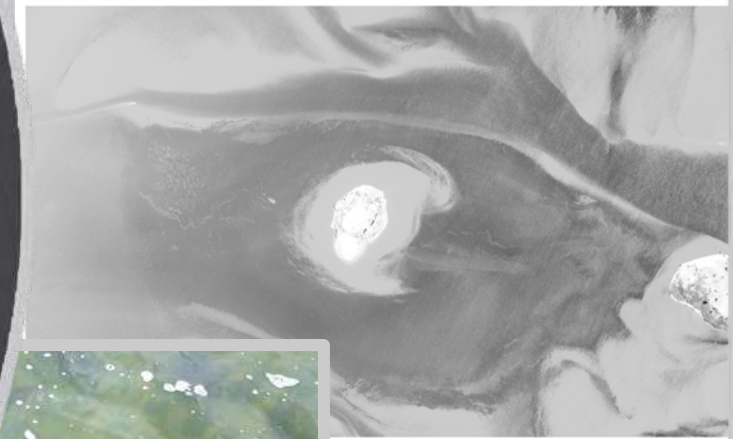




U.S. ARMY

Modeling applications and BU opportunities to expand SAV habitats

Emily Russ (EEW)
EL Homecoming Tech Talks
March 23, 2023



US Army Corps
of Engineers®



Submerged Aquatic Vegetation (SAV)

- **SAV are submerged rooted and flowering plants**
- **SAV provide critical ecosystem services:**
 - Ecological (nursery habitat, food, shelter)
 - Chemical (oxygen production, carbon sequestration, nutrient cycling)
 - Physical (wave/current attenuation, sediment trapping, sediment stabilization)
 - Cultural (tourism, recreation)



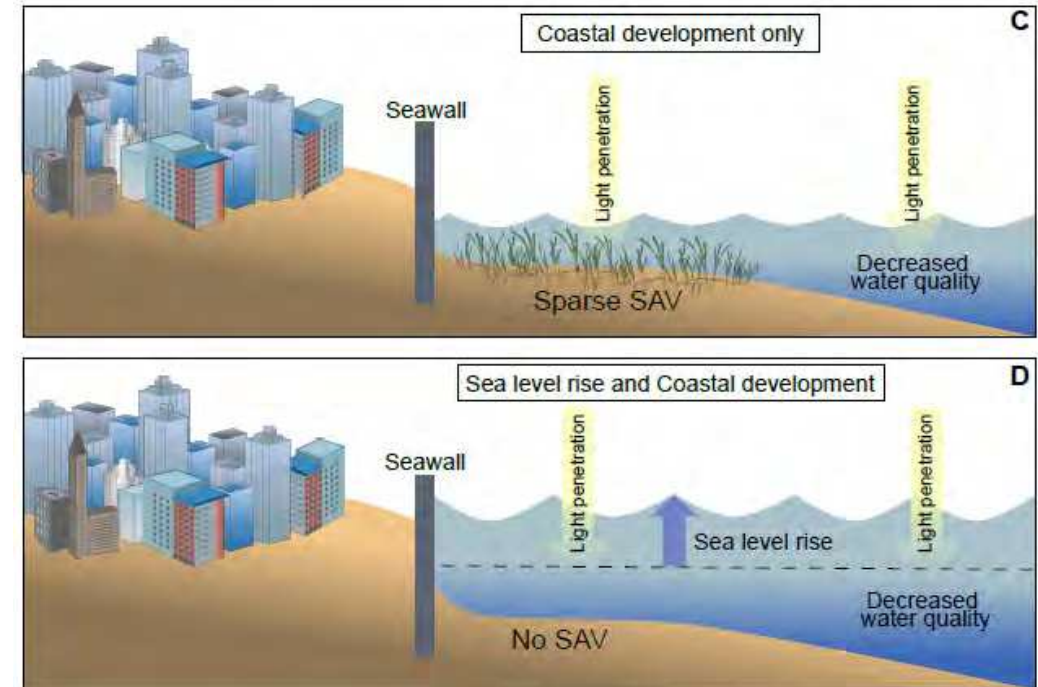
<https://www.nwp.usace.army.mil/Estuary/Structure/Submerged/>



Threats to SAV

- 30% area loss globally (since 1800s)
- 7% lost annually due to multiple stressors, including:
 - Poor water clarity (agricultural, urban, and industrial run-off)
 - Coastal development
 - Climate change
 - Unregulated fisheries
 - Dredging*

Image created by Amy Yarnall

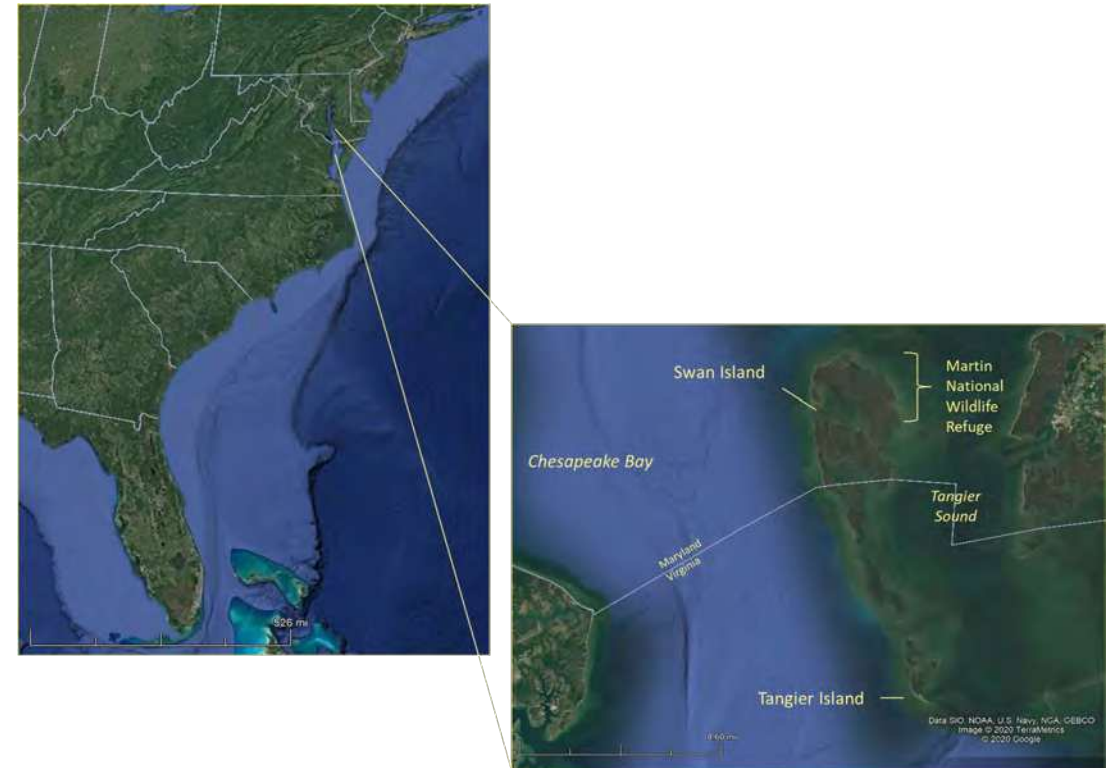


EWN® Research to conserve and expand SAV

- **2 Case Studies:**
 - **Swan Island, MD – SAV Modeling efforts for island restoration project**
 - **Barnegat Bay, NJ – Dredged sediment can benefit SAV**

Swan Island Restoration

- Rapid erosion ($\sim 3\text{m/yr}$) since 1942 – fragmented low-elevation marsh
- Important benefits to Smith Island Communities (wave break)
- BU Application of EWN principles
 - Material from nearby navigation channel
 - Placement (and planting) to restore marsh and dune habitat



Quantifying and predicting island resilience

- **Modeling Goal: Develop integrated model to quantify island resilience**

- Waves/currents
- Island Profile
- Sediment availability
- **Vegetation (including SAV)**

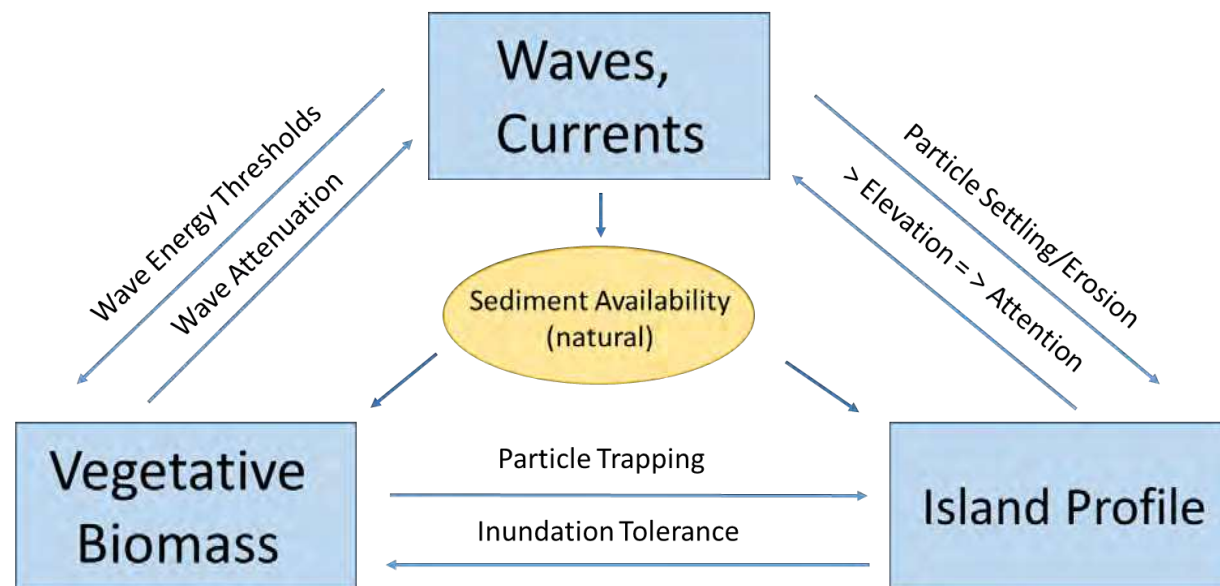
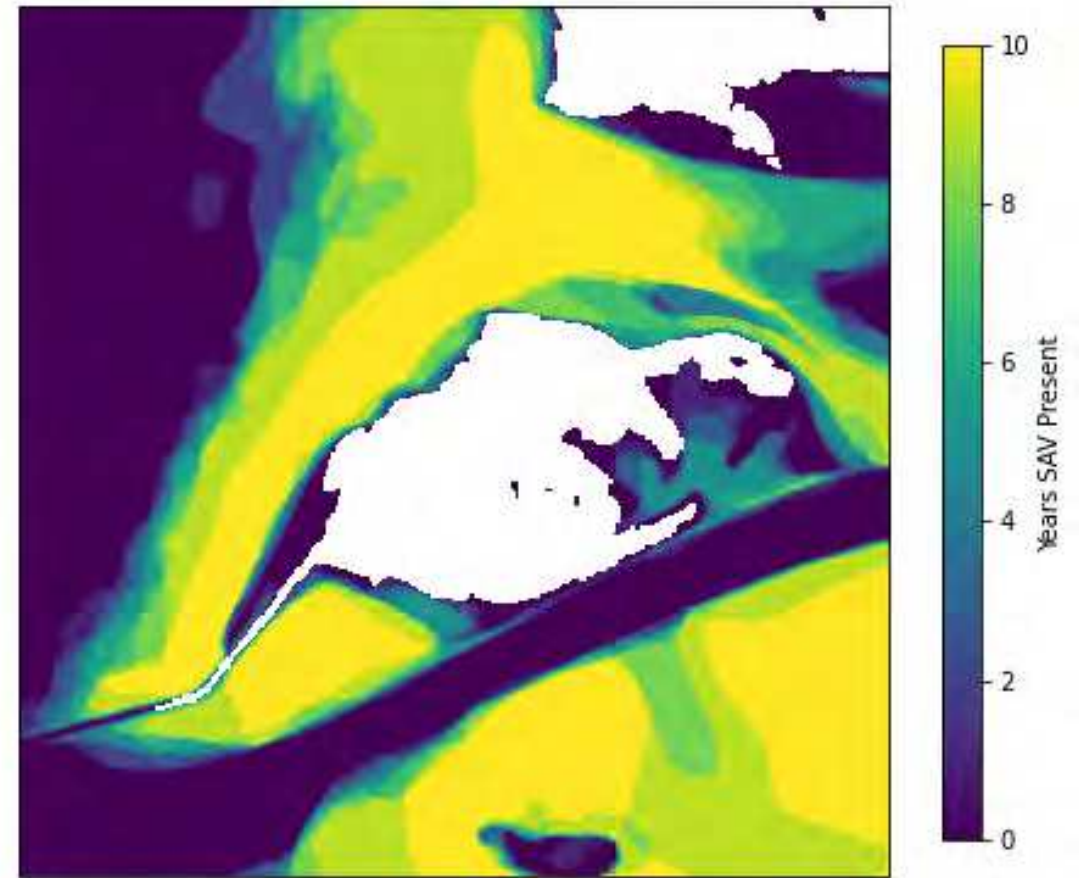
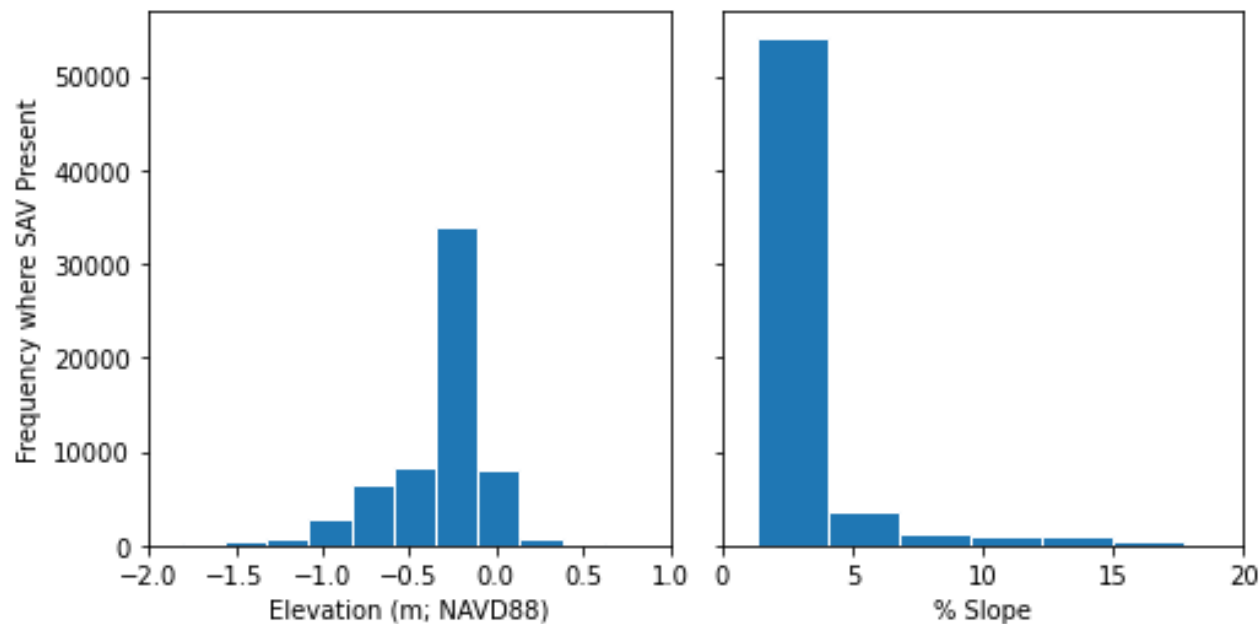


Image Credit: Herman et al. (2023)

SAV Habitat Suitability Model – Presence/Absence

- SAV presence is light dependent
- Elevation is a proxy for light availability



Next Steps: Integrated Island Model

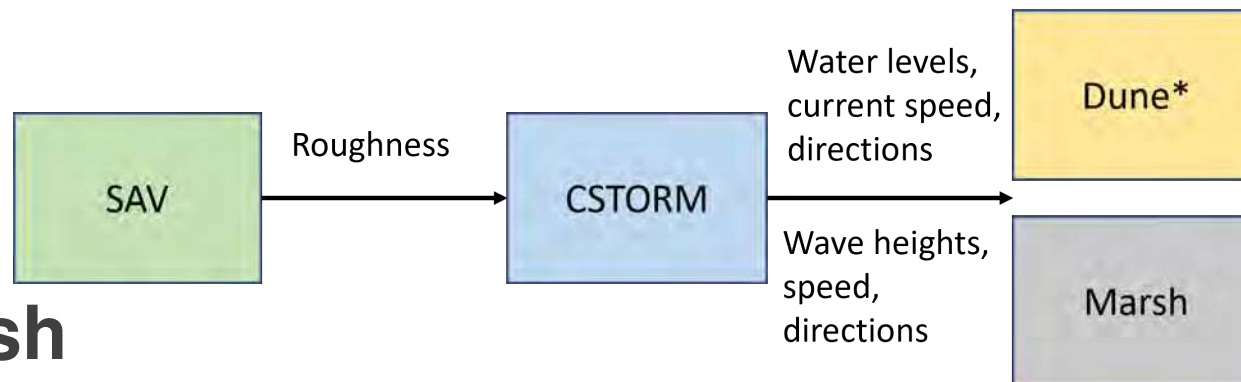
- SAV determines roughness



- Hydrodynamics (CSTORM)

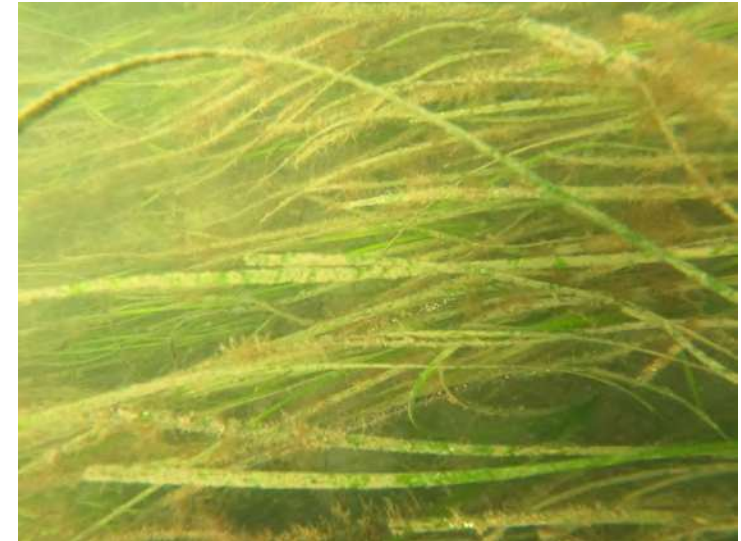


- Water levels, wave heights, velocities go into dune/marsh models



SAV vs. Dredging

- **Dredging impacts include:**
 - Physical removal
 - Burial
 - Elevated Turbidity
- **Resource agencies focus on these short-term impacts to SAV**



<https://www.saw.usace.army.mil/Missions/Navigation/Dredging/District-Plant-Dredging/Merritt/>

*Notes on environmental impacts of dredging...

- **Most dredging-related SAV loss associated with direct removal**
- **Turbidity plumes not greater than background levels**
- **Better environmental management techniques:**
 - *In situ* monitoring
 - Particle tracking models to forecast turbidity
- **Few studies document impacts of dredging on SAV**

Positive long-term outcomes?

- **SAV is resilient – (Laguna Madre, TX; Wood Island, ME)**
- **Dredged material can create suitable habitat (Barnegat Bay, NJ)**

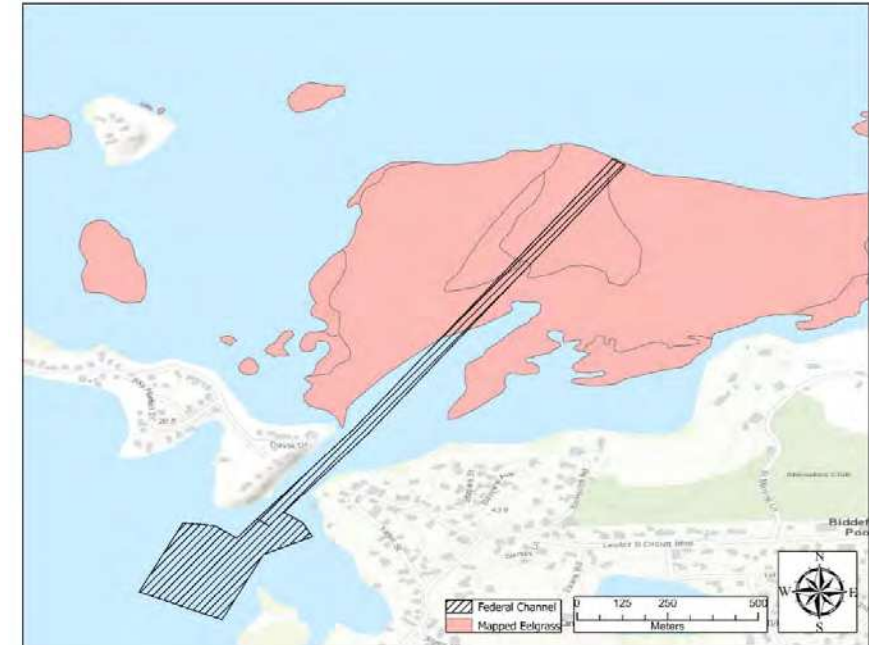


Image Credit: Thomas et al. (in prep)

Barnegat Bay, NJ – Oyster Creek Channel

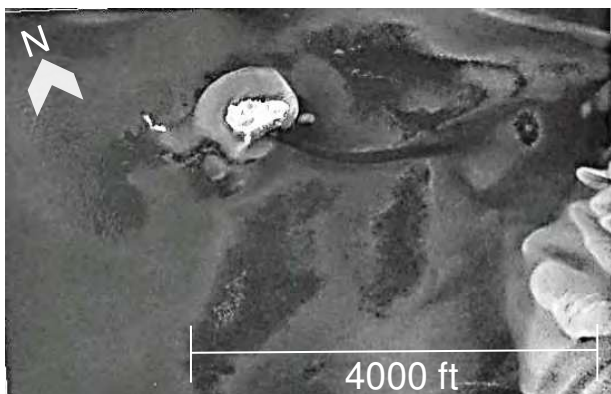
- **Oyster Creek Channel – Dredged ~2 years between 1981-2017**
- **Material placed at 2 open-water disposal areas that became islands**
 - 26A (East) – inactive since 2008, now a Heron Rookery
 - 26B (West)



Barnegat Bay, NJ – 26B SAV

Imagery from GoogleEarth

March 1995



May 2008



September 2013



October 2017



Last placement: 1991
Next placement: 1996

Last placement: 2004
Next placement: 2009

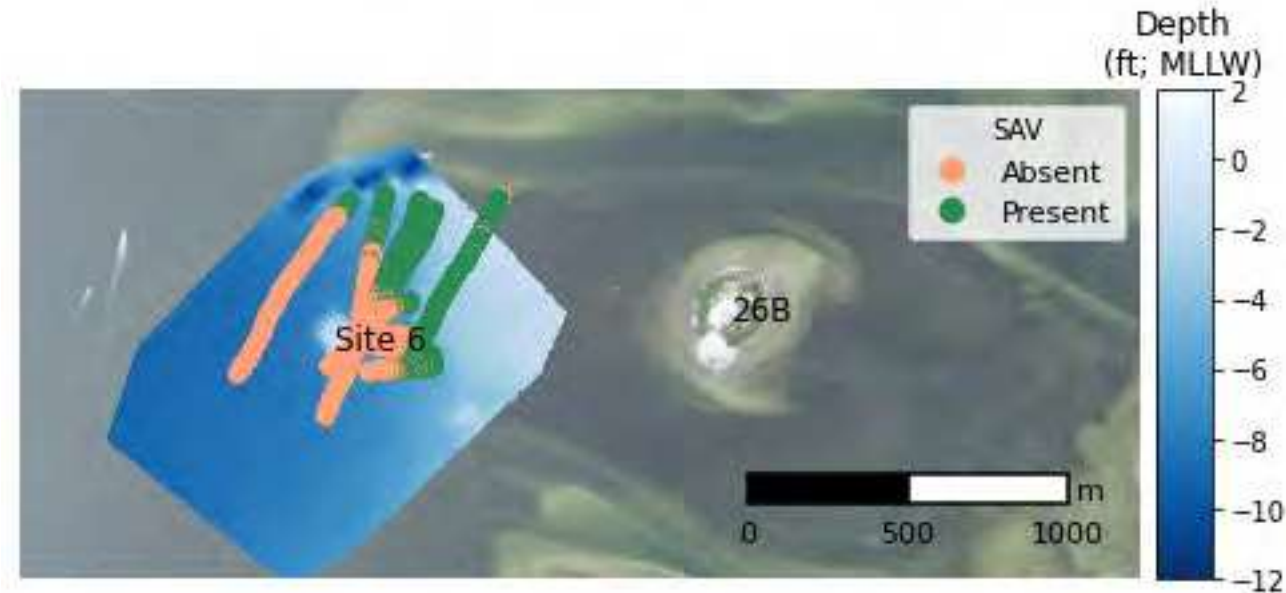
Last placement: 2010
Next placement: 2015

Last placement: 2017*



Barnegat Bay, NJ – Site 6

- **WRDA 1122 Pilot Project**
 - Support navigation mission and use sediments beneficially
- ~1 km west of 26B, deeper, no SAV (yet)
- Started placing sediment Fall 2020



Conclusions

- **SAV provides essential ecosystem services**
- **SAV habitats vulnerable to multiple threats**
- **Modeling necessary to understand suitability and habitat interconnectedness**
- **Beneficial use can be used to expand SAV habitats**

Questions?

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