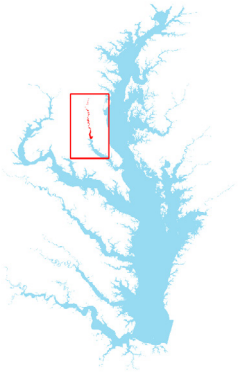
Attainable

Upper Patuxent River (PAXTF, PAXOH, WBRTF)

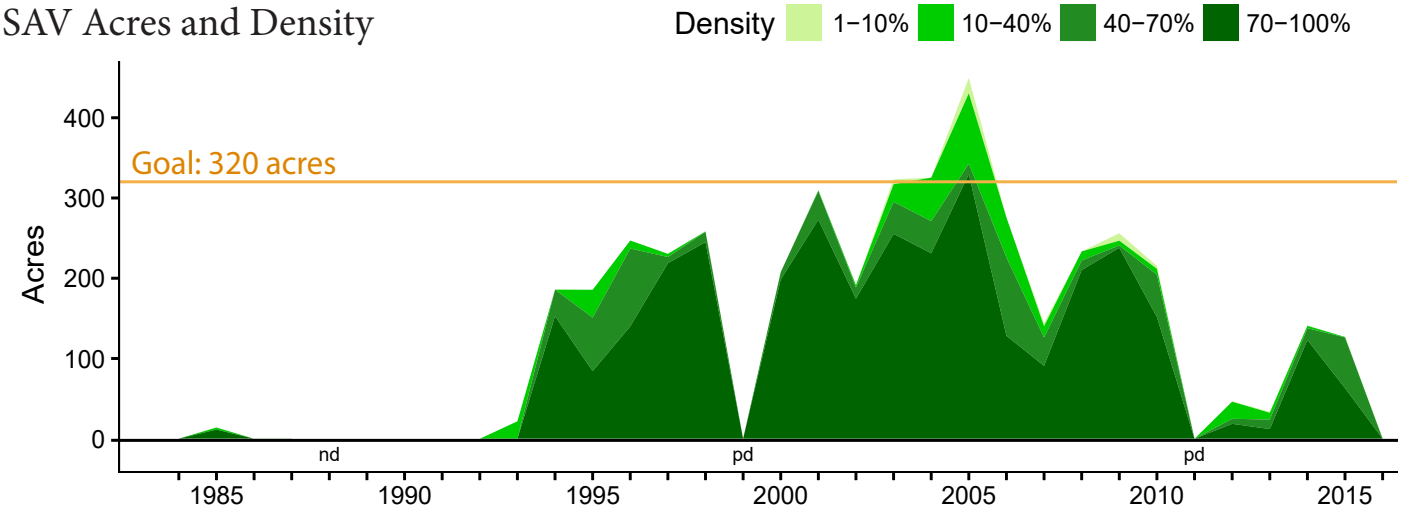


The upper Patuxent River experienced a submerged aquatic vegetation (SAV) resurgence following wastewater treatment plant (WWTP) upgrades.

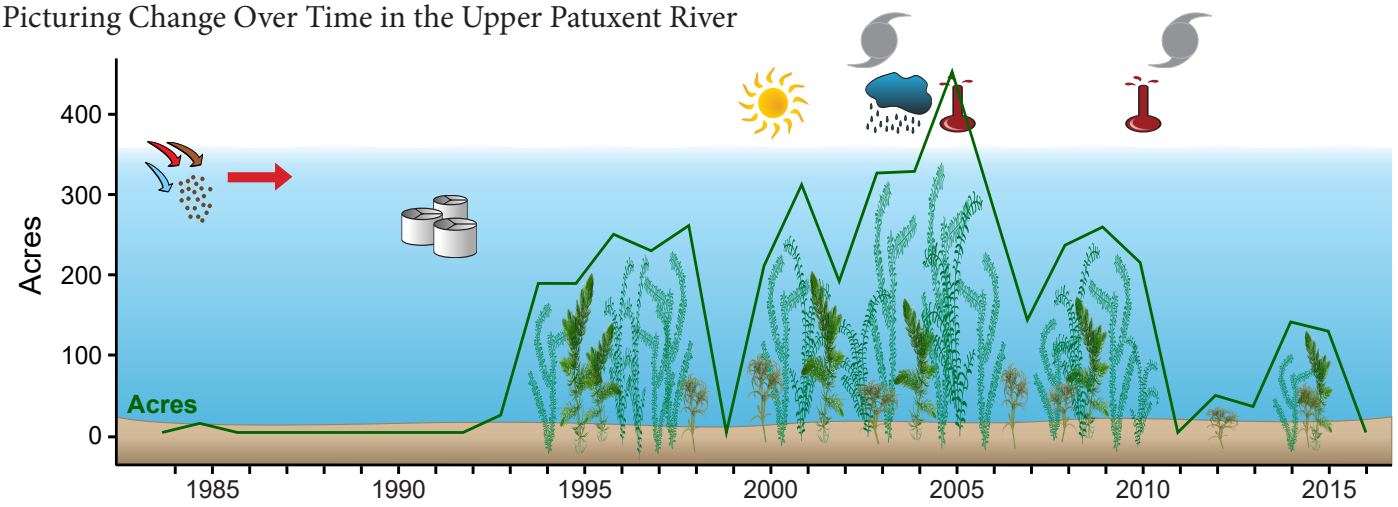
Executive Summary

There is a dearth of information on the historical coverage of SAV in the upper Patuxent River, but in the late 1800s and early 1900s, it may have resembled what was observed in the upper Potomac River at that time. More recently, excessive nutrient input from poorly treated sewage led to SAV declines in the mid-1970s. WWTP upgrades in the early 1990s contributed to significant improvements in water quality, however, which led to the resurgence of a diverse assemblage of SAV in the mid-1990s. Although much of the resurgence was attributed to the spread of hydrilla, other species present included hornwort, naiads and common waterweed. SAV attained the restoration goal of 320 acres in three consecutive years from 2003 to 2005.

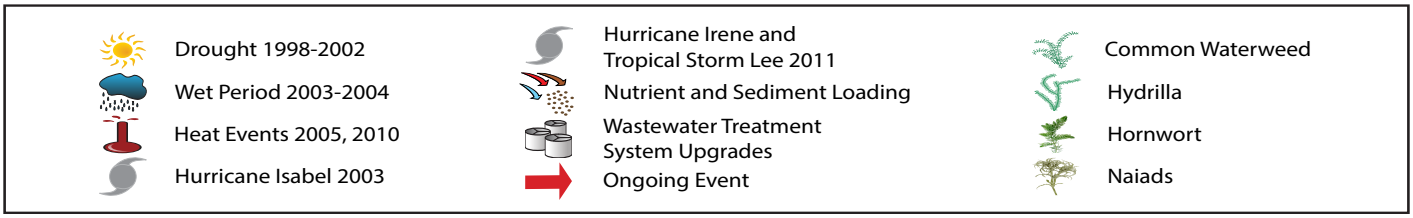
SAV Acres and Density



Picturing Change Over Time in the Upper Patuxent River



Key



Attainable

Take Home Points

Goal - Attainable
The goal of 320 acres was achieved from 2003 to 2005, following a decade of improving water quality due to a reduction in total nitrogen from advanced WWTP upgrades and expanding SAV beds.

Historical Coverage
Historical coverage not well known
Although no historical SAV data was found for the upper Patuxent River, it is entirely possible that small populations were once present. Most were likely unable to survive the rapid development and subsequent reduction in water quality that resulted from poorly treated sewage, however. Fortunately, WWTP upgrades in the early 1990s contributed to significant improvements in water quality which led to the resurgence of a diverse assemblage of SAV in the mid-1990s. Although much of the resurgence was attributed to the spread of hydrilla, other species present included hornwort, naiads and common waterweed. SAV abundance fluctuated over the following decades but attained the restoration goal of 320 acres in three consecutive years from 2003 to 2005. Heat events in 2005 and 2010 may have led to reductions in abundance in 2006 and 2011, which were compounded by impacts from Tropical Storm Lee and Hurricane Irene in 2011.

Key Events
Hydrilla introduction
Hydrilla was first observed in these segments in 1994 along with a number of other native and non-native species. While currently found in a number of marsh creeks and in narrow bands along some of the mainstem, it has not achieved the densities and abundance noted in the neighboring Potomac River.

Vulnerability/Resilience
Waste water treatment plant upgrades
WWTP upgrades have assisted with the recovery of SAV in the upper Patuxent River. Any further reductions in nitrogen loading from WWTP upgrades will make the system more resilient to long-term change, as will the potential for species diversity that is inherent to freshwater regions of the Bay.

Water clarity
Nitrogen reductions contributed to improved water clarity and allowed the non-native hydrilla to establish and develop large dense beds that continued to improve water clarity.

Storms and floods
Areas in the tidal fresh portion of the upper Patuxent River, where the river channel is narrower and more riverine, can be subject to high flows during extreme floods. This results in both erosion and sediment deposition which can affect SAV beds; especially vulnerable would be the beds currently found fringing the main channel.

Management Implications
Nutrient and sediment reductions; WWTP upgrades
Managers will need to focus on reducing nutrients and sediment for SAV to significantly improve. Much of the nutrient pollution to this river is processed by the Western Branch Waste Water Treatment Plant. Although improvements have been made to the Western Branch WWTP over the years, any future technological advancement in wastewater treatment should be employed here to further reduce nitrogen and phosphorus pollution to the river, particularly if additional development of the watershed occurs. If development can be balanced by additional nutrient removal, some of the stressors associated with development (reduced water quality and clarity) may be mitigated to favor conditions conducive to SAV recovery. Additionally, efforts to maintain separate systems for stormwater overflow are critical to reduce nutrient and sediment levels in this river.

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)