Enhancing Development of Strategies for Coastal Wetland Conservation Prioritization in Virginia Under Climate Change

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Virginia Institute of Marine Science, William & Mary

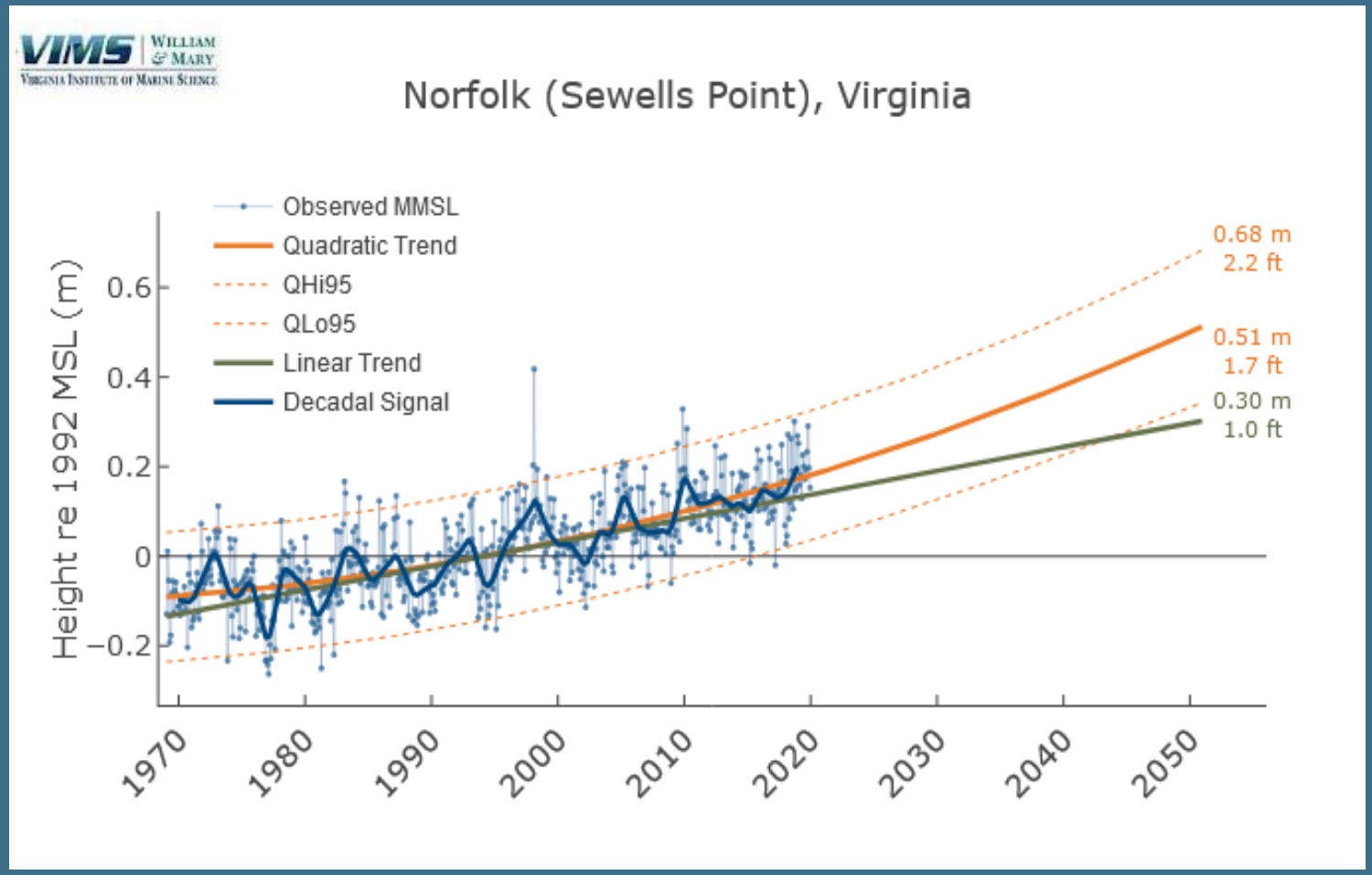
Project goals:
Improve our understanding of our changing tidal marshes

- **Increased ability to monitor vegetative changes**
  - Investigate the potential for remote sensing to enhance tidal marsh inventory
  - Using drone and satellite (Planet) data

- **New baseline data for marsh bird use of changing systems**
  - Bird use surveys of marshes on the Eastern Shore of VA
  - Evaluate newly created marsh areas as habitat and compare the newly established community to reference bird communities within historic marshes.

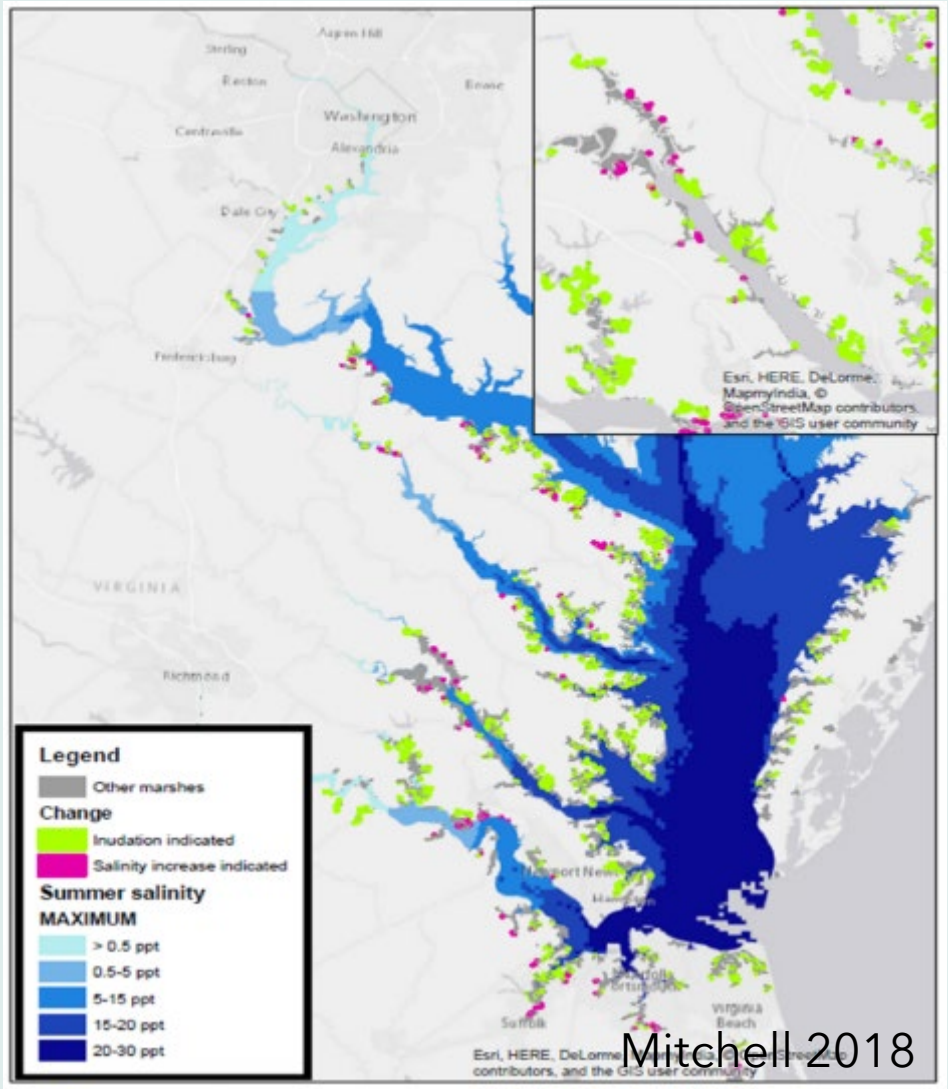
Virginia Tidal Marsh Inventory

- Survey info:
  - Historic TMIs vegetation surveyed from 1973-1991
  - Current TMIs vegetation surveyed from 2010-2018
  - Average time between surveys was 32 years
  - ~ 15 cm of sea level rise
  - Expect ~50cm sea level rise in next 30 years



Survey of over 17,000 marsh plant communities

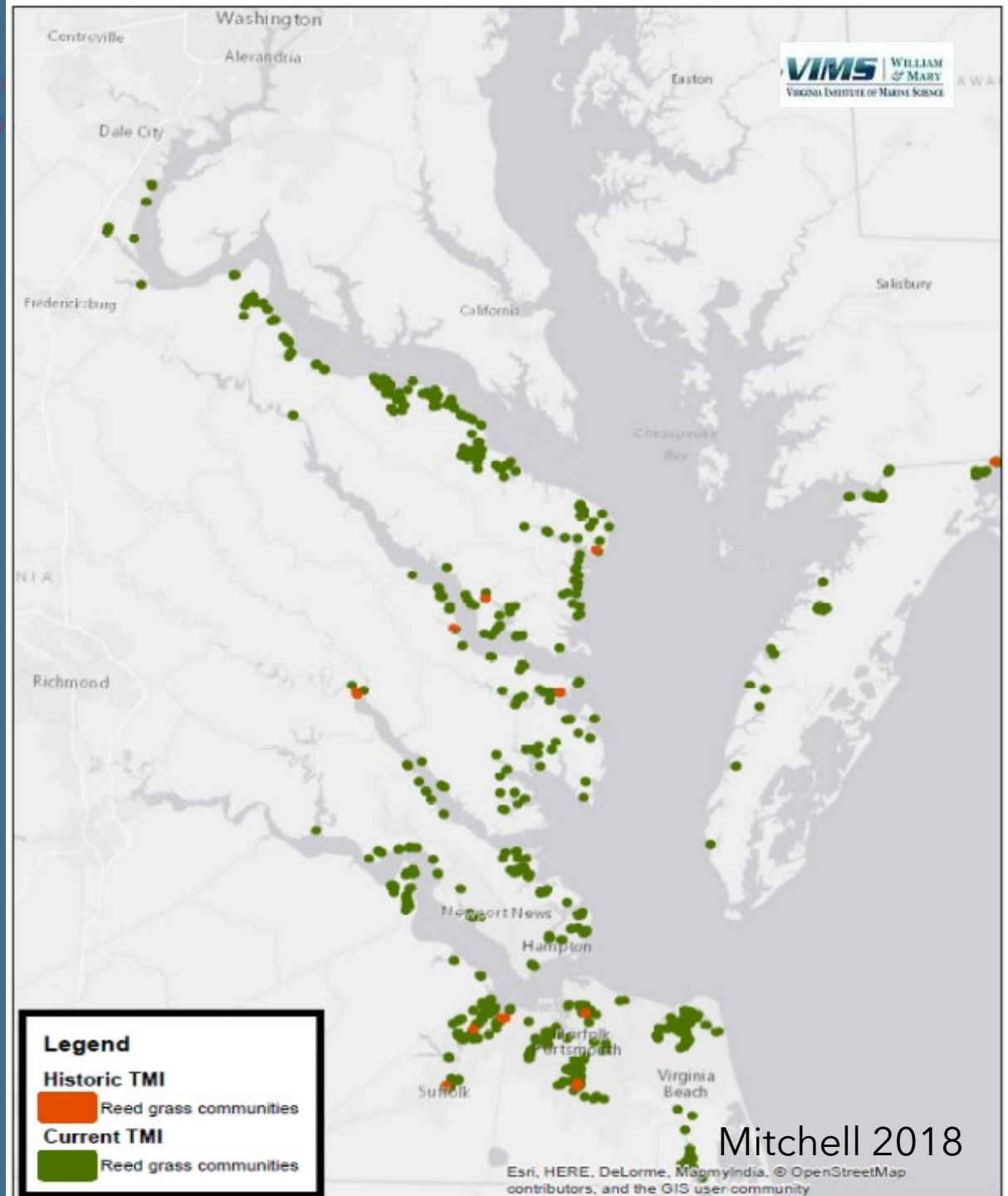
Sea level rise is changing our marshes



Mitchell 2018

Expansion of an invasive marsh plant (*P. australis*)

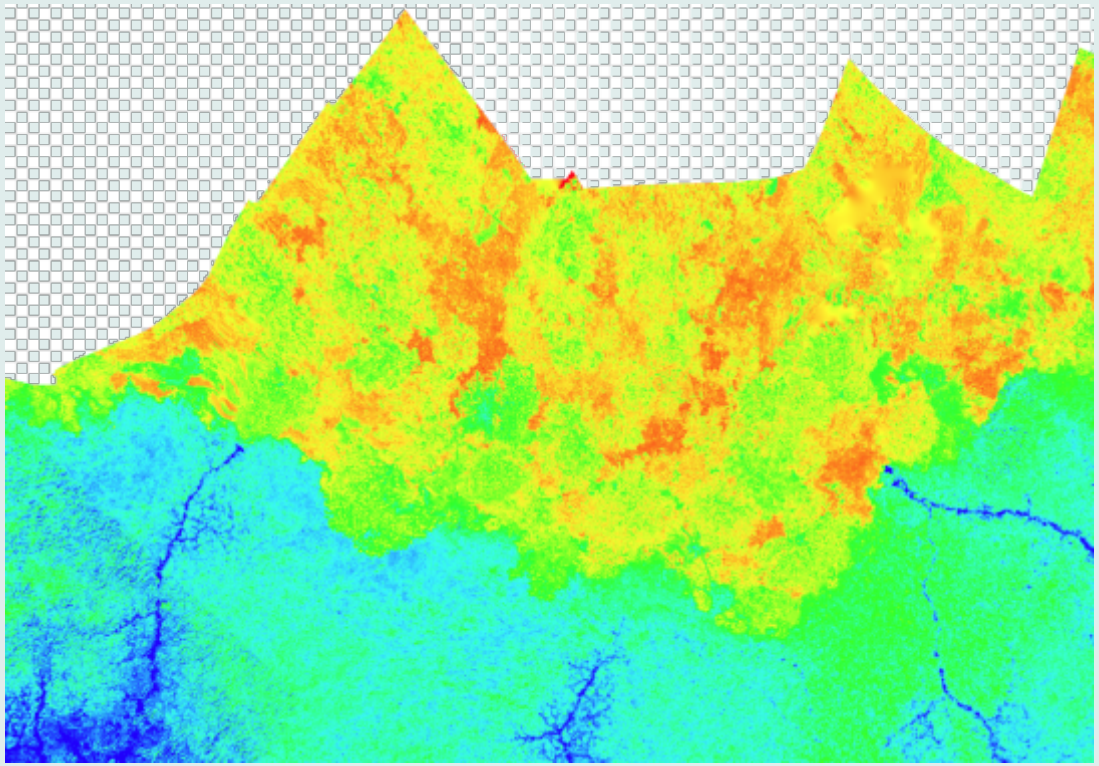
- 724 marsh plant communities (4% of marshes) converted to *P. australis*
- This actually underestimates the distribution
  - Present, but not dominant in many marshes
  - *P. australis* patches found in many headwaters
  - *P. australis* often leading edge of marsh migration into forested areas



Mitchell 2018

Problem: We need a faster method to survey and monitor changes in marsh vegetation

- **Drone surveys** allow for precise location and identification of plant species
  - Tricky to use AI for plant identification, so still needs expert analysis



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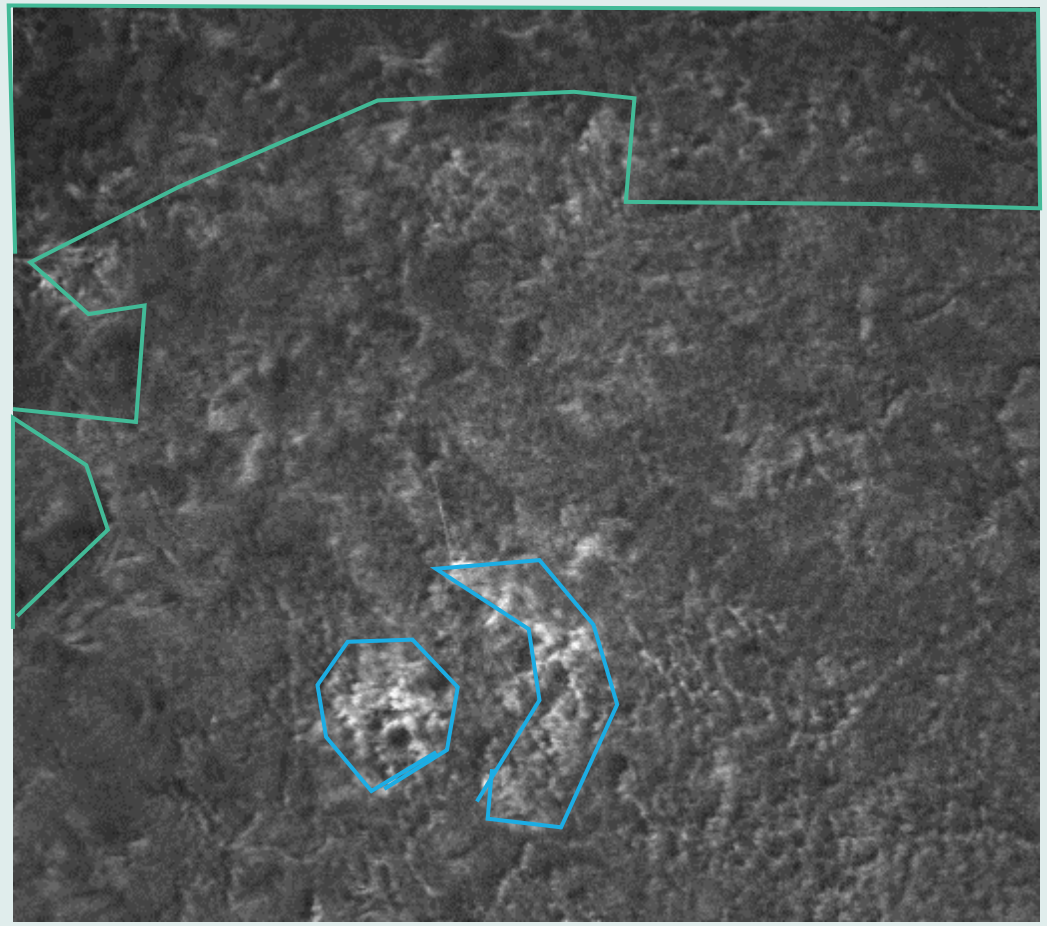


- **Satellite data** reduces field time and allows for more frequent monitoring, but currently can't identify species reliably (pixel resolution is an issue)
- Using drone plant identification to train AI models for satellite data

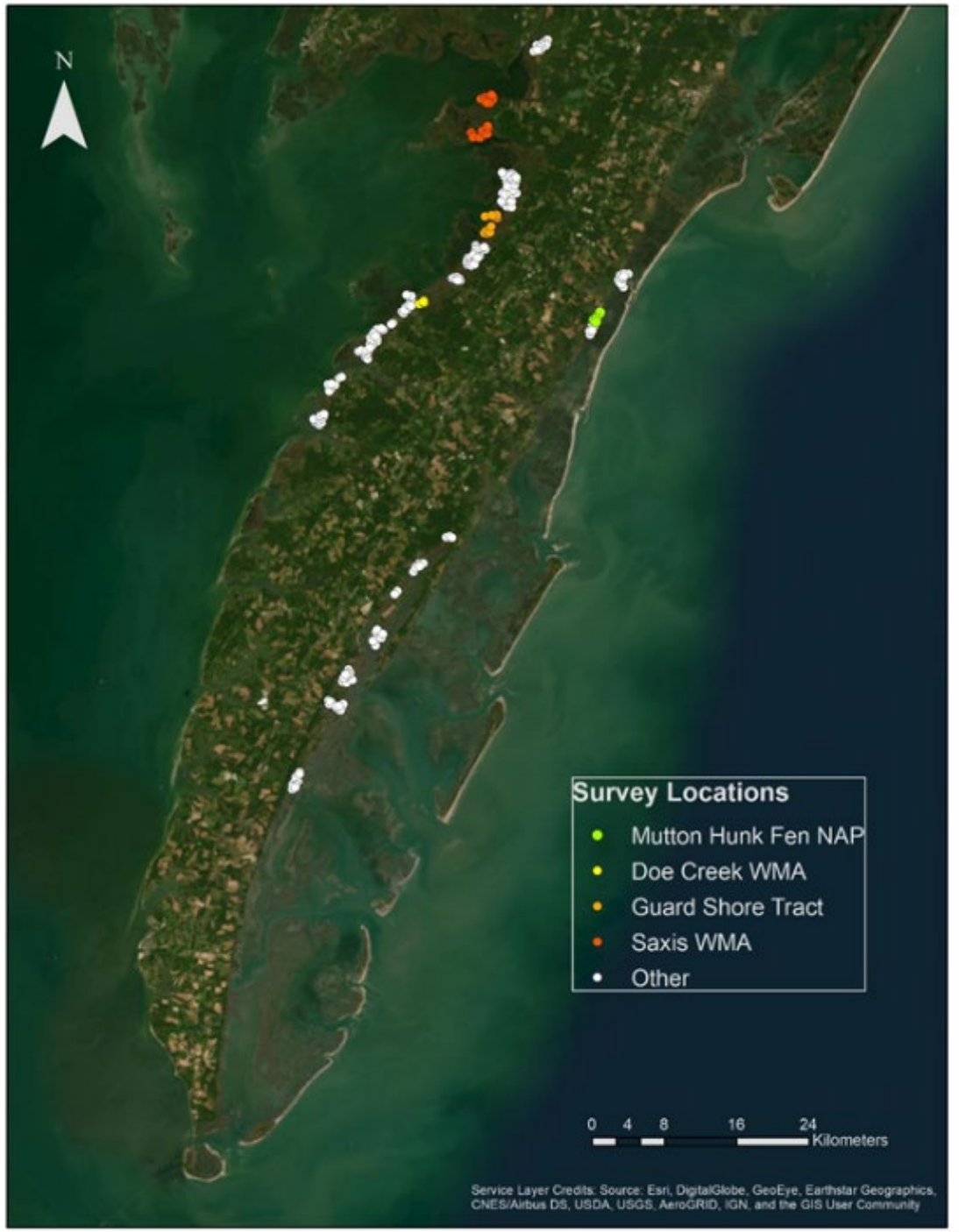
Problem: We need to understand the impact of marsh change on habitat provision

- Key survey during the early 1990's established a baseline for bird communities (including marsh obligates & facultative species)
- Changing marsh vegetation impacts bird usage
- Example: Needlerush marshes have become more common on the eastern shore since the mid-20th century and the species that are more likely to use these patches for nesting remain relatively common while others have declined precipitously

https://ccbbirds.org/2023/06/01/ccb-and-saltmarsh-bird-surveys/

Bird survey methods

- Use aerial photos to identify marsh patches that had converted from forest or agriculture
- Surveyed in these marsh patches four times during the nesting season
- Fit occupancy models for individual species and N-mixture abundance models for saltmarsh obligate, marsh-obligate, and marsh facultative breeding birds



New Marsh

Example of a marsh patch that has converted from upland habitat.

The linear water feature is a former agricultural irrigation ditch which may alter the natural tidal flow and allow species that are less tolerant of saline conditions, like Phragmites and Black needlerush to dominate the plant community.

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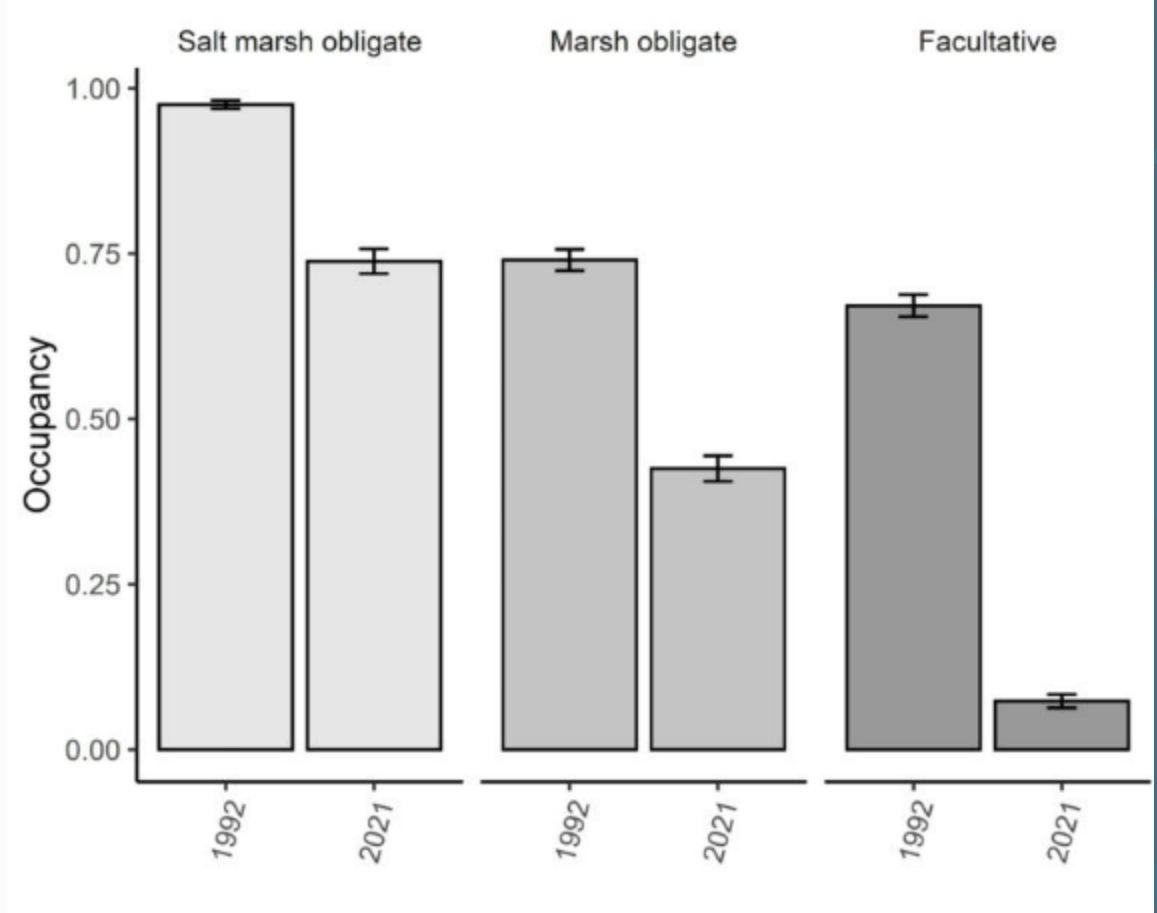

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Bird survey results

(preliminary)

The "newness" of a marsh on the seaside was a significant predictor for all three groups of birds and newly created marshes were associated with **lower** abundance for saltmarsh and marsh obligate species, but **positive** for facultative marsh breeding species

State of our understanding

- Tidal marsh conditions are changing rapidly → changing extent and vegetation
- Monitoring needs to be more frequent to keep up with accelerating SLR
- Although marshes are expanding in some areas, new marsh does not always provide the same habitat

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