

Gunpowder River (GUNOH1, GUNOH2)

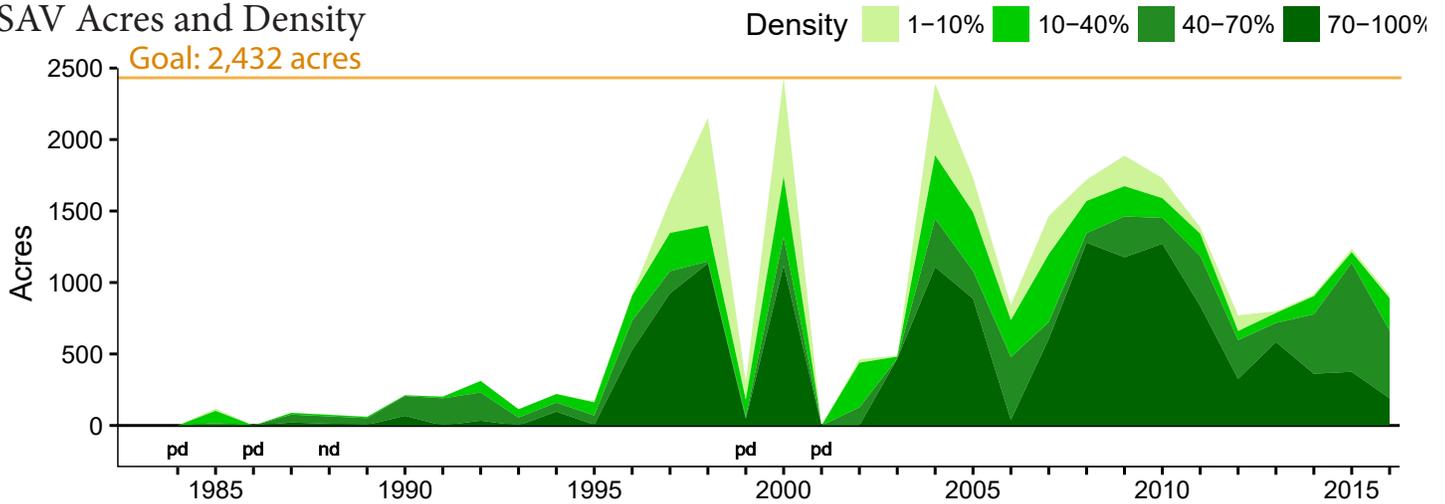


Moderately dense beds of hydrilla, milfoil, naiads and several other species of submerged aquatic vegetation (SAV) are found throughout the Gunpowder River.

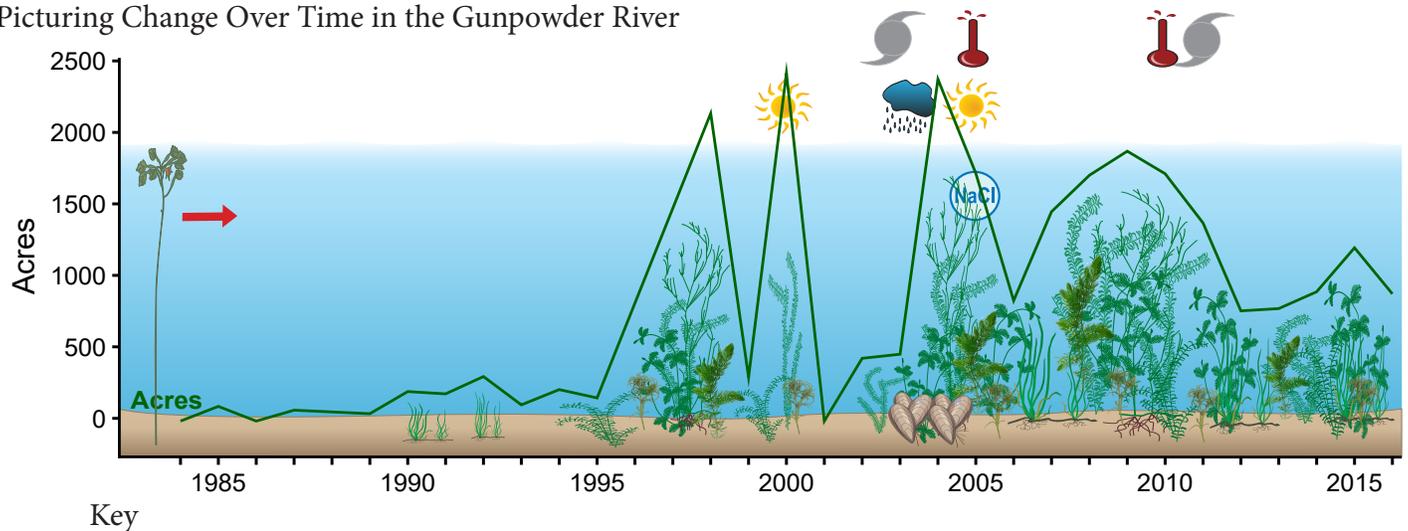
Executive Summary

SAV was likely historically abundant in the Gunpowder River regardless of the minimal cover observed during the Chesapeake Bay-wide aerial survey prior to 1996. Following Hurricane Isabel, the arrival of dark false mussels to freshwater tributaries throughout the northern portion of the Bay facilitated a rapid expansion of SAV due to their ability to filter and clear turbid water. This expansion was quickly tempered by drought and a higher salinity in 2005 and 2006, which eliminated the mussel populations, but led to an abundance of SAV that has been generally maintained in the system since. SAV resilience here is most likely assisted by the protection that Aberdeen Proving Ground provides the watershed from development. Continued improvements in water clarity through reductions in nutrient and sediment loading will ensure the long-term recovery of SAV in the Gunpowder River and allow it to meet its restoration goal of 2,432 acres.

SAV Acres and Density



Picturing Change Over Time in the Gunpowder River



	Drought 1998-2002, 2005		Tropical Storm Lee 2011		Ongoing Event		Hornwort
	Wet Period 2003-2004		Increased Salinity		Milfoil		Hydrilla
	Heat Events 2005, 2010		Dark False Mussels		Pondweeds		Common Waterweed
	Hurricane Isabel 2003		Invasive Water Chestnut		Wild Celery		Naiads

Goal - Attainable

The combined segment goal for the Gunpowder River is 2,432 acres and was attained once in 2000.

Historical Coverage

Minimal in the 1980s; SAV acreage and species diversity increased in the 1990s

Although SAV was minimal for the first decade of the Bay-wide aerial survey, SAV was likely historically abundant and diverse prior to development of the Bay watershed. Data from the 1960s and 1970s indicate that several of the species that are commonly observed today were seen then as well. In the latter part of the 1990s, SAV acreage increased rapidly although only partial data is available for some years. Since the early 2000s, SAV has remained abundant but hasn't exceeded its goal since 2000. Non-native milfoil and hydrilla have been observed in the Gunpowder River and have possibly facilitated the recovery of native species which generally require better water quality conditions. Recent observations include several species of both native and non-native grasses, including common waterweed, hornwort, wild celery, hydrilla, milfoil, naiads and pondweeds. In the Bird River, invasive floating emergent water chestnut has also been present since the mid-1950s, but populations have been kept low and from spreading due to active eradication efforts.

Key Events

Expansion of dark false mussels improved water clarity following Hurricane Isabel and Tropical Storm Lee

SAV in the Gunpowder River recovered rapidly beginning in 1996 and like other rivers in the Bay, was affected by Hurricane Isabel in 2003. While initially damaging because it created extensive turbidity and scour, the dramatic increase in freshwater that was delivered to the Bay by the hurricane ultimately allowed for a proliferation of dark false mussels. Through filtration, the mussels cleared the water and consequently allowed for the rapid expansion of SAV the following season. Hurricane Isabel was followed by two years of hot, dry conditions in 2005 and 2006, which then reduced the freshwater SAV population by increasing the river's salinity. SAV recovered in later, wetter years until 2011 when Tropical Storm Lee impacted the region and reduced SAV cover again.

Vulnerability/Resilience

Species diversity; protection from development

Although the river is somewhat 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 reducing boating use. Additionally, the freshwater regions of the Bay host up to 15 species of SAV, so diversity—and the potential for resilience from diversity—is naturally higher in these areas.

Water chestnut in the Bird River

The presence of invasive water chestnut may eventually impact SAV abundance in the Bird River and throughout the Gunpowder River if populations are allowed to expand. As a floating emergent plant, water chestnut can outcompete SAV, particularly in areas where SAV is already stressed due to poor water quality.

Management Implications

Nutrient and sediment reductions; potential sediment release from Conowingo Dam; water chestnut

SAV in the Gunpowder River has recovered in correlation with Bay-wide improvements in water clarity and quality. Reductions in sediment, nitrogen and phosphorus have made this possible. Consequently, efforts to continue water quality improvements are vital to the long-term and lasting success of SAV in this system. High density and diversity will shield SAV from some stress, but that resilience is not infinite. Sediment release from behind the Conowingo Dam may affect all of the rivers in the upper Bay, so management actions must focus on reducing the risk of spills as well as a general reduction in sediment loading to the Susquehanna River in the first place. Finally, management efforts to eradicate water chestnut from the Bird River should be continued to avoid population increases that could compete with SAV.

References

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

www.vims.edu/bio/sav/SegmentAreaChart.htm (abundance data)

www.vims.edu/bio/sav/maps.html (species information)

www.eyesonthebay.org (Maryland water quality data)

<https://dnr.maryland.gov/waters/bay/Pages/Water-Chestnut-Eradication-Report.aspx> (information on water chestnut)