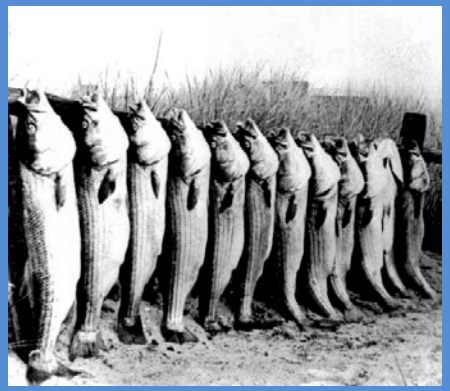
Submersed Aquatic Vegetation in Chesapeake Bay:

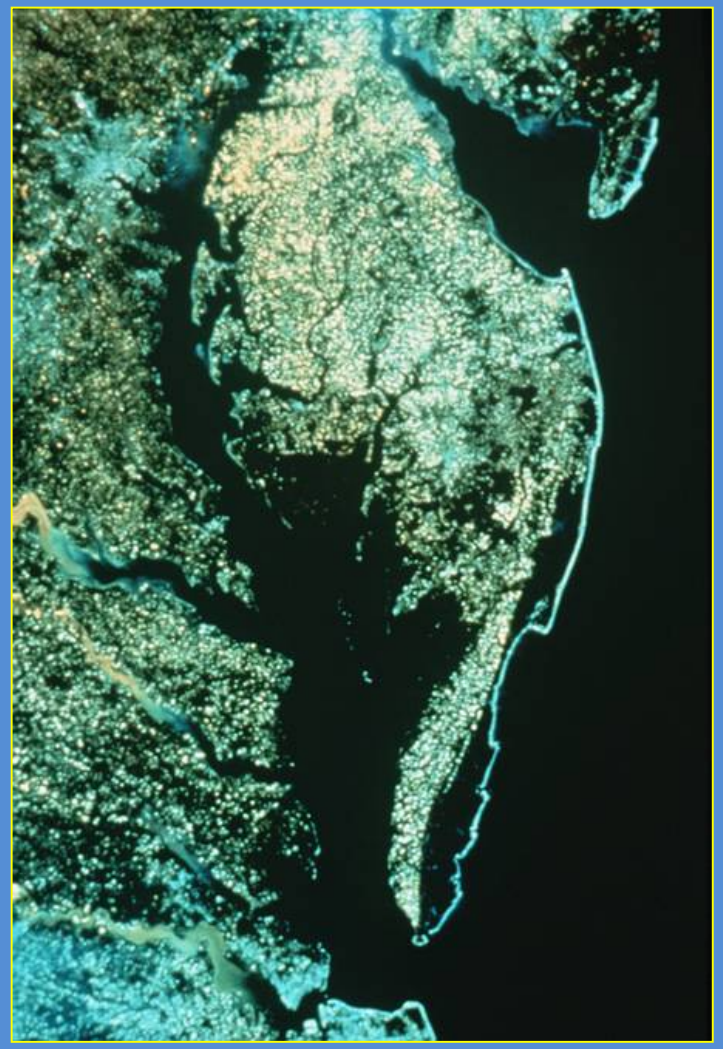
Sentinel Species in a Changing World

Chesapeake Bay – 1607 and the early days

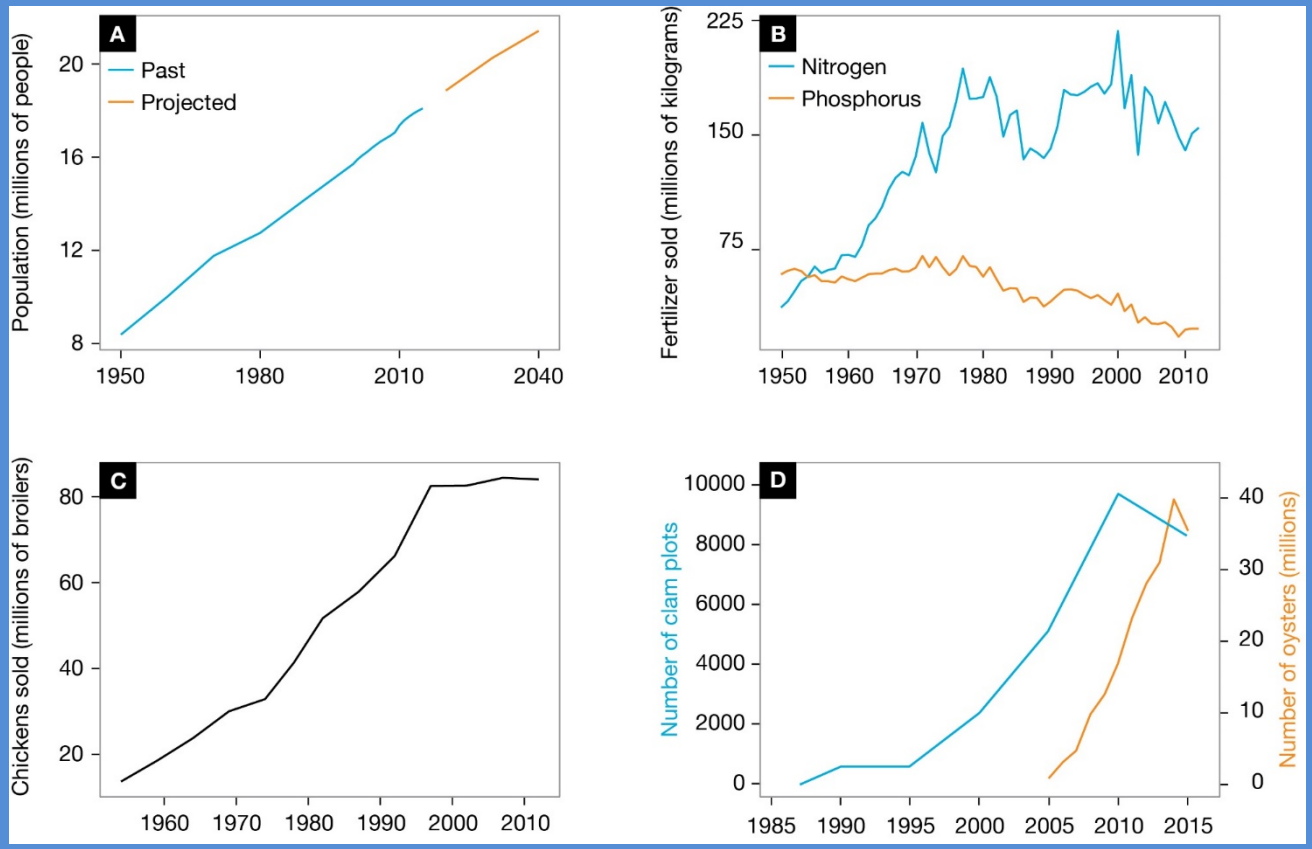


Abundance of Structured Habitats

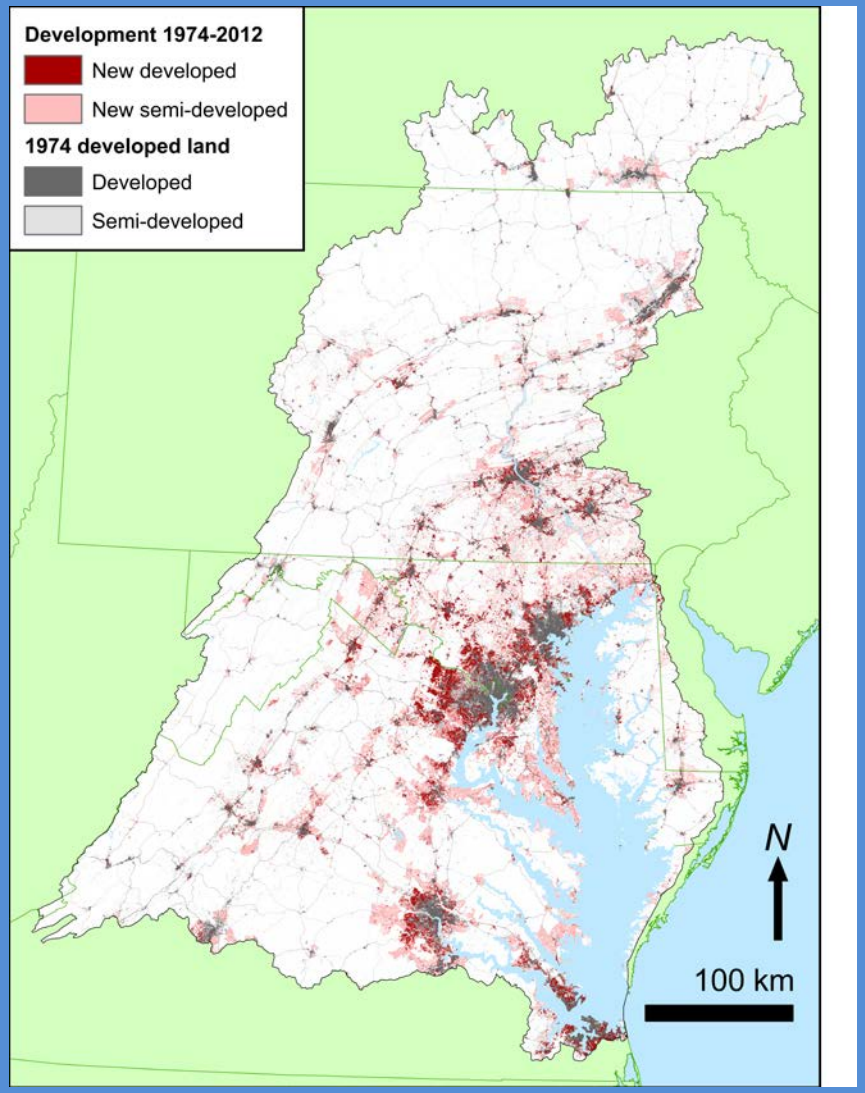
But what about now?
400 years of change!




A

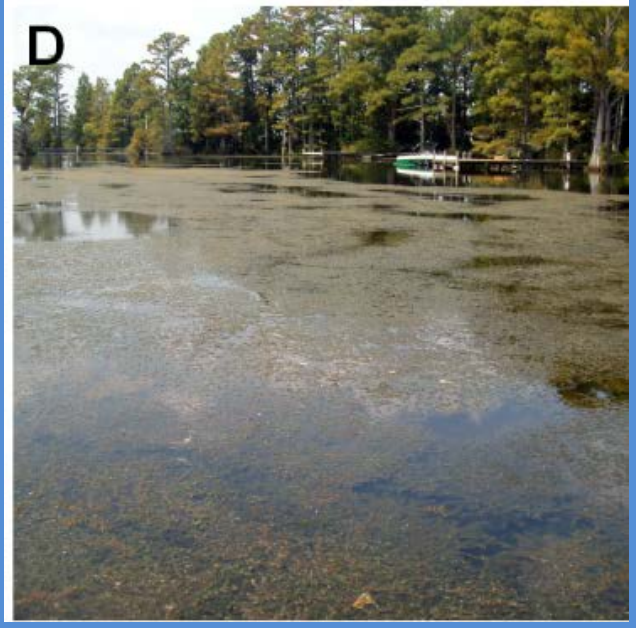

A
Past
Projected
Population (millions of people)
20
16
12
8
1950
1980
2010
2040
B
Nitrogen
Phosphorus
Fertilizer sold (millions of kilograms)
225
150
75
1950
1960
1970
1980
1990
2000
2010
C
Chickens sold (millions of broilers)
80
60
40
20
1960
1970
1980
1990
2000
2010
D
Number of clam plots
10000
8000
6000
4000
2000
0
Number of oysters (millions)
40
30
20
10
0
1985
1990
1995
2000
2005
2010
2015

Expansion of developed land in the Chesapeake Bay watershed 1974-2012



Falcone 2015

Armored Shoreline



Invasive species, e.g. *Hydrilla*

Chesapeake Bay Oyster Harvest 1870-2008

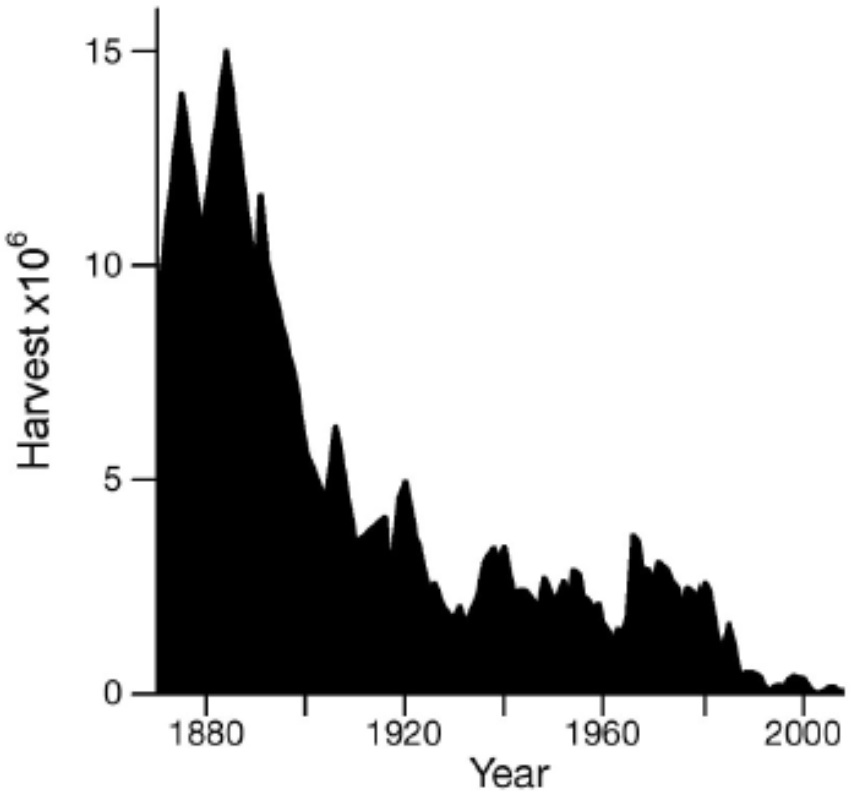


Fig. 1. *Crassostrea virginica*. Reported harvest of Chesapeake Bay oysters (in Maryland bushels) in Maryland and the Potomac River, USA, during 1870 to 2008

Wilberg et al. 2011

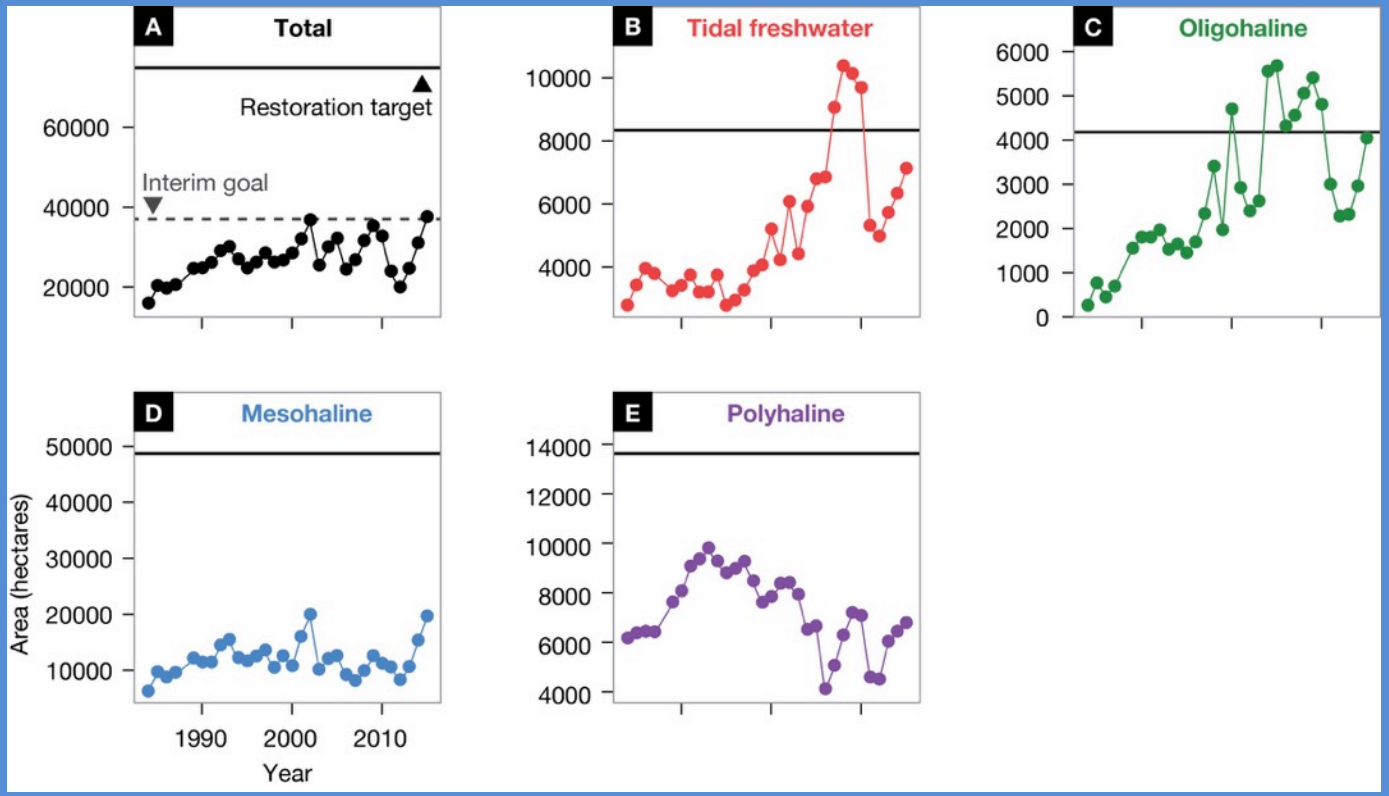
BIOLOGICAL SENTINELS

SAV = canary in mine shaft ; one of the key indicators being used by Bay managers to assess the effectiveness of the clean-up of the Chesapeake Bay

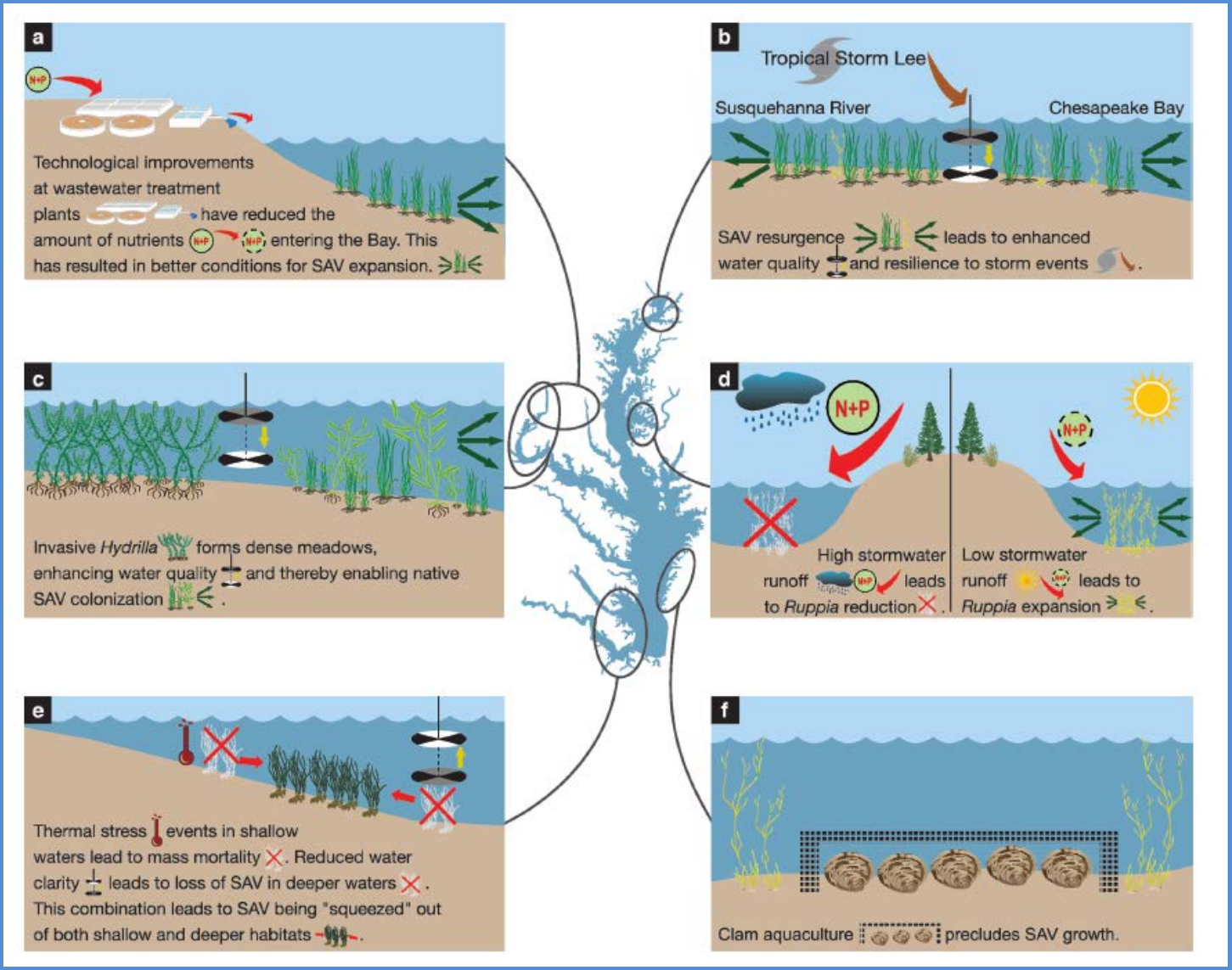
Why Sentinels of Change and Who Are They ?

- A “sentinel” is something that watches, guards and defends.
- the term “sentinel species” in conservation and ecology connotes an indicator of broader ecological function and/or an early warning of ecological impairment.
- SAV is not only an indicator of water quality, it can also modify its environment to enhance its own abundance, and thus is also a defender of water quality.
- It likewise acts as a defender of shorelines against erosion, and a defender of juvenile fish and crabs by providing refuge/cover.
- SAV is the epitome of a sentinel species because it is both an indicator and a defender

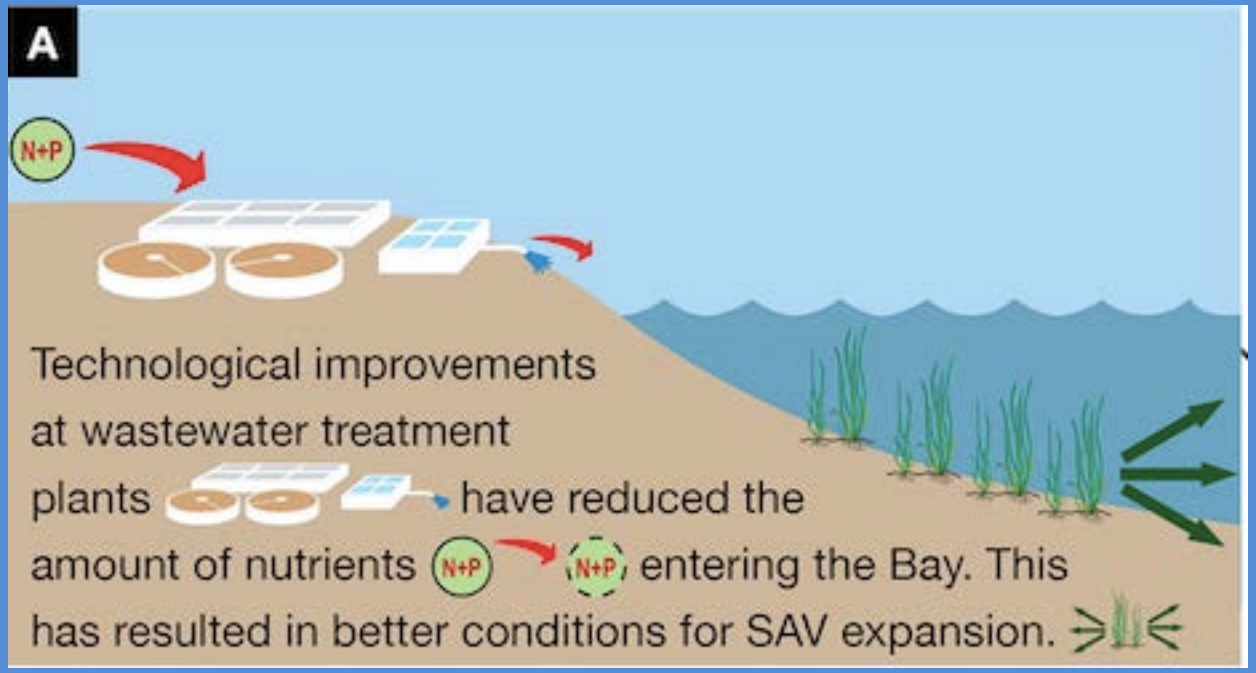
Multiple SAV trajectories

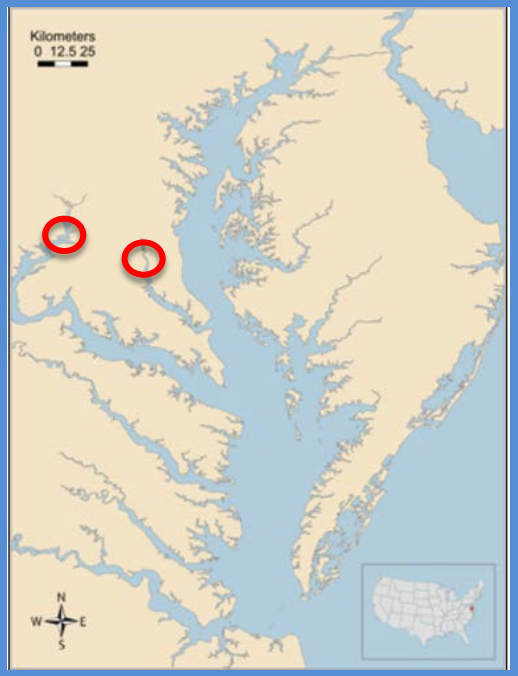


Processes and Factors that Influence SAV

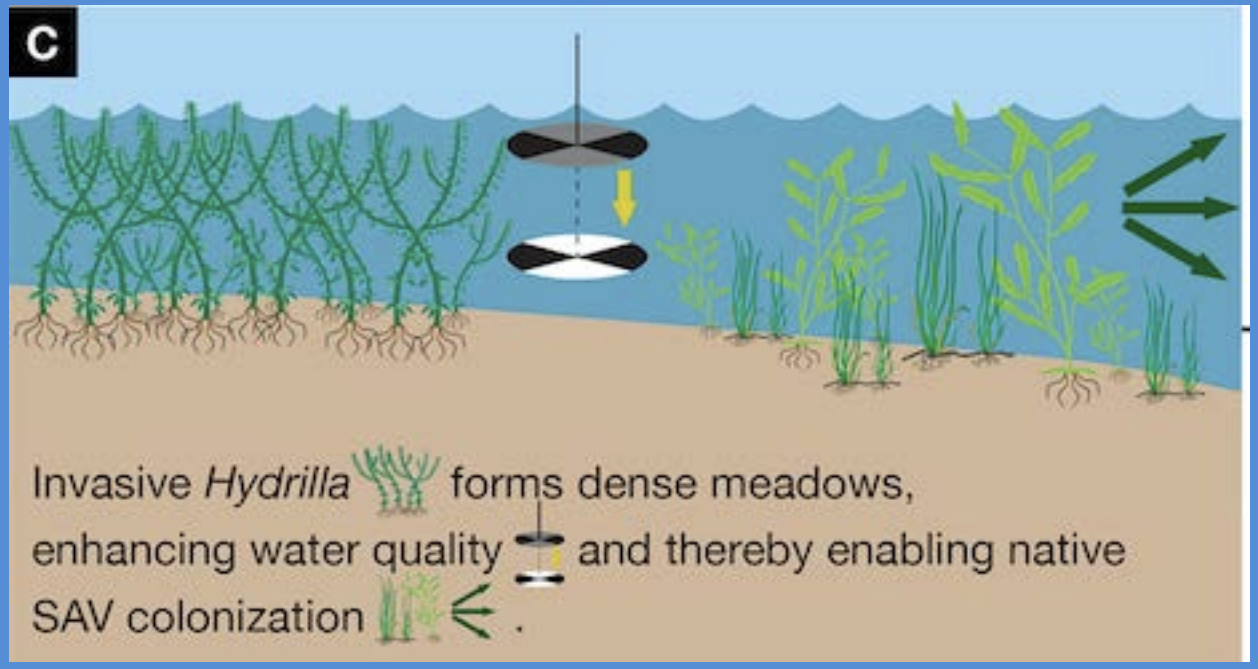


SAV recovery

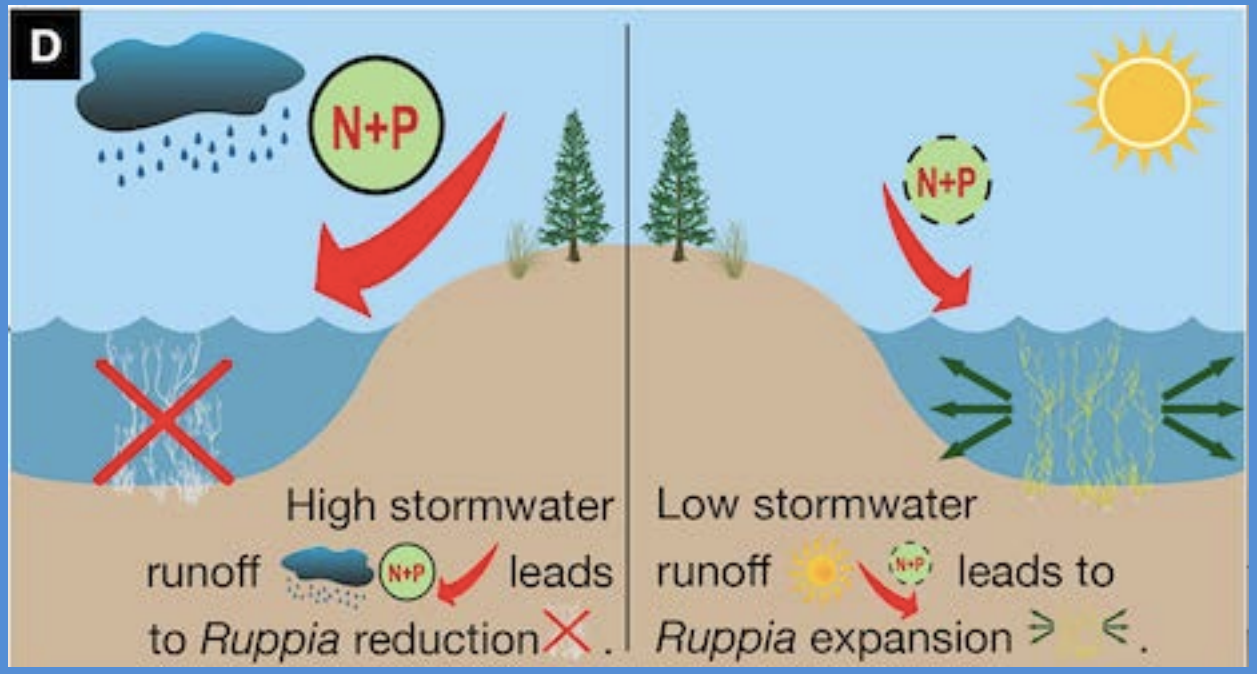


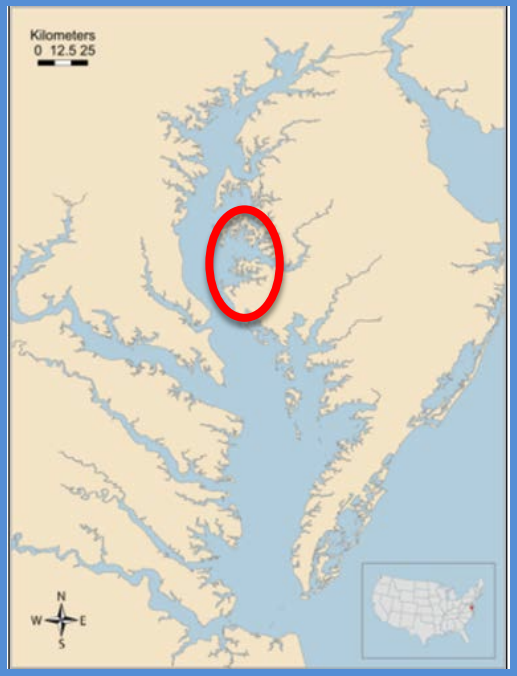


SAV invasives

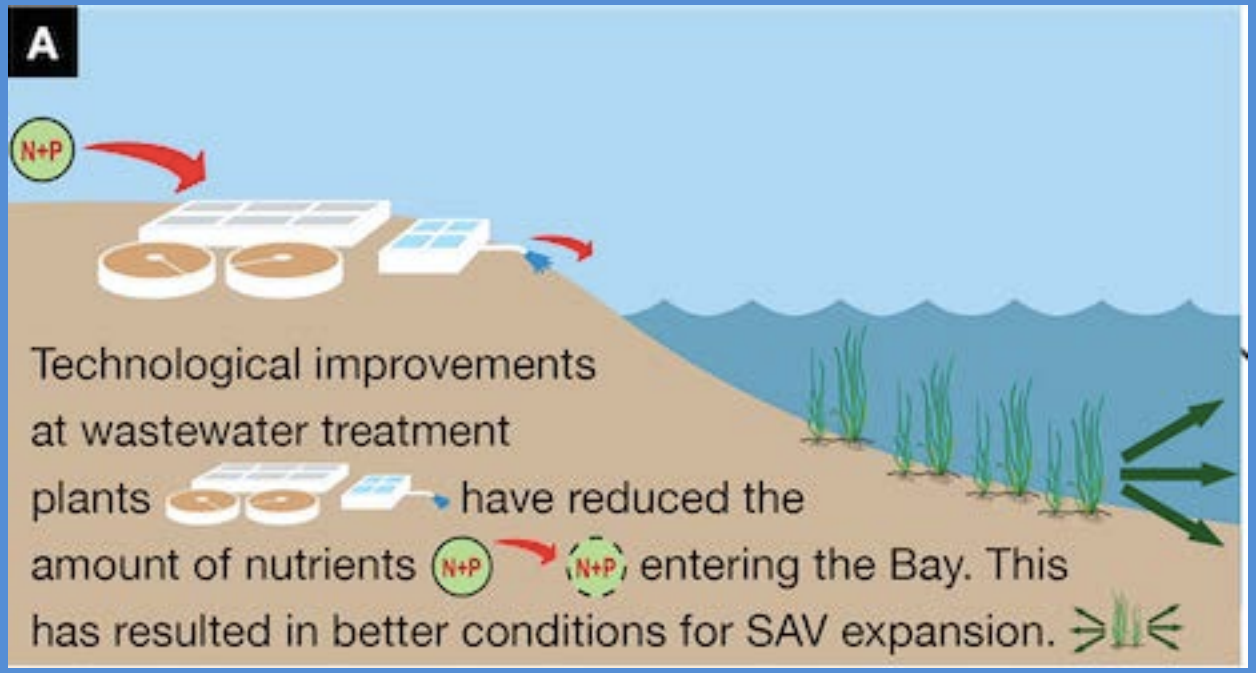


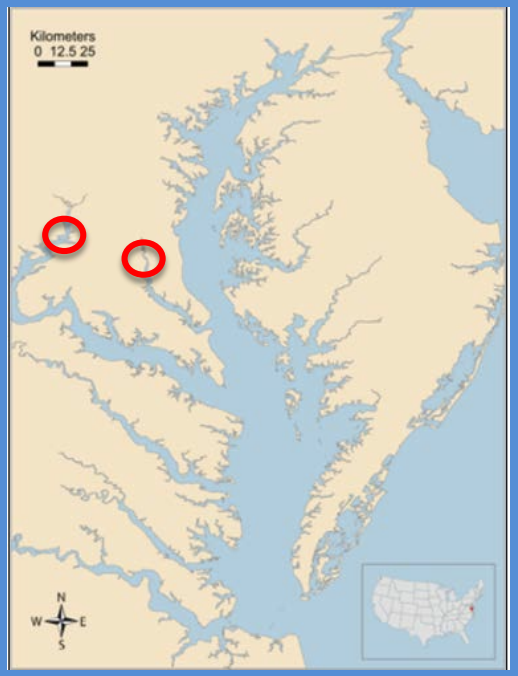
SAV opportunist



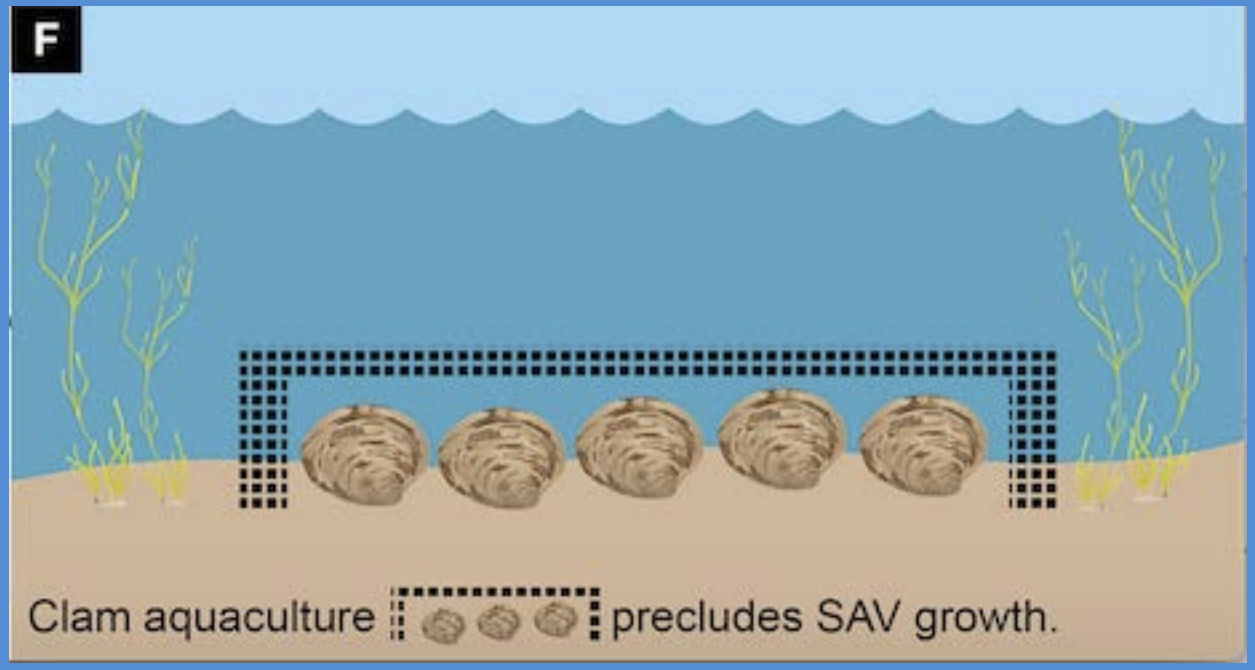


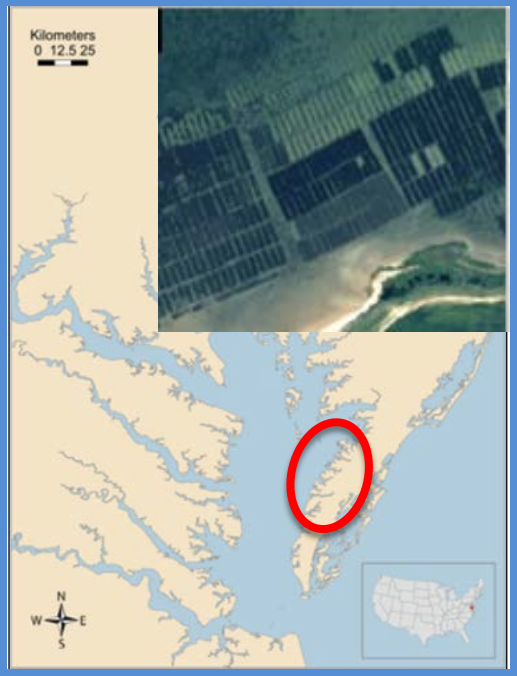
SAV recovery



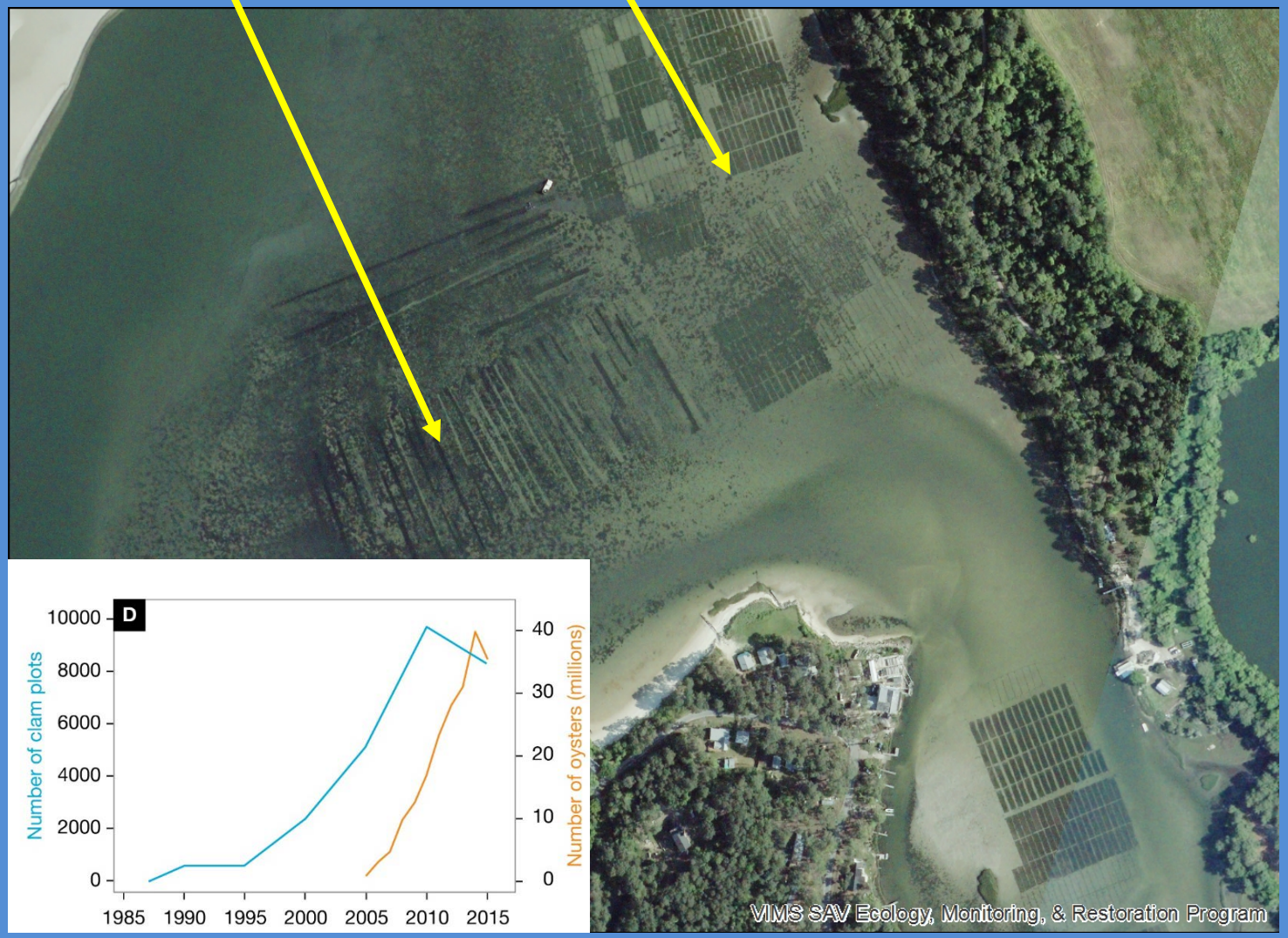


SAV competitors

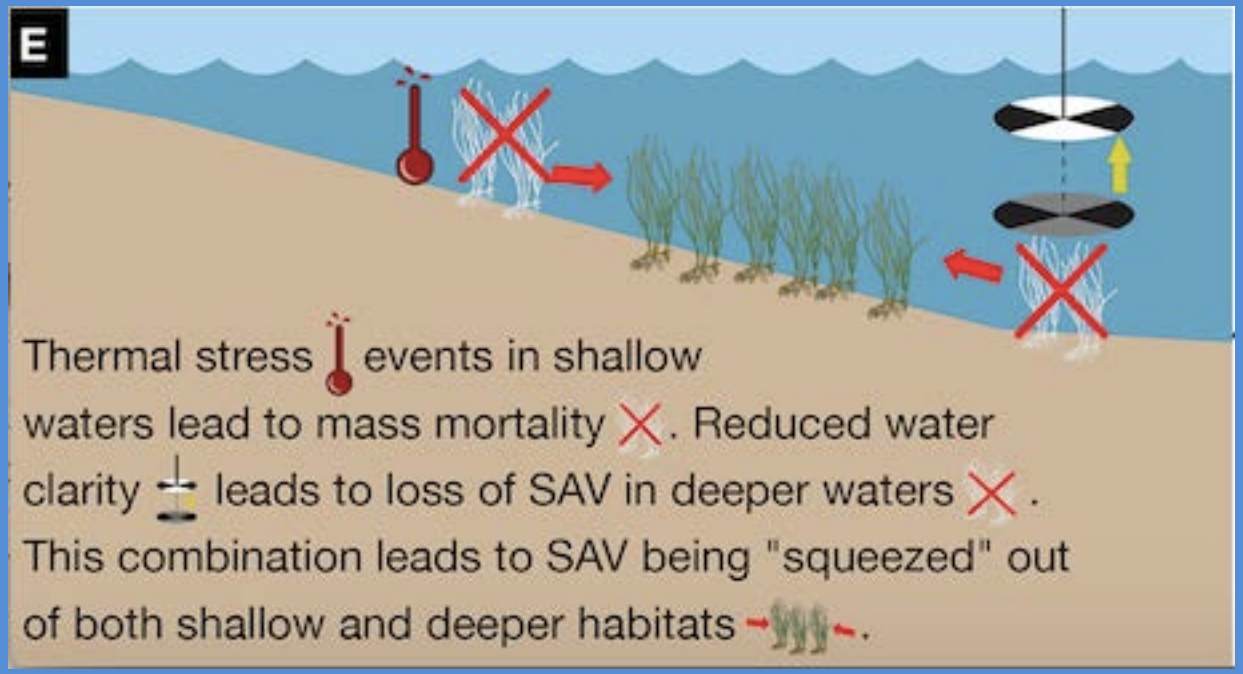




Oyster and Clam Aquaculture Plots in Seagrass Beds



SAV squeeze

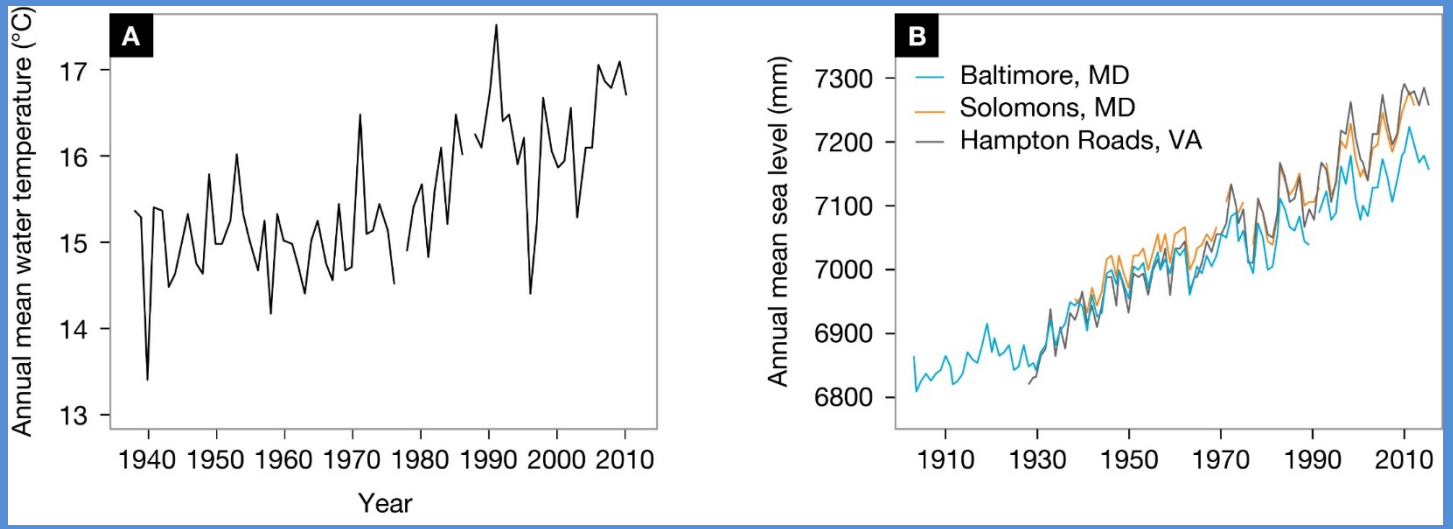

E
Thermal stress events in shallow waters lead to mass mortality. Reduced water clarity leads to loss of SAV in deeper waters.
This combination leads to SAV being "squeezed" out of both shallow and deeper habitats.


Kilometers
0 12.5 25
N
W
E
S

Emerging Stressors

Water temperature

Sea Level Rise



Thanks – SAV SYN Team/EPA

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