MONITORING SUBMERGED AQUATIC VEGETATION RECOVERY IN THE CHESAPEAKE BAY

Chesapeake Bay Program
Science. Restoration. Partnership.

CRC Chesapeake Research Consortium

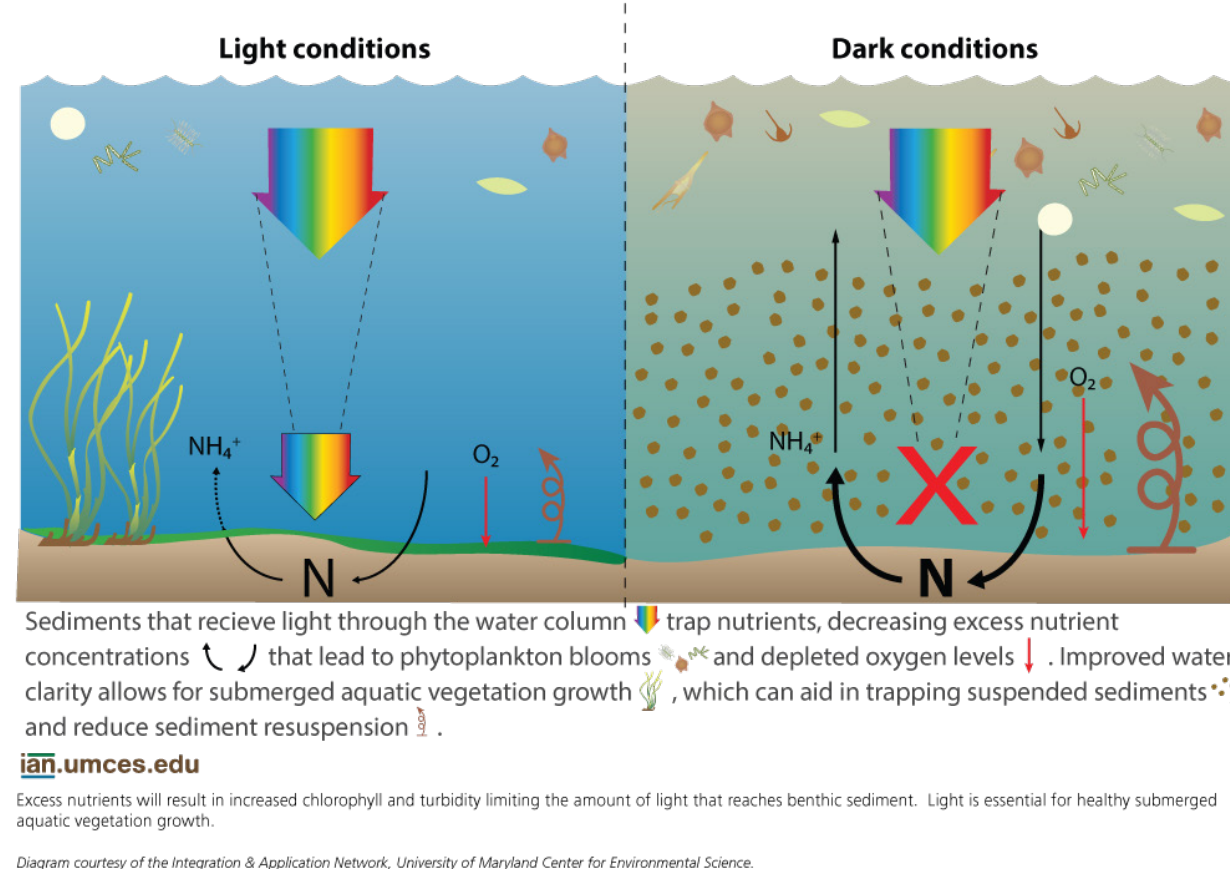*Paige Hobaugh[1], Margot Cumming[1]*

INTRODUCTION:

Submerged aquatic vegetation (SAV) is an important component of healthy aquatic ecosystems ranging from headwaters to coastal systems. SAV in the Chesapeake Bay provides habitat for many commercially important and keystone species including blue crabs, oysters, fish and waterfowl.

High water clarity is a key component of optimal growth conditions for SAV. A positive feedback loop is created as flowing water naturally slows down over SAV beds, causing sediment deposition.
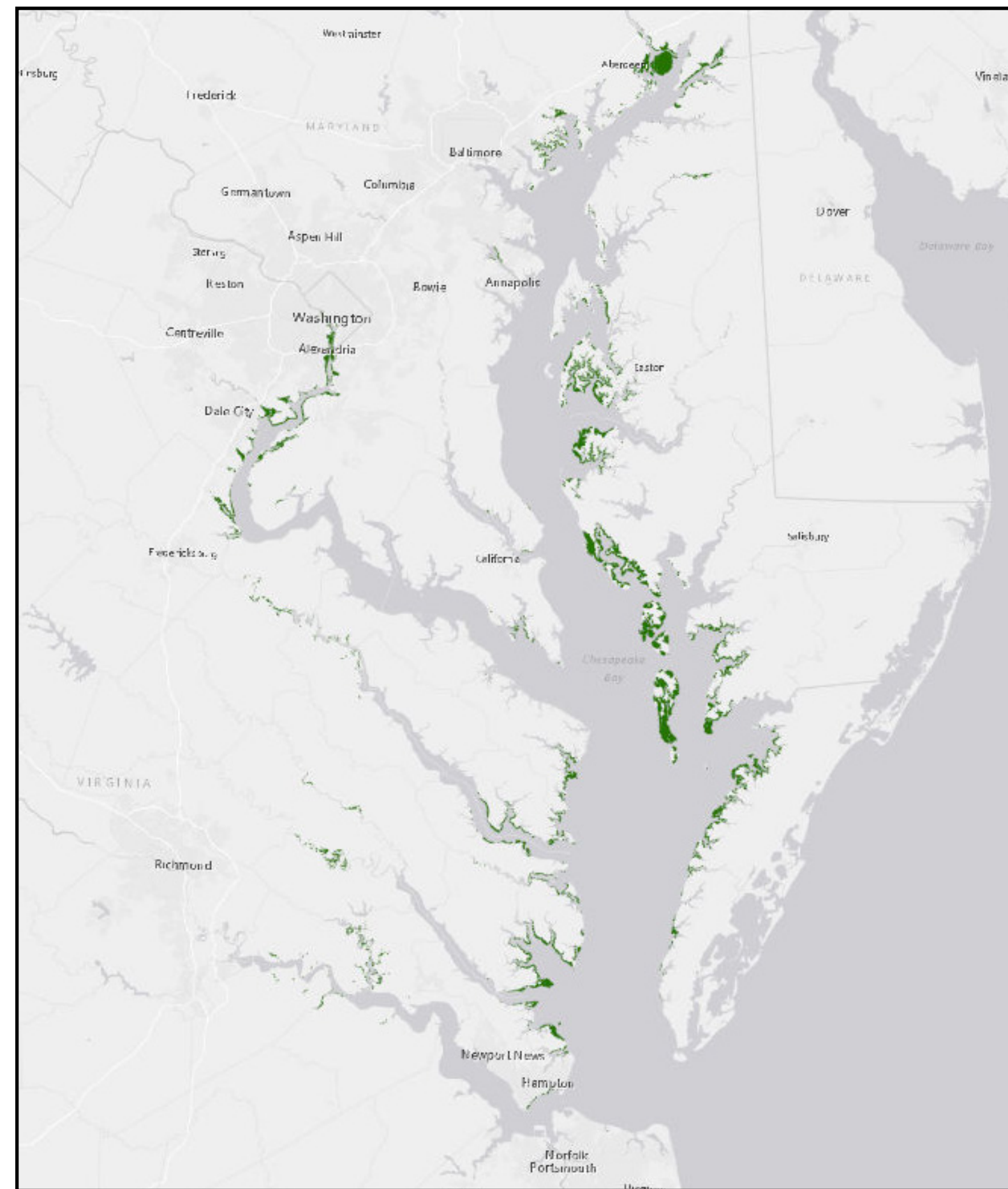
With a population of 18 million and growing, land development and polluted run-off has increased in the Chesapeake Bay Watershed. This causes a negative feedback loop: increases in nutrients cause algal blooms, which have negative impacts on SAV due to shading, and declines in SAV beds reduce important sedimentation further decreasing water quality.

CHESAPEAKE BAY PROGRAM:

1970s: Notable declines in the Chesapeake Bay's wildlife and aquatic resources lead to Congress funding a study identifying excess nutrient pollution as the cause.

1983: The first Chesapeake Bay agreement founds of the Chesapeake Bay Program (CBP) office and acknowledges that cooperative solutions are needed.

1987: The Bay Program releases a second agreement which outlines specific pollution reduction targets.

2000: A third guiding document is released to focus on holistic ecosystem-based approaches to Bay restoration – this initiative finds limited success.
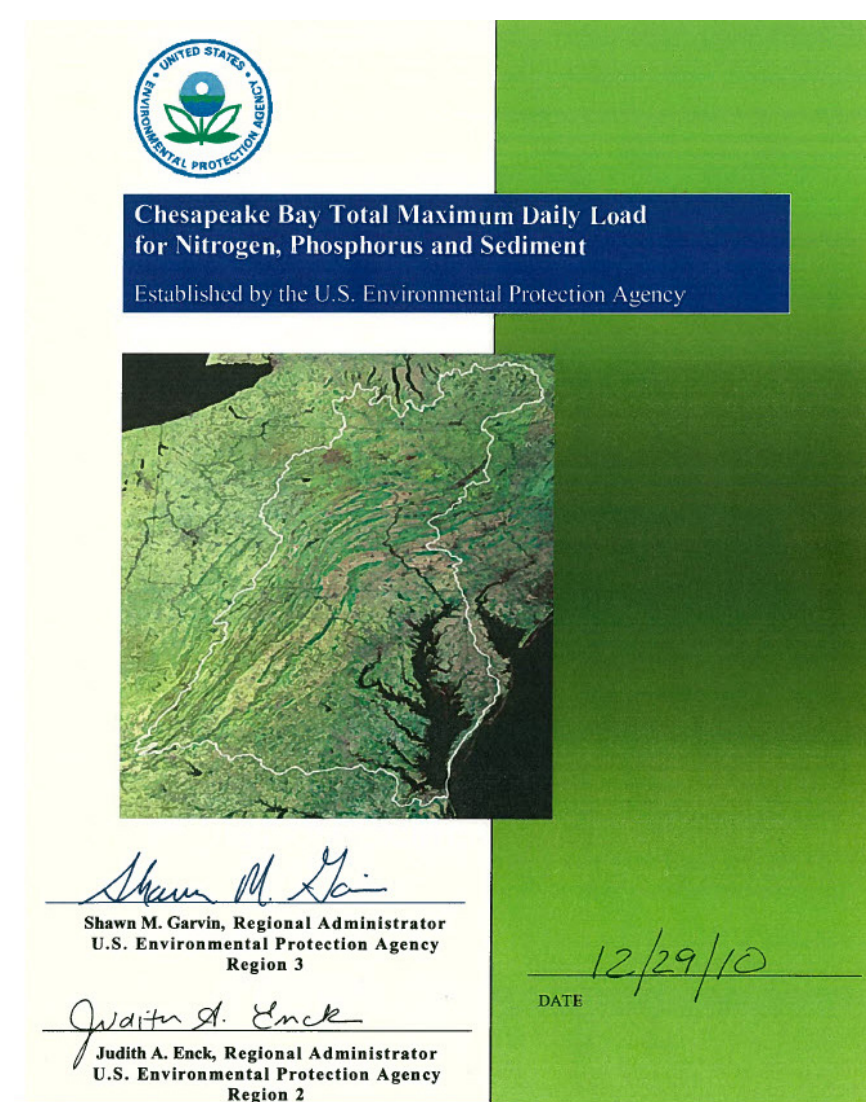
2010: EPA establishes landmark Chesapeake Bay Total Maximum Daily Load (see below).

2014: Chesapeake Bay Watershed Agreement is signed which outlines goals and management strategies to address current and emerging environmental concerns.

TOTAL MAXIMUM DAILY LOAD:

In 2010, the US Environmental Protection Agency (EPA) established the Chesapeake Bay Total Maximum Daily Load (TMDL) to expedite Bay clean-up efforts. This historic "pollution diet" lays out necessary reductions of nitrogen, phosphorus and sediment to meet water quality standards.

The TMDL is written to require all pollution control measures to be in place by 2025 and includes various accountability and backstop measures. With the help of the multi-phase Watershed Implementation Plans (WIPs), each of the 7 watershed jurisdictions detail their plans for pollution reduction efforts and submit them to EPA for approval.

STATUS:

The lowest recorded extent was 38,228 acres in 1984. In 2017, VIMS mapped an estimated 104,843 acres of SAV in the Chesapeake Bay. This exceeds the 2017 bay-wide restoration target of 90,000 acres and achieves 56% of long-term 185,000-acre goal (believed to be historical extent of SAV in early 1900s).

A recent study done by Chesapeake Bay scientists concluded that nutrient loading plays a dominant role in reducing SAV cover, attributing SAV success in the Chesapeake Bay to CBP water quality management efforts. With the success of SAV recovery in the Chesapeake Bay, the need to ensure continuous monitoring and protection to existing beds has become paramount.

1984 Extent of SAV in Chesapeake Bay

2017 Preliminary Extent of SAV in Chesapeake Bay

MONITORING & PROTECTION:

Since 1984, the Virginia Institute of Marine Science (VIMS) has conducted an annual aerial survey of the Chesapeake Bay to gather SAV imagery. By interpreting aerial survey imagery and supplemental data gathered through ground surveys (conducted when possible by volunteers and partner scientists to determine species composition and measure bed size), VIMS reports SAV acreages bay-wide each year (right).

The reliable nature of this publicly accessible data makes it useful for a variety of users.

Funding partners for the Aerial Survey have diminished since the 1980s and by 2016, most funding for this program was provided by the Environmental Protection Agency (EPA). Historically, the cost of this program has been shared between state and federal agencies. The survey has increased in the cost from under $250,000 in 1989 to around $325,000 in 2016 (in 1989 dollars). The 2017 Aerial Survey budget stood at $689,000 total.

Submerged Aquatic Vegetation (SAV) Abundance (1984-2017)

With increases in program cost and decreases in funding partners, annual operation of the current SAV Aerial Survey is unsustainable.

As SAV continues to recover and expand into areas it hasn't existed for decades, habitat conflict use is expected to increase. Popular Chesapeake Bay practices including shellfish aquaculture and shoreline protection (e.g. shoreline armoring, living shoreline installation, wetland restoration) occur in the same shallow, nearshore habitat in which SAV thrives, threatening the existence and continued success of recovered beds bay-wide. This alongside an increase in public perception of SAV as a nuisance species in waterfront areas prompts the need for attention to SAV protection measures.
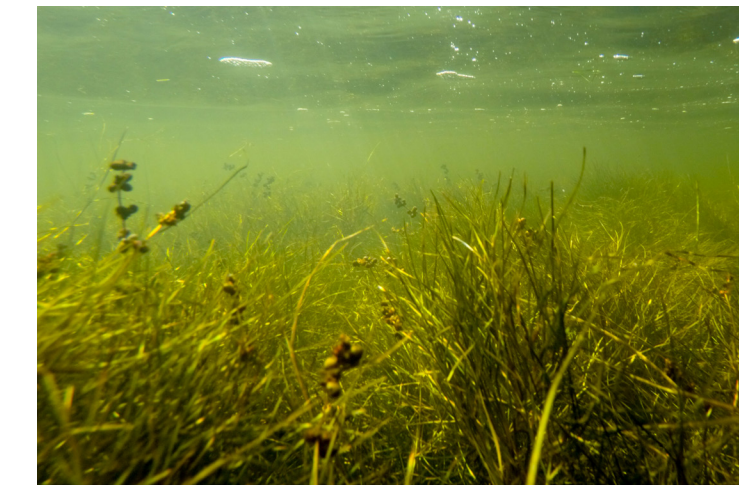
CURRENT EFFORTS:

The need to establish a more sustainable source of funding for the aerial survey prompted the CBP to host a workshop in 2017 to discuss potential survey design modifications to reduce program costs.

A questionnaire was used to survey data users about their usage behaviors and needs. Responses showed a diverse pool of users, and a small number of contributors.

Purposes for Access and Use of Data
Other (Education and Outreach, Research, Tracking Bay Restoration, etc.) 39
Water Quality Standards Assessment 31
Public Reporting 30
Regulation 20
Permitting 28

Organizations Using SAV Data
Federal 25%
State 25%
Local Gov't 4%
Non-profit 24%
Academic 13%
Other 9%

Does your organization contribute to the ground-survey efforts by providing SAV observation data to VIMS?
Yes 33%
No 43%
14%

If annual SAV data becomes unavailable, would there be impacts to services that your organization provides?
Yes 82%
No 18%

Workshop recommendations focused on the feasibility of continuing the survey into the future and meeting organizational needs:
a. Four alternative survey design options with potential cost savings were identified; further discussions pending;
b. Ground survey efforts need to be expanded into a coordinated, baywide effort;
c. Exploration of further funding options.

Participants agreed that federal and state agencies directly benefitting from data access need to provide a greater proportion of total budget.

PREPARING FOR THE FUTURE:

The Chesapeake Bay Program Budget and Finance Workgroup (BFWG) assisted in developing a conceptual framework for a financing strategy to create a system able to sustain the near $1 million necessary for the SAV Aerial Survey and other SAV Workplan actions. A series of three dialogues with finance experts, stakeholders, and subject matter experts was held and through discussion and a potential solution framework emerged:
a. Marketplace Efficiency – The value of SAV to the marketplace (data users, watermen, etc.) would pay for the cost of SAV recover efforts. Revenue could be generated, for example, by passing the cost of generating Aerial Survey data onto users through a subscription or by requiring fee to remove SAV.
b. Proactive Restoration (Mitigation Banking) – Organizations would pay a fee for preemptive damage done to SAV before projects begin and the fee would be used to fund SAV restoration elsewhere in the bay.
c. Third-party institution to manage funds – The creation of a habitat restoration fund or endowment.

Before action can be taken to implement any of these strategies, the financial experts need to know the monetary worth of SAV based on its ecosystem services (nutrient sequestration capacity of SAV to TMDLs). This being studied currently.

With EPA funds through the CBP, there are two projects aiming to addressing monitoring and protection needs:
a. Development of a citizen scientist SAV monitoring protocol, manual, training and certification program;
b. Review of statutes and regulations, including recommendations for insufficient protections.
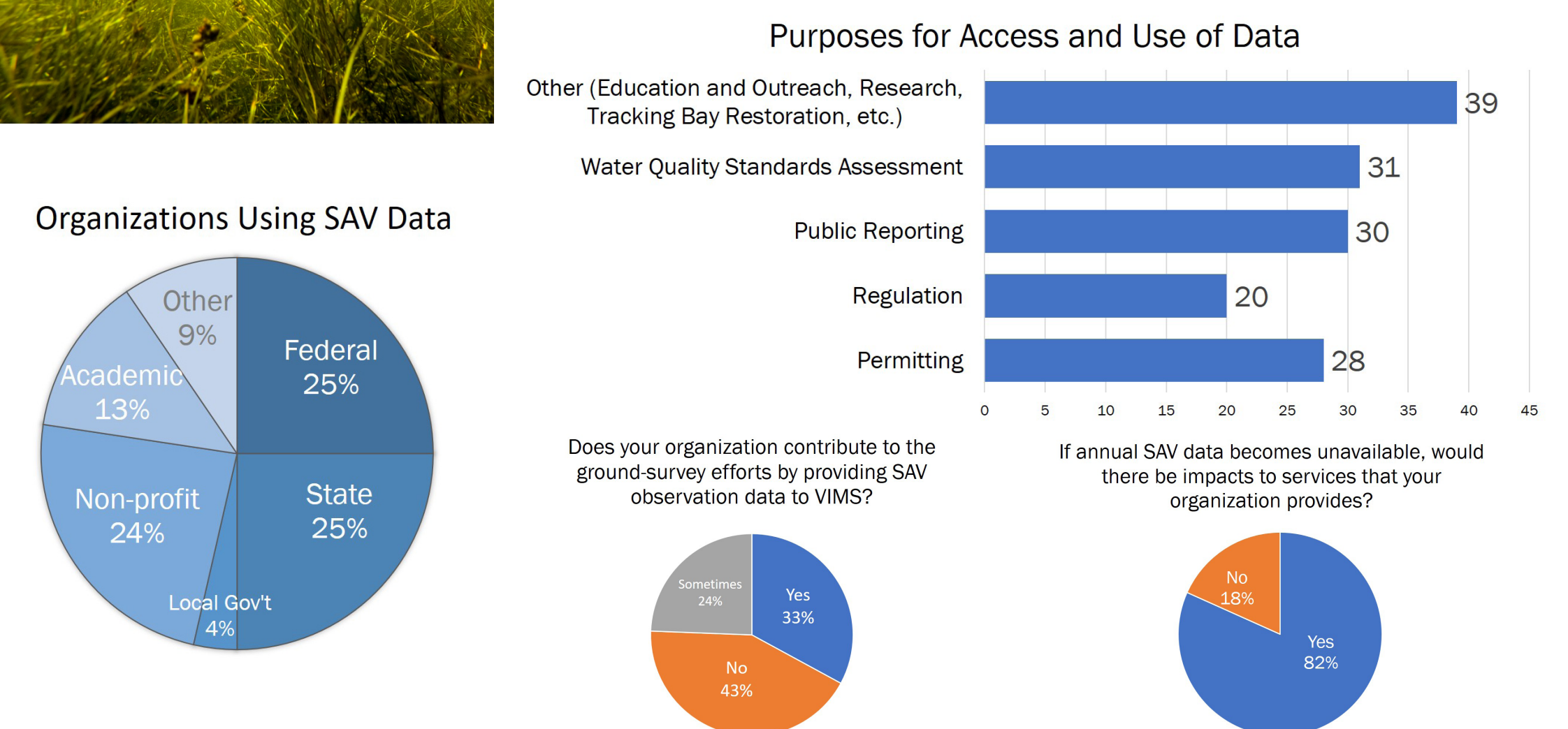
References:
Chesapeake Bay Program. (2018). Submerged Aquatic Vegetation Finance Options and Summary (Draft Report). Annapolis, MD.
Chesapeake Bay Program. (2017a). Chesapeake Progress – Submerged Aquatic Vegetation (SAV).
Chesapeake Bay Program. (2017b). The Chesapeake Bay Program Partnership's SAV Aerial and Ground Survey Design Workshop.
Chesapeake Bay Program. (2017c). Funding Year 2017 GIT Funding Proposal Compendium. Annapolis, MD.
Environmental Protection Agency. (2010). Chesapeake Bay TMDL Executive Summary.
Landry, B. (2018). SAV Workgroup Member Updates. Lecture presented at Summer 2018 SAV Workgroup Meeting, Annapolis, MD.
Lefcheck, J. S. ... (2018). Long-term nutrient reductions lead to the unprecedented recovery of a temperate coastal region. Proceedings of the National Academy of Sciences, 115(14), 3658-3662. doi:10.1073/pnas.1715798115
Submerged Aquatic Vegetation (SAV) in Chesapeake Bay and Coastal Bays. (n.d.).