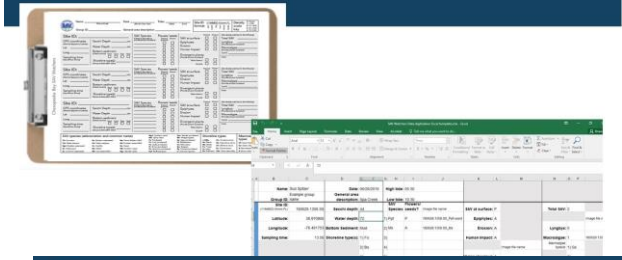
Chesapeake Bay SAV Watchers

Chesapeake Bay SAV Watchers is a program to provide volunteer scientists with an engaging and educational experience with submerged aquatic vegetation (SAV) while also generating useful data for Bay scientists and managers.

This is the first official SAV monitoring program for volunteer scientists developed by the Chesapeake Bay Program.

www.chesapeakebaysavwatchers.com

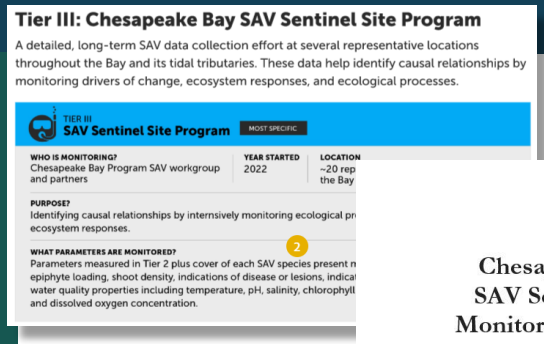
Standardized datasheet and digitization template



"Train the trainer" certification events offered each summer

www.chesapeakebaysavwatchers.com

SAV Sentinel Site Program



Tier III: Chesapeake Bay SAV Sentinel Site Program

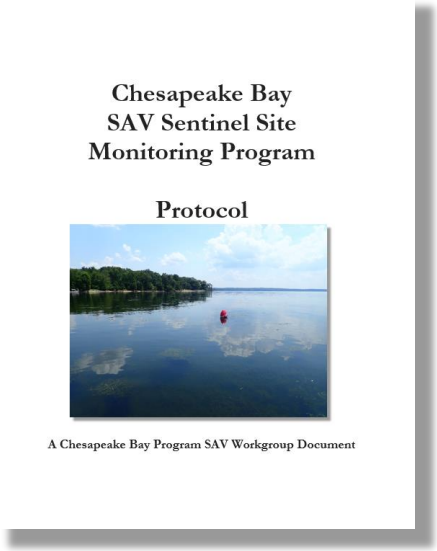
A detailed, long-term SAV data collection effort at several representative locations throughout the Bay and its tidal tributaries. These data help identify causal relationships by monitoring drivers of change, ecosystem responses, and ecological processes.

TIER III
SAV Sentinel Site Program MOST SPECIFIC

WHO IS MONITORING?	YEAR STARTED	LOCATION
Chesapeake Bay Program SAV workgroup and partners	2022	~20 rep the Bay

PURPOSE?
Identifying causal relationships by intensively monitoring ecological pr ecosystem responses.

WHAT PARAMETERS ARE MONITORED? 2
Parameters measured in Tier 2 plus cover of each SAV species present n epiphyte loading, shoot density, indications of disease or lesions, indica water quality properties including temperature, pH, salinity, chlorophyll and dissolved oxygen concentration.



Chesapeake Bay
SAV Sentinel Site
Monitoring Program

Protocol

A Chesapeake Bay Program SAV Workgroup Document

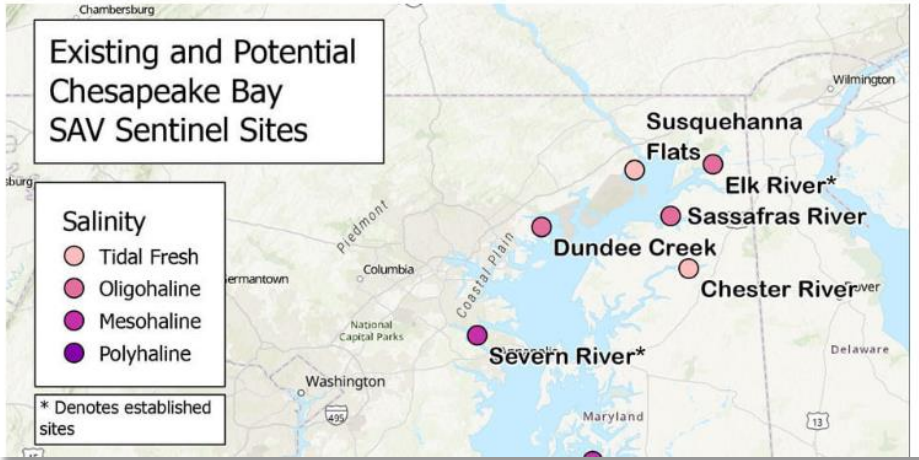
Who wants to adopt a site for 2023?

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.



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