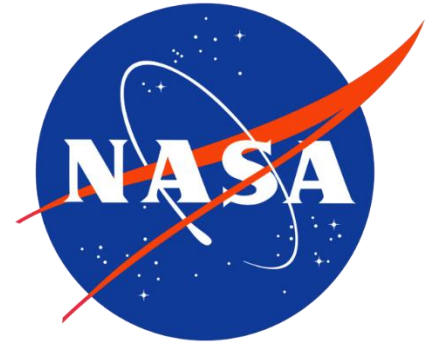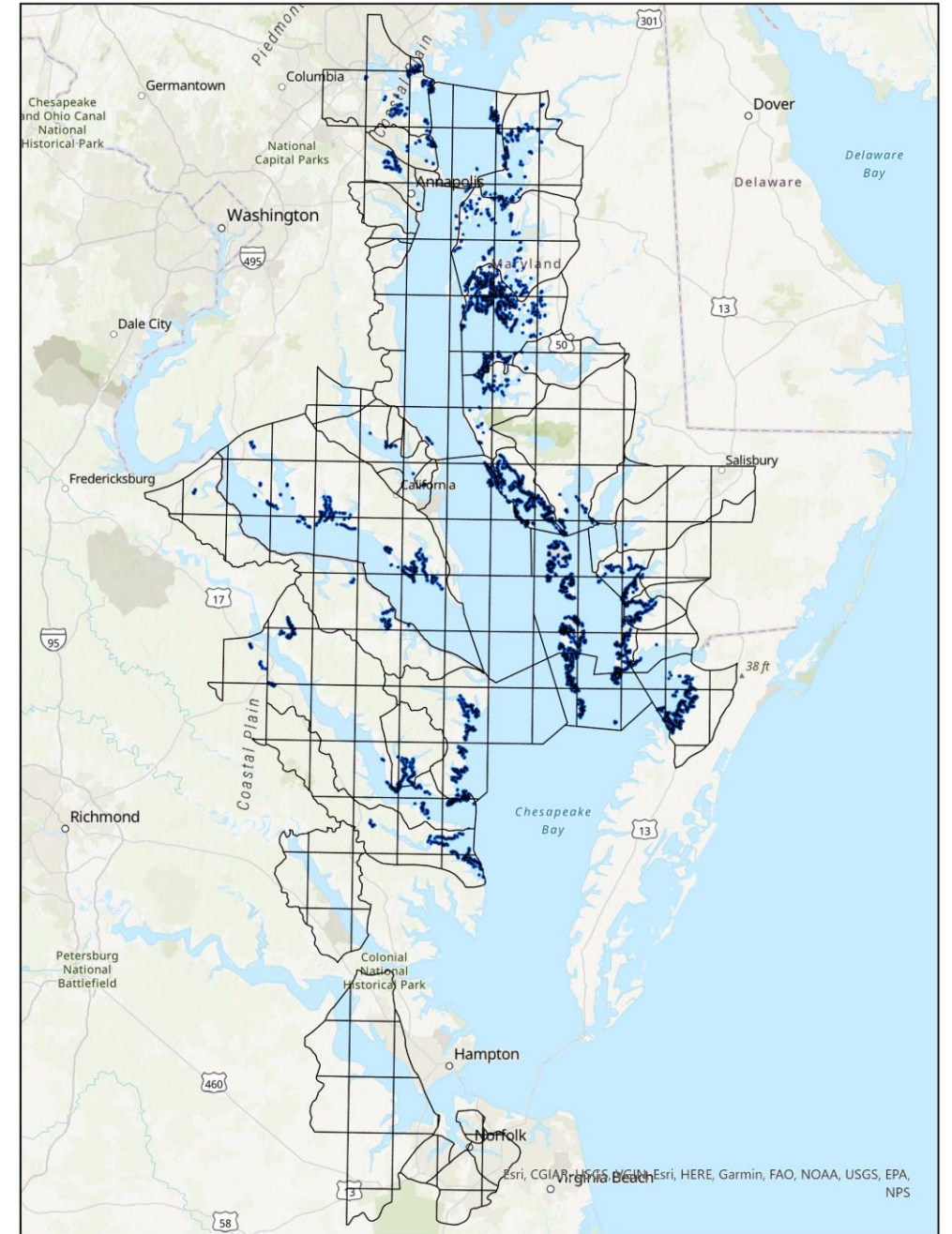# Mapping SAV in the Chesapeake Bay from high resolution satellite imagery

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# Chesapeake Bay known SAV distribution mesohaline

- Activity 1: Using Planet satellite imagery; map the density and distribution of SAV throughout the mesohaline habitats in Chesapeake Bay. We will:

  - Provide accuracy estimates and identify the potential limitations of satellite imagery for these purposes.

  - Develop deep learning classification models for automated mapping

- Activity 2: Develop and document a robust, repeatable method of generating vector-based polygons that are

  - Calibrated to the hand-delineated SAV mapping as estimated from the present SAV survey protocol,

  - Suitable for summarizing acreage and density throughout the mesohaline.

The Opportunity – Satellite Remote Sensing

- Planet now operates >200 cubesats
  - 8 spectral (color) bands (SuperDoves)
  - 3 m ground resolution (nadir)
  - Radiometrically calibrated
  - Atmospherically corrected
  - Harmonized to ESA Sentinel
  - Daily coverage, no tasking required
- SuperDove coverage started in 2020.
- Prior to 2020, Doves had only 4 bands
- SkySat is 0.5 m with 4 bands and requires tasking
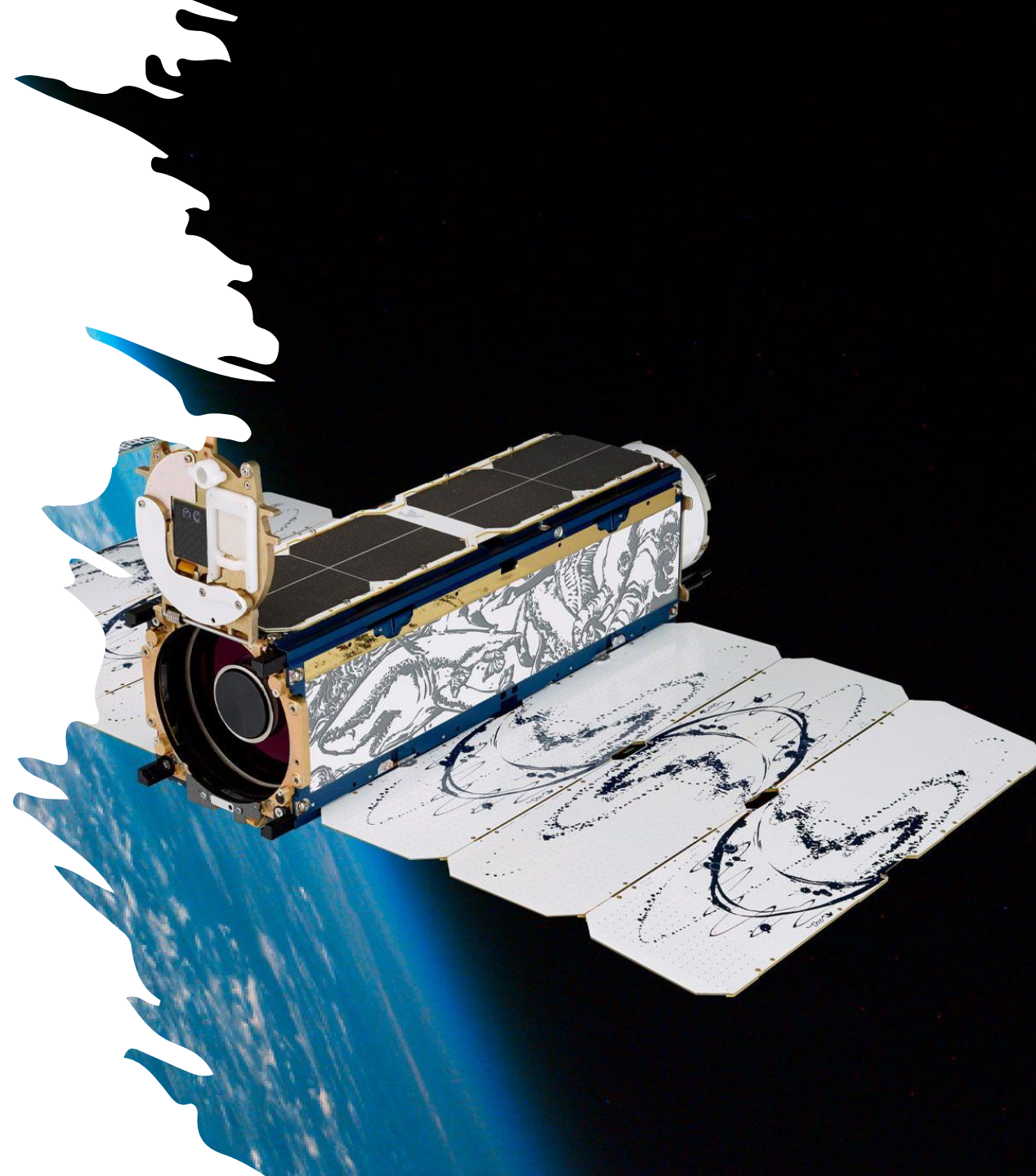
Methodology:

1. Download every clear sky image for every MH section, 2020 through 2024.

2. Initial QC which includes removing images with extensive glint, high turbidity.

3. Preprocessing includes masking of land and deep water leaving only shallow water pixels.

4. Every image then has manually delineated training patches generated by expert user.

   I. Use the VIMS aerial imagery as an initial guide for SAV location
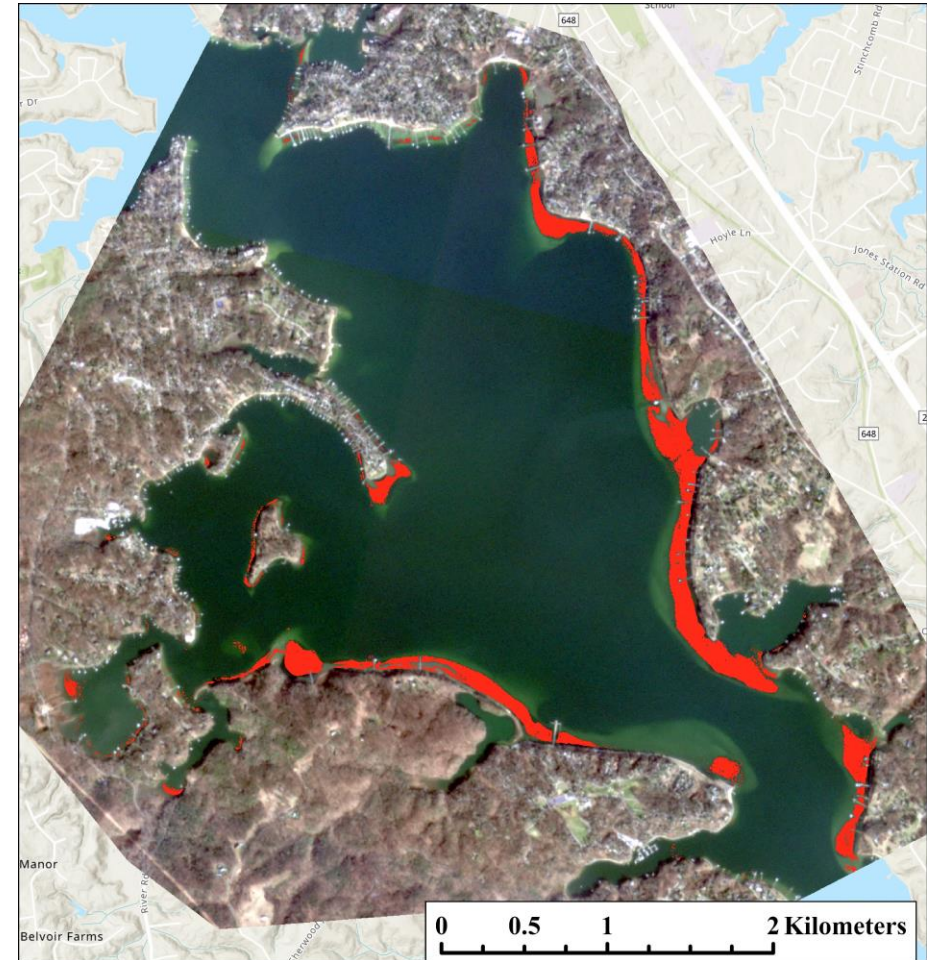   II. Individual images are trained and then classified

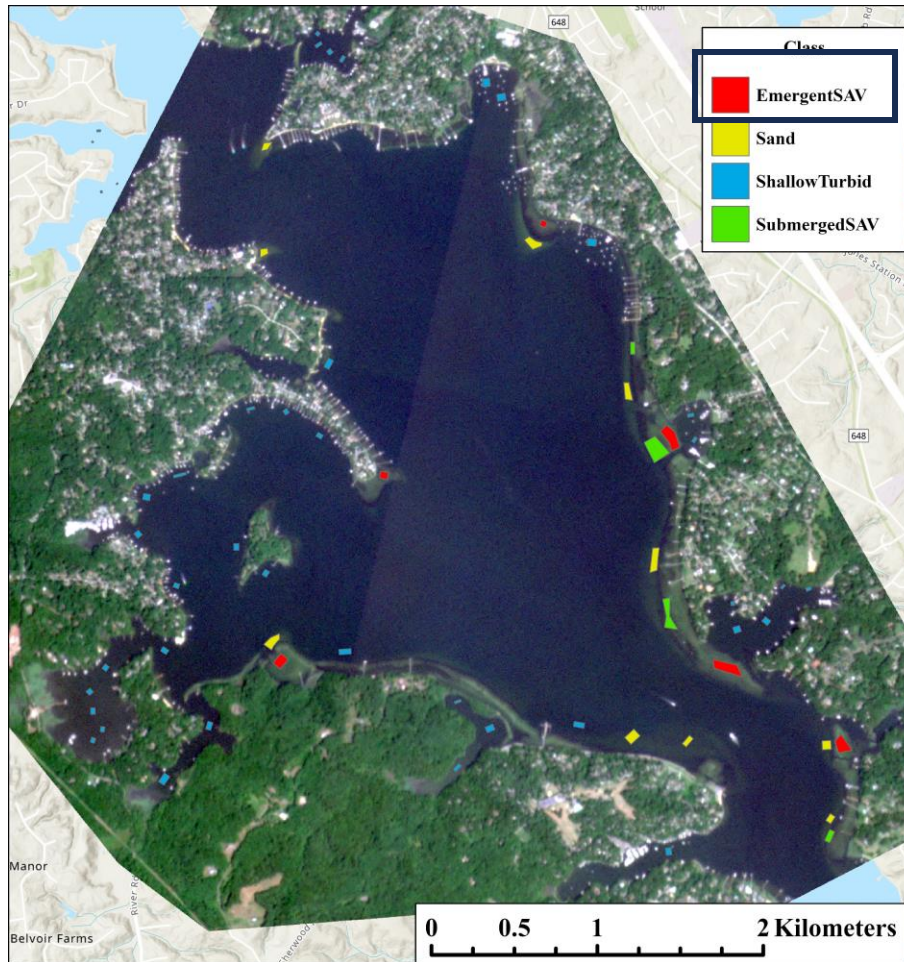# Example: Severn River – February 2024

Mosaic with training patches

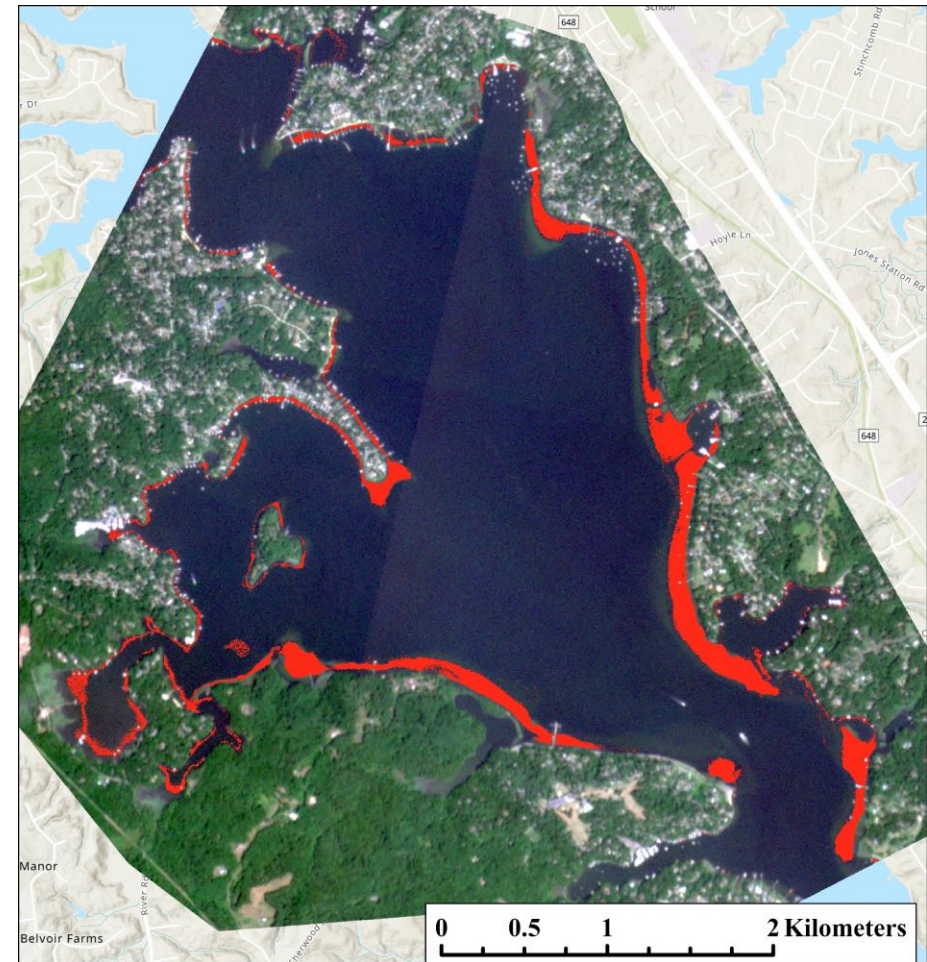| Class	
🟨	Sand
🟦	ShallowTurbid
🟩	SubmergedSAV
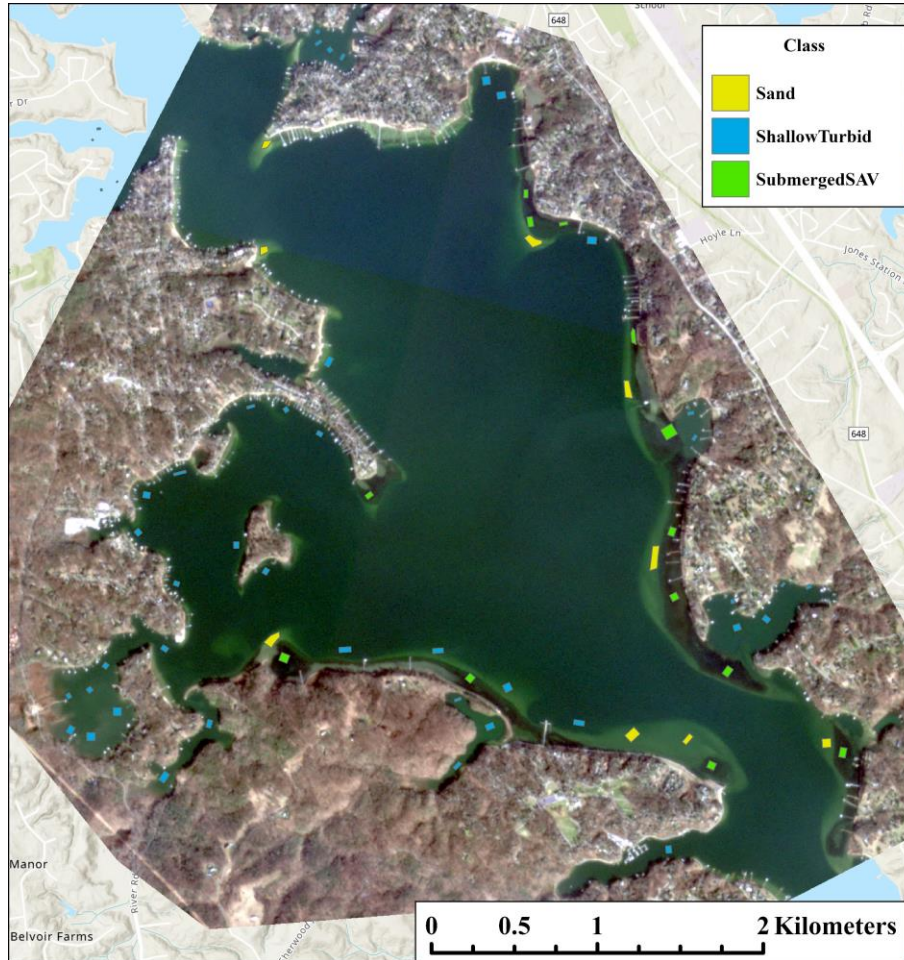
SAV classified

Example: Severn River – August 2024

Mosaic with training patches

SAV classified

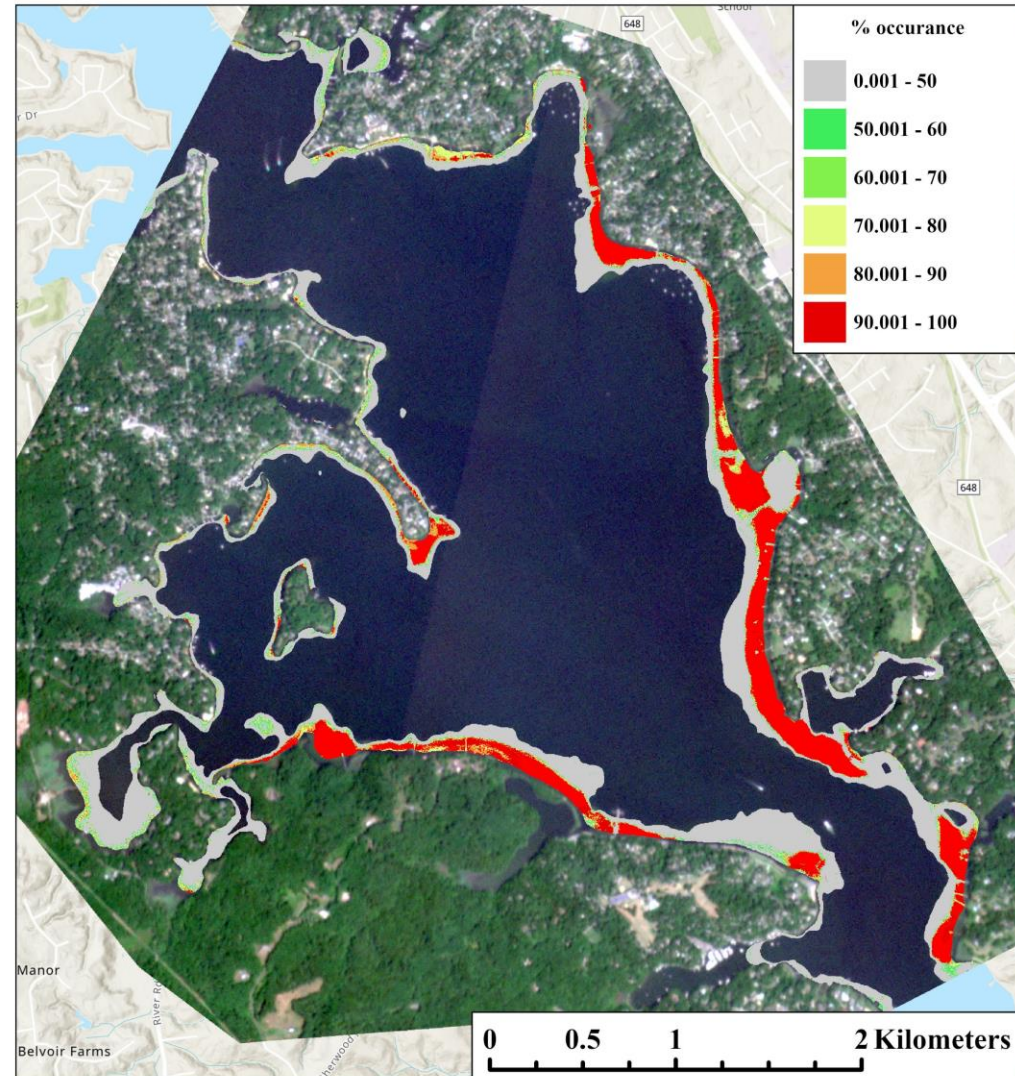Class

- **EmergentSAV**
- **Sand**
- **ShallowTurbid**
- **SubmergedSAV**

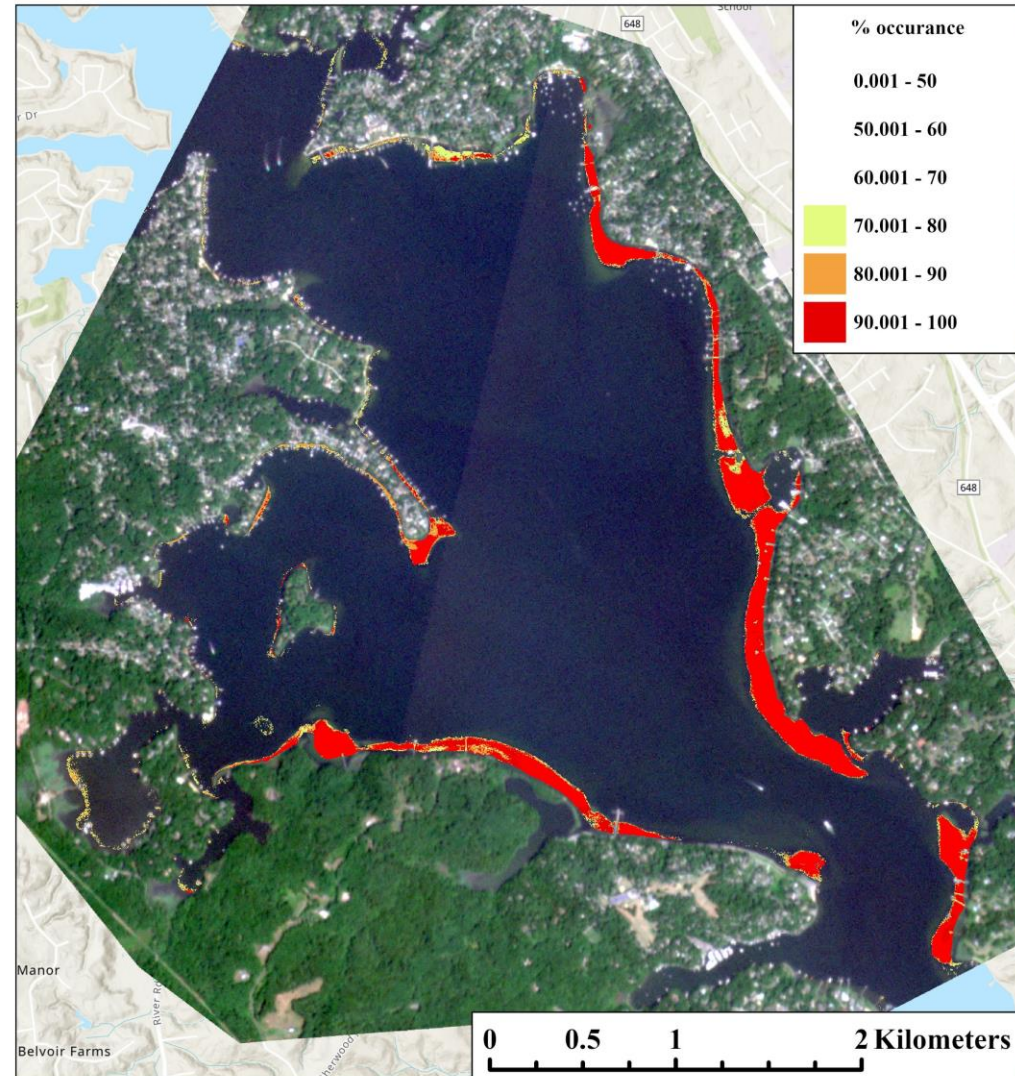# Severn River – Frequency occurrence growing season

All classified presence images are then stacked and percent times that a pixel is identified as SAV is calculated.

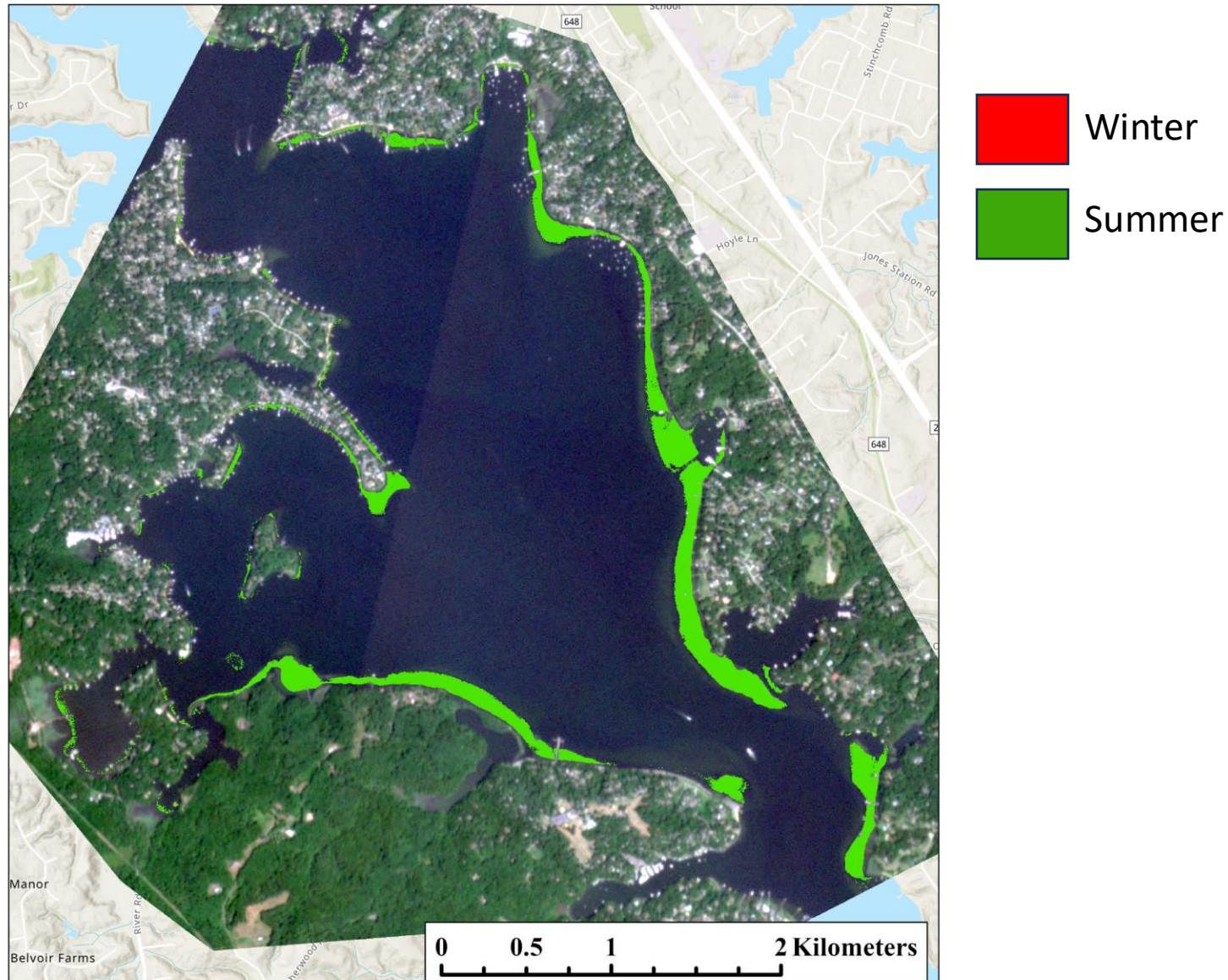# Severn River – Frequency occurrence

- Threshold of frequency occurrence is used to designate location of SAV
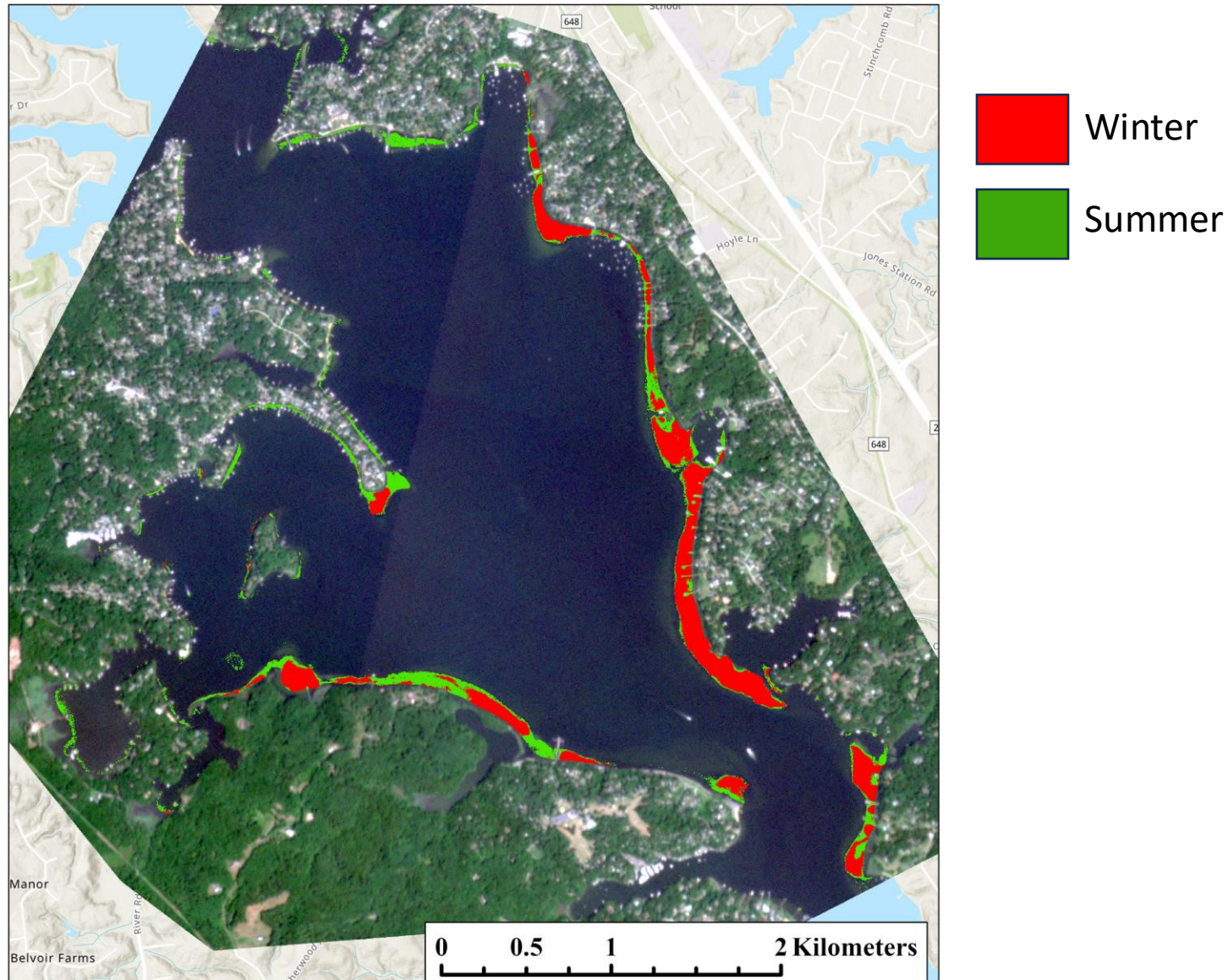- ~ 70%

Product 1: Maps of presence/absence 2024

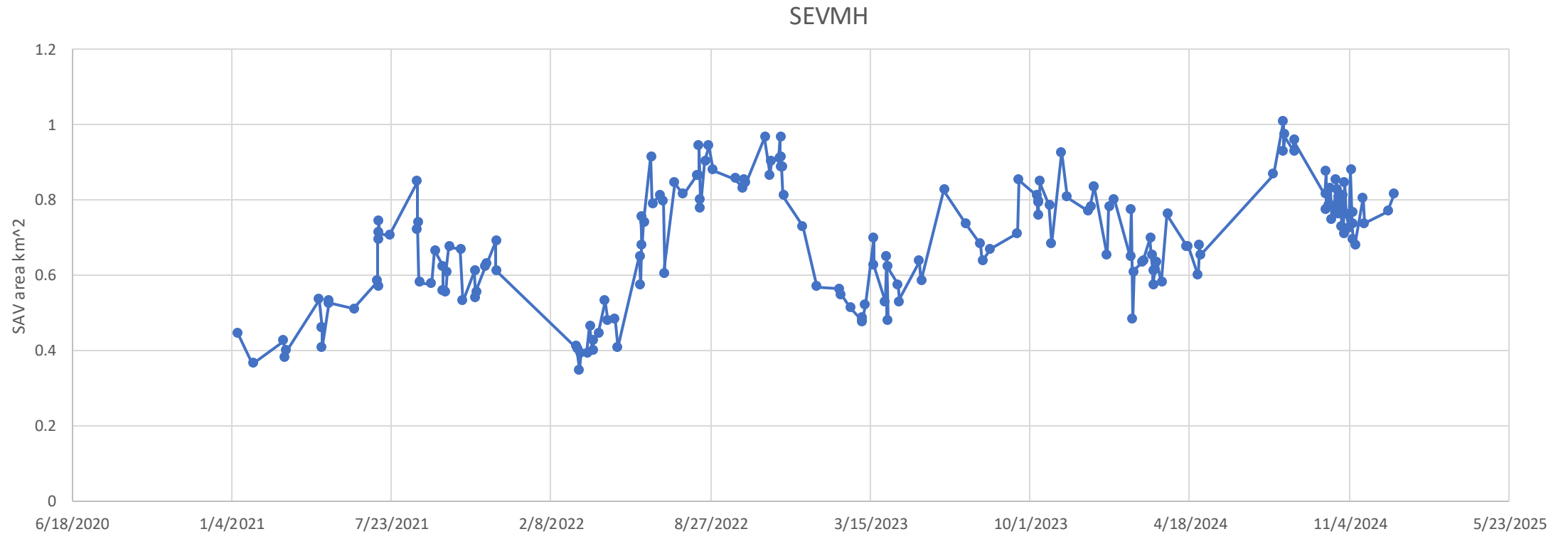- Maps of presence each month/season or growing/non growing can be generated

Product 1: Maps of presence/absence 2024

- Maps of presence each month/season or growing/non growing can be generated

Product 2: Year-round area estimates

SEVMH

Delayed due to NASA renegotiation of Planet account

Image download was halted Sept – Dec 2024

Download has restarted

Current progress – highly vegetated areas were prioritized

Legend:
- ▭ (red) Downloaded
- ▭ (black) Download in progress
- ▭ (gray) Next in queue

Mapping Completed:
2021 through 2024
CHSMH
SEVMH
Mapping in progress:
EASMH
CHOMH1
HNGMH
POCCFMH
CB5MH

Current progress – highly vegetated areas were prioritized

Downloaded

Download in progress

Next in queue

Mapping Completed:
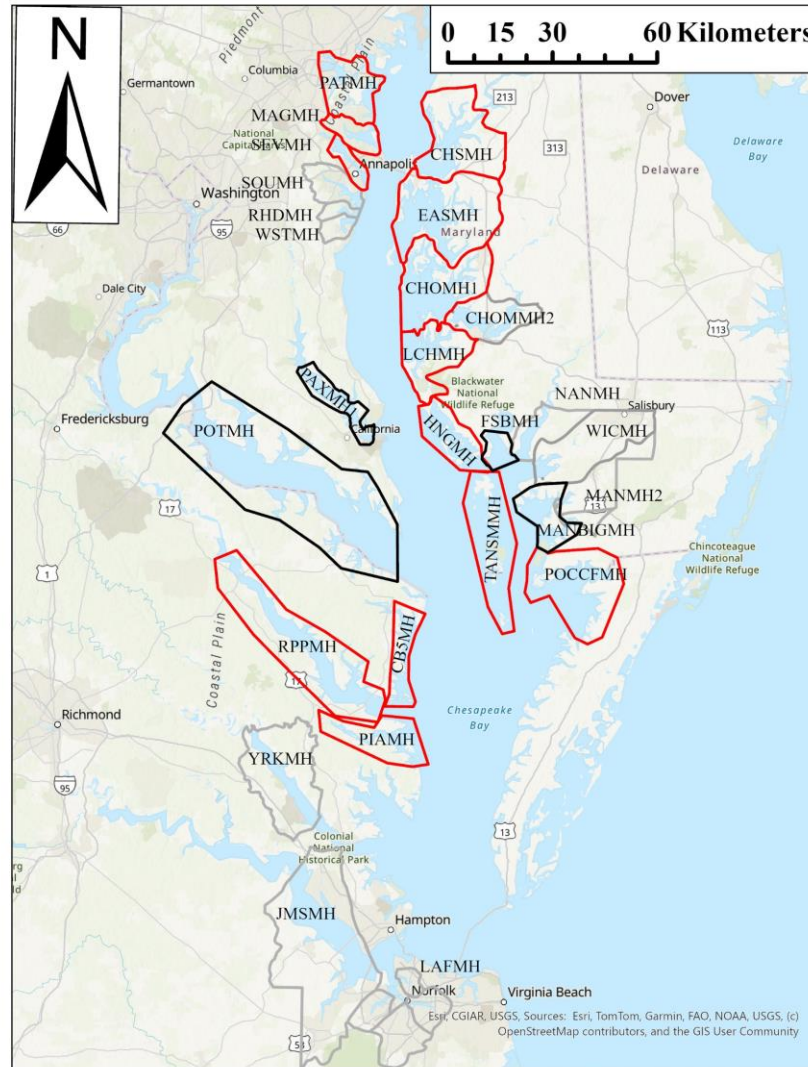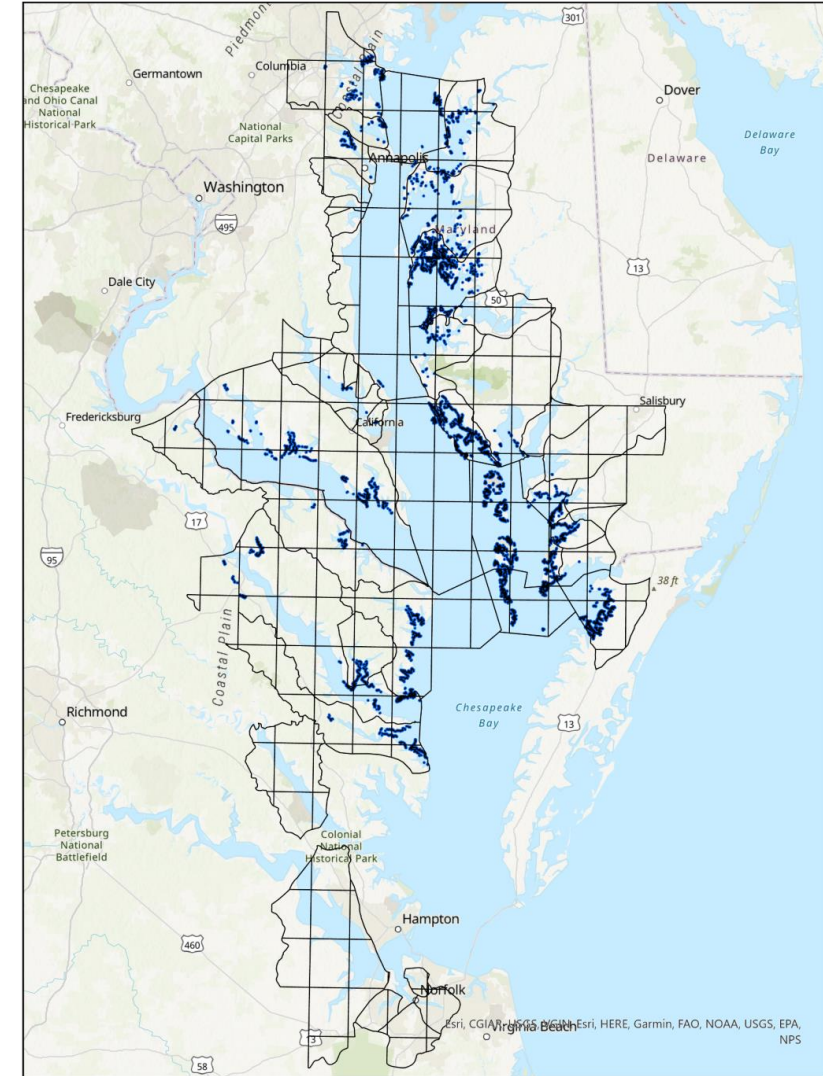2021 through 2024
CHSMH
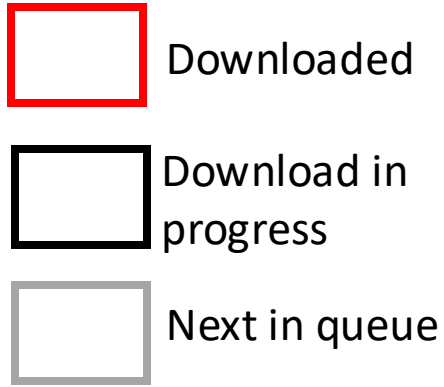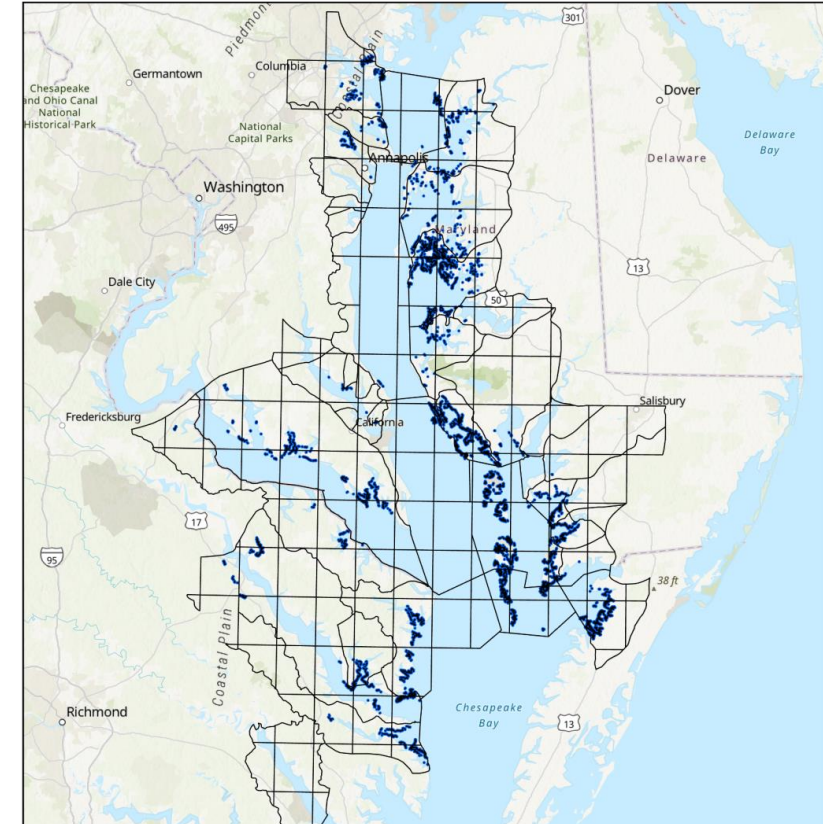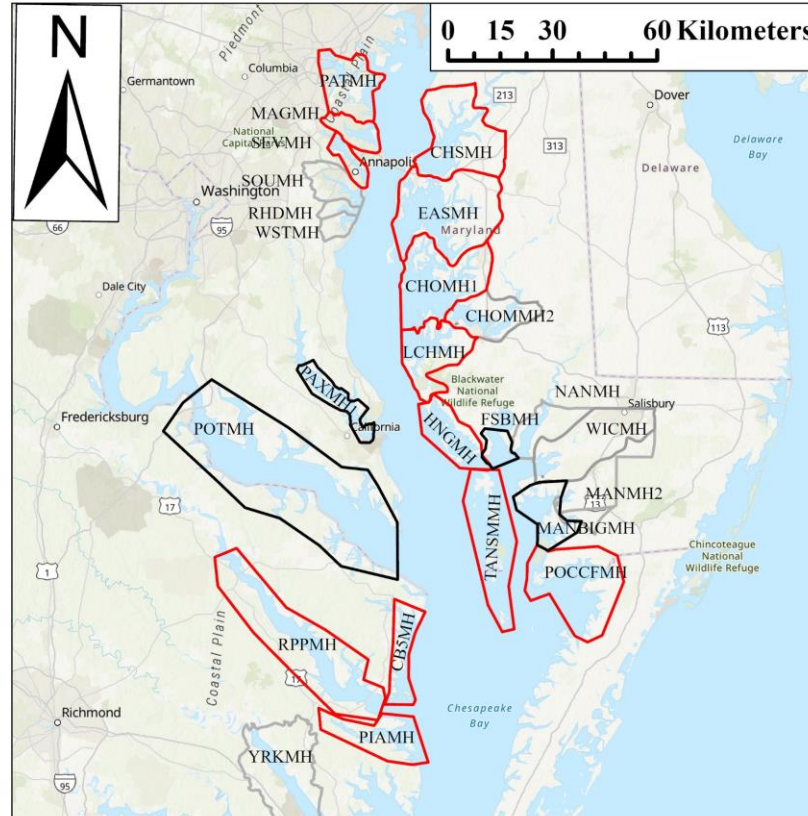SEVMH
Mapping in progress:
EASMH
CHOMH1
HNGMH
POCCFMH
CB5MH

Maps will be available for viewing in an ArcGIS online portal

Expected timeline

- Summer 2025: 2021 – 2024 maps of mesohaline sections completed
  - Identify areas that will need higher resolution.
    - Skysat
    - Drones
    - In situ
- 2025 - 2026
  - Train and test deep learning models for automated classification
  - Validate/Tune density algorithm
  - Compare our machine learning satellite products to hand-delineated aerial polygons