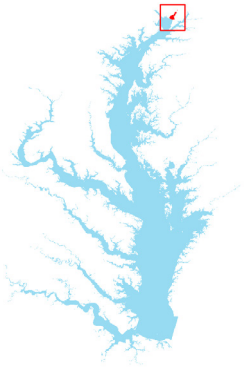
Attainable

Northeast River (NORTF)

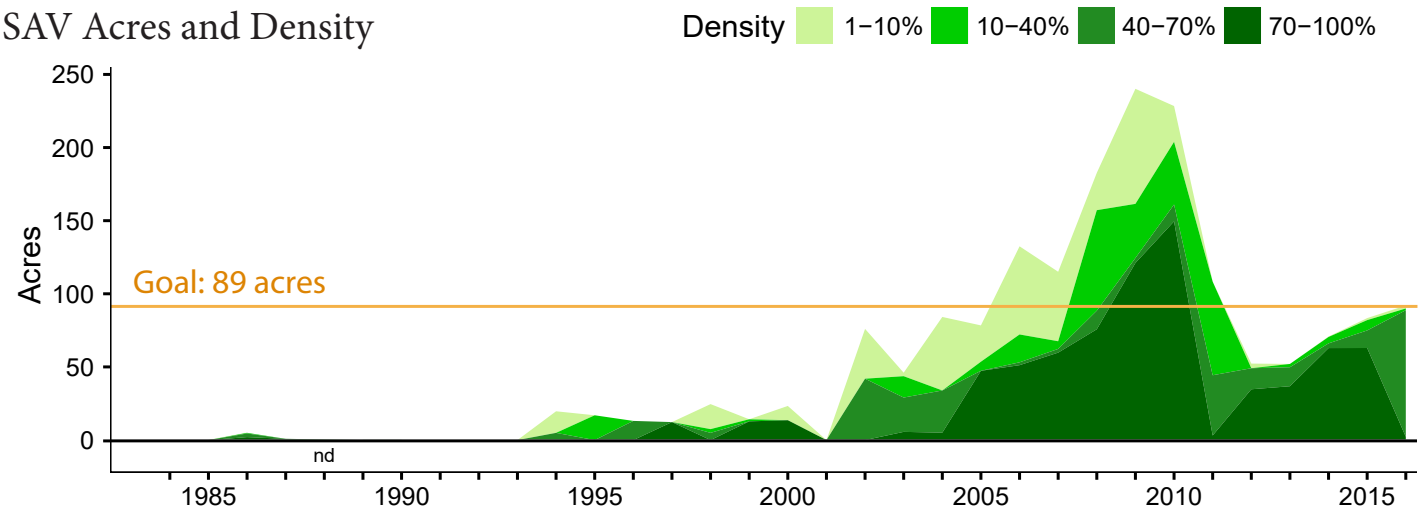


There are very few recorded observations of submerged aquatic vegetation (SAV) in the Northeast River, but it is likely influenced by the expansive SAV beds just south on the Susquehanna Flats.

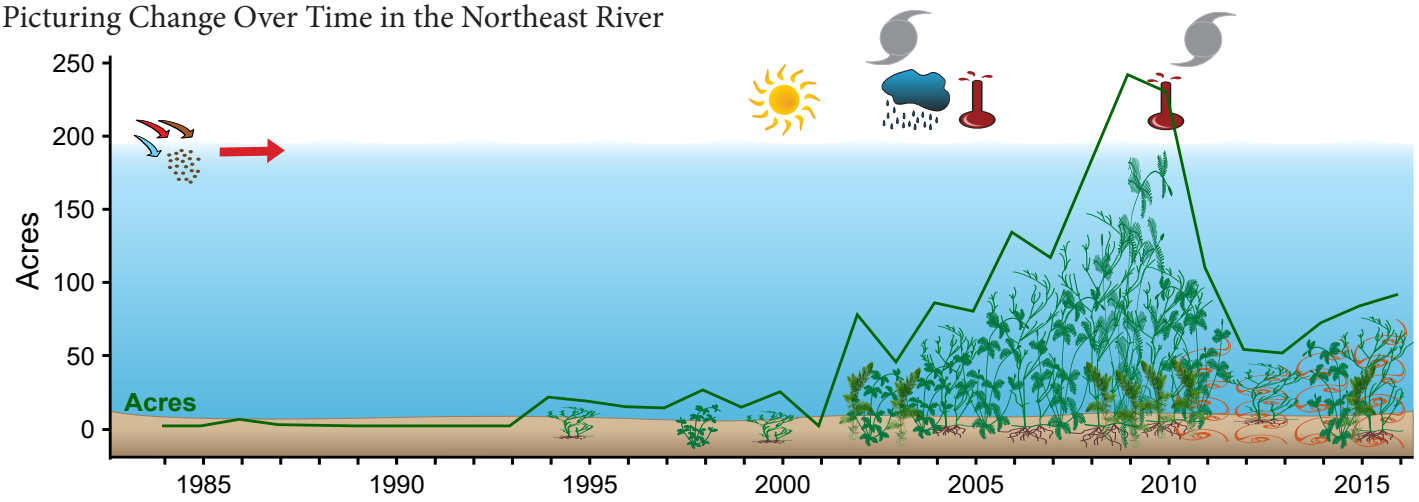
Executive Summary

SAV in the Northeast River is likely influenced by the Susquehanna Flats, which is home to the largest and most diverse SAV bed in Maryland. Responding to Chesapeake Bay-wide improvements in water quality, SAV in the Northeast River exceeded its restoration goal of 89 acres from 2006-2011. In September 2011, however, the SAV there was negatively impacted by Tropical Storm Lee and cover remained low until 2013 when it began to expand again, reaching its restoration target for a seventh time in 2016. Sediment and nutrient loading from the Susquehanna River pose a risk to SAV beds in the region, but the acreage, density and diversity of SAV on the Susquehanna Flats will promote resilience to those stressors. *Lyngbya* and filamentous green algae have also become a concern in this region, but more research is necessary to determine the scope of the problem.

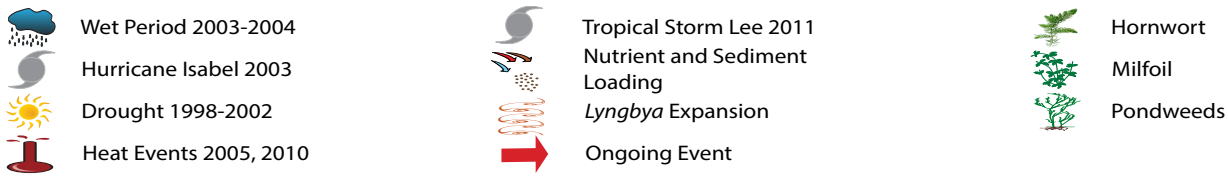
SAV Acres and Density



Picturing Change Over Time in the Northeast River



Key



Attainable

Take Home Points

Goal - Attainable

The goal of 89 acres is attainable and was achieved from 2006-2011 and again in 2016 following Bay-wide improvements in water quality.

Historical Coverage

Little historical SAV coverage; reached peak SAV abundance in 2009

There is little data regarding the historical coverage and species composition of SAV in the Northeast River prior to the onset of the Bay-wide aerial survey in 1984, and still relatively little following. Limited citizen scientist data from the late 1980s through early 2000s indicate that the SAV beds that were mapped during those years of the aerial survey were made up primarily of milfoil, but may also have included hornwort and pondweeds. Acreage was minimal until 2002 when SAV cover began to expand near the mouth of the river, likely from the influence of the expanding SAV bed just south on the Susquehanna Flats. Abundance peaked in 2009 at 240 acres, significantly exceeding the river's 89-acre SAV restoration goal, but contracted in 2011 in response to Tropical Storm Lee and continued to decrease in cover until 2013. In 2014, 2015 and 2016, this segment saw a resurgence in SAV acreage and in 2016 the SAV restoration target was reached again. There is no ground truth data from those years to indicate which plants were responsible for the modest recovery.

Key Events

Tropical Storms Agnes and Lee

SAV was experiencing a general decline in abundance throughout the Bay in the 1960s and early 1970s when the region was hit by Tropical Storm Agnes in 1972. Agnes caused an extreme runoff event that resulted in the loss of most remaining SAV in the upper Bay. Following the eventual resurgence of SAV in the region, Tropical Storm Lee led to another dramatic decline of SAV in September 2011. The impact from Tropical Storm Lee was compounded by an inundation of sediment, nutrients and debris spilling over from behind the Conowingo Dam that caused excessive turbidity, burial and scour of the plants in this region. This system began to recover quickly, however, and the recovery has been ongoing in the years since 2013.

Vulnerability/Resilience

Conowingo Dam and turbidity; resilience from bed size, density and diversity

SAV in the Northeast River will remain vulnerable to sediment and nutrient influx from the Susquehanna River and Conowingo Dam, but the size, density and diversity of species just south on the Susquehanna Flats will contribute to the river's long-term resilience by providing a local and abundant seed source.

Expansion of filamentous green algae and Lyngbya

Several species of filamentous green algae as well as *Lyngbya*, an invasive cyanobacteria that thrives in warm, nutrient-rich water, have become prevalent components of the Susquehanna Flats SAV bed in recent years and therefore may ultimately impact nearby SAV beds at the mouth of the Northeast River. These nuisance species grow on the substrate and also loosely attach to SAV blades, but as they decomposes, they form dense, floating mats on the surface of the water, shading the SAV below. In other regions of the world, *Lyngbya* has been known to decrease SAV density, but it has not been found to negatively impact SAV on the Susquehanna Flats to date. Additionally, some species of *Lyngbya* produce toxins that cause dermatitis, but additional research is needed to identify which species of *Lyngbya* are present on the Susquehanna Flats to determine if that is a concern here.

Management Implications

Sediment and nutrient reductions; filamentous green algae and Lyngbya

There are two major issues that will influence the continued abundance and diversity of SAV in this region: sediment and nutrient loading and filamentous green algae and *Lyngbya* expansion. All efforts should be made to reduce sediment and nutrient loading from the Susquehanna River to ensure SAV persistence in this region. A reduction in nutrient loading would likely also decrease the prevalence of filamentous green algae and *Lyngbya*. More research is needed to determine if these nuisance species will impact SAV abundance and density in the long-term and if the species present are those that produce toxins and/or have other ecosystem impacts.

References

Stevenson and Confer 1978; Bailey et al. 1978; Orth and Moore 1983, 1984; Dennison et al. 1993; Moore et al. 2000, 2004; Kemp et al. 2005; Orth et al. 2010a, 2017; Patrick and Weller 2015; Gurbisz et al. 2016, 2017; 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)