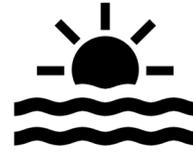




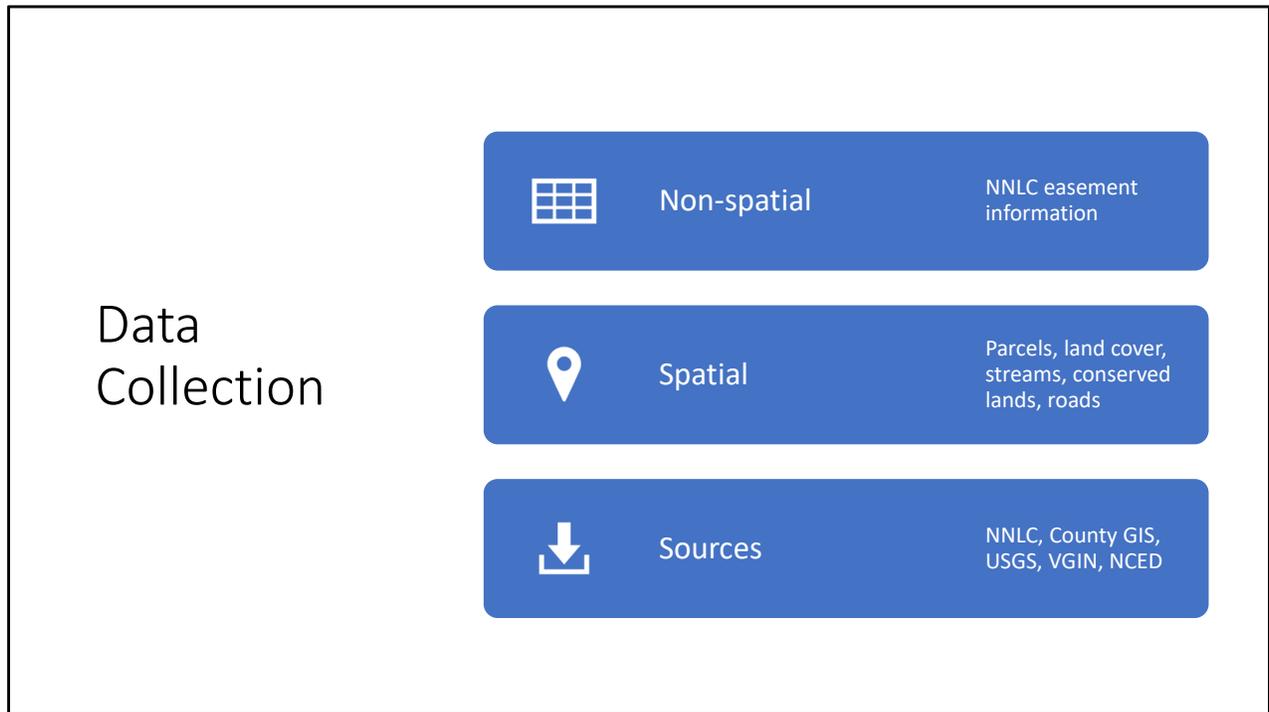
Hi everyone, this is Marisa Payne reporting from home. The date is April 22<sup>nd</sup>, 2020, so happy 50<sup>th</sup> anniversary of Earth Day to you all. I am here reporting on my GIS capstone project, which is based on an internship that I completed with Friends of the Rappahannock this spring. The title of my project is Conserving the Northern Neck: Highlighting the Restoration Potential of Conserved Lands in Virginia. The Northern Neck is a peninsula of land in northeastern Virginia, pictured here, which is constituted by King George, Westmoreland, Northumberland, Lancaster, and Richmond Counties.



- Completed for: Friends of the Rappahannock in partnership with Northern Neck Land Conservancy
- Goal: Create a user-friendly pamphlet containing maps of NNLC's conservation easements which highlight opportunities for restoration projects.

So, as I said, this project was completed in service of Friends of the Rappahannock, Fredericksburg's local non-profit river conservation organization. This spring, FOR entered into a partnership with the Northern Neck Land Conservancy, an accredited land trust based out of Lancaster, Virginia. For those of you who are not familiar with what a land trust is, it's an organization that partners with landowners to conserve their land and protect it from future development.

NNLC holds 35 conservation easements within the Northern Neck and Essex County—six counties altogether. The goal of this project is to create a map of each one of these easements, highlighting any ecological features that would make the easement a good candidate for restoration projects. The maps will be secured into a pamphlet by FOR and supplemented with details and contact information regarding restoration opportunities.



There was a wide range of data necessary for this project, perhaps the most important being the information about the NNLC easements themselves. NNLC sent over a spreadsheet containing the easements' tax map IDs, owner names, acreages, county specifications, and more. Next, parcel data for each of the six counties was collected. Some parcel shapefiles were sourced from county GIS teams, and the rest were located in an online database created by the Virginia Geographic Information Network. Unfortunately, parcel data for Northumberland County was not available. Land cover and Virginia road data was downloaded from the Virginia Geographic Information Network. Stream data was downloaded from USGS in the form of the National Hydrography Dataset. Conserved lands data was downloaded from the National Conservation Easement Database and would be used to show conservation easements held by organizations other than NNLC.

# Data Manipulation

1

## Locating easements

- Matching NNLC records to parcel data
- Consulting public records for IDs and addresses

2

## Sorting land cover data

- Picking relevant land covers
- Writing a code to add labels based on ID numbers
- Reclassifying structures

3

## Symbolizing features

- Displaying features in a nonobstructive manner
- Adding labels and reference points

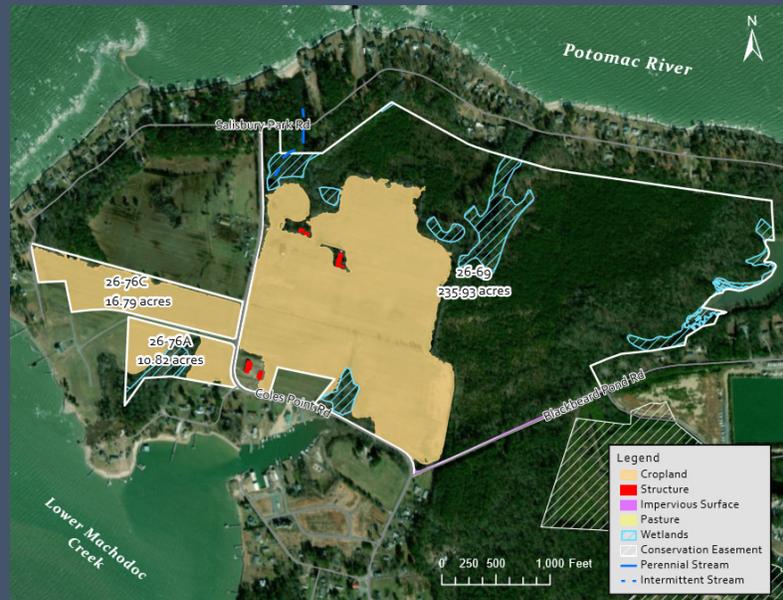
The next step was to locate each of the NNLC easements within the parcel shapefiles. This was more difficult than expected due to mismatched tax ID numbers in NNLCs records. This obstacle was luckily overcome through the use of county public records, which allow you to search for parcels by the owner's last name. Because NNLC's records provided only mailing addresses for easement owners, public records were used again later to locate the easements' physical addresses for inclusion in the final product.

The VGIN landcover data was the next thing that needed some work. The records in the download only contained ID numbers to differentiate between land cover types, and therefore needed to be assigned labels for ease of use. My internship supervisor and I decided that the land covers of interest would be cropland, pasture, impervious surfaces, and wetlands, so I created a brief code in the field calculator to assign labels to these classes only. The impervious surfaces category was then split into two—structures and general impervious surfaces—because there are different restoration recommendations for each. Aerial imagery was used to differentiate between impervious surfaces, and polygons were manually reclassified.

Land cover and the remaining features (rivers, roads, and conserved lands) were then symbolized in a manner that would convey information without completely overpowering the aerial imagery. Easement parcels were labeled with their tax ID numbers and acreage, and roads and larger bodies of water were labeled by name to provide map users with points of geographic reference.

## Results: Coles Point

- Large parcel with waterfront property to the east; nearly 50% cropland; multiple structures; one stream
- Possible recommendations:
  - Nutrient management
  - Residential stormwater management
  - Afforestation
  - Oyster restoration



I have included a few maps for you today, each one representing a unique conservation scenario. Keep in mind, each of these maps will be placed on an 8.5 by 11 inch piece of paper with room for restoration recommendations below the map.

Here is a map I created of an easement named Coles Point. As you can see, Coles Point is nearly 300 acres total and contains a large area of cropland and some waterfront property. The easement also features multiple structures, and one intermittent stream to the north. Based on this map, I expect the folks at FOR to recommend a nutrient management plan for the cropland, stormwater management around the structures, and potentially afforestation of any unused cropland. Of particular concern is the area of cropland near the intermittent stream, which may be contributing harmful chemicals into the water system. Lastly, oyster restoration is a possibility because of the waterfront property to the east.

## Results: NERD Farms

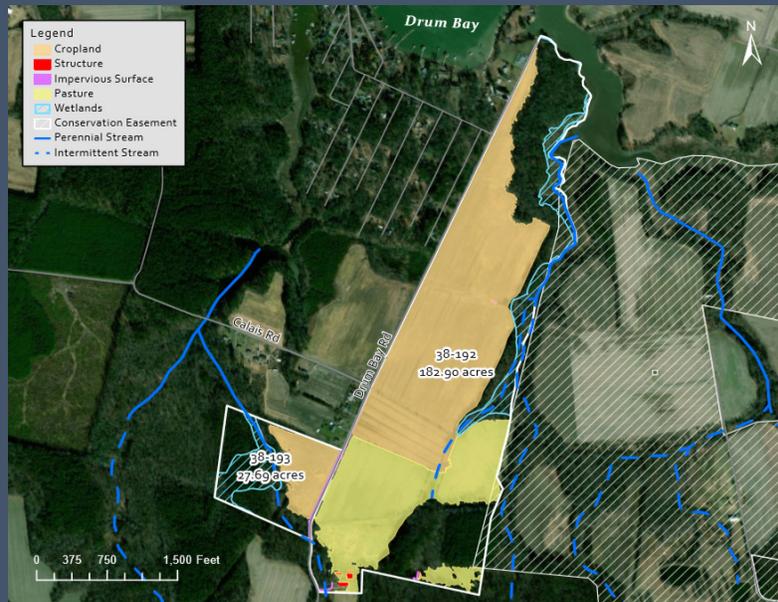
- Smaller easement; almost selectively composed of cropland; perennial stream between crop fields
- Possible recommendations:
  - Nutrient management
  - Implementation of forested riparian buffer
  - Wetland restoration



This next map is of NERD Farms. This easement is made up almost entirely of cropland, which is a problem because of the perennial stream to the south of the property and the property's proximity to Mattox Creek. A nutrient management plan is surely in need if one is not already in place, and the easement could also benefit from reforestation or wetland restoration around its streams' headwaters.

## Results: Drum Bay

- Waterfront property to the north; pasture and multiple streams on property; neighboring conservation easement
- Possible recommendations:
  - Livestock fencing
  - Oyster restoration
  - Wetland restoration
  - Afforestation



This is the last example. This map shows the easement Drum Bay, named after its location at the edge of a Drum Bay inlet. This easement is unique because it contains multiple streams and animal grazing pasture, and it directly borders a conservation easement held by another organization.

This easement shows great opportunity for restoration projects, and one of importance would be the construction of livestock exclusion fencing around the intermittent stream that runs directly through pasture. Fencing would help to reduce the risk of livestock waste and overgrazing from damaging stream health.

Oyster and wetland restoration are both viable options for the waterfront portion of this property, and afforestation of unused pasture and cropland is always a possibility. Partnership with the neighboring easement would be helpful in the completion of any restoration projects.

## Discussion: setbacks



- No parcel data for Northumberland County
  - 17 of 35 easements
  - Relatively small acreages
- Oyster habitat and shoreline erosion data not available for public use
  - Owned by the Virginia Institute of Marine Science (VIMS)

Though I am very happy with how this project has turned out, it's important to recognize that there were a few setbacks that prevented the project from reaching its full potential. The major one is that parcel data for Northumberland was nowhere to be found—countless resources were consulted to no avail. Northumberland County contains 17 of NNLC's 35 easements—nearly half—but luckily those 17 easements are relatively small compared to the easements in other counties. We also would have liked to include oyster habitat and shoreline erosion data in the map products, but it was not available for public use. Perhaps a connection with VIMS could be established to solve this problem in the future.

## Discussion: final product

- Comprehensive product
- Provides much needed tool to NNLC easement managers and landowners
- Greater accuracy than site survey
- Restoration projects will increase easement conservation value

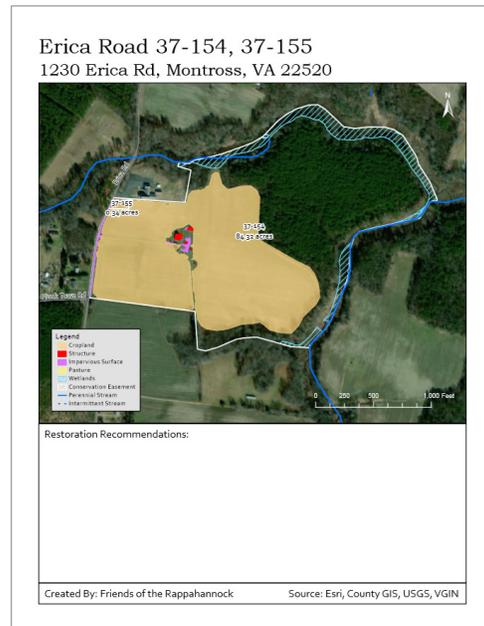


The results of this project are significant for the impact that they will have among conservation easements in the Northern Neck and Essex County. These maps represent a compilation of important data into one, easy-to-use format. The material presented in these maps was not previously so readily accessible to NNLC easement managers or property owners, and its availability is expected to ease communication and understanding and bring efficiency to restoration projects.

An example of the efficacy of these maps is seen in the Drum Bay map, where an intermittent stream passes directly through polluting livestock pasture. In the situation which this easement was physically assessed during a time period where the stream was not running, the option for livestock fencing could easily have been overlooked. It is for reasons and situations like these that this project shows such great potential to increase the conservation value of NNLC's many easements.

## Conclusion

- Eighteen maps created
- Countless restoration recommendations to be made
- Potential for partnerships
- Both non-profits aided in their goals to achieve healthier lands, water and people



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Slide 11 contains reference information.