



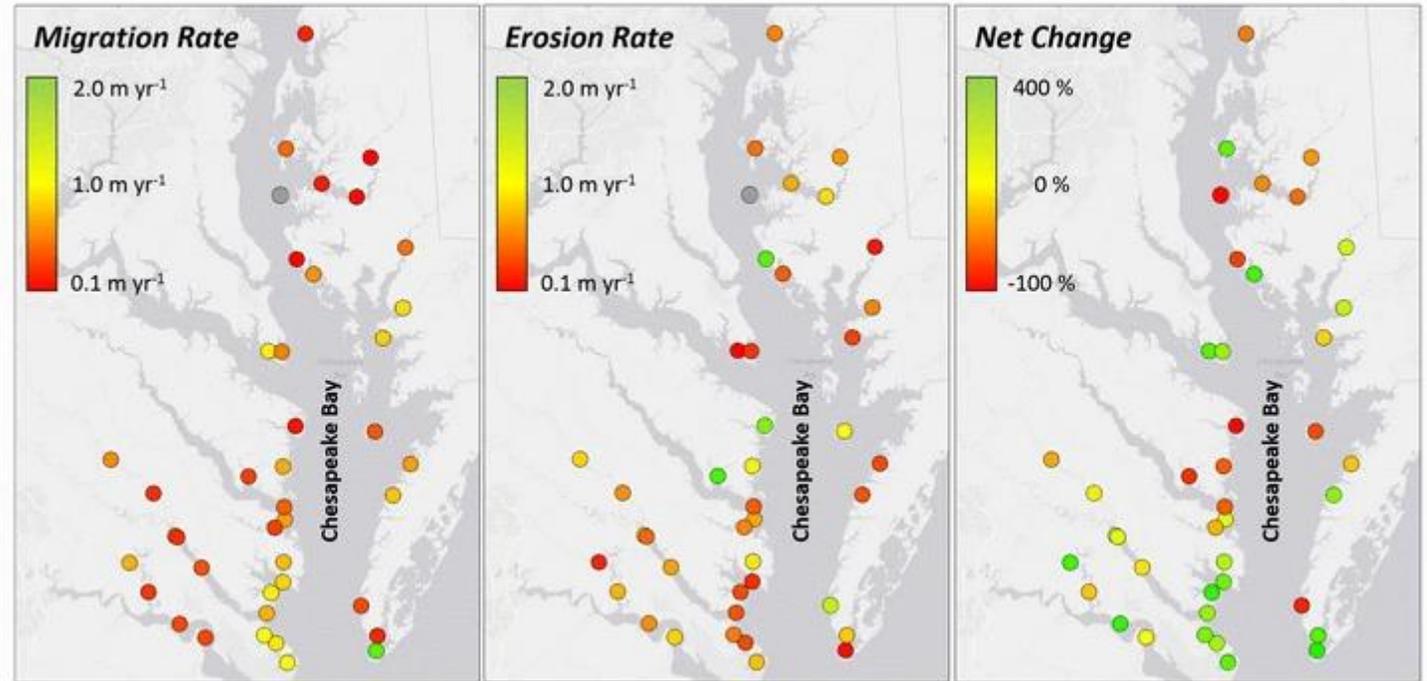
Bird Use in Recently Created Marshes

Chance Hines, Bryan Watts, Molly Mitchell

Center for Conservation Biology, Virginia Institute for Marine Studies

William & Mary

Marsh Migration



- Marshes in Chesapeake Bay maintaining spatial extent – Schneider et al 2017



Sea Level Rise and Marshes

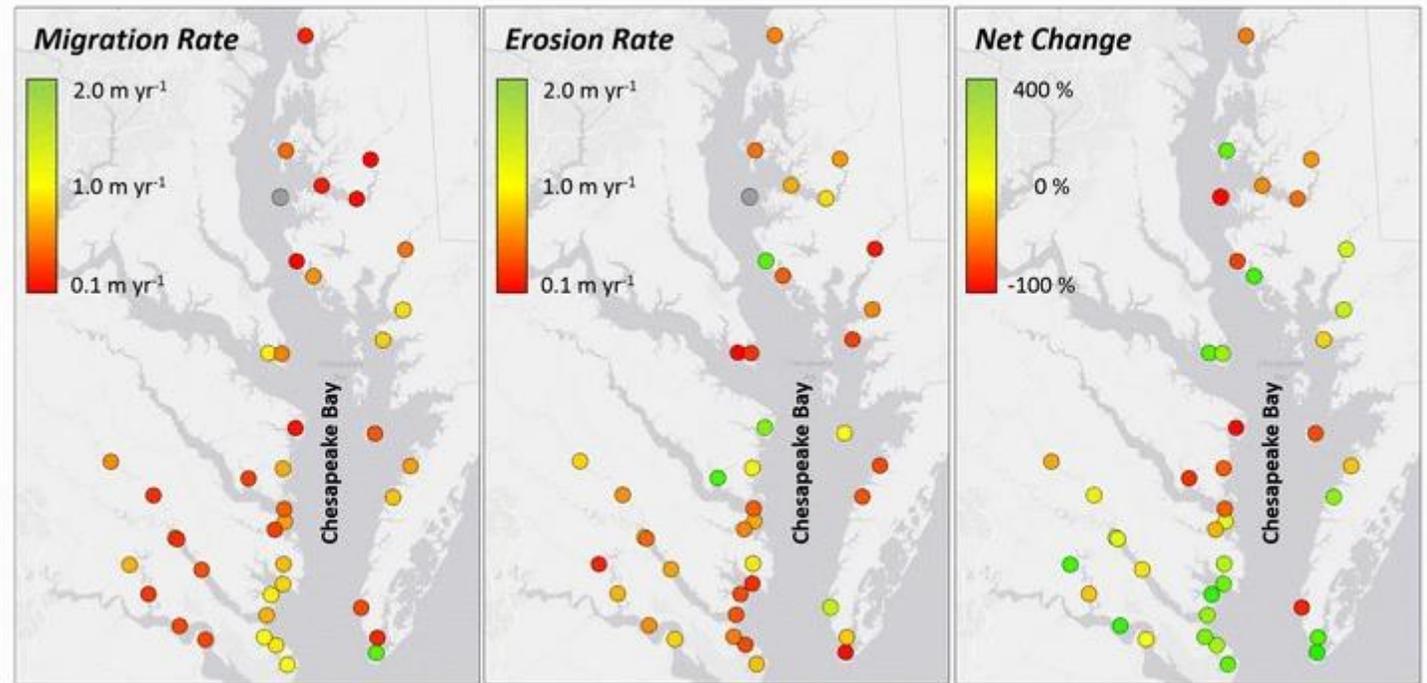
Marsh migration into adjacent
uplands

Sea Level Rise and Marshes

Marsh erosion away from the
seaward edge



Marsh Migration



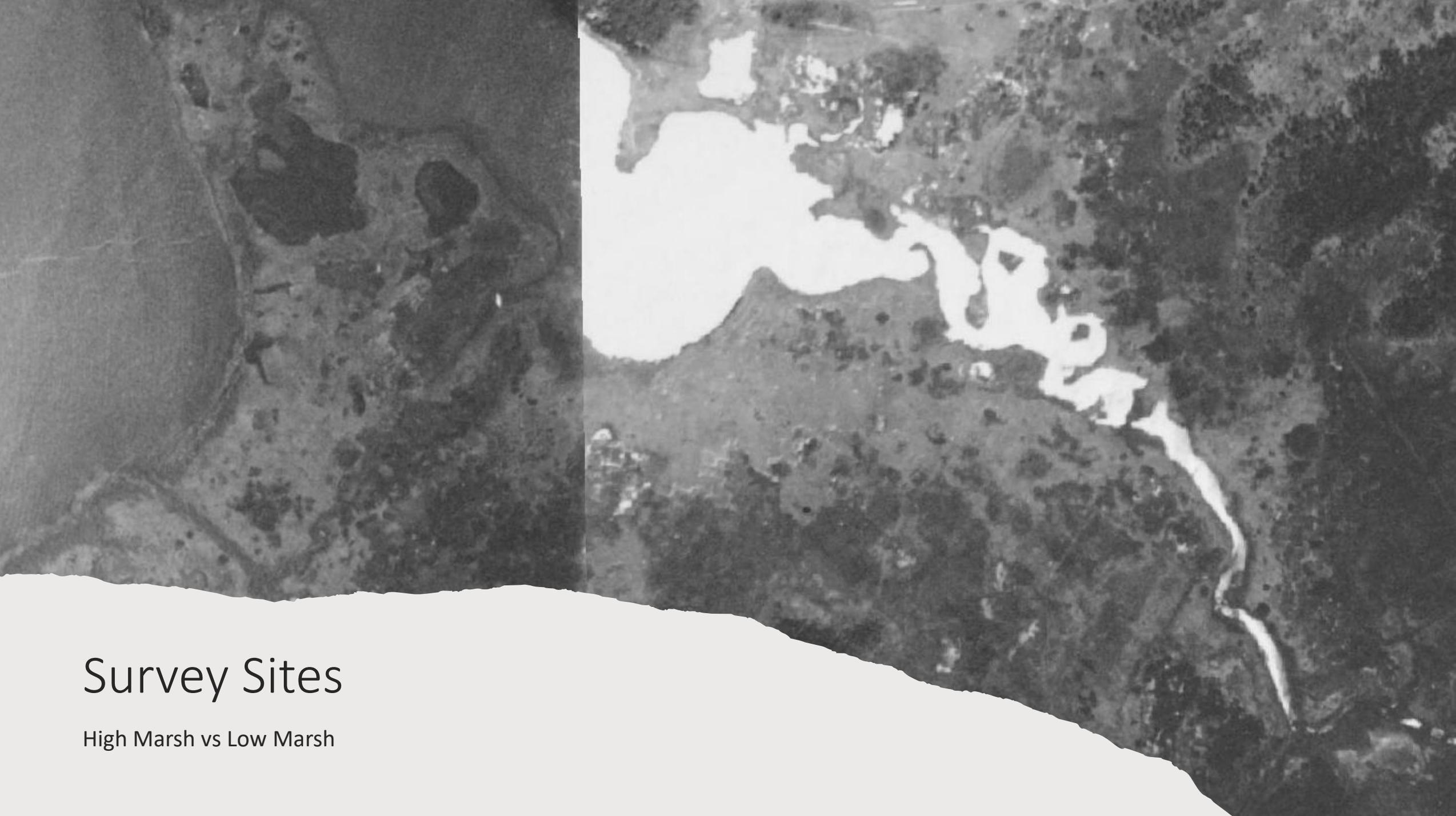
- Over 100,000 acres created over last 100 years (~1/3 of existing marsh)



Survey Sites

VIMS shoreline change viewer

https://www.vims.edu/research/units/programs/ssp/gis_maps/index.php



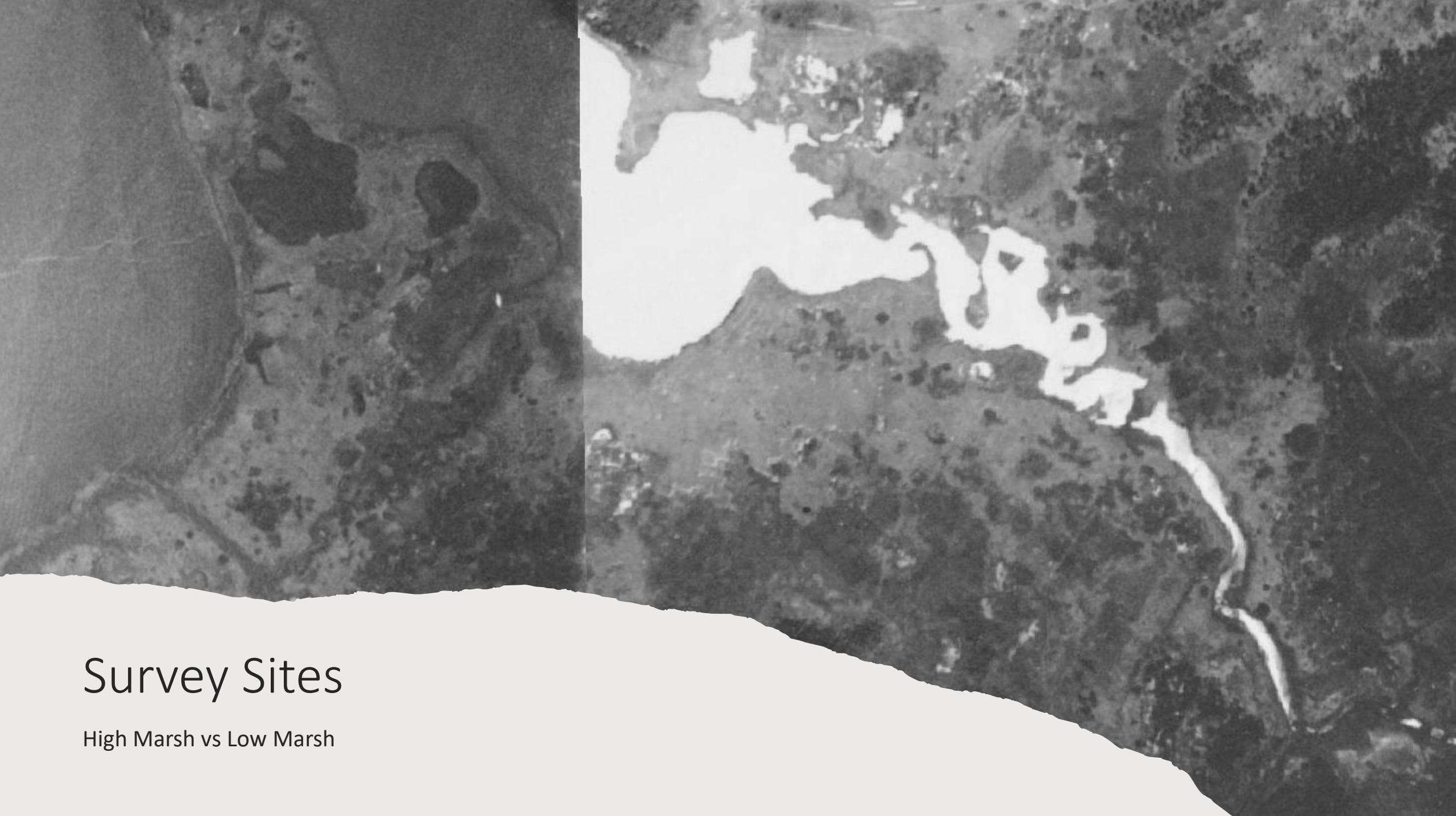
Survey Sites

High Marsh vs Low Marsh



High Marsh





Survey Sites

High Marsh vs Low Marsh



Low Marsh



Low Marsh

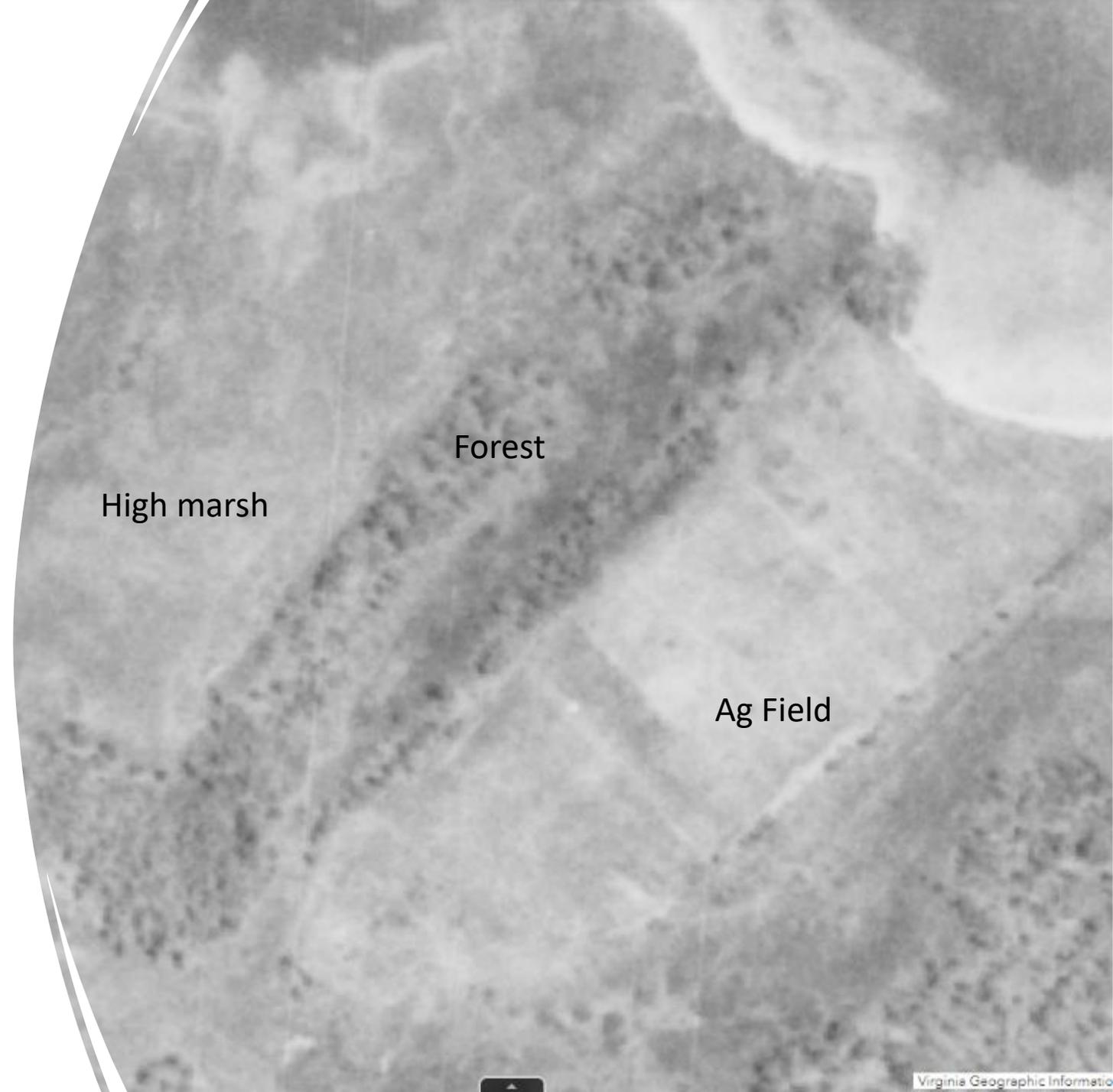


Survey Sites

High Marsh vs Low Marsh

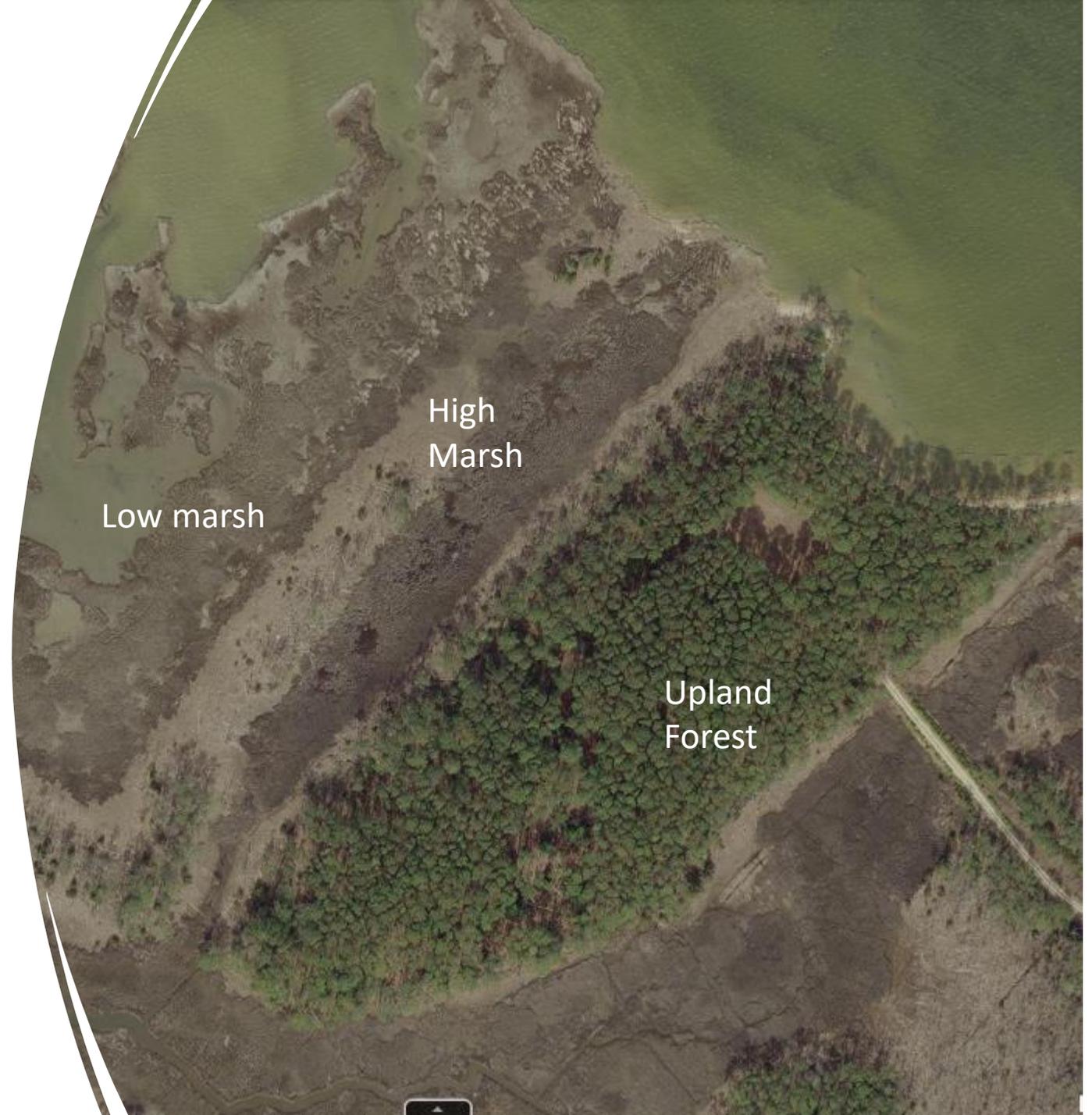
Survey Sites

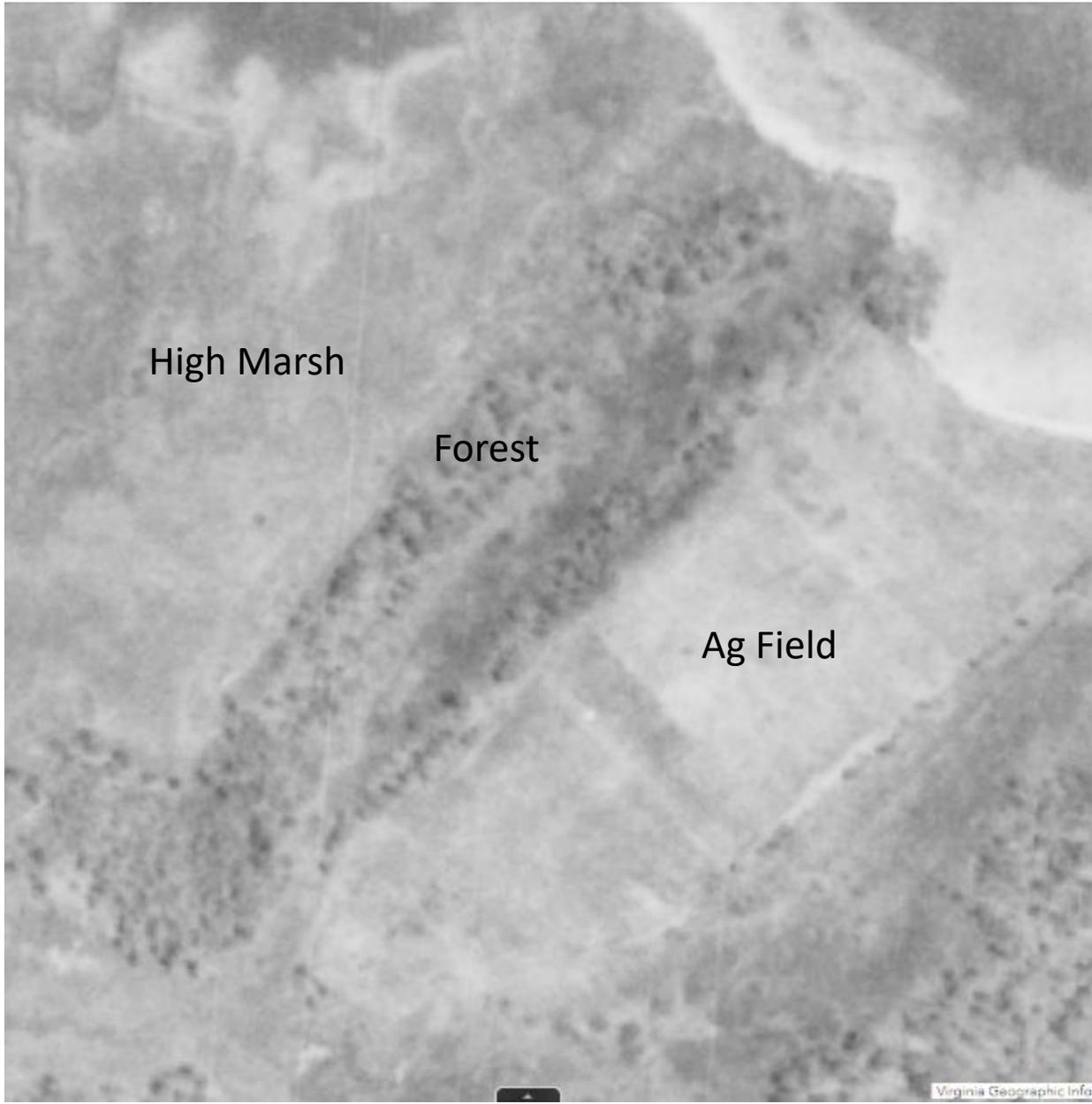
- Recent Marsh Conversion



Survey Sites

- Recent Marsh Conversion





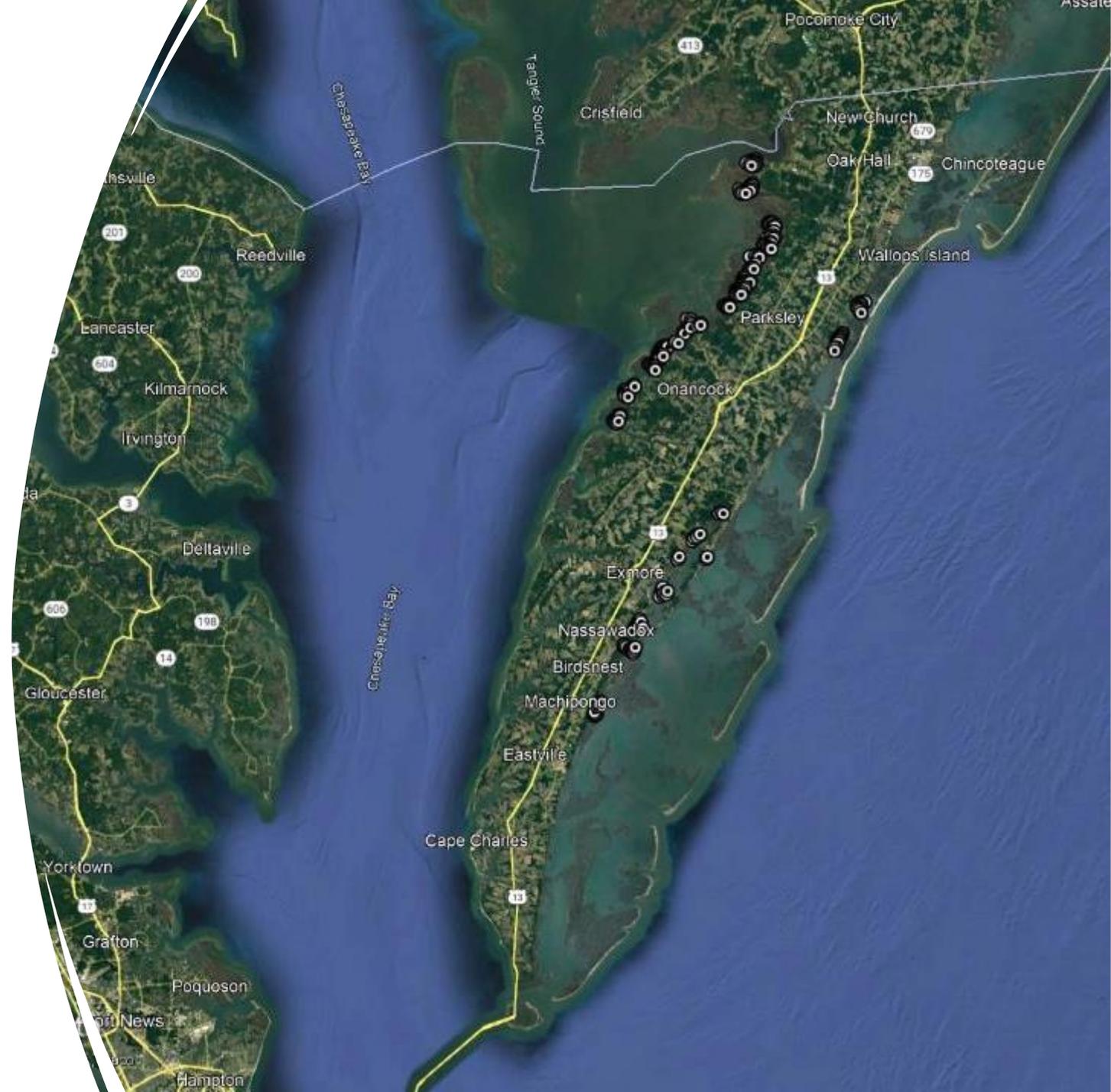
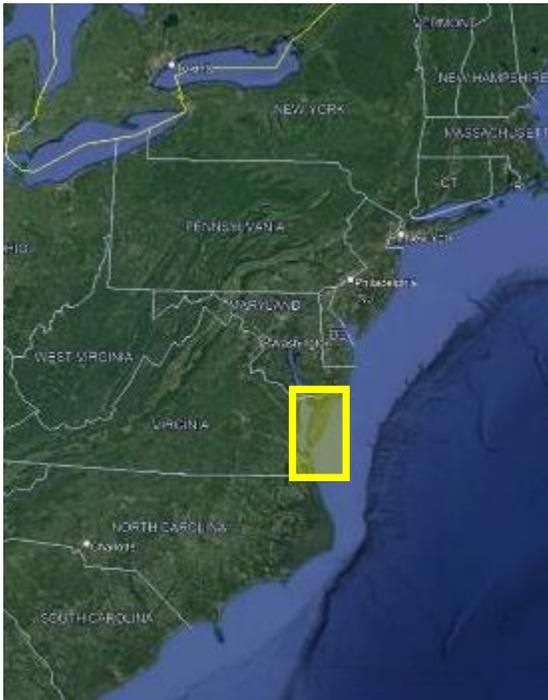
Survey Sites

- Past Agricultural Use



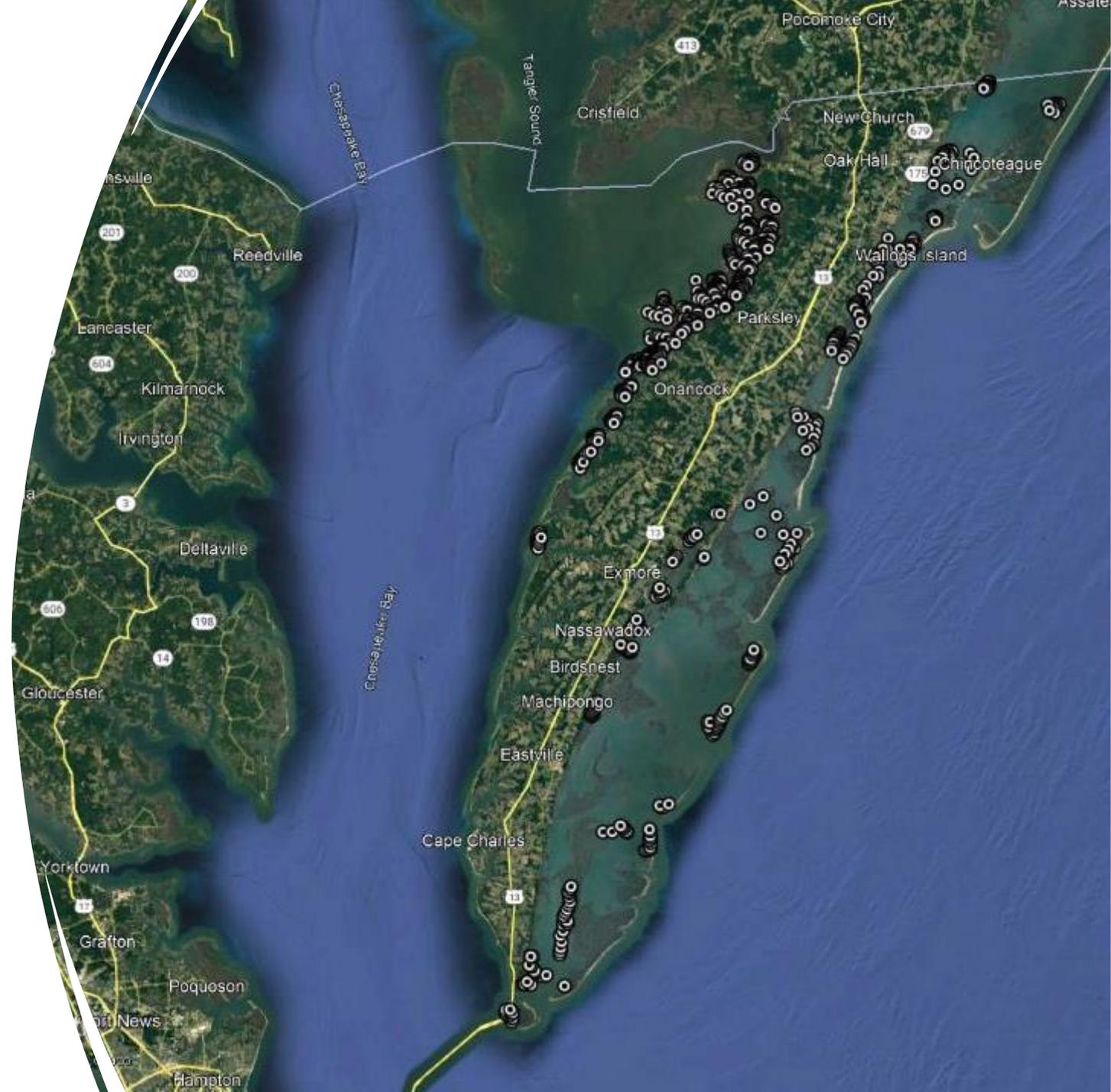
Survey Sites

- 2022: 238 sites



Survey Sites

- 2023: 615 sites



Marshbird Surveys

- Followed SHARP Protocol
 - 4 survey rounds April 15 – July 31
 - 10 minute surveys
 - Last 5 minutes with secretive marshbird audio playback
 - Points separated by ≥ 200 m



Habitat Parameters

- Estimated Cover
- # Trees
- Horizon angle



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Organic Matter

- Soil cores at subset of points (n = 134) to quantify % organic matter



Marshbird Data Analysis

- Constructed occupancy models in package 'Unmarked'
- Used model selection to select best models (lowest AIC score)
- Predictors included
 - Environmental predictors in detection function
 - Whether site was on bayside or seaside, latitude and interaction between terms
 - Whether site was previously ag, recently converted and interaction between terms
 - % cover for each habitat type, counts of trees, mean horizon angle
 - % cover for each plant species

Marsh Nesting Bird Guilds

- Saltmarsh Obligates



- Marsh Obligates



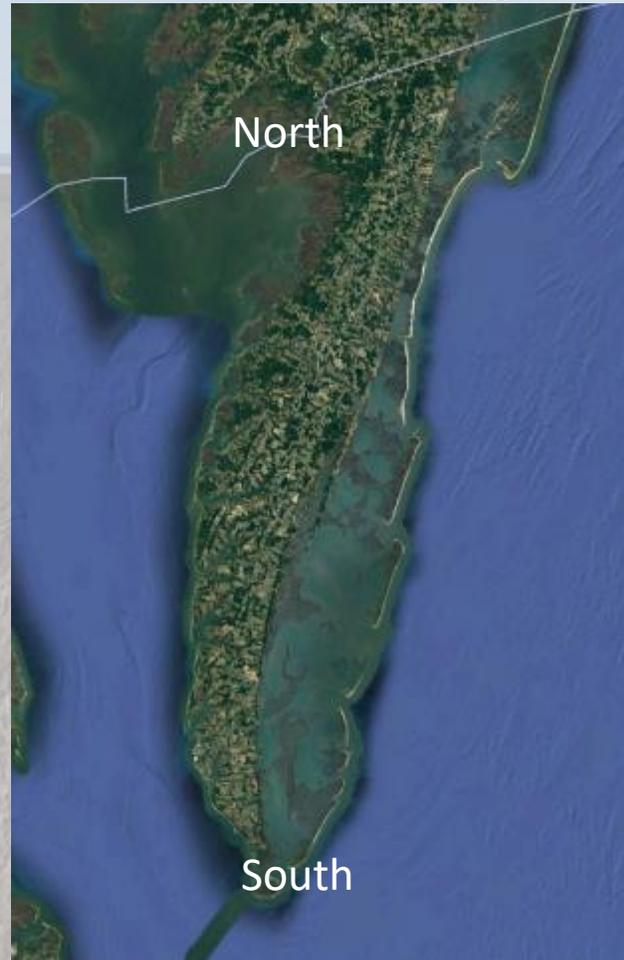
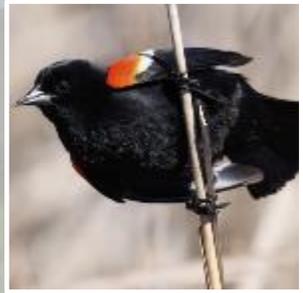
- Marsh Facultative



Parameters Affecting Occupancy

Geographical Location

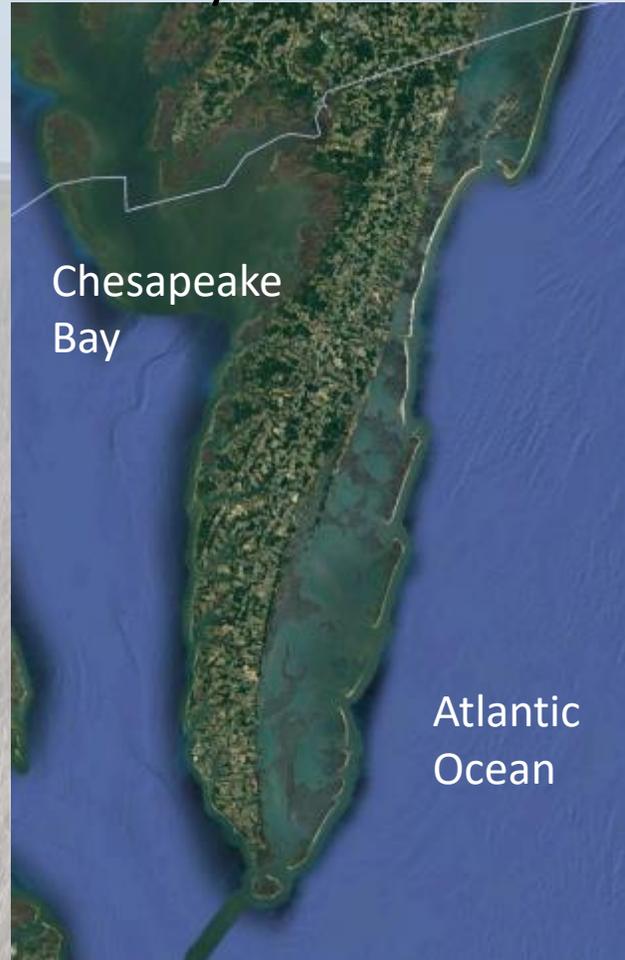
- North-South gradient



Parameters Affecting Occupancy

Geographical Location

- Bayside vs Seaside



Parameters Affecting Occupancy

Marsh History

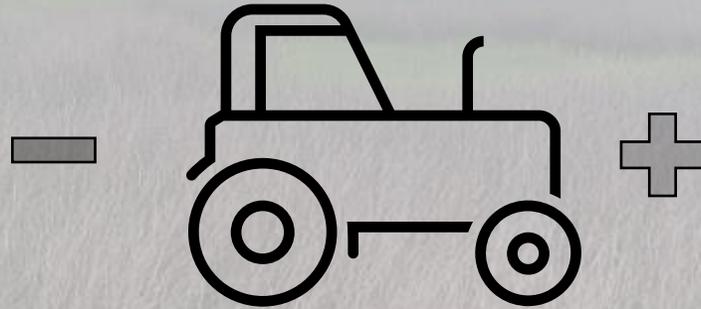
- Recently Converted



Parameters Affecting Occupancy

Marsh History

- Agricultural Past



Parameters Affecting Occupancy



Veg and other

- Mean horizon



Parameters Affecting Occupancy

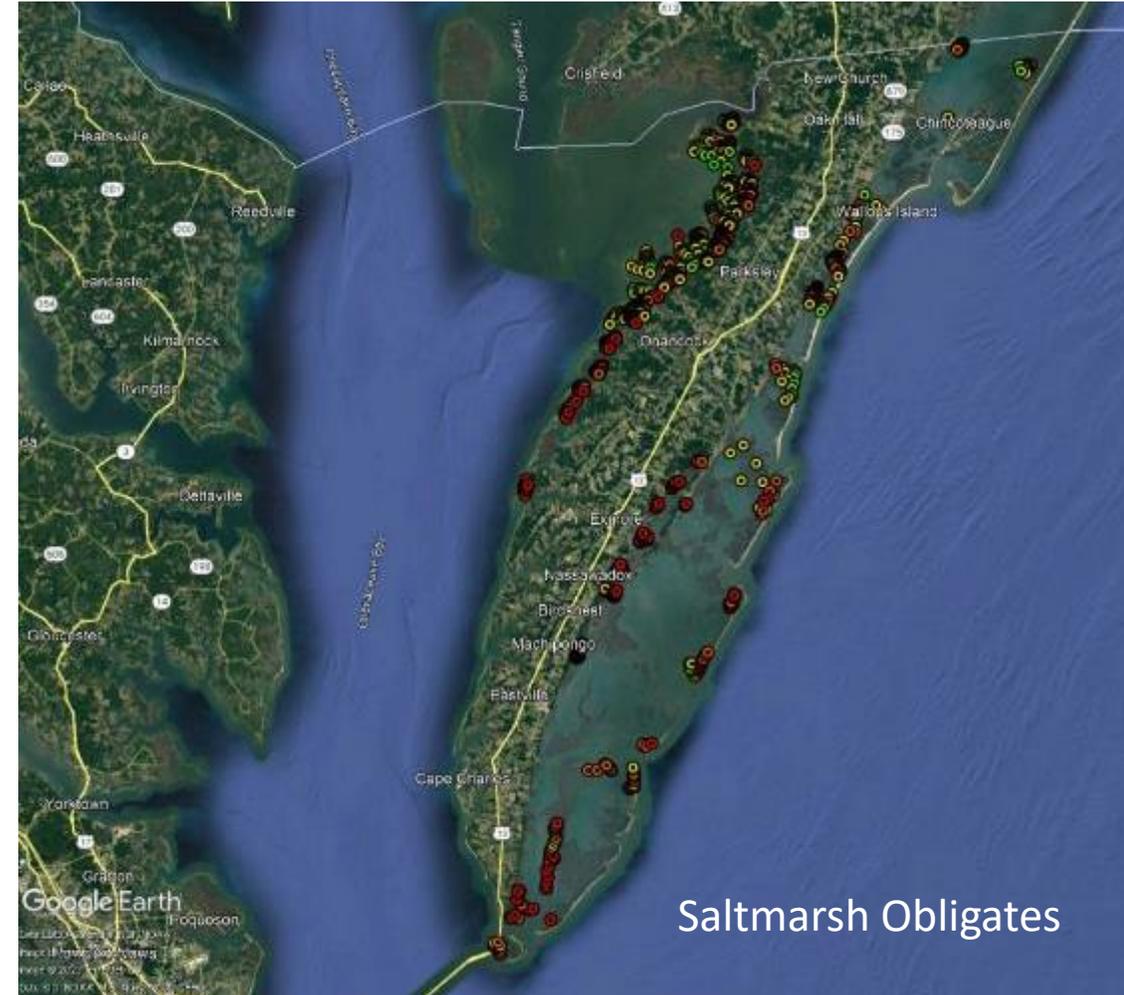
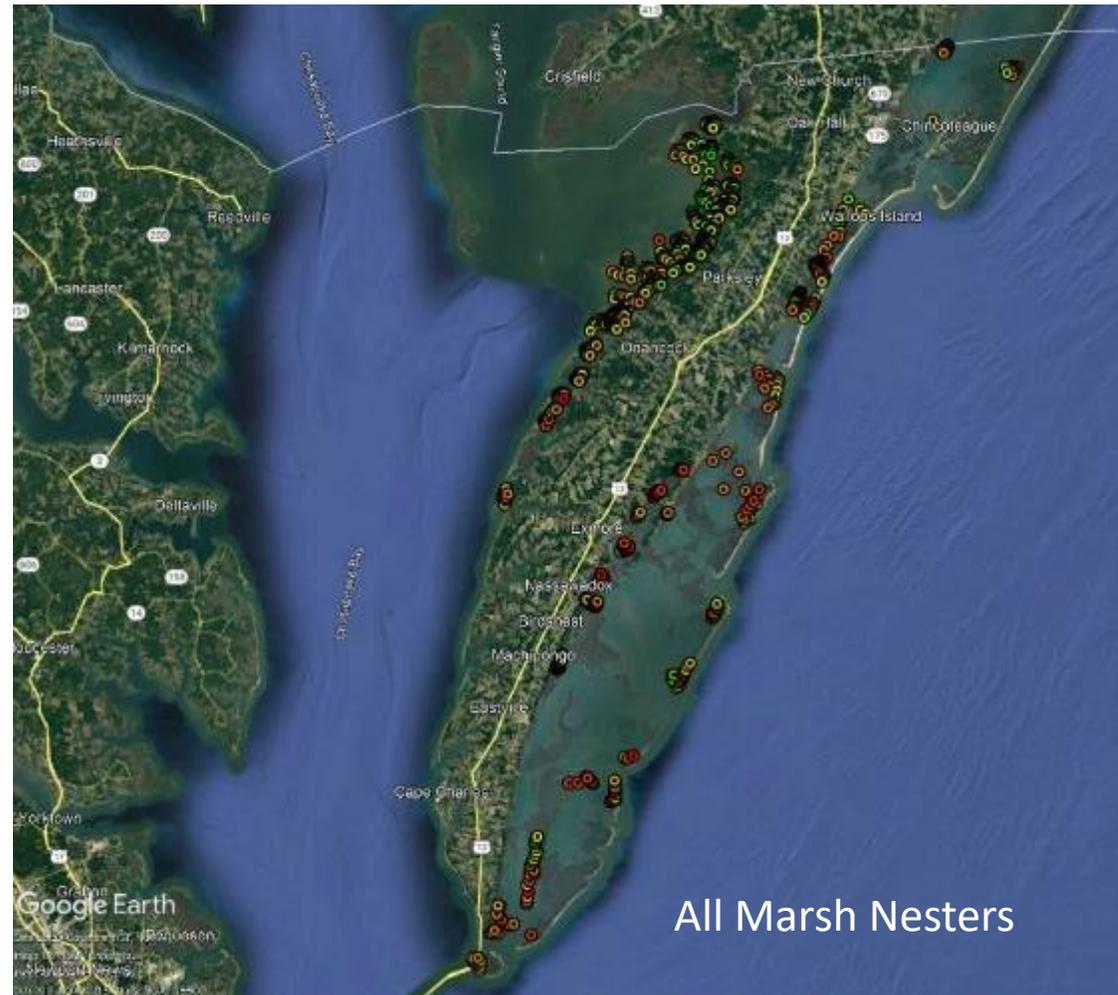


Veg and other

- % Black Needlerush Cover



Predicted Bird Richness



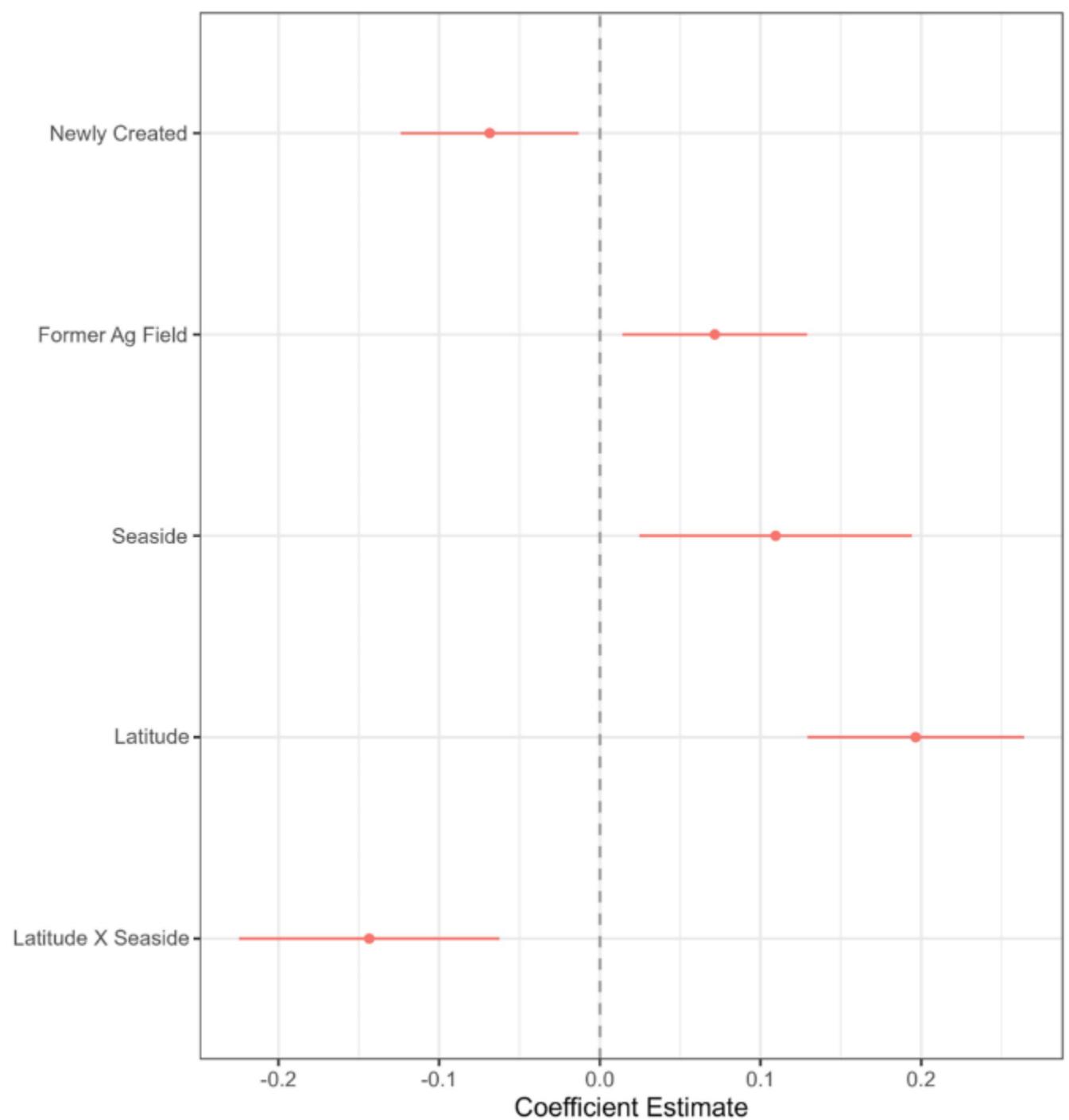
Organic Matter

- Beta Regression Predictors
 - Whether site was on bayside or seaside, latitude and interaction between terms
 - Recently converted, past agricultural use and interaction
 - Model Selection using AIC



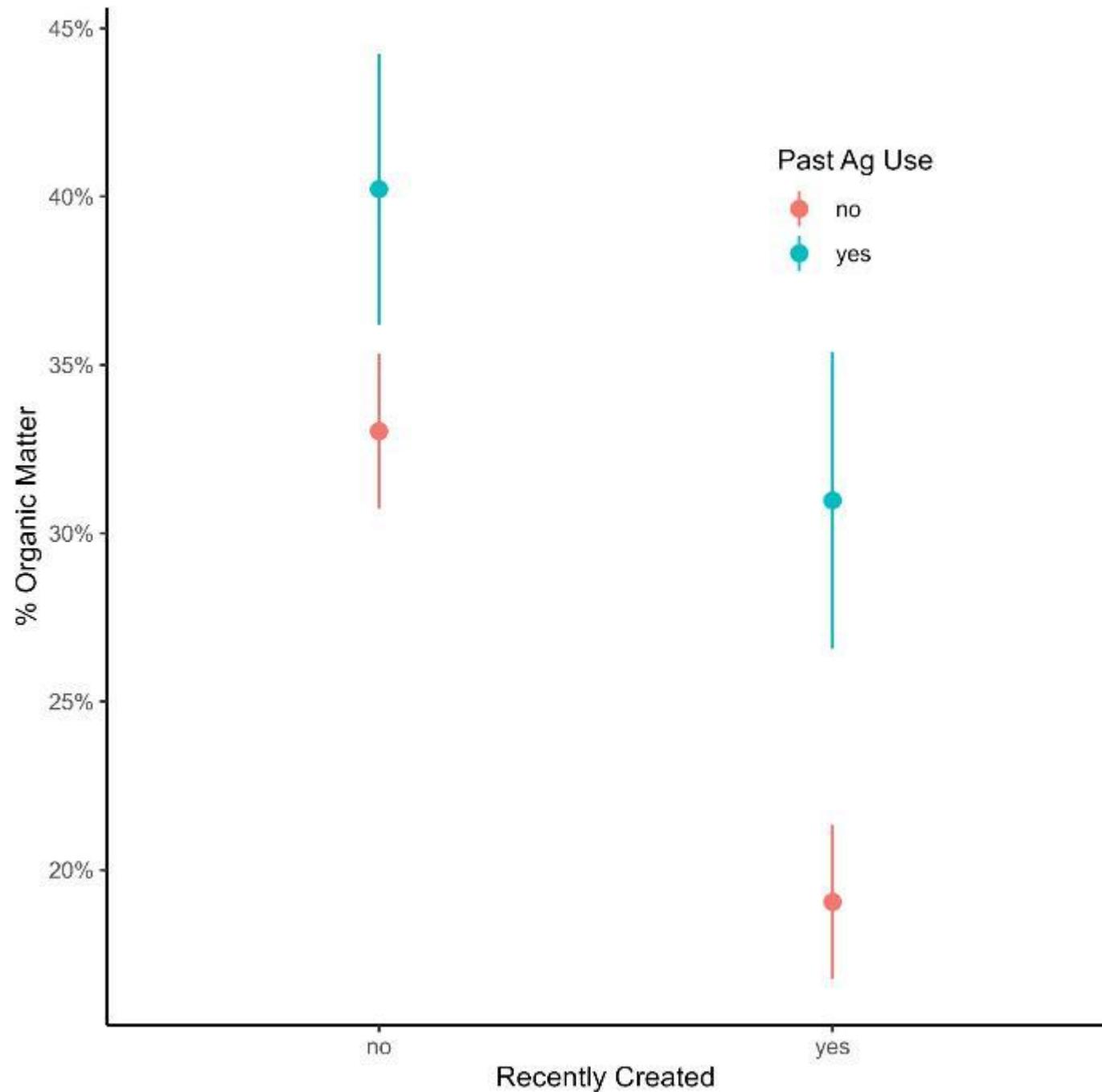
Organic Matter

- Final Beta Regression Predictors
 - Whether site was on bayside or seaside, latitude and interaction between terms
 - Recently converted and past agricultural use



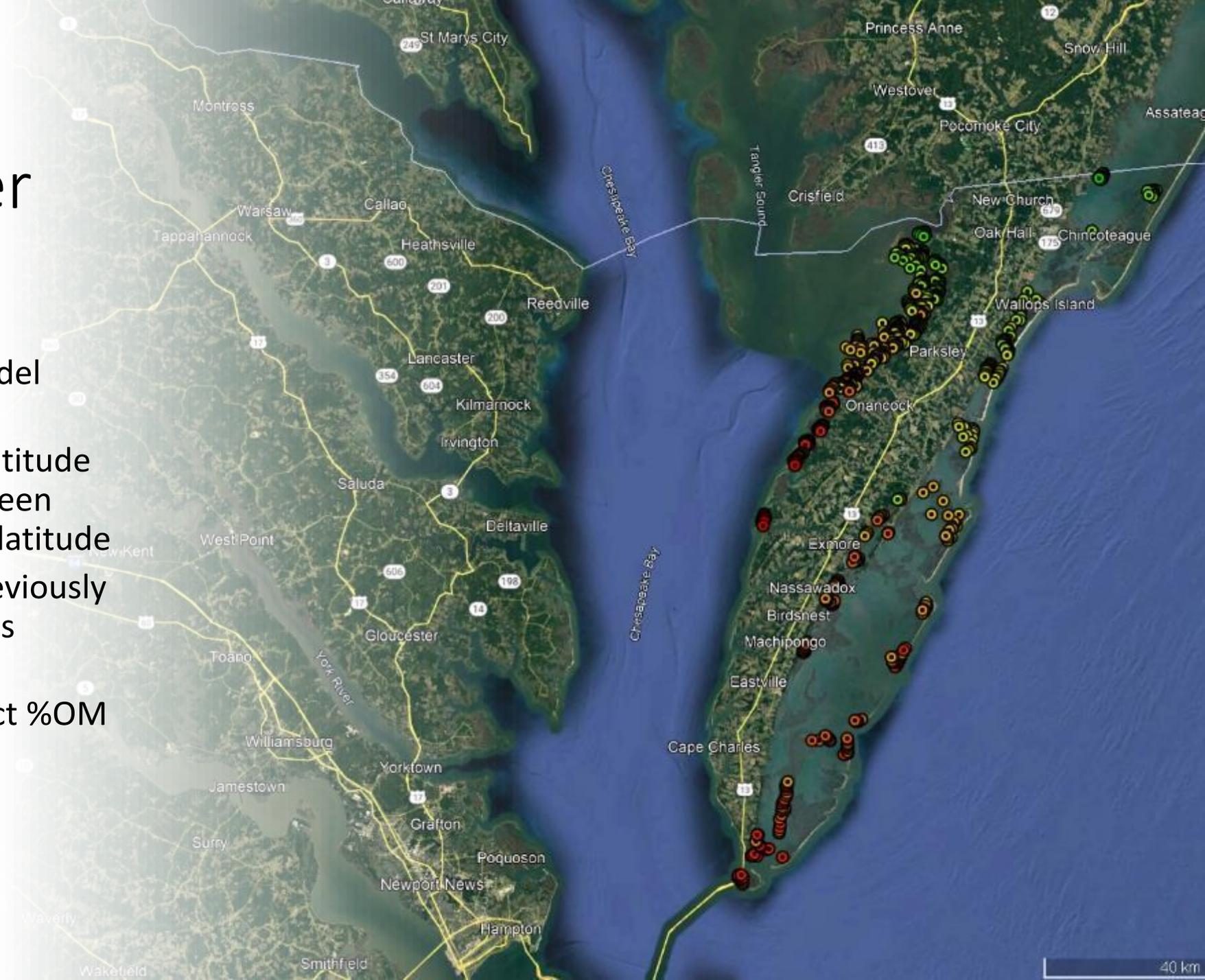
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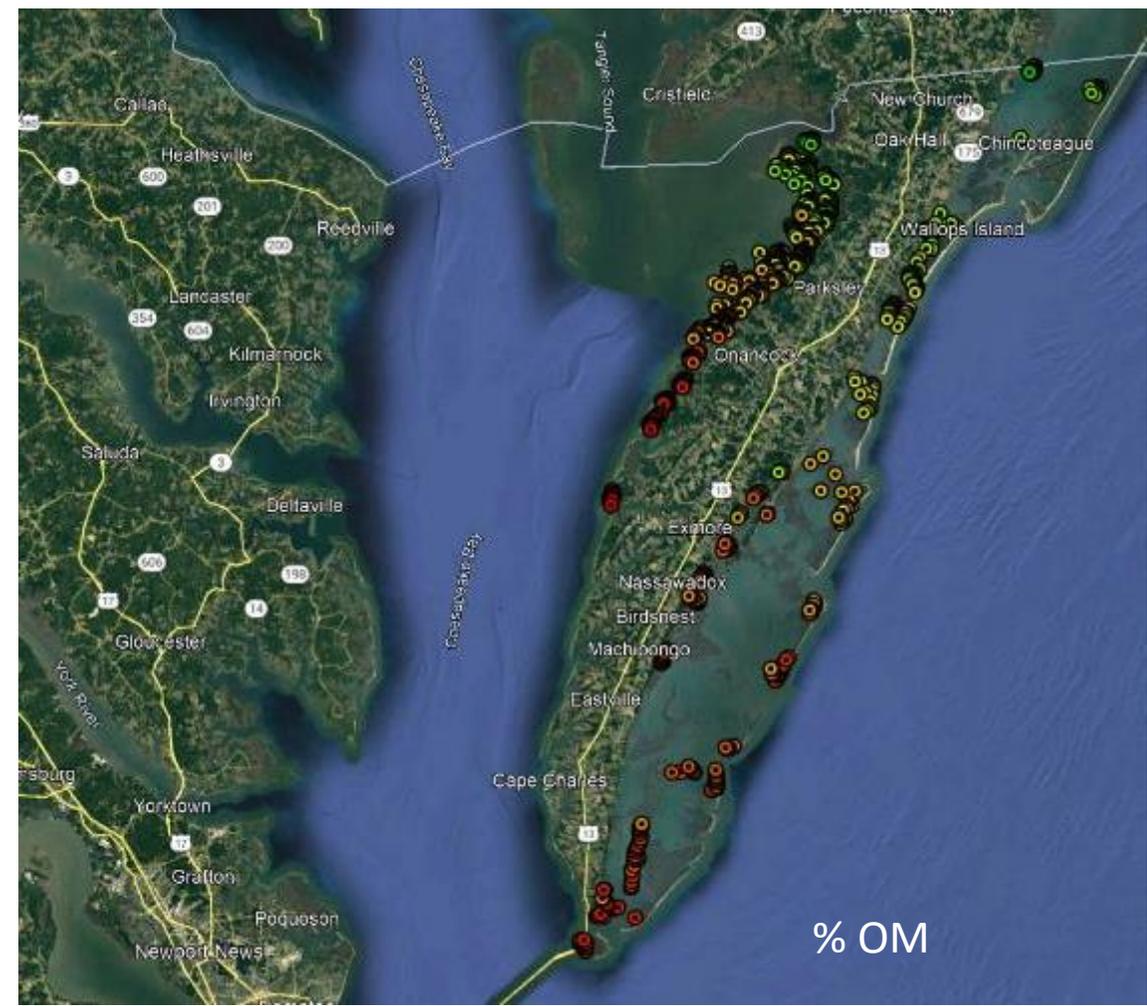
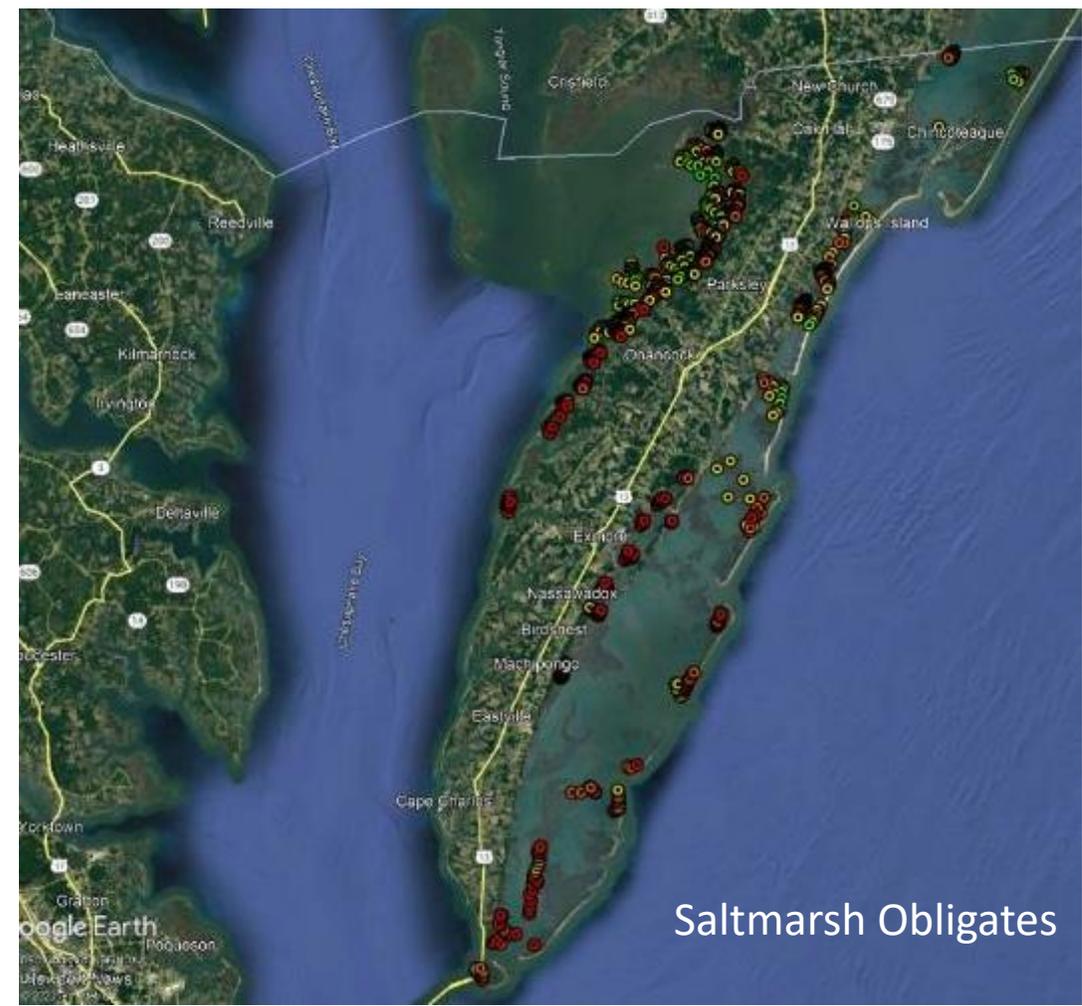


Organic Matter

- Final Beta Regression Model
 - Whether site was on bayside or seaside, latitude and interaction between bayside/seaside and latitude
 - Whether site was previously ag and whether it was recently converted
 - Used model to predict %OM at all survey points



Bird Richness & Organic Matter



Organic Matter and Birds

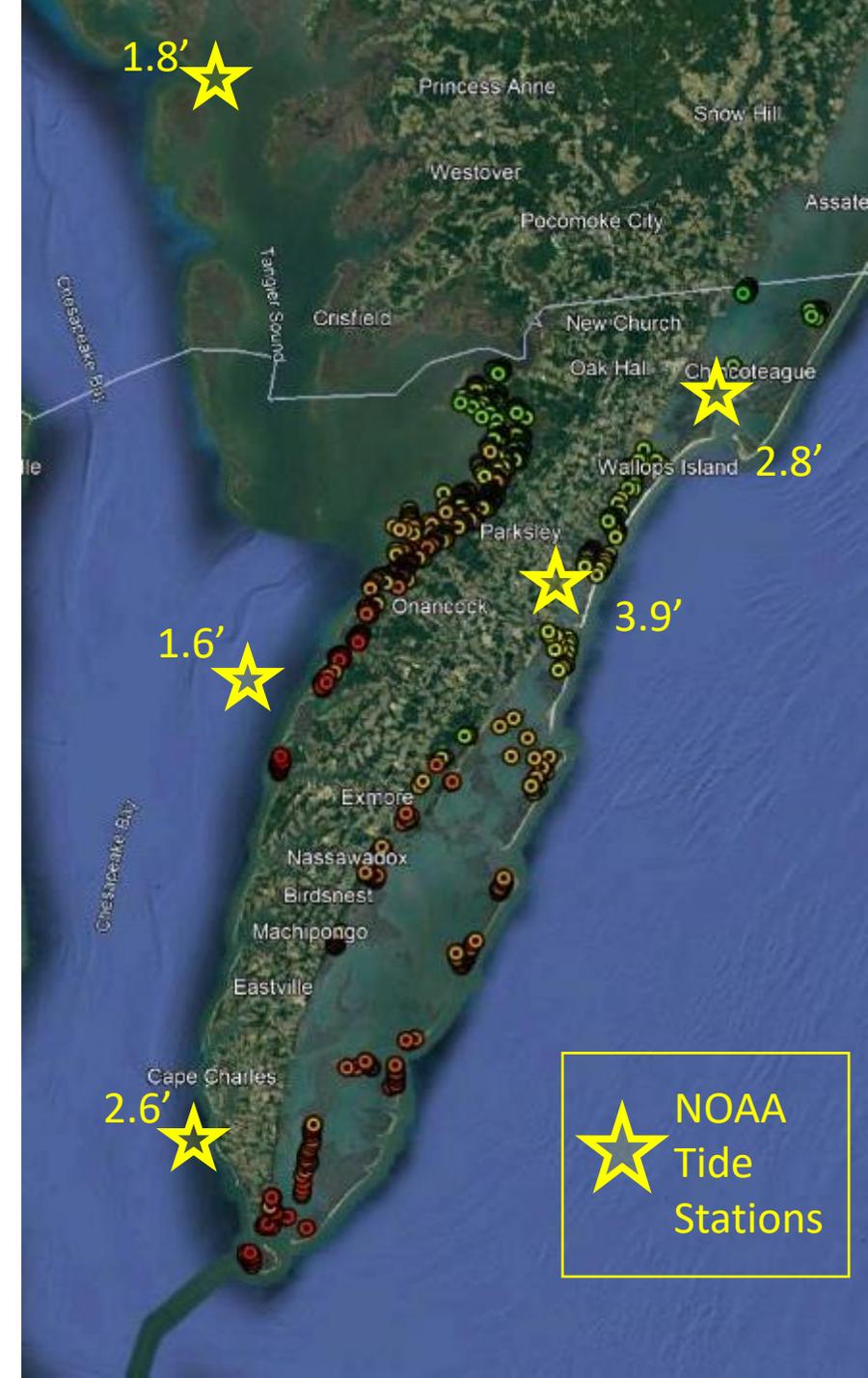
Used predicted bird richness as response, predicted %OM as predictor

Higher % organic matter = more birds

| Marsh Nesting Bird Species Richness | | | |
|-------------------------------------|-----------------|------|--------|
| Bird Response Group | %OM Effect Size | SE | p |
| All Marsh-nesting Birds | 2.28 | 0.25 | <0.001 |
| Salt-marsh Obligates | 3.00 | 0.37 | <0.001 |
| Marsh Obligates | 2.39 | 0.47 | <0.001 |
| Facultative | 0.99 | 0.49 | 0.043 |

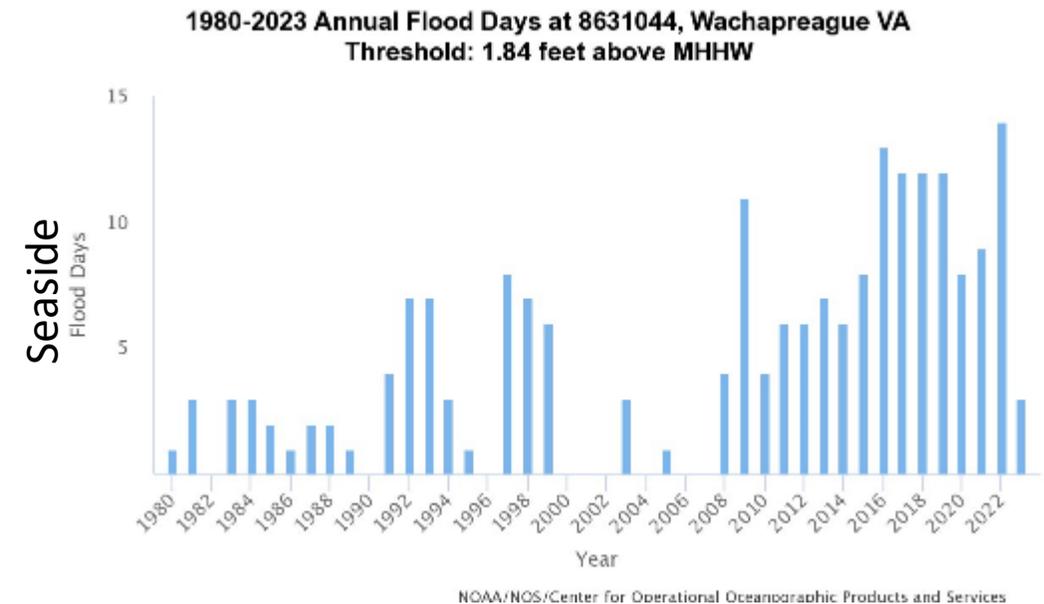
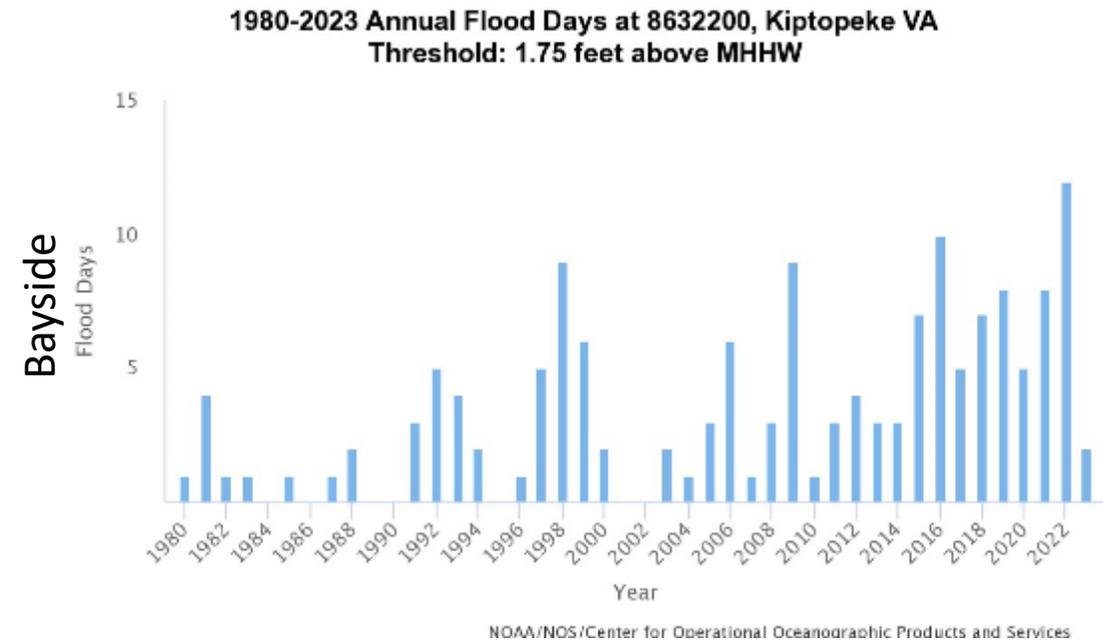
OM % and Bird Richness driven by same forces

- Geographical influences
 - Generally higher tides in southern portion of peninsula and on the seaside
 - More flood days on seaside
 - Large input of sediment from ocean near mouth of Bay



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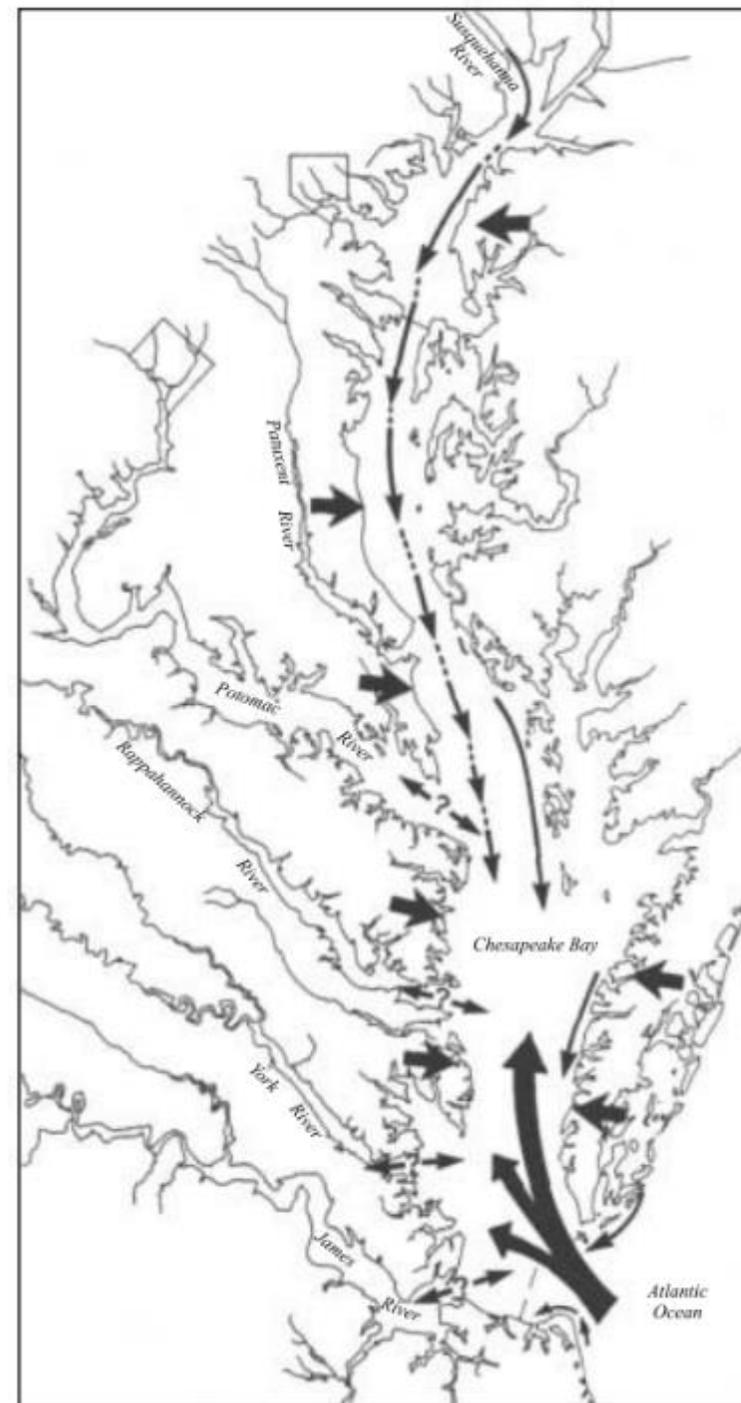


Figure 6.1. Major pathways of sediment transport in Chesapeake Bay (from Hobbs and others, 1990). (Note, the thickness of arrows does not equate to amount of mass transported.)

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OM % and Bird Richness driven by same forces

- Past Agricultural History
 - Berms are a barrier to tidal flow and plant colonization
 - Leaves/detritus accumulates between farm abandonment and saltmarsh conversion
 - Trees persist on berms



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What does the future hold?

- A greater proportion of newly created marshes will occur in former ag fields
- Potential for greater carbon storage?





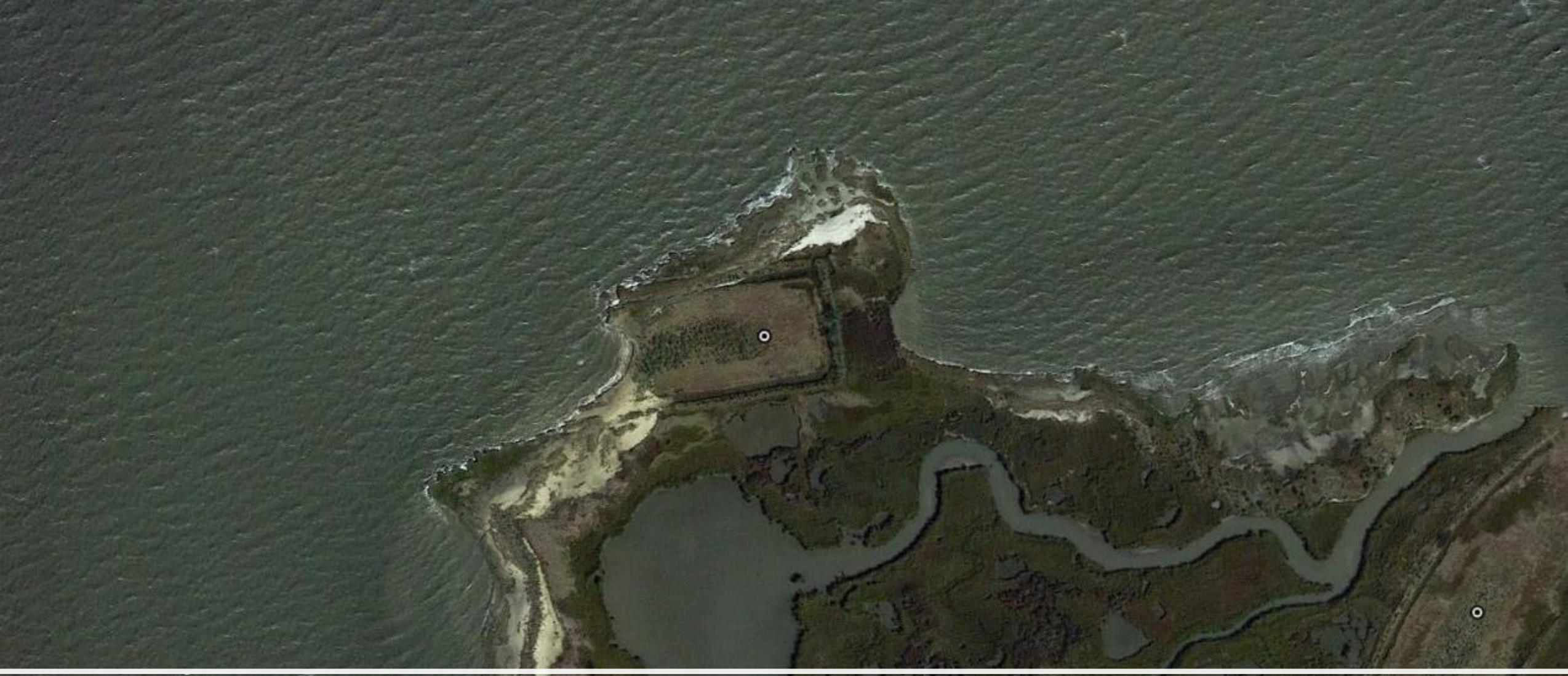
Erosion Rate for Ag Fields?



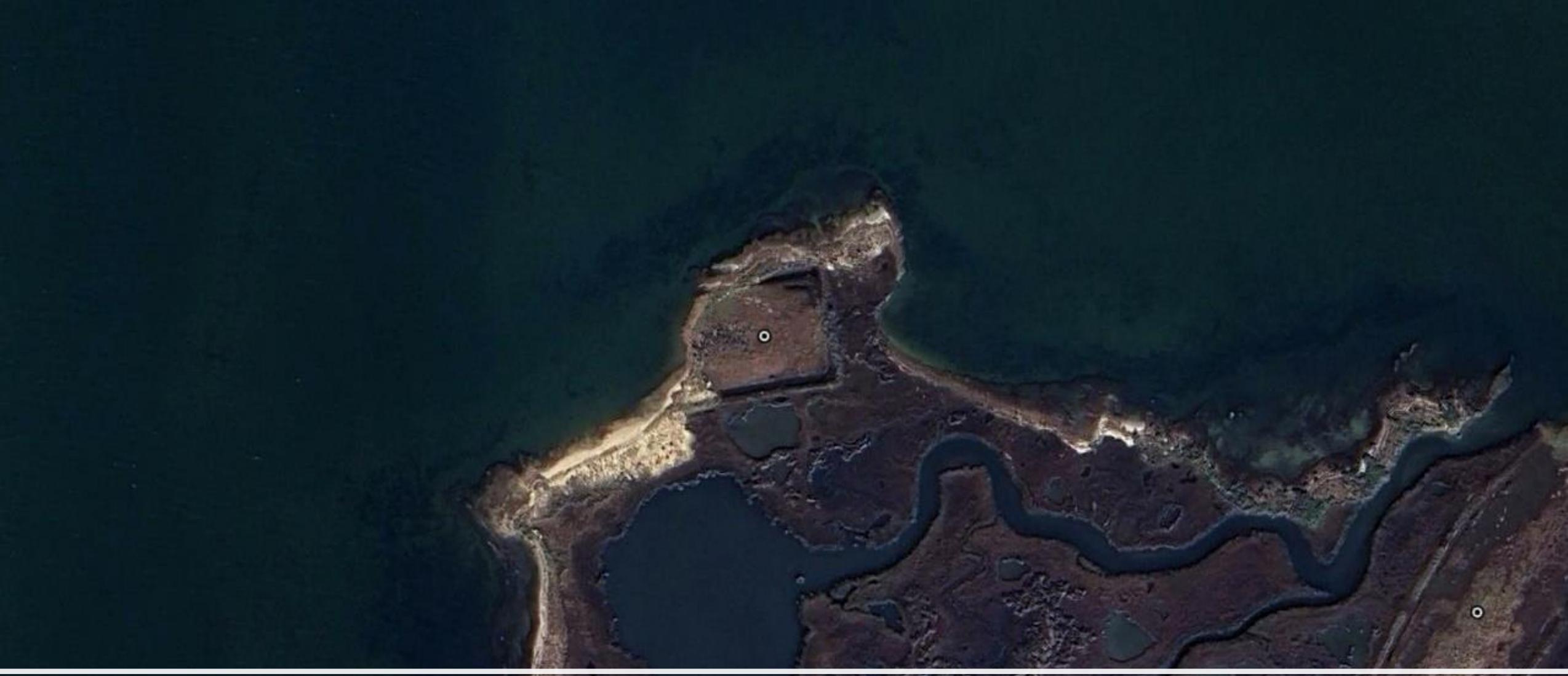
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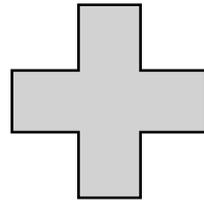
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What does the future hold?

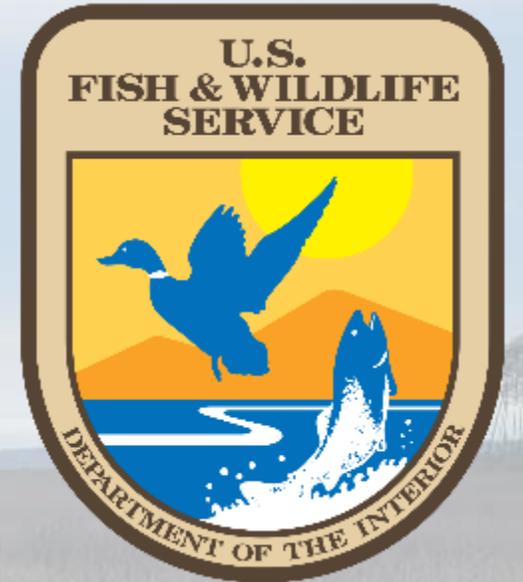
- Bird community will shift toward fewer saltmarsh obligate species and more species that also breed in freshwater marshes



Thank You!



The CENTER for
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