

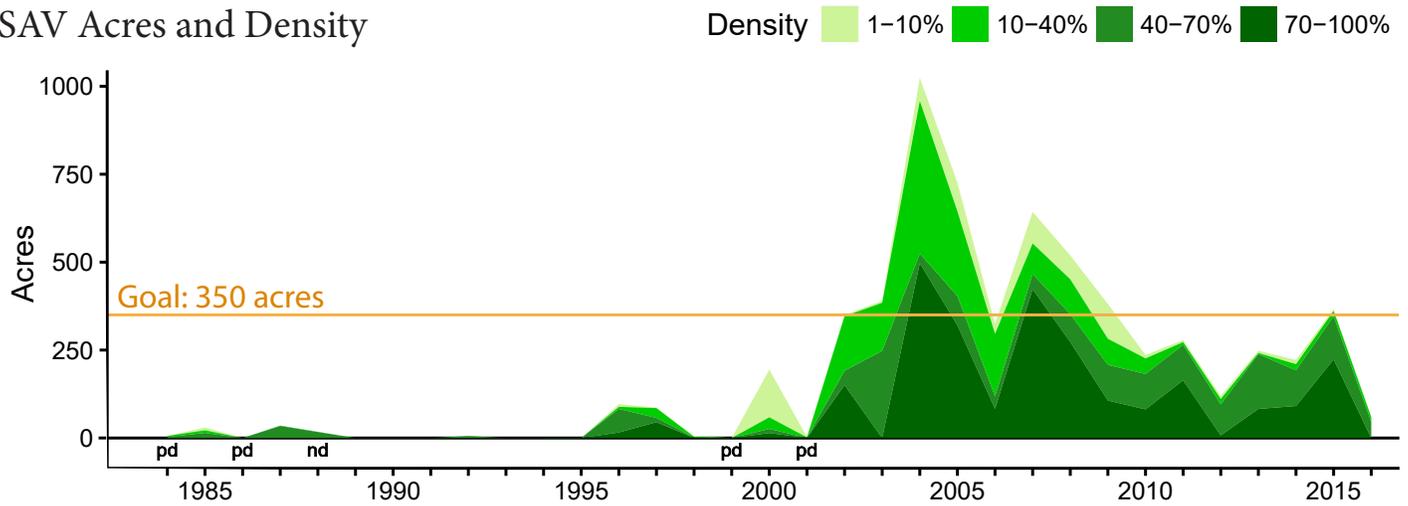


Moderately dense beds of hydrilla, milfoil, naiads and several other submerged aquatic vegetation (SAV) species are found throughout the Bush River.

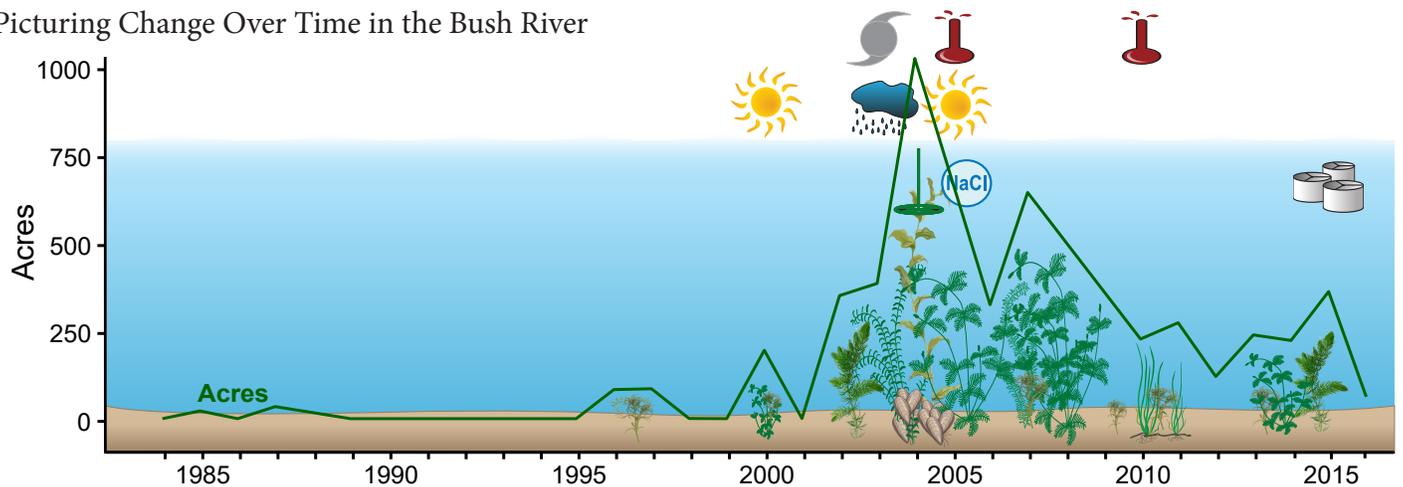
## Executive Summary

SAV was likely once abundant in the Bush River, regardless of the minimal cover observed during the Chesapeake Bay-wide aerial survey conducted in years prior to 2002. The arrival of dark false mussels to freshwater tributaries throughout the northern portion of the Bay following Hurricane Isabel facilitated a rapid expansion of SAV due to their ability to filter and clear turbid water. This expansion was quickly tempered by drought and higher salinities in 2005 and 2006 which eliminated the mussel populations, but an abundance of SAV has been generally maintained in the system since. Continued improvements in water clarity through nutrient and sediment reductions will ensure the long-term recovery of SAV in the Bush River and allow it to meet its restoration goal of 350 acres as it has in previous years.

## SAV Acres and Density



## Picturing Change Over Time in the Bush River



### Key

	Drought 1998-2002, 2005		Wastewater Treatment System Installation		Redhead Grass		Hornwort
	Wet Period 2003-2004		Good Water Clarity		Wild Celery		Hydrilla
	Heat Events 2005, 2010		Dark False Mussels		Common Waterweed		Naiads
	Hurricane Isabel 2003		Increased Salinity		Milfoil		

**Goal - Attainable**

The goal for this segment is 350 acres and has been exceeded on multiple occasions since 2002.

**Historical Coverage**

*Diversity of species present; declining species abundance*

SAV was most likely abundant in the Bush River prior to significant population increases in the Bay watershed. In 1965, large beds of milfoil, wild celery and hornwort were noted. By the time the Bay-wide SAV aerial survey began in 1984, however, SAV was minimal and remained all but absent from the river until 2002, when the population surged to 350 acres. In 2004, SAV reached an impressive 1,024 acres in the Bush River, thanks to a short-term expansion of dark false mussels that helped to clear the water. Since then, multiple species have been observed, including milfoil, wild celery, hornwort, common waterweed, hydrilla, southern and brittle naiads and redhead grass, although overall abundance has declined.

**Key Events**

*Spread of dark false mussels improves water quality*

In 2003, high flows from Hurricane Isabel spread dark false mussels to several tributaries of the Bay in which they are not normally abundant. The sudden, dense appearance of filter feeders cleared the water and allowed for the short-term recovery of SAV in 2004. Although the rapid and expansive resurgence of SAV was interrupted by a drought in 2005-2006, healthy populations of SAV have been maintained at lower levels throughout the river since.

**Vulnerability/Resilience**

*Wastewater treatment facility upgrades; protection from development*

Although the river is vulnerable to the effects of upstream development, its proximity to Aberdeen Proving Ground will play a role in the system's long-term resilience by providing the watershed some level of protection from development, as well as reduced exposure to boating traffic. Aberdeen Proving Ground also recently installed an additional wastewater treatment plant in 2015, which met discharge requirements by 2016. Efforts such as this to reduce nutrient pollution to the system will improve its resilience. Additionally, the freshwater regions of the Bay host up to 15 species of SAV, so this diversity and its potential for resilience is naturally higher in these areas.

**Management Implications**

*Nutrient and sediment reductions*

With a relatively small goal compared to the river's potential SAV acreage, the goal is attainable and SAV cover could be easily maintained through further nutrient and sediment reductions. All efforts should be made to implement best management practices that lead to increased nutrient and sediment reductions both within and outside the boundaries of Aberdeen Proving Ground.

**References**

Stevenson and Confer 1978; Orth and Moore 1983, 1984; Moore et al. 2000, 2004; Orth et al. 1994, 2010a, 2017; Patrick and Weller 2015; Lefcheck et al. 2018

[www.vims.edu/bio/sav/SegmentAreaChart.htm](http://www.vims.edu/bio/sav/SegmentAreaChart.htm) (abundance data)

[www.vims.edu/bio/sav/maps.html](http://www.vims.edu/bio/sav/maps.html) (species information)

[www.eyesonthebay.org](http://www.eyesonthebay.org) (Maryland water quality data)