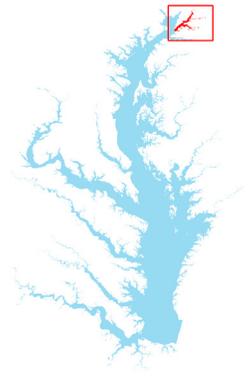




Elk and Bohemia Rivers and the Chesapeake & Delaware Canal (ELKOH1, ELKOH2, C&DOH, BOHOH)



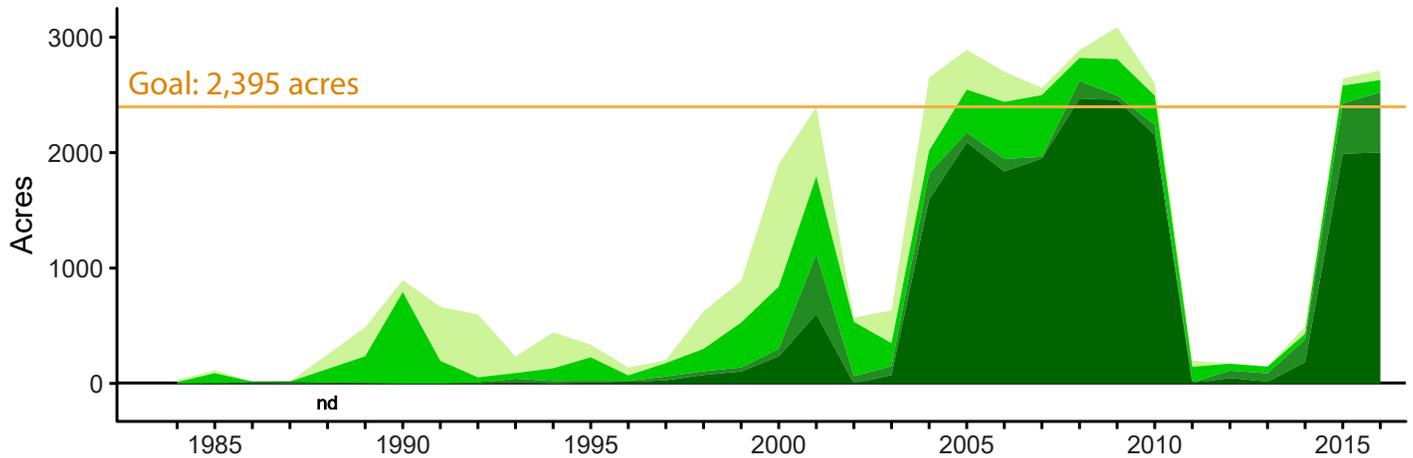
Dense beds of submerged aquatic vegetation (SAV) are dominated by wild celery but also include a suite of native and non-native species.

Executive Summary

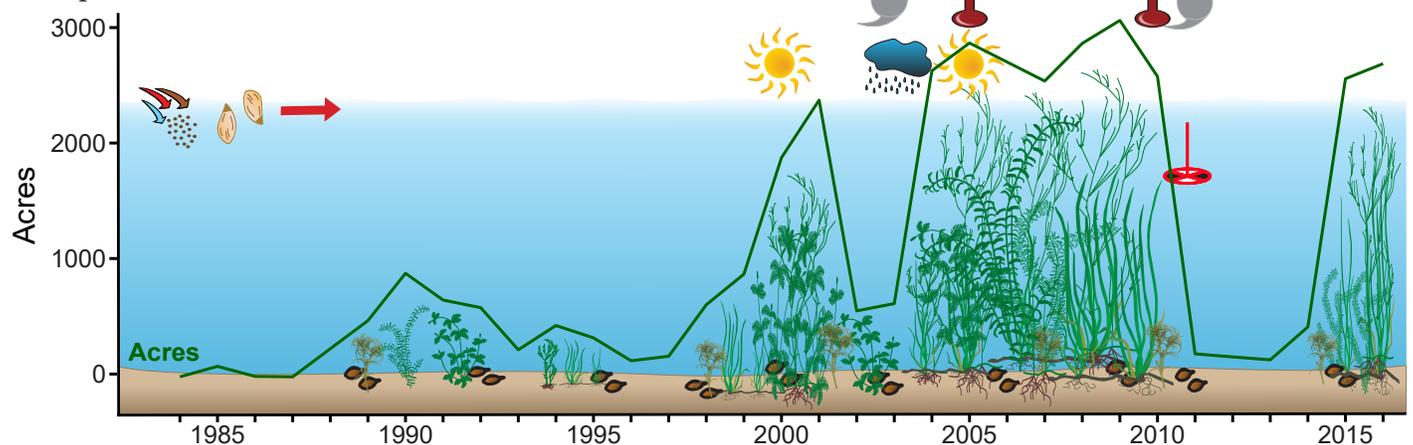
SAV was likely once abundant in the Elk and Bohemia rivers regardless of the minimal cover observed during the Chesapeake Bay-wide aerial survey in years prior to 2000. The 2,395-acre goal for these segments was reached in 2001 and cover has generally been high since then, with some exceptions. Wild celery is the dominant plant, but the population is represented by a diversity of both native and non-native freshwater species. In 2011, Tropical Storm Lee severely impacted the SAV beds in the upper Bay through high flow, scour and lasting reductions in water clarity. By 2015, however, the SAV beds had fully recovered in cover, density and diversity, due in part from the beds own seed banks, but likely also from nearby seed sources such as the expansive SAV bed in the Susquehanna Flats. Continued efforts to reduce sediment, nitrogen and phosphorus loads will help these resilient SAV beds to persist, as will efforts to reduce the likelihood of potential impacts from the Conowingo Dam.

SAV Acres and Density

Density 1-10% 10-40% 40-70% 70-100%



Picturing Change Over Time in the Elk and Bohemia Rivers and the Chesapeake & Delaware Canal



Key

	Drought 1998-2002, 2005		Poor Water Clarity		Seeds from Upstream		Pondweeds		Milfoil
	Wet Period 2003-2004		Heat Events 2005, 2010		Seedbank		Hornwort		Common Waterweed
	Hurricane Isabel 2003		Nutrient and Sediment Loading		Ongoing Event		Hydrilla		Watergrass
	Tropical Storm Lee 2011				Naiads		Wild Celery		Stargrass

Goal - Attainable

The combined goal for these segments is 2,395 acres and was achieved in 2001, from 2004-2010 and again in 2015 and 2016. With continued improvements in water quality and clarity through reductions in sediment, nitrogen and phosphorus, there is no reason to suggest that SAV will not persist in this region.

Historical Coverage

Minimal SAV coverage 1984-2000; expansive and rapid recovery from 2000 onward

SAV was most likely abundant in the Elk and Bohemia rivers prior to significant population increases in the Bay watershed and the construction of the Chesapeake & Delaware Canal. Herbarium specimens and other observational data from the 1950s-1970s indicate that the species present now, with the exception of hydrilla, were also present in the decades leading up to Bay-wide SAV monitoring efforts, though in limited and inconsistent abundance. Data from the Bay-wide aerial survey indicate that SAV cover remained minimal between 1984 and 2000. Since 2000, however, SAV cover has expanded in this system unless interrupted by episodic stressors. While these meadows are dominated by wild celery, a diversity of both native and non-native species are also found including hornwort, common waterweed, water stargrass, milfoil, hydrilla and several species of naiads and pondweeds.

Key Events

Delayed image acquisition; Tropical Storm Lee

Following recovery of SAV in the Elk and Bohemia rivers in 2000, it has remained a resilient and diverse community. Although there appears to have been a reduction in SAV cover from 2002-2003, it is possible that SAV appeared reduced in those years due to timing of imagery acquisition. Bay-wide aerial surveys were conducted later than usual in 2002 and 2003, potentially after much of the year's population had already died back for the season. Between 2004 and 2010, SAV was abundant and dense, but in 2011, Tropical Storm Lee severely impacted SAV here.

Vulnerability/Resilience

Conowingo Dam; high density and diversity

Because of the positioning in the Bay, the Elk and associated river systems are vulnerable to nutrient and water clarity problems associated with the Conowingo Dam, but they are also in close proximity to a major seed source—the expansive SAV bed in the Susquehanna Flats. The density and diversity of plants in the Susquehanna Flats most likely plays a role in the resilience of the Elk River SAV beds by contributing seeds from a variety of species annually. Elk River SAV beds likely also receive a diversity of seeds from upstream, allowing for recovery following stressors. This is a situation unique to the freshwater tributaries of the Bay. Seeds that are washed downstream in the river remain in the appropriate salinity zone in the upper Bay. Lower in the Bay, seeds of freshwater species are carried into saltier waters where they cannot grow. Also, the freshwater regions of the Bay host up to 15 species of SAV, so diversity and the potential for resilience from that diversity are naturally higher in these areas.

Management Implications

Nutrient and sediment reductions; proximity to Conowingo

SAV in the Elk and Bohemia rivers has recovered in correlation with Bay-wide improvements in water clarity and quality. Reductions in sediment, nitrogen and phosphorus loading 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 the SAV from some stress, but that resilience is not infinite. Sediment released from behind the Conowingo Dam will undoubtedly affect all of the rivers in the upper Bay, so management actions should focus on the general reduction in sediment loading to the Susquehanna River from upstream.

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)