

Agricultural Economic Losses from Salinization

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University of Delaware

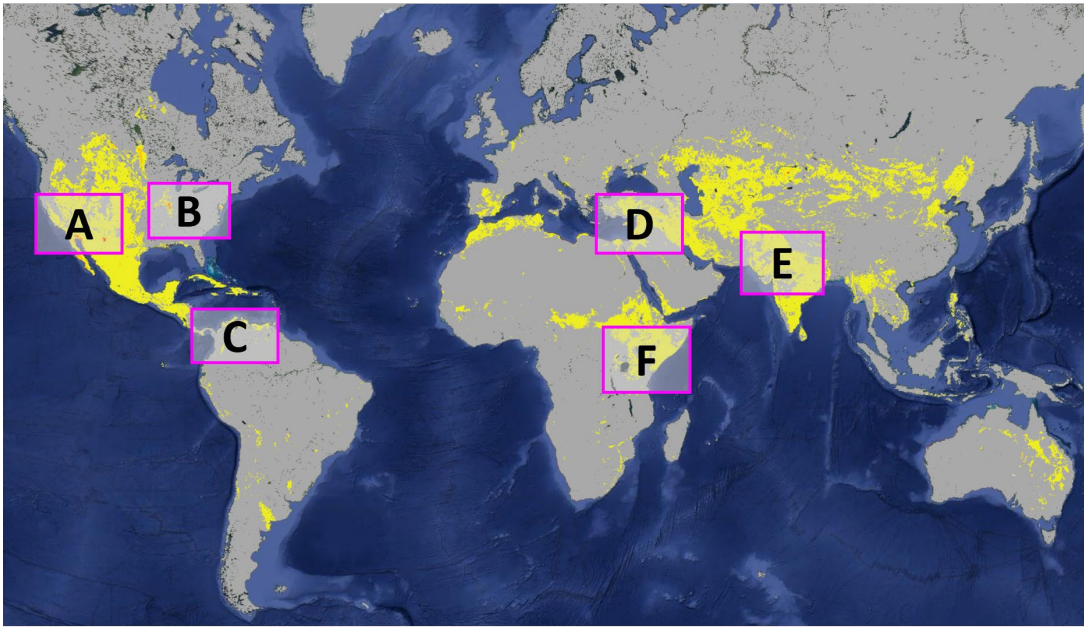
Email: mondalp@udel.edu

Chesapeake Bay Program's STAC Workshop

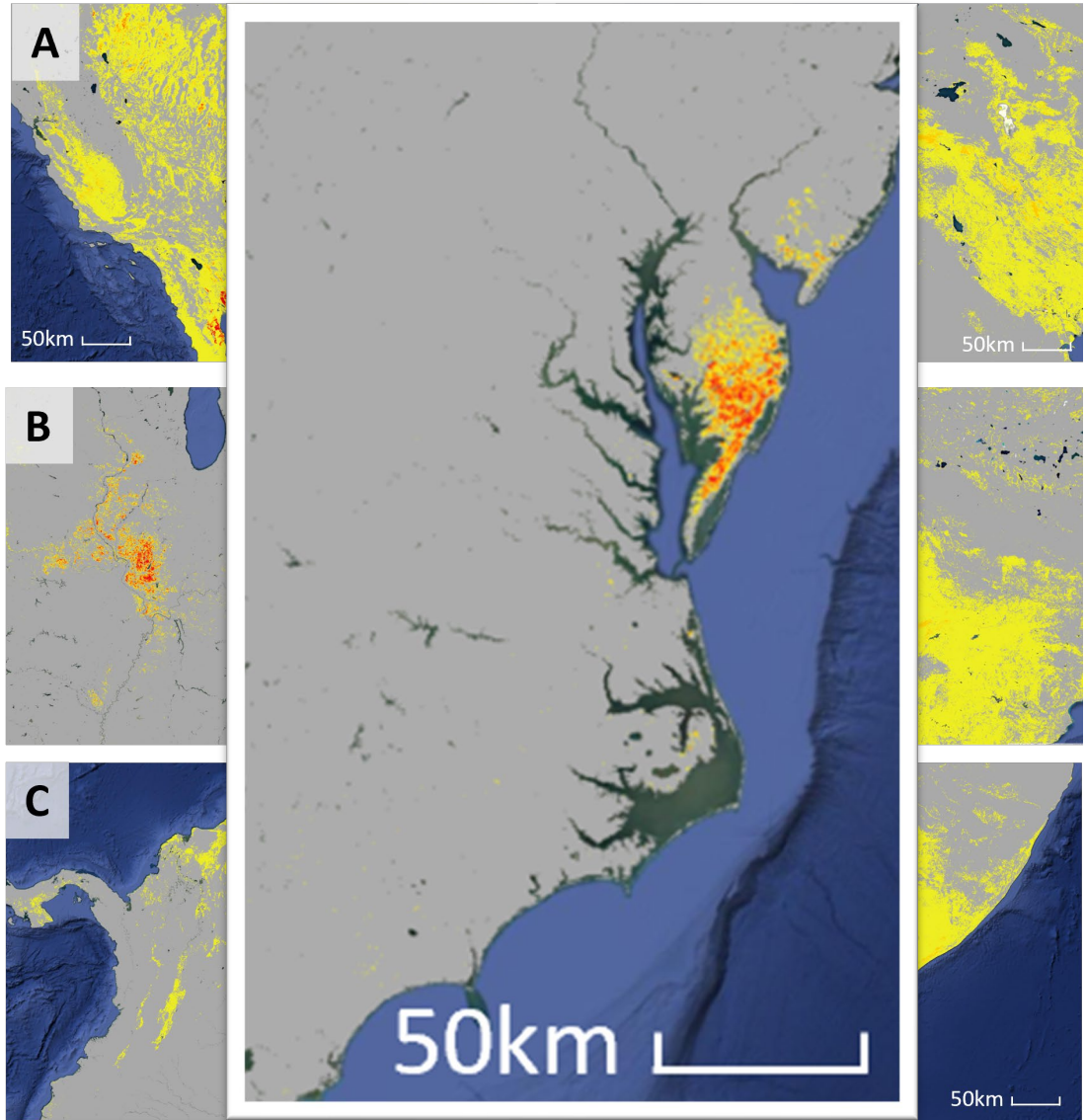
May 27, 2026

Photo: Dr. Jarrod Miller, UD





Legend	
 Non-saline	<2 EC _e (dS/m)
 Slightly saline	2-4 EC _e (dS/m)
 Moderately saline	4-8 EC _e (dS/m)
 Highly saline	8-16 EC _e (dS/m)
 Extremely saline	>16 EC _e (dS/m)



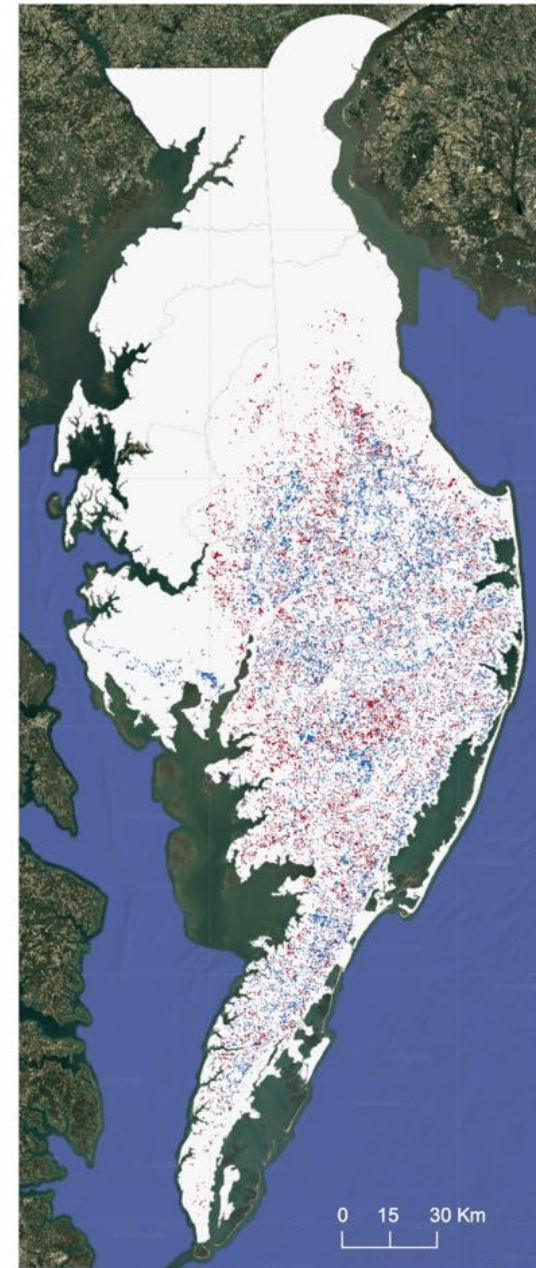
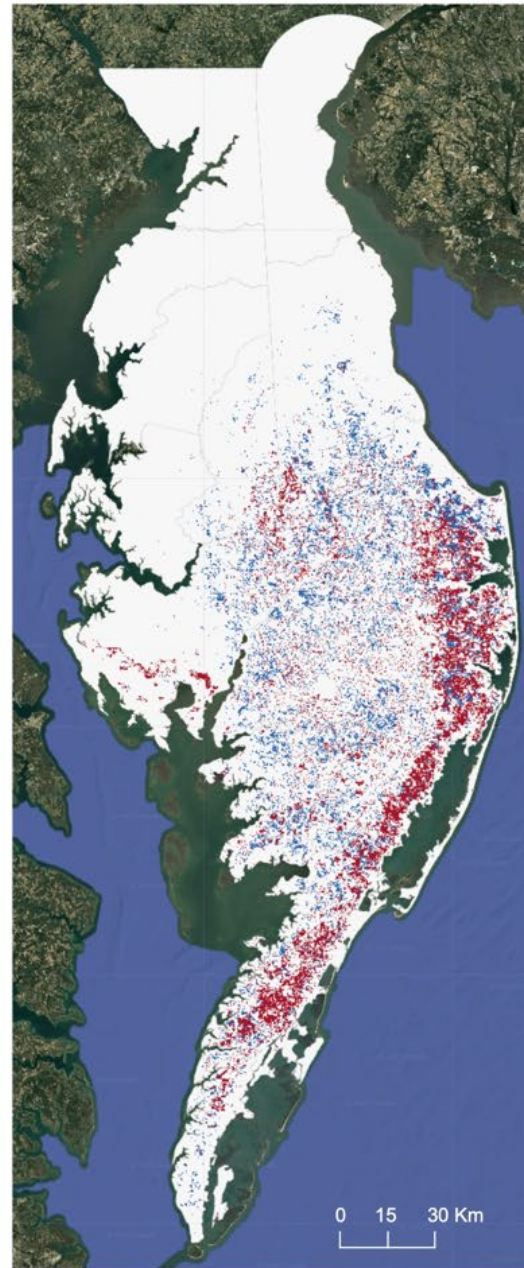
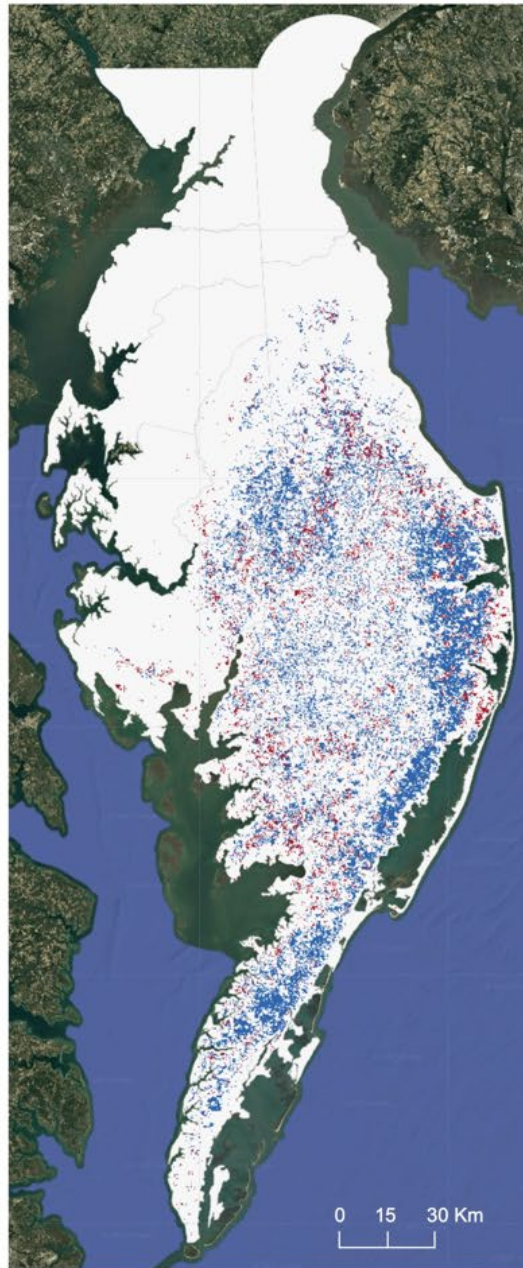
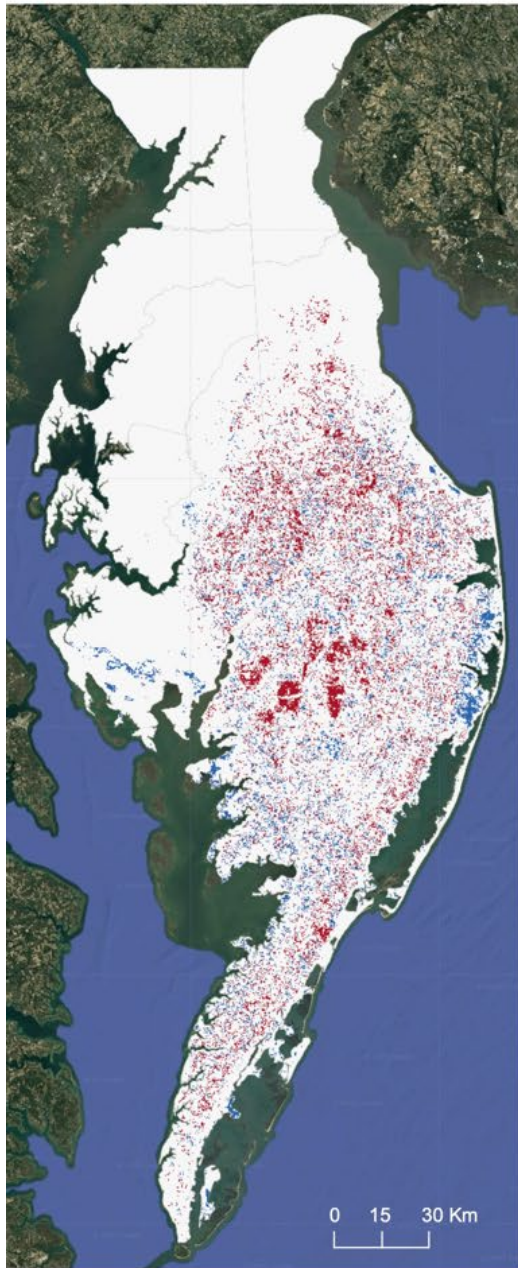
Global Soil Salinity Maps (GSSM) showing spatial distribution of soil salinity levels in coastal areas. The GSSM dataset was derived by using 7 soil properties, thermal infrared imagery and the EC_e point data from the World Soil Information Service (WoSIS) database.

2000-2002

2002-2005

2005-2009

2009-2016



■ Increased salinity

■ Decreased salinity

□ No change

Source: Sarupria et al., 2026.
Scientific Reports



Search for locations

Explore map data

Upload

DATA SETS (1)

Remove All

Collapse All

GSASmap Topsoil (Salt Affected Areas)

IDEAL ZOOM

ABOUT DATA

Opacity: 80 %

☒ No Data
☐ None
☐ Salt Affected Soils

About

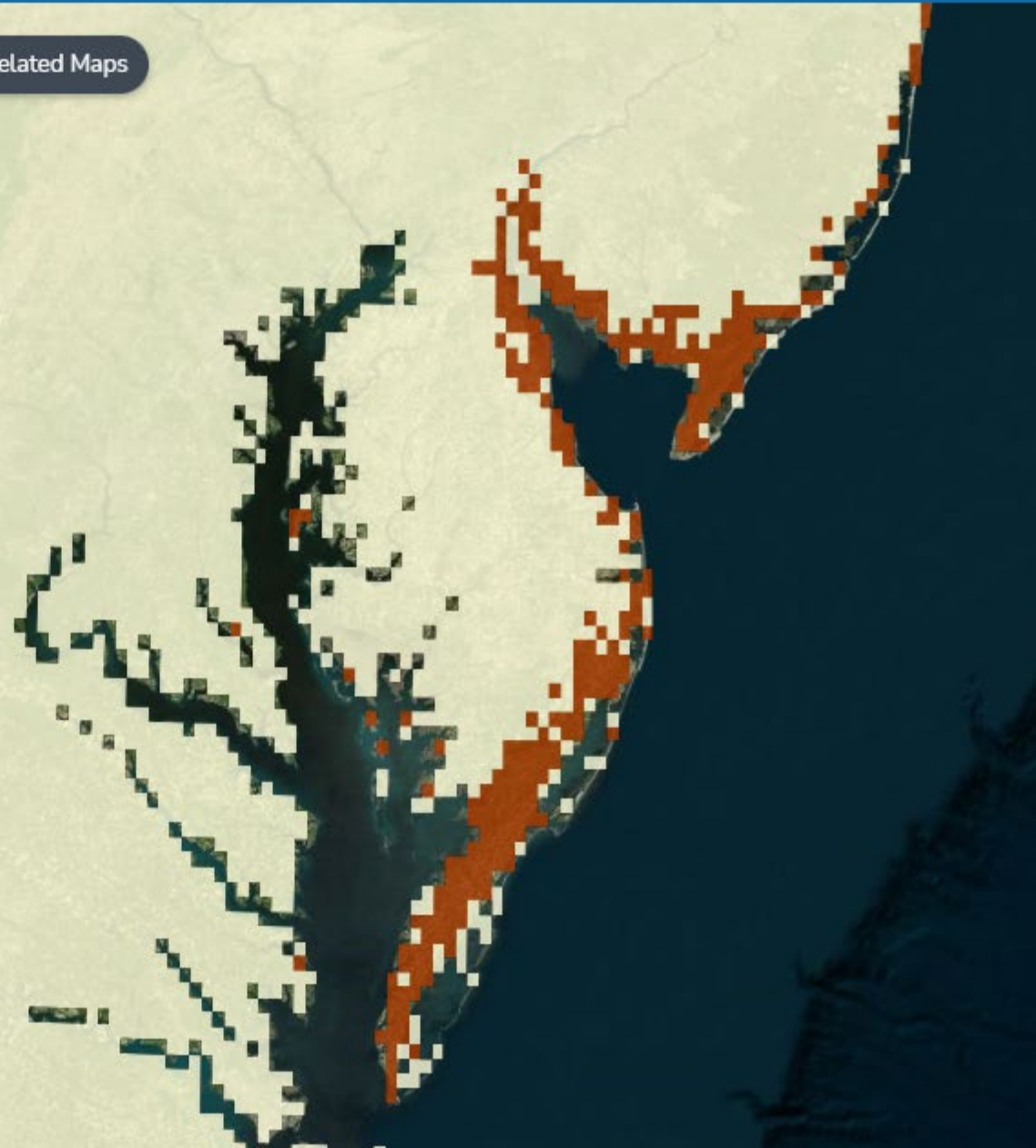
Related Maps

GSSmap - Global Soil Salinity Map (V1.0)

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Description

The Global Map of Salt-Affected Soils (GSASmap) is a product containing contributions from over 118 countries with 257419 locations containing measured soil data. More than 350 national experts were involved in the harmonization of its input data and methods for mapping salt-affected soils and were trained in the state of the art methods for digital soil mapping. Every country then produced their maps following the agreed technical specifications. This participatory country-driven process offers more opportunities for future periodic update, which is an important aspect that has been missing in previous global SAS information.



High-resolution Salt Patch Mapping



Aerial Image
(NAIP Data)

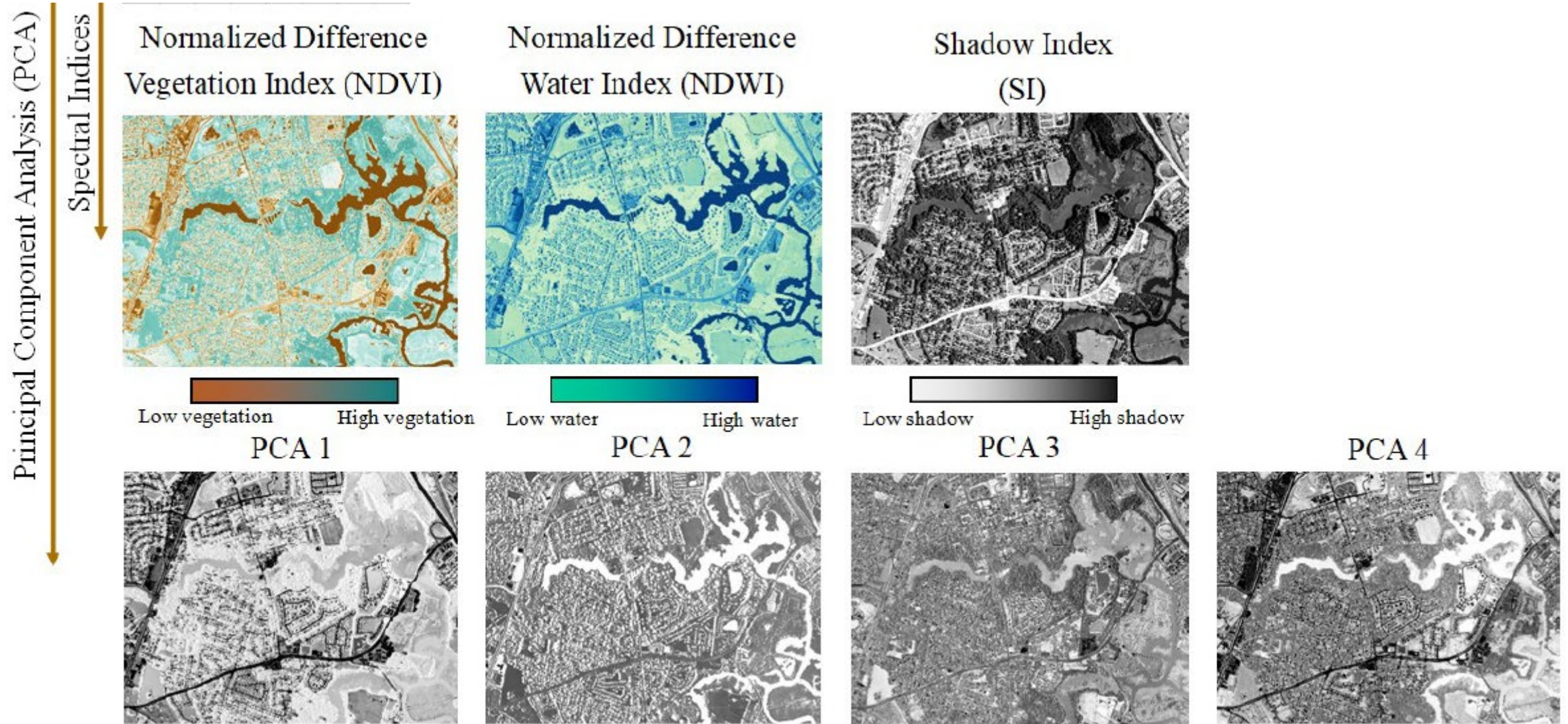


Satellite Image
(Landsat Data)

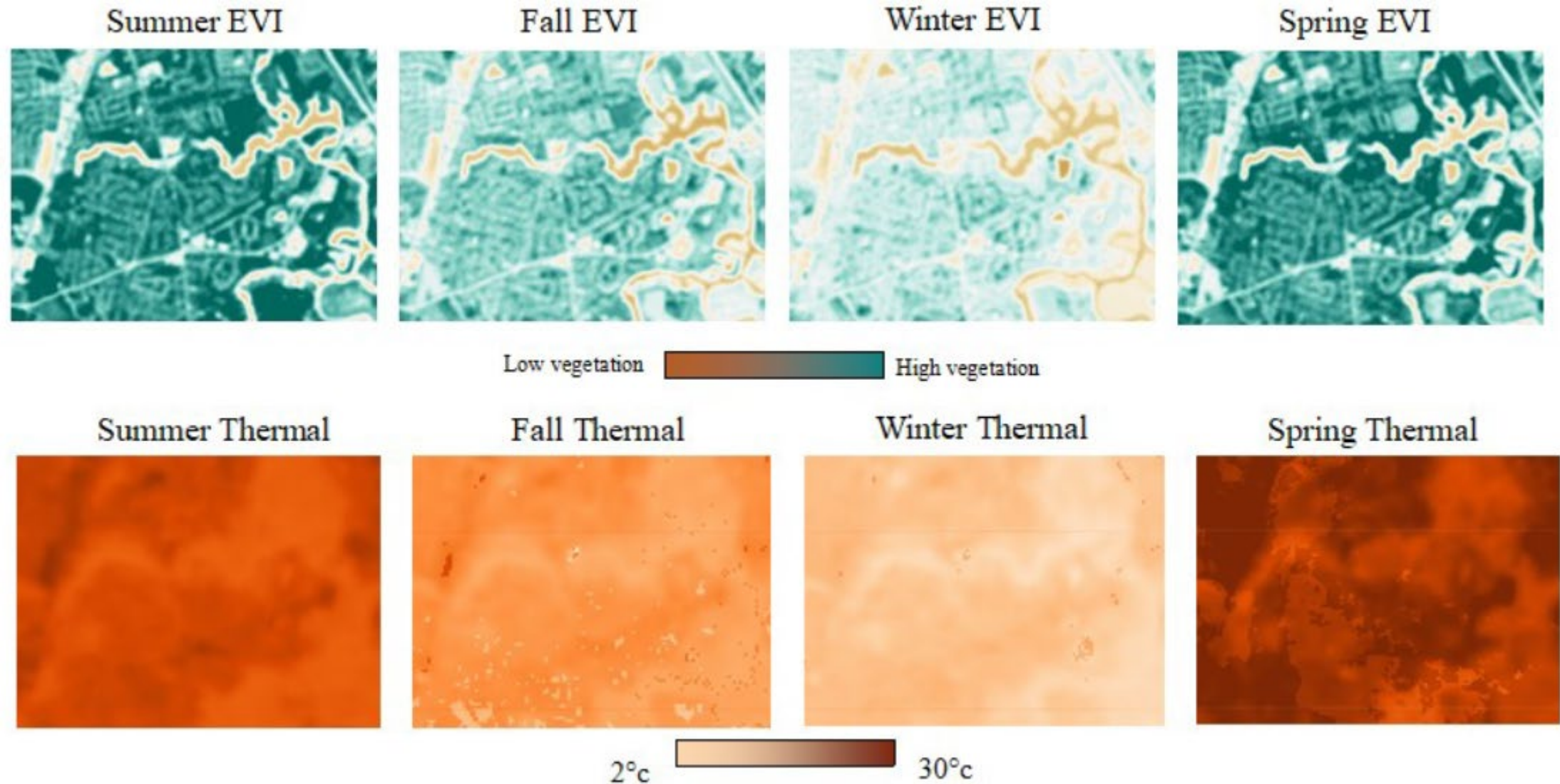


Photo: Dr. Jarrod Miller, UD

Spectral Data + >94,000 reference points + Machine Learning

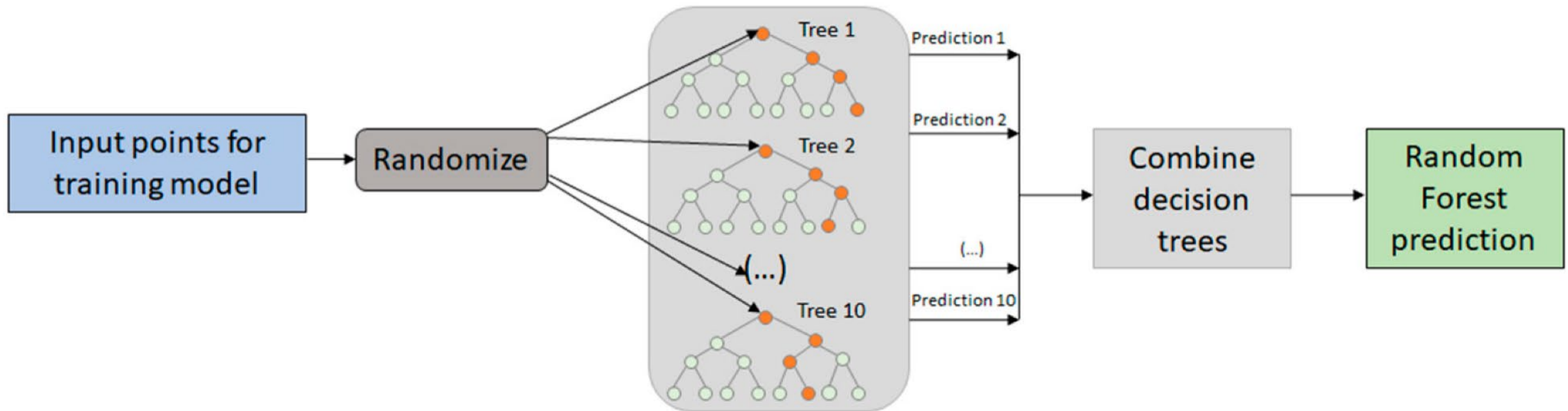


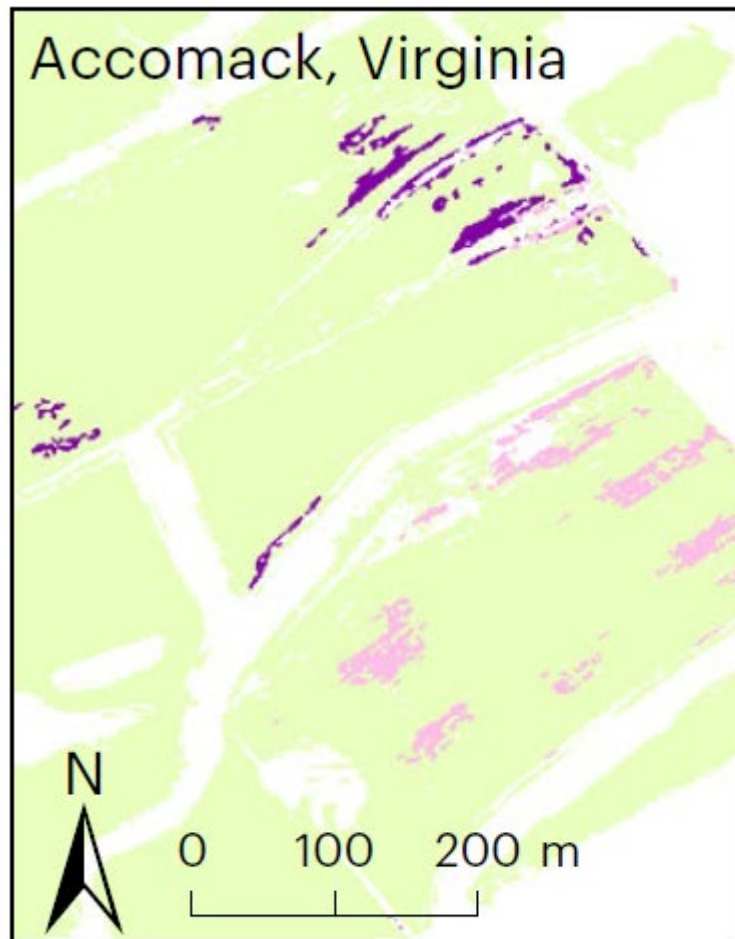
Spectral Data + >94,000 reference points + Machine Learning



Spectral Data + >94,000 reference points + Machine Learning

- 70% of points for training the model
- 30% of points for testing accuracy
- Random Forest Model (Google Earth Engine Statistical Machine Intelligence and Learning Engine (SMILE))





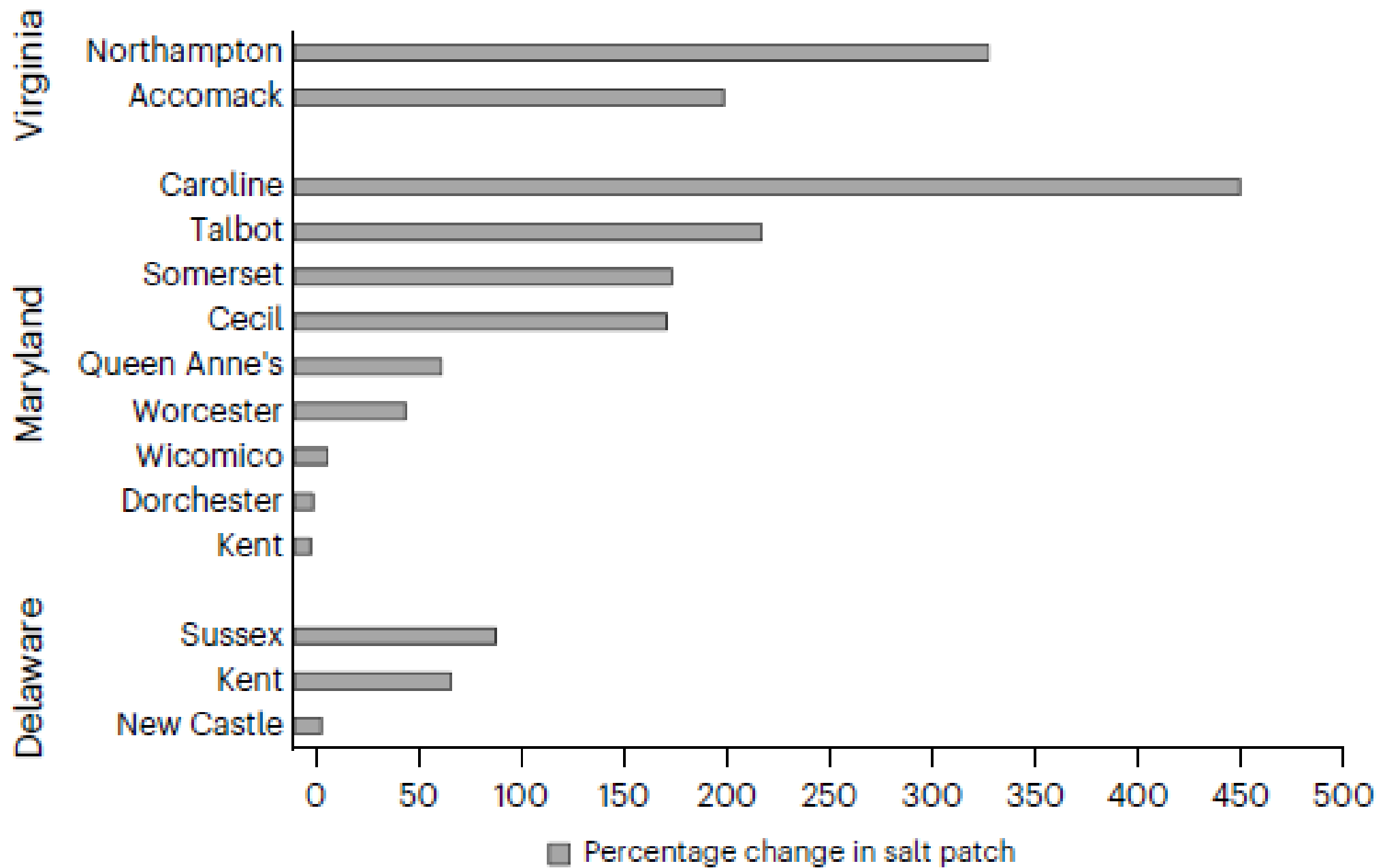
Farmland to salt patch



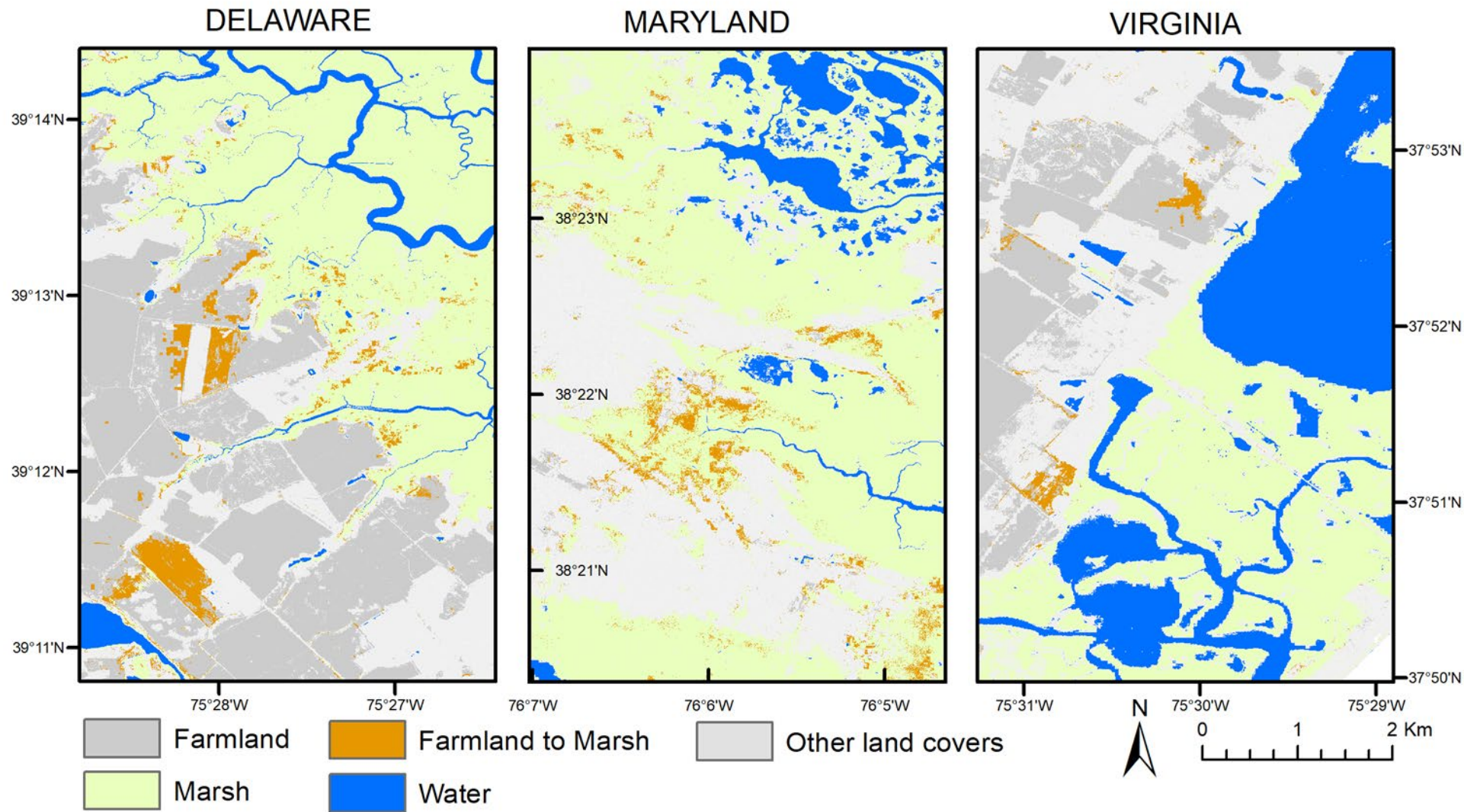
Salt patch in 2011-2013



Farmland in 2011-2013



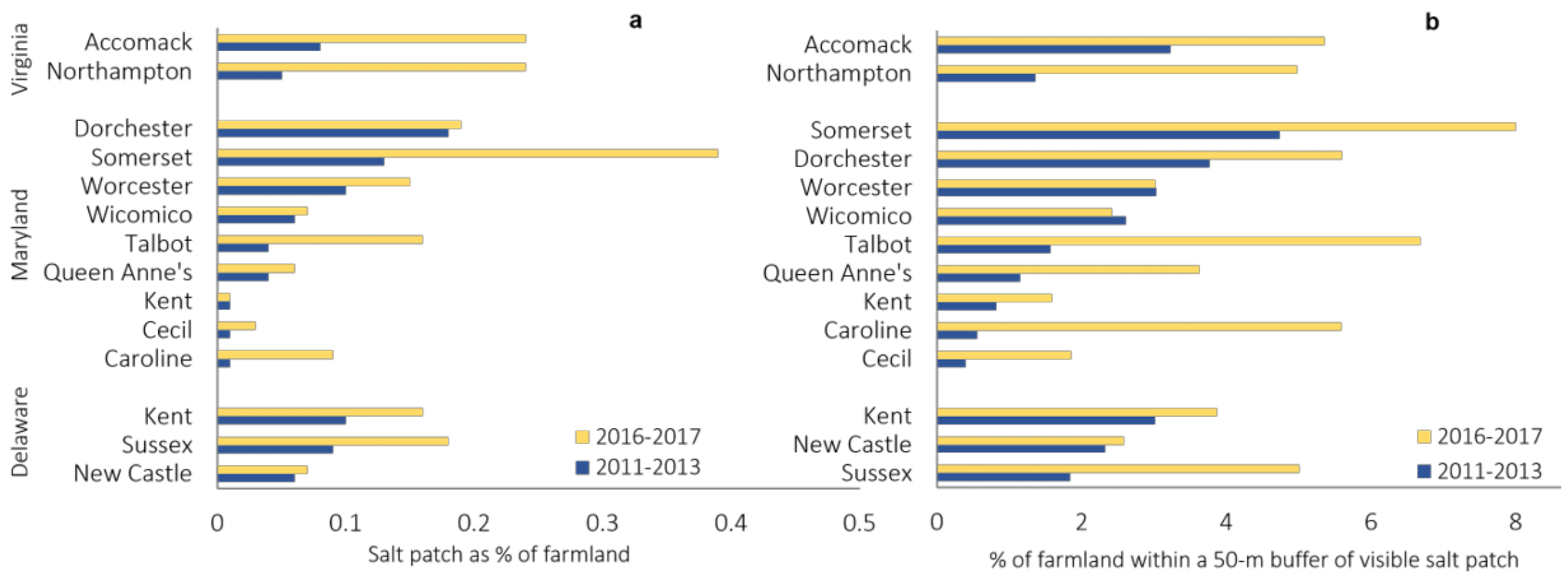
Mondal et al., 2023. The spread and cost of saltwater intrusion in the US Mid-Atlantic. *Nature Sustainability*.



Salt patch → Marsh:
36.5 ha

Bare soil → Marsh:
1,007 ha

Farmland → Marsh:
8,096 ha



2019



2020



2021



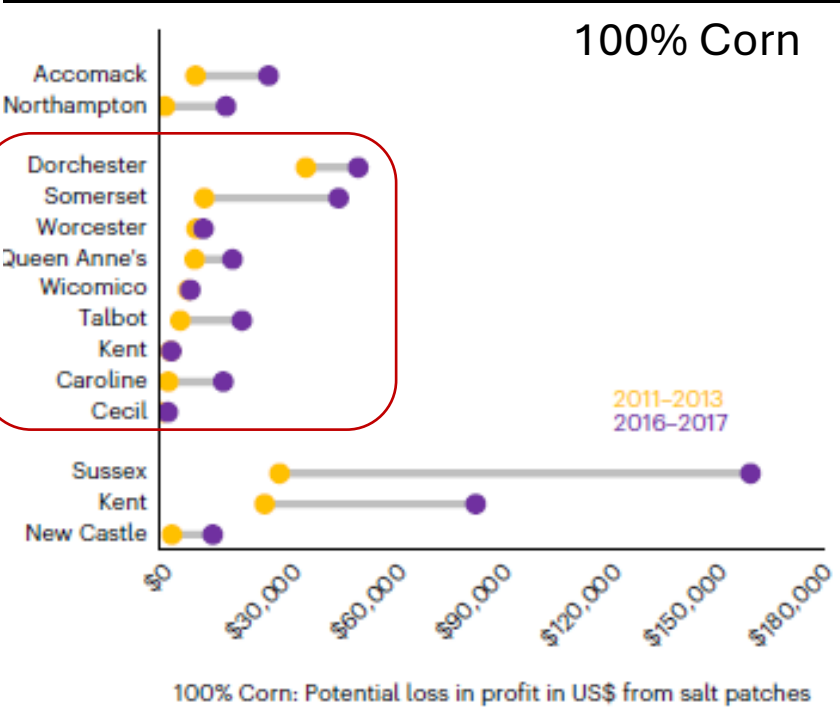
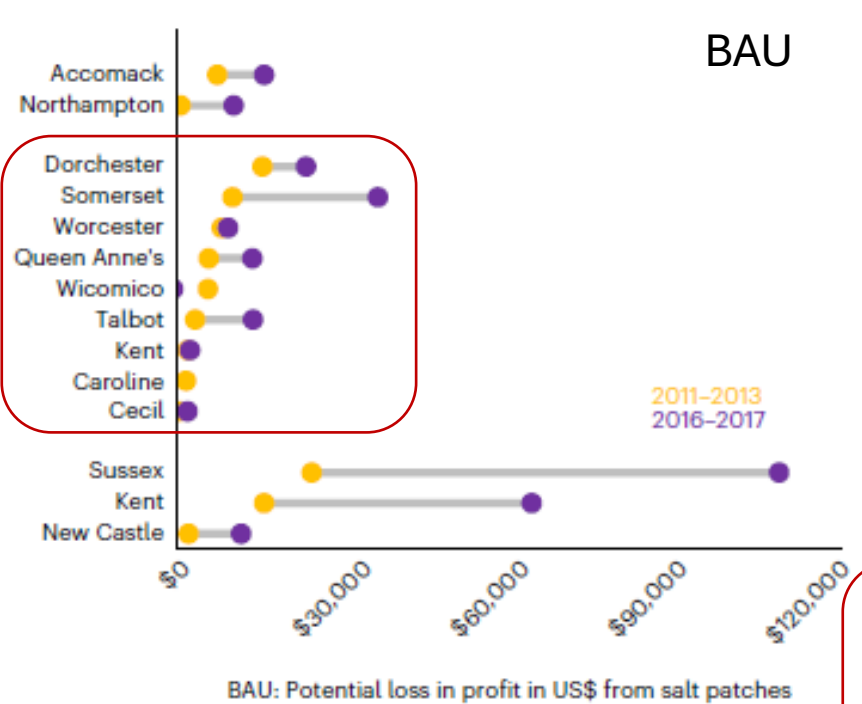
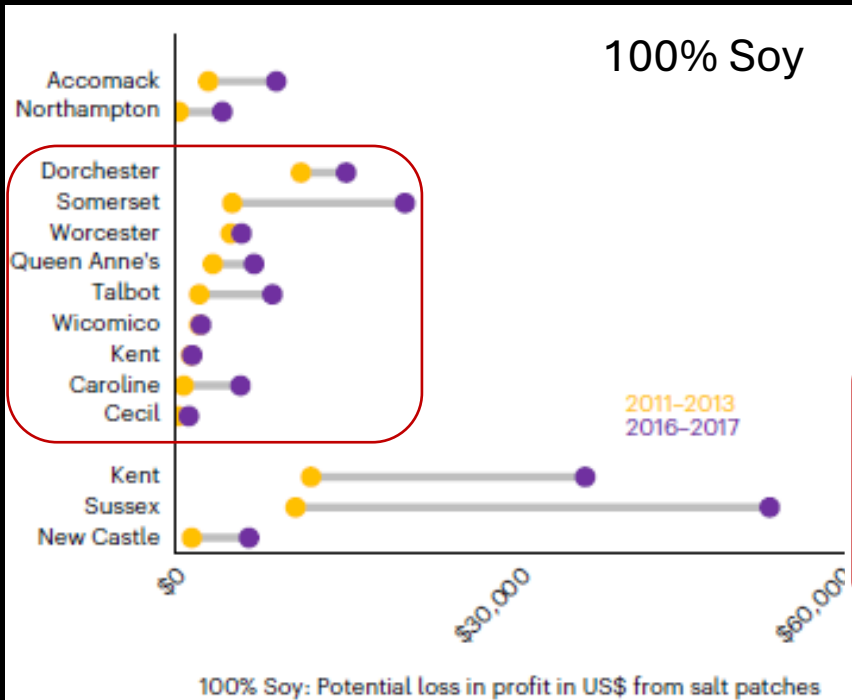
2022



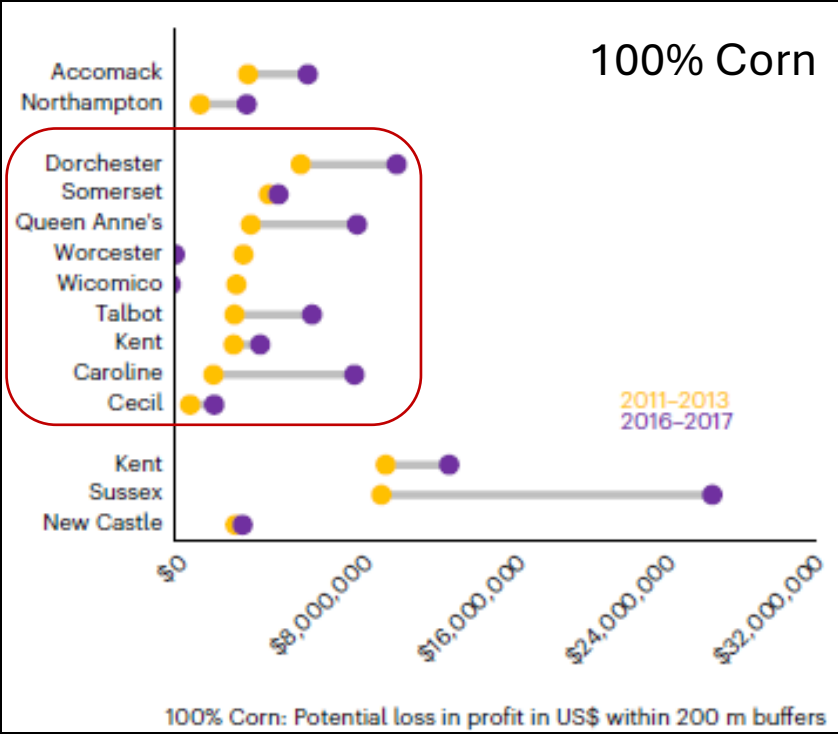
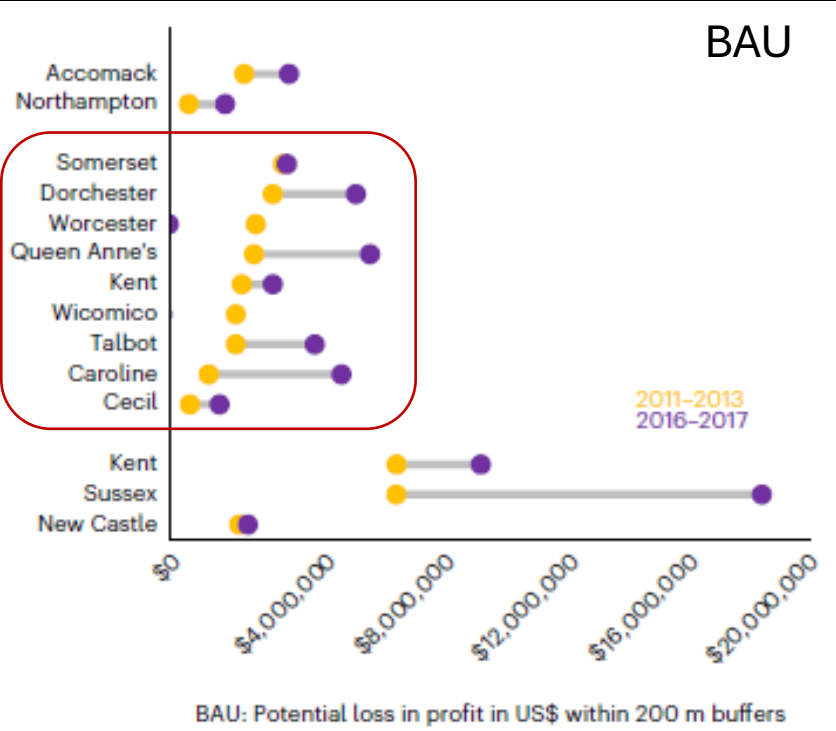
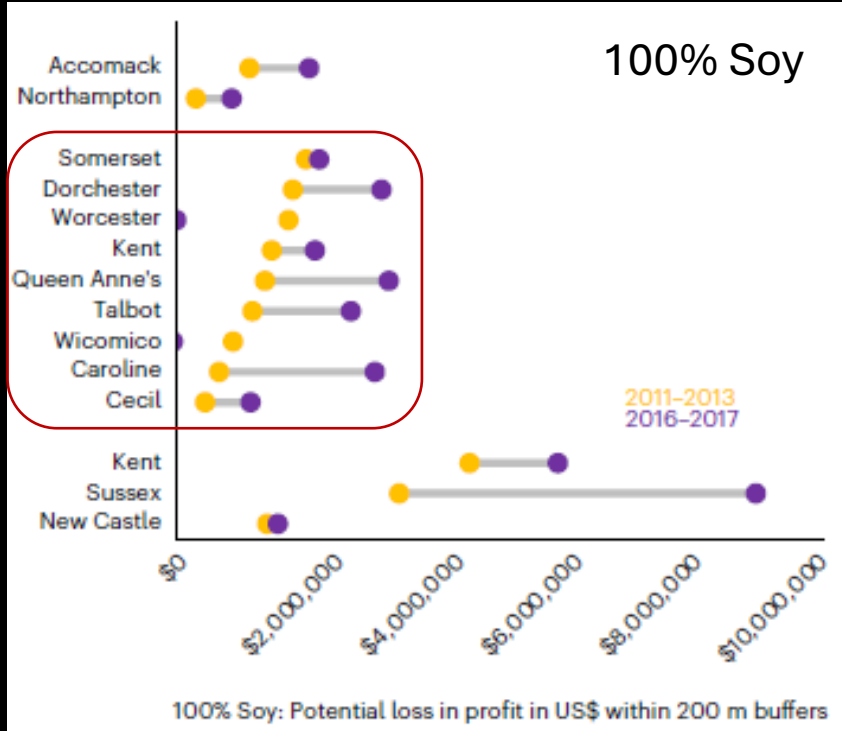
2023



Potential losses in profit



Potential losses in profit

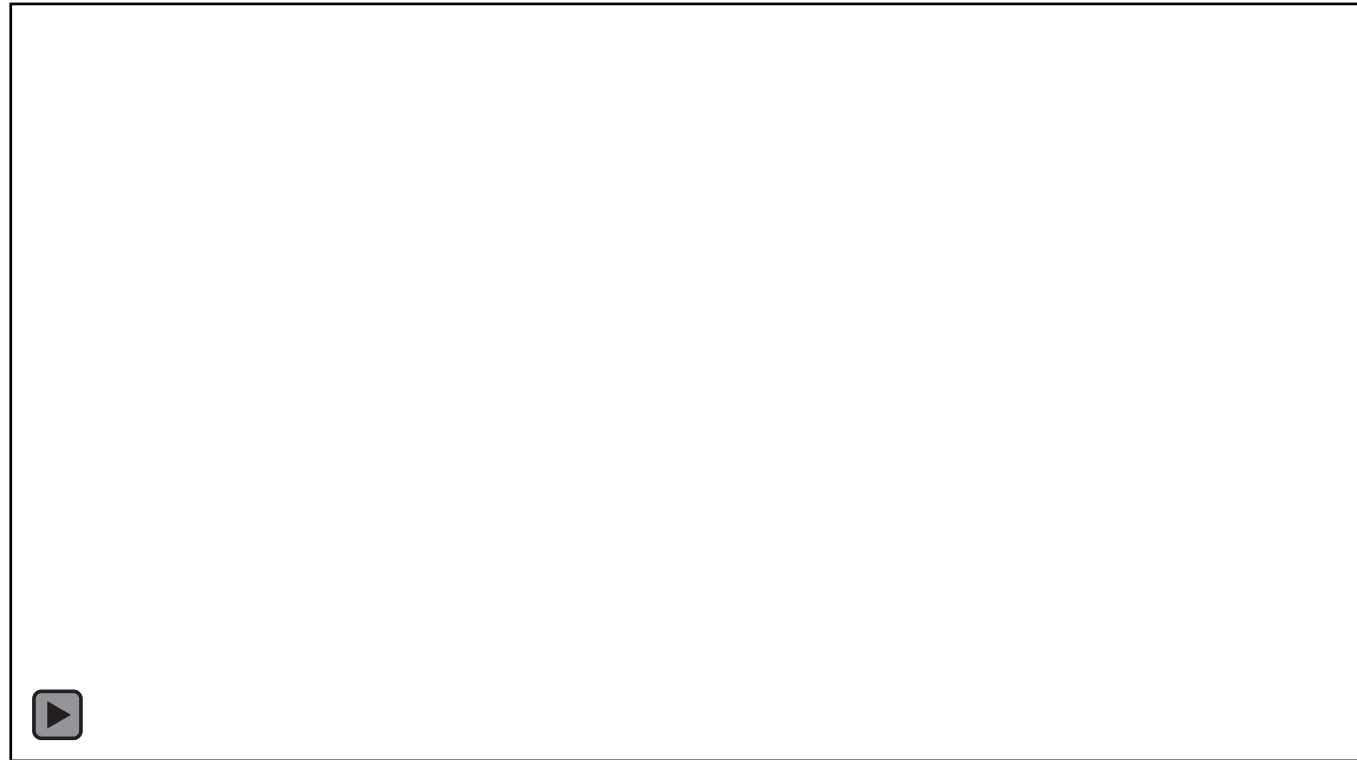


Saltwater Intrusion in Delmarva: Aerial & Optical

- 14 counties across Delmarva (15,670 km²)
 - 3 in Delaware
 - 9 in Maryland
 - 2 in Virginia
- 2 time-steps
 - 2011-2013
 - 2016-2017



Salt Patch Mapper



Papers

- Mondal et al., 2023. *Nature Sustainability*.
- Sarupria et al., 2025. *Remote Sensing of Environment*.
- Mondal et al., 2025. *Advances in Agronomy*.
- Sarupria et al. 2026. *Scientific Reports*.

Datasets

- Mondal et al., 2022. Salt patch and other land covers (1m)
- Sarupria et al., 2025. Fractional abundance of salt patch and marsh (2019-2023)
- Sarupria et al., 2025. Historical land cover: 2000, 2002, 2005, 2009, 2016 (30m)

EARTH OBSERVATION FOR SUSTAINABLE ECOSYSTEM & LIVELIHOOD (EASEL) LAB

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Current Projects on Saltwater Intrusion



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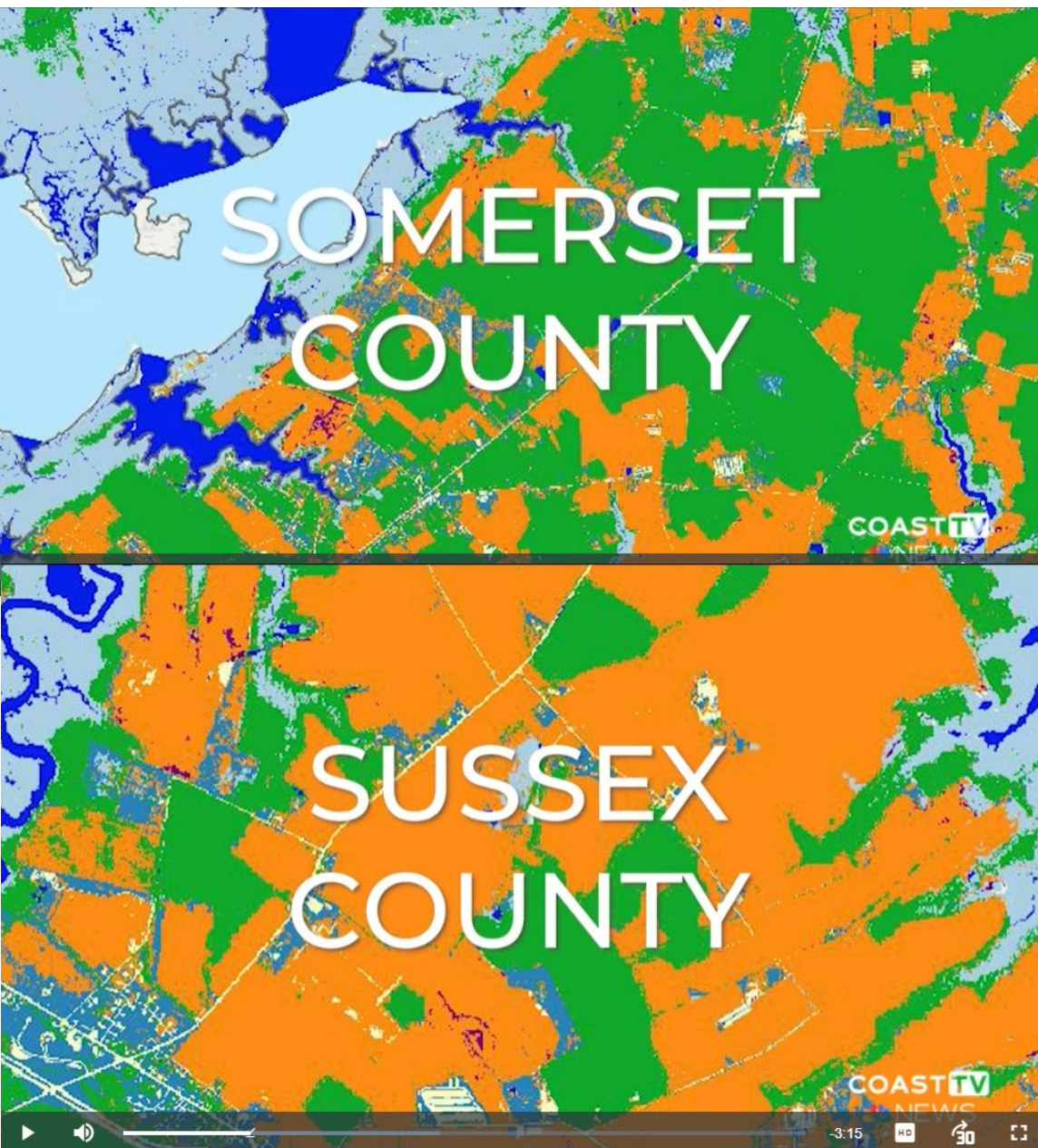


[Click on the image to visit project homepage](#)



Harry R. Hughes
CENTER FOR AGRO-ECOLOGY

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“I am currently working on doing a larger story about Sea Level Rise and its impacts in the state of Delaware and **that tool would be extremely useful in finding farmers** to speak to. I have finally found a farmer willing to speak with me about the Saltwater intrusion in the Slaughter Beach area.”

- Alex Seymore, meteorologist and reporter at CoastTV in Milton, DE

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Photo: Dr. Jarrod Miller, UD

