

CENTER FOR
**WATERSHED
PROTECTION**

Town of Bluffton Wetland Mapping

Lisa Fraley-McNeal

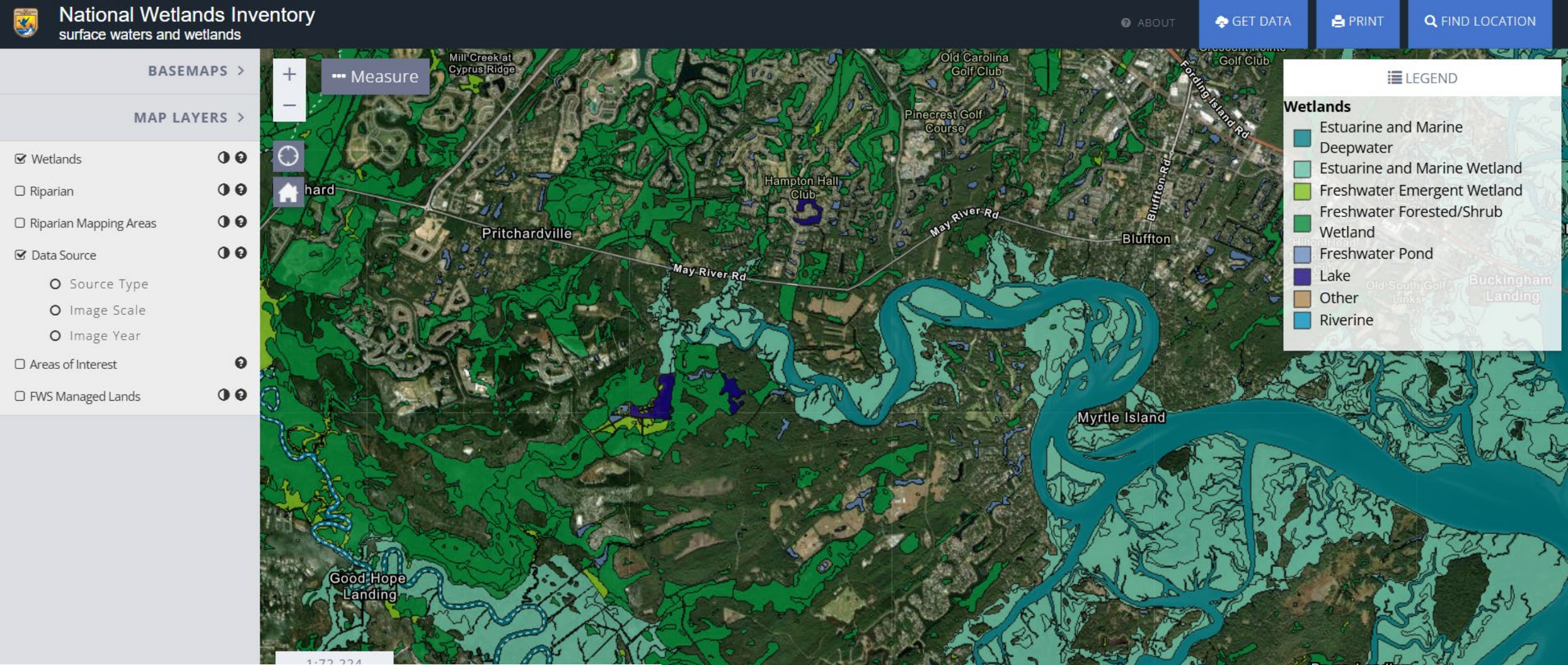
Protecting Wetlands:
The Role of Local Government
April 30, 2026



ENVIRONMENTAL
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National Wetland Inventory

- Last updated from imagery in 2006 and 2011
- Does not include wetlands smaller than 1-3 acres



Wetland Mapping Methods

Head's Up Digitizing

Method

- Manually tracing from digital imagery or high-resolution aerial photos.
- Used by USFWS to create the NWI.

Accuracy

- NWI standards require 98% producer's accuracy

Data Needs

- Leaf-off digital color infrared with a resolution of 1.0 meter or less.
- Ancillary datasets that include hydrologic indicators, vegetation patterns, or soil data.

Limitations

- Highly dependent on image quality.
- Requires a wetland analyst with remote sensing experience/certification
- Time required for manual digitization
- Requires ground-truthed data for verification

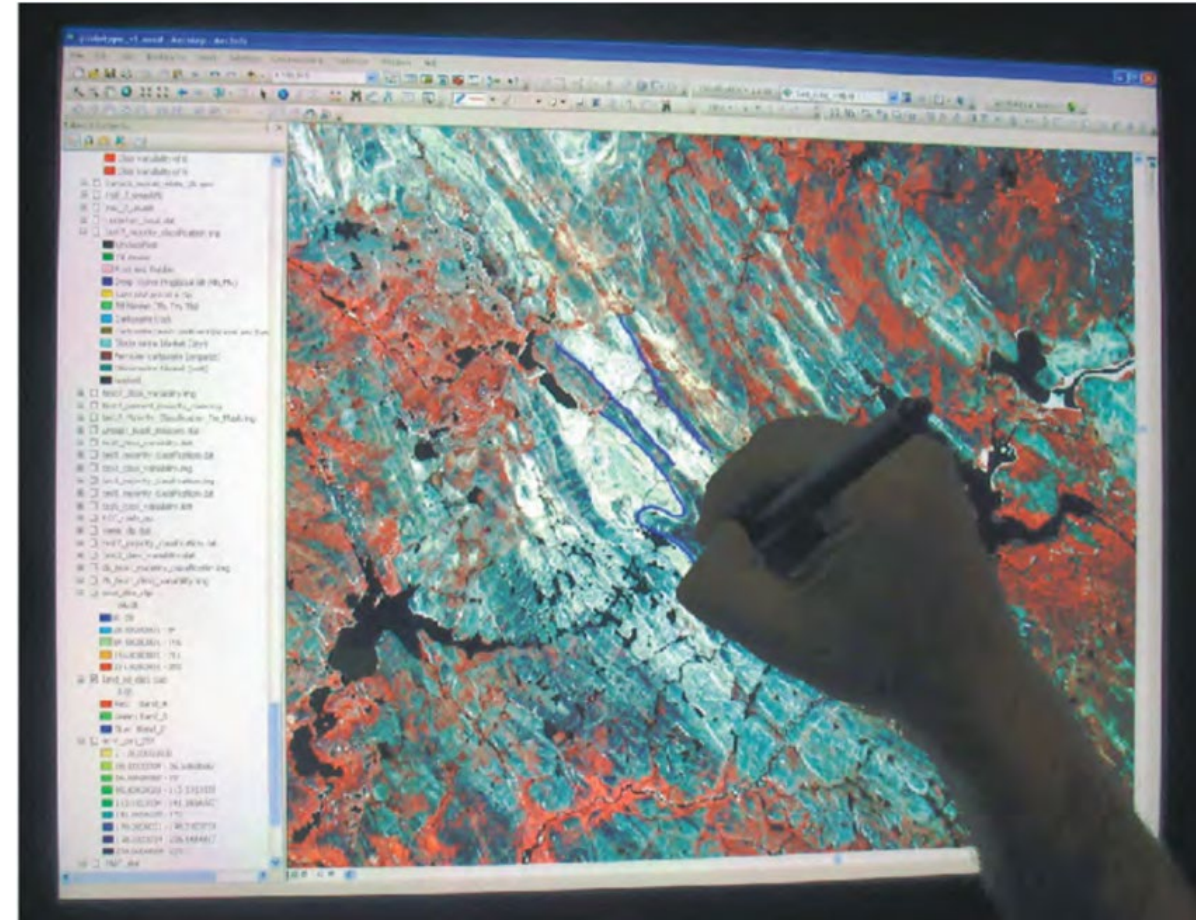


Photo Source: [Harris et al., 2012](#)

Overlay Analysis

Method

- Various wetland indicator datasets are combined to generate a probability surface of wetland occurrence.

Accuracy

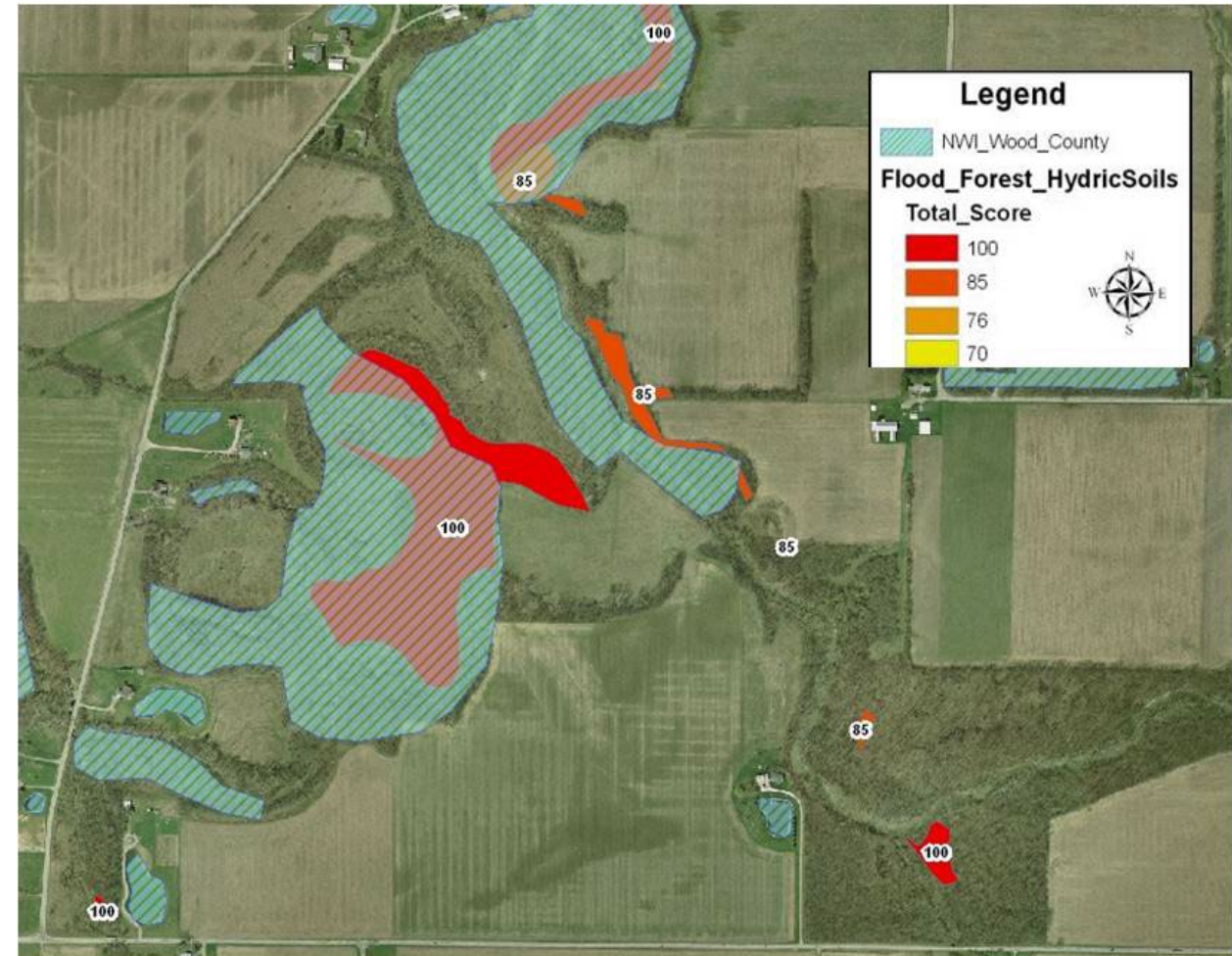
- Case studies reported 27-88% producer's accuracy

Data Needs

- Required: high-resolution DEM, hydric soils, NWI
- Supplemental: hydrography, vegetation, floodplain, etc.

Limitations

- Quality of the input data will directly affect the accuracy of the results.
- Ground-truth data would be needed for verification and refinements to improve accuracy.



Example from Wood County, OH that used hydric soil, 100 year FEMA floodplain, and forest indicator layers.
Source: <https://owl.cwp.org/257lcb/>

Machine Learning

Method

- Involves training algorithms to recognize patterns in data and subsequently classify new data based on these learned patterns.
- Deep learning is a subset of machine learning that uses artificial neural networks to mimic the learning process of the human brain.

Accuracy

- Case studies reported 70-94% producer's accuracy

Data Needs

- High-resolution DEM, ground-truth wetland training data, aerial imagery, vegetation, soils, multispectral satellite imagery, etc.

Limitations

- Requires an iterative process to identify optimal parameters and build the best performing model.
- May require multiple model runs due to data size limitations
- Large amounts of data storage and computational capacity
- **Requires ground-truth wetland locations to use as training data that covers the Town extent.**

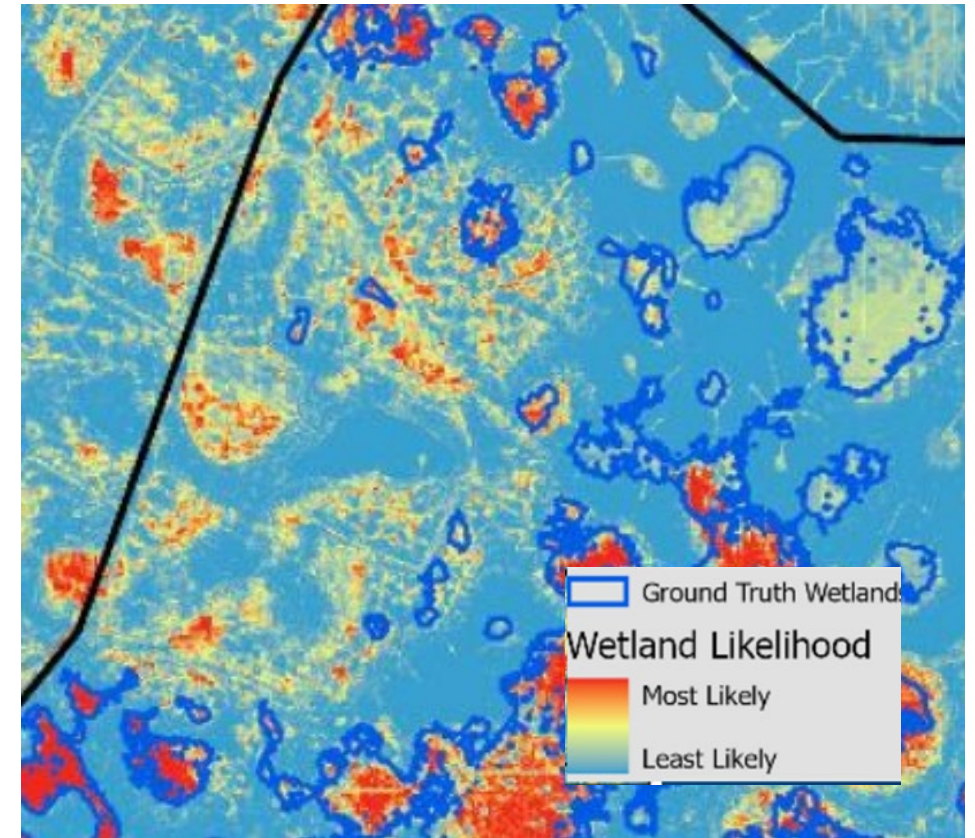


Image Source: [O'Neil, 2021 ESRI Presentation](#)

Recommended Approach



Heads-Up Digitizing

Would be time-intensive, require a wetland analyst with remote sensing expertise, and would need to be ground truthed. Results would likely be similar to NWI.



Overlay Analysis

Wetland indicator data layers are available and ground truth data is not required.



**Future
Effort**

Machine Learning

Would provide more accurate results than an overlay analysis but requires a robust training dataset of known wetland locations across the Town that is currently not available.

**Town of Bluffton
Overlay Analysis to
Identify Potential Wetlands**

Data



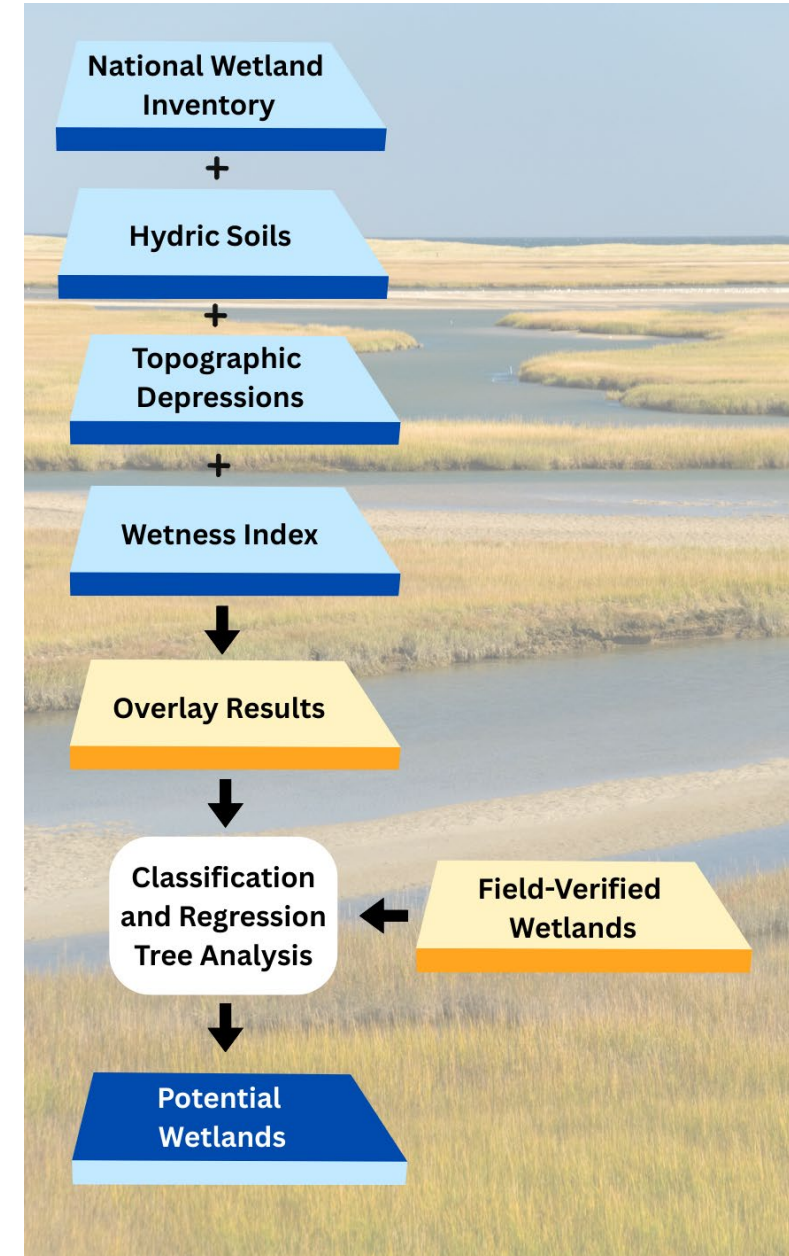
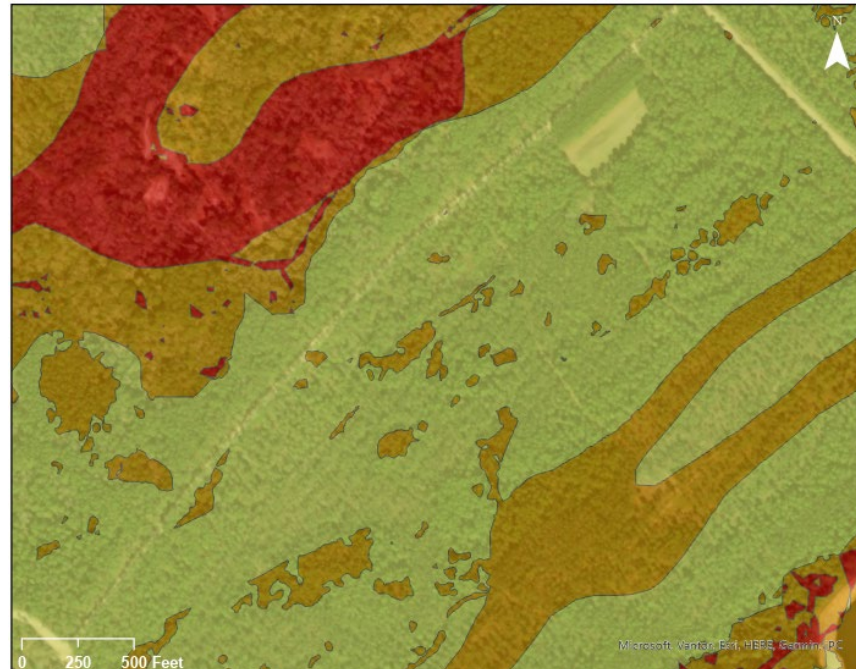
Approach

Overlay Analysis - Wetland datasets that indicate the potential presence of wetlands were combined to generate a probability surface of wetland occurrence.

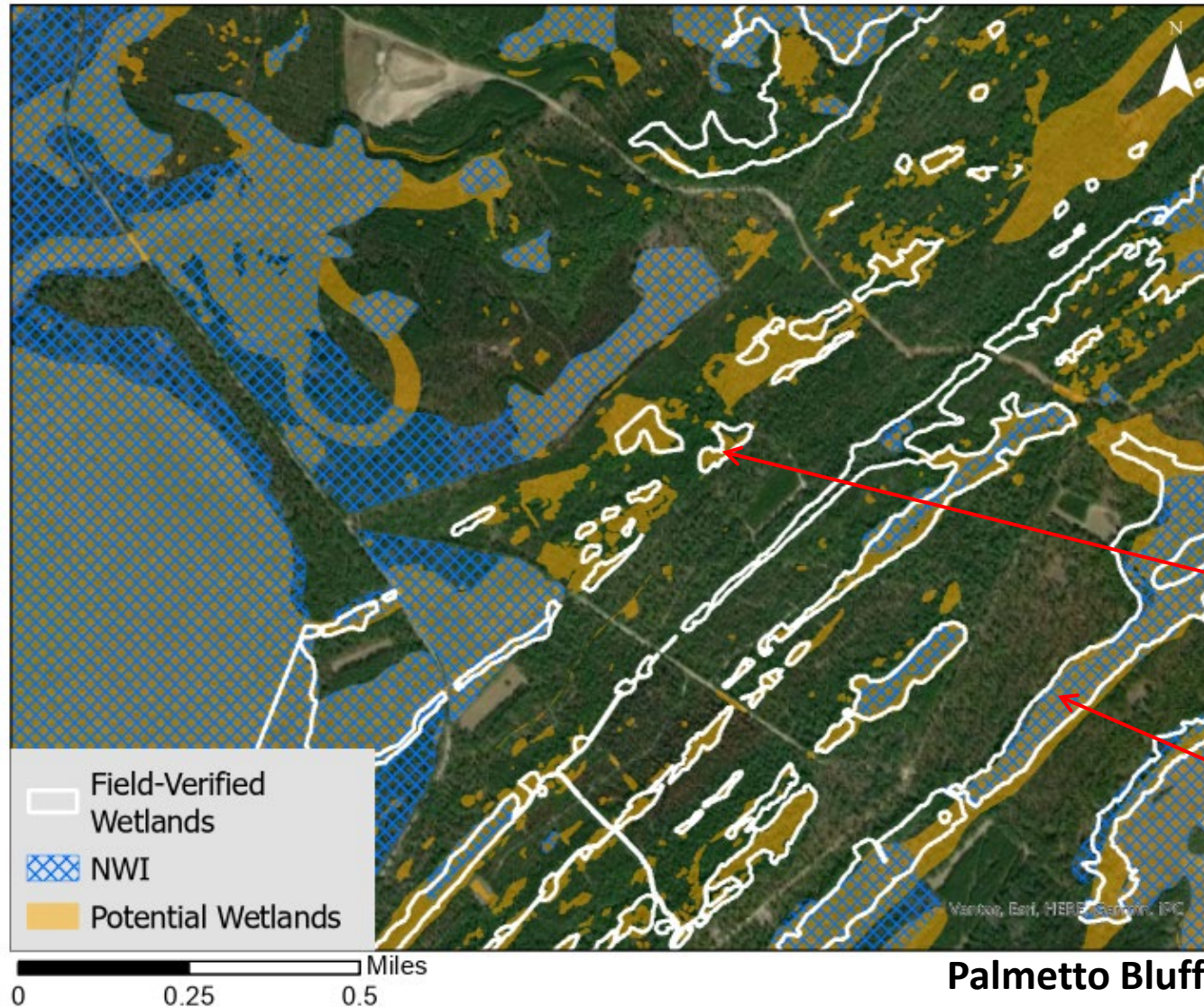
1. Conduct overlay analysis using potential wetland indicator layers.
2. Use plan sets from permitted projects to digitize field-verified wetland locations.
3. Conduct a statistical regression and classification analysis to determine wetland probability.
4. Create map of wetland potential.

Wetland Potential

- High
- Medium
- Low



Results Compared to NWI



Overlay analysis captures smaller wetlands

NWI captures larger wetlands

Results Compared to NWI

Total Wetland Acres in the Town

Overlay Analysis	NWI
16,784	13,703

Total Wetland Acres on Undeveloped Parcels

Overlay Analysis	NWI
2,405	1,963

Producer's Accuracy: 82% (compared to 69% for NWI).

User's Accuracy: 50% (compared to 55% for NWI).

Higher producer's accuracy indicates that more field-verified wetlands were identified. Lower User's Accuracy indicates that wetlands were overestimated, which is beneficial for ensuring they are protected.



Next Steps

- Use the resulting map of “potential wetlands” to assist with the implementation of amendments to the Unified Development Ordinance to expand wetland protections .
- Continue to expand the digitized wetlands GIS layer for future mapping updates, such as through machine learning.

THANK YOU

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Photo Source: Town of Bluffton

