

NCDOT WETLAND MODELING PROGRAM UPDATES

Presented at the **Interagency Coordination
Meeting**

October 16, 2014

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PURPOSE AND NEED

- NCDOT's Streamlined Project Development Process includes GIS-based impact projections
- Existing GIS data sources are not of sufficient quality => all proposed corridors must be field surveyed => more time and money
- Examples:
 - USFWS National Wetland Inventory (NWI)
 - USGS 1:24,000 scale streamlines
 - NRCS Soil Survey Maps

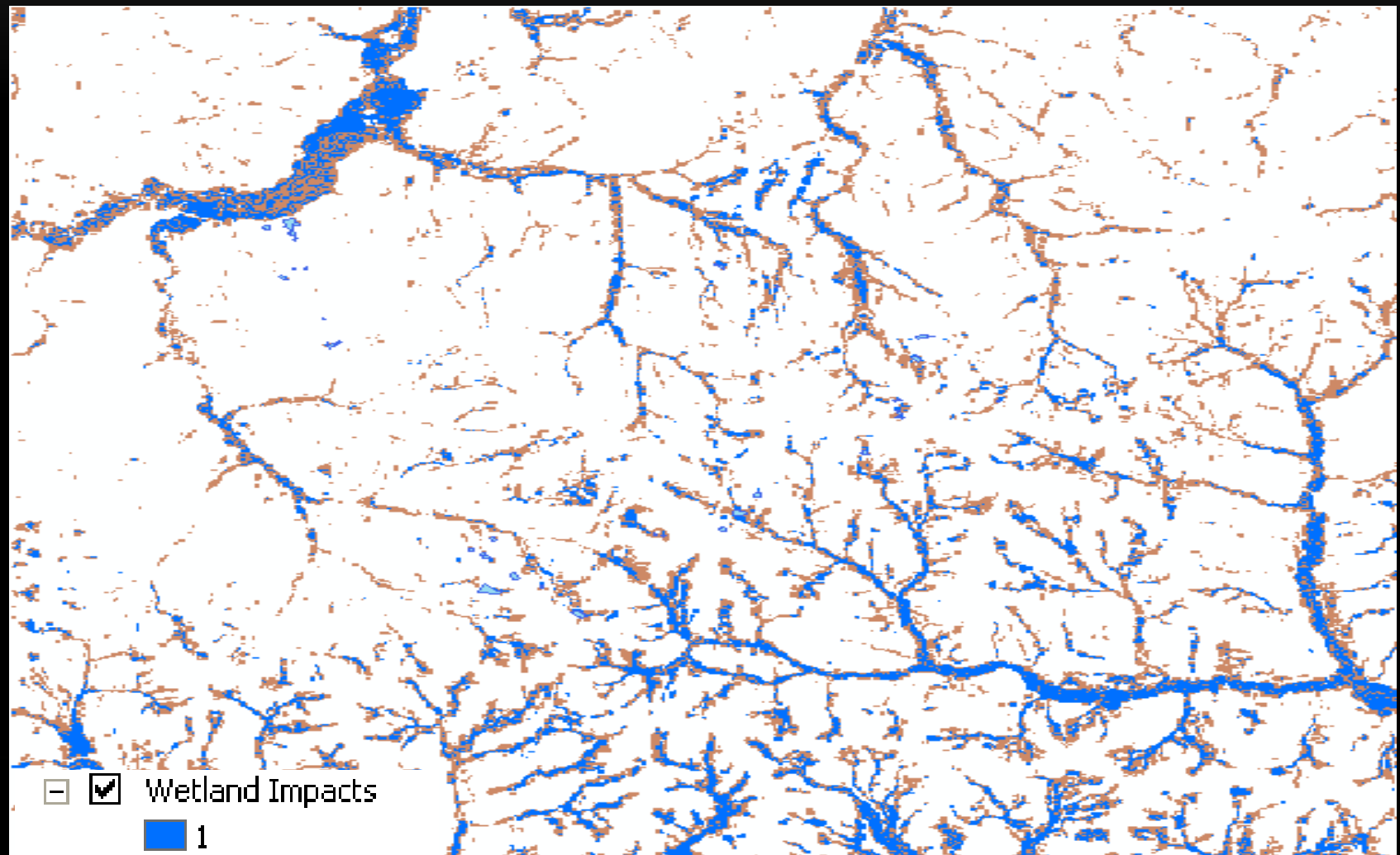
PURPOSE AND NEED

- Produce high quality GIS data that is accurate and consistent enough to compare alternatives
- Reduce field work, costs and project delivery times
- NCDOT goal of requiring full field delineations only for LEDPA corridor.
- Three pilot projects established: Carthage, Kinston, and ? (originally Dillsboro Bypass)

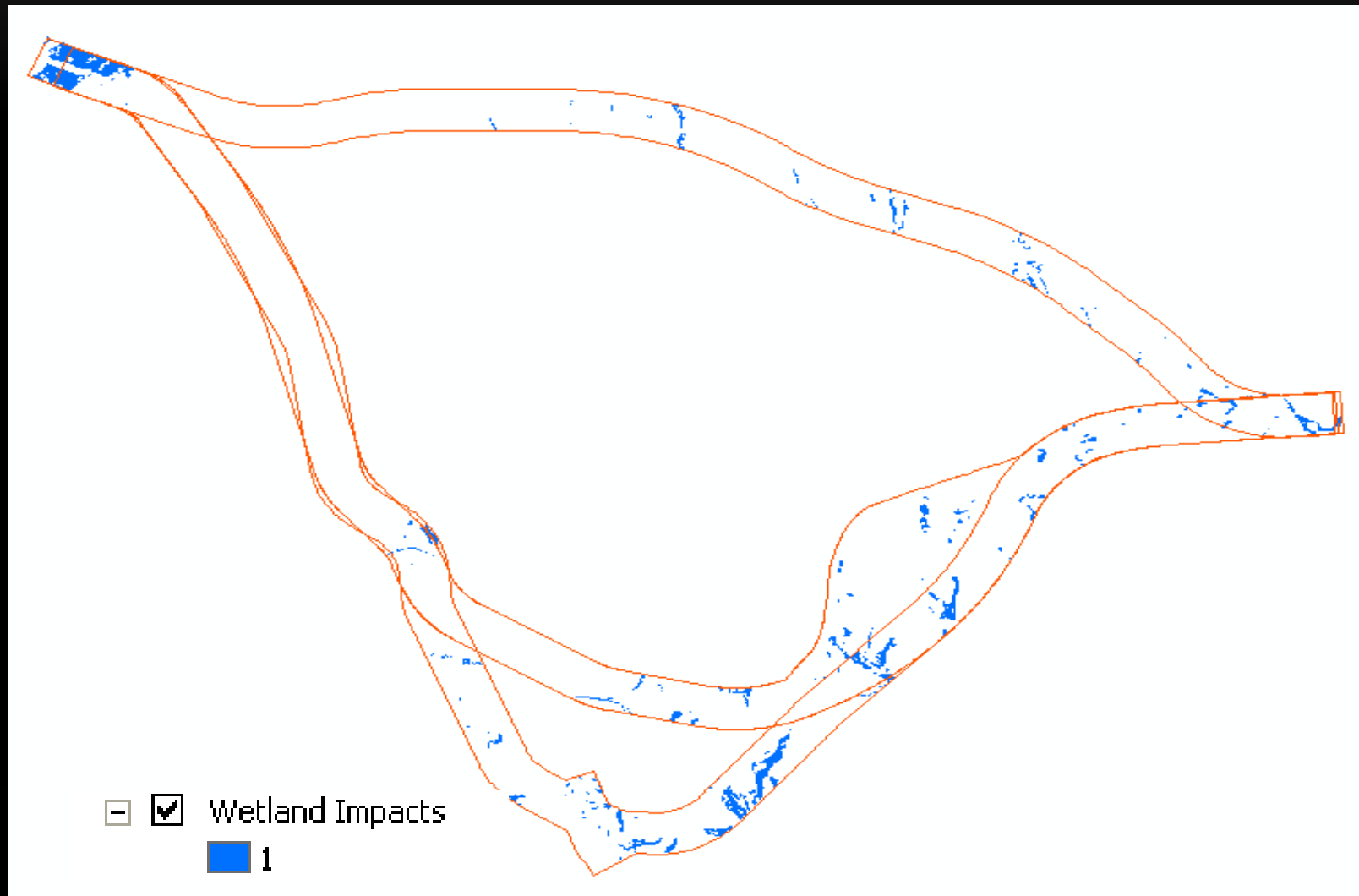
PILOT PROJECT - CARTHAGE

- Carthage bypass, TIP R-2212, is the first proposed pilot project
- Located in Moore Co.
- Triassic Basins and Sandhills ecoregions
- Wetland and headwater stream models developed and applied
- Accuracy assessed
- Results were used to determine utility and feasibility of expansion of modeling efforts to other pilot projects and eventually the entire state

RESULTS CARTHAGE



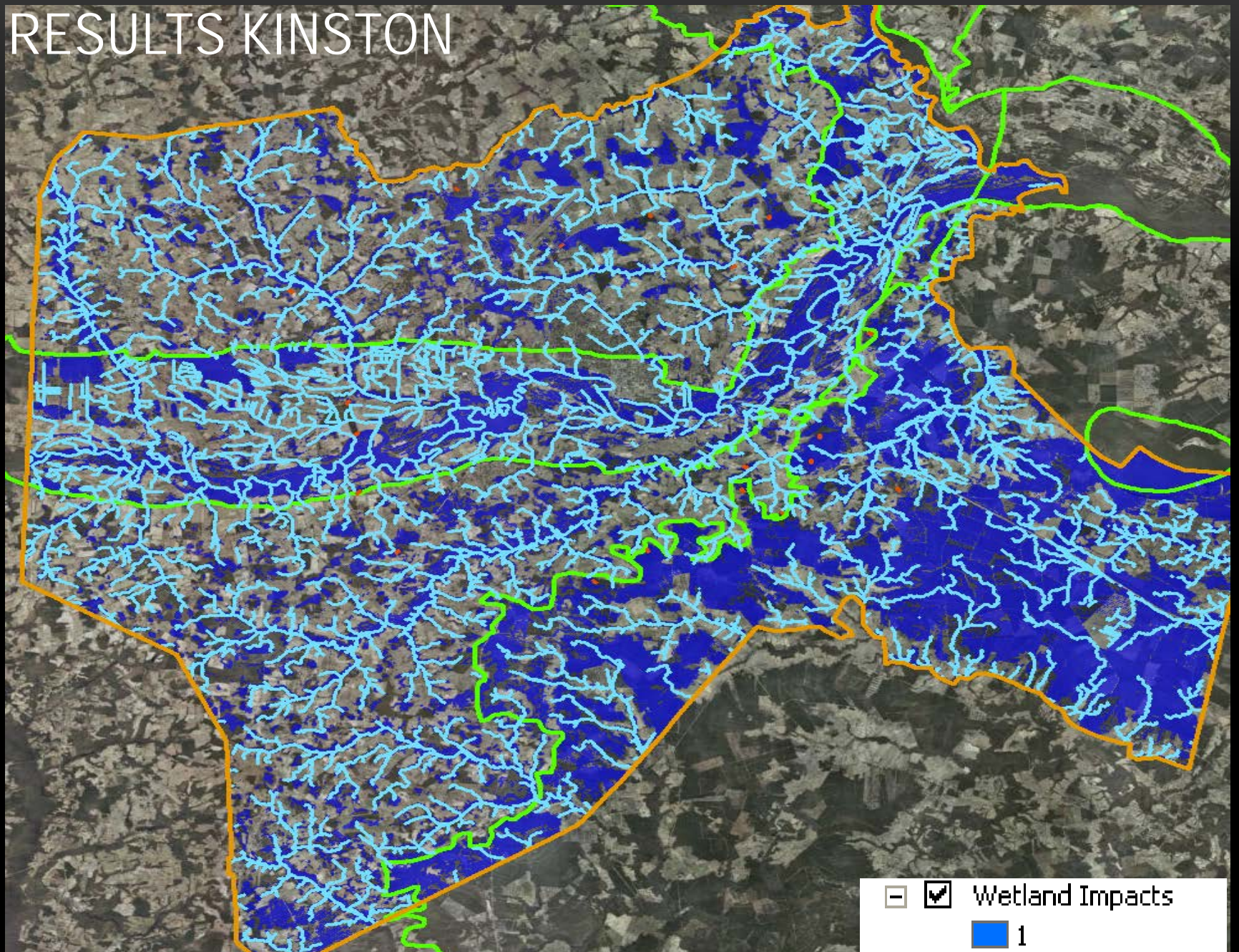
RESULTS CARTHAGE (BY CORRIDOR)



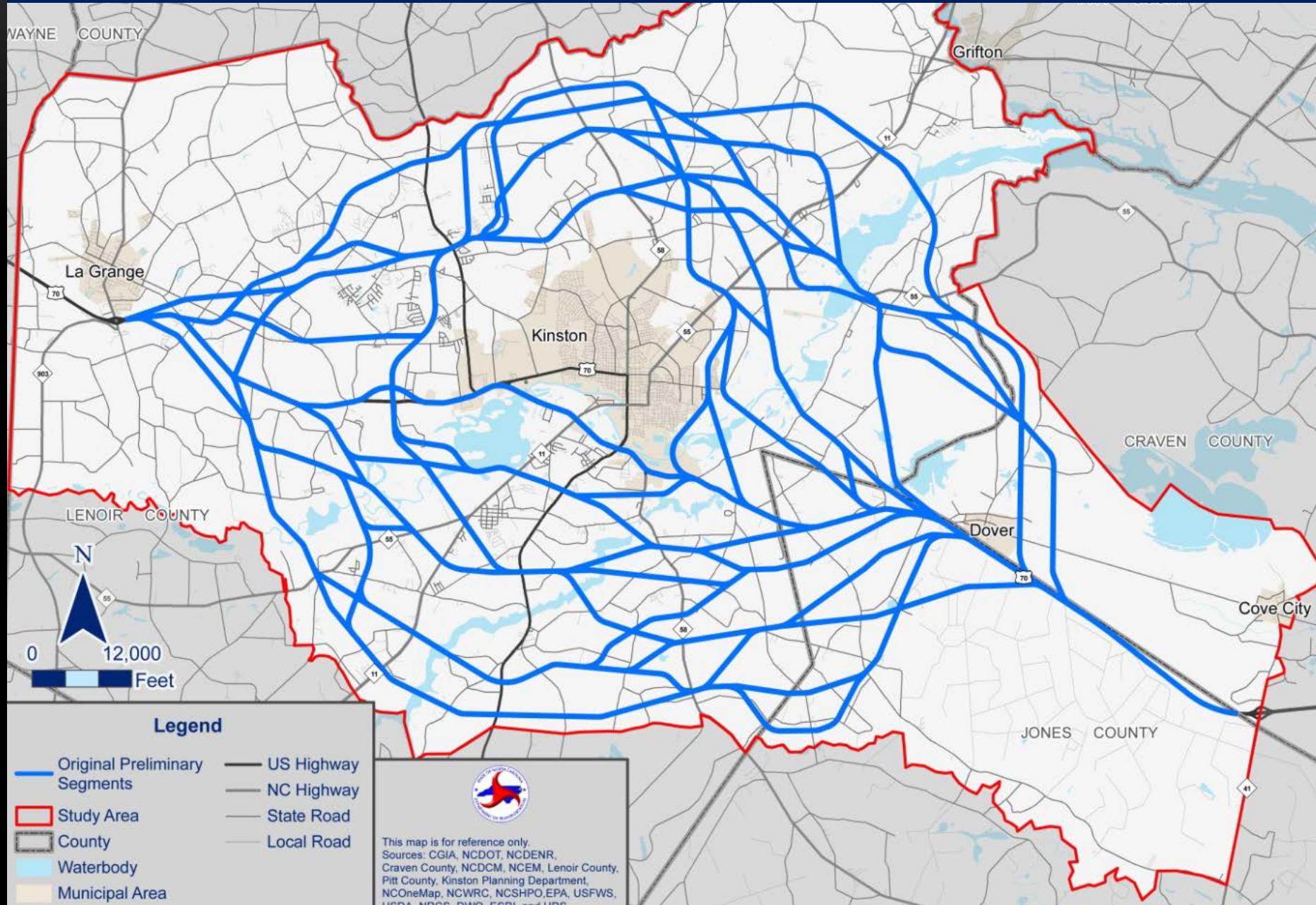
PILOT PROJECT – KINSTON BYPASS

- Kinston bypass, TIP R-2553, is the second proposed pilot project
- Located in Lenoir Co.
- Rolling Coastal Plains, Southeaster Floodplains/Low Terraces and Carolina Flatwoods ecoregions
- Wetland and headwater stream models developed and applied
- Updated ~30 layers for the entire county to help choose LEDPA
- Developed GIS-based NRTR
- Developed remote-assessment for stream crossings for CP2A
- Developed county-wide ditch model to estimate lateral effect – to be determined how to use appropriately

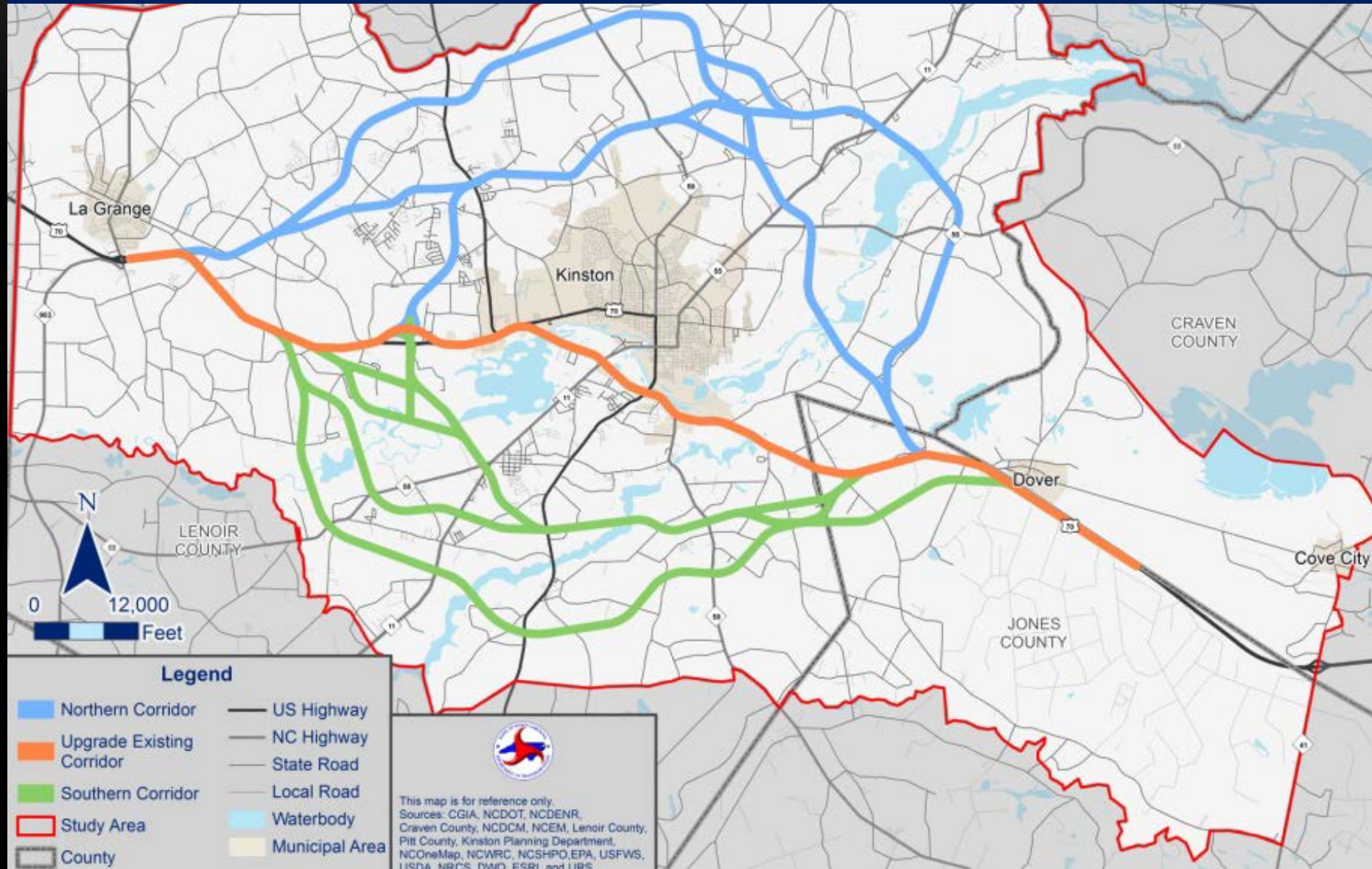
RESULTS KINSTON



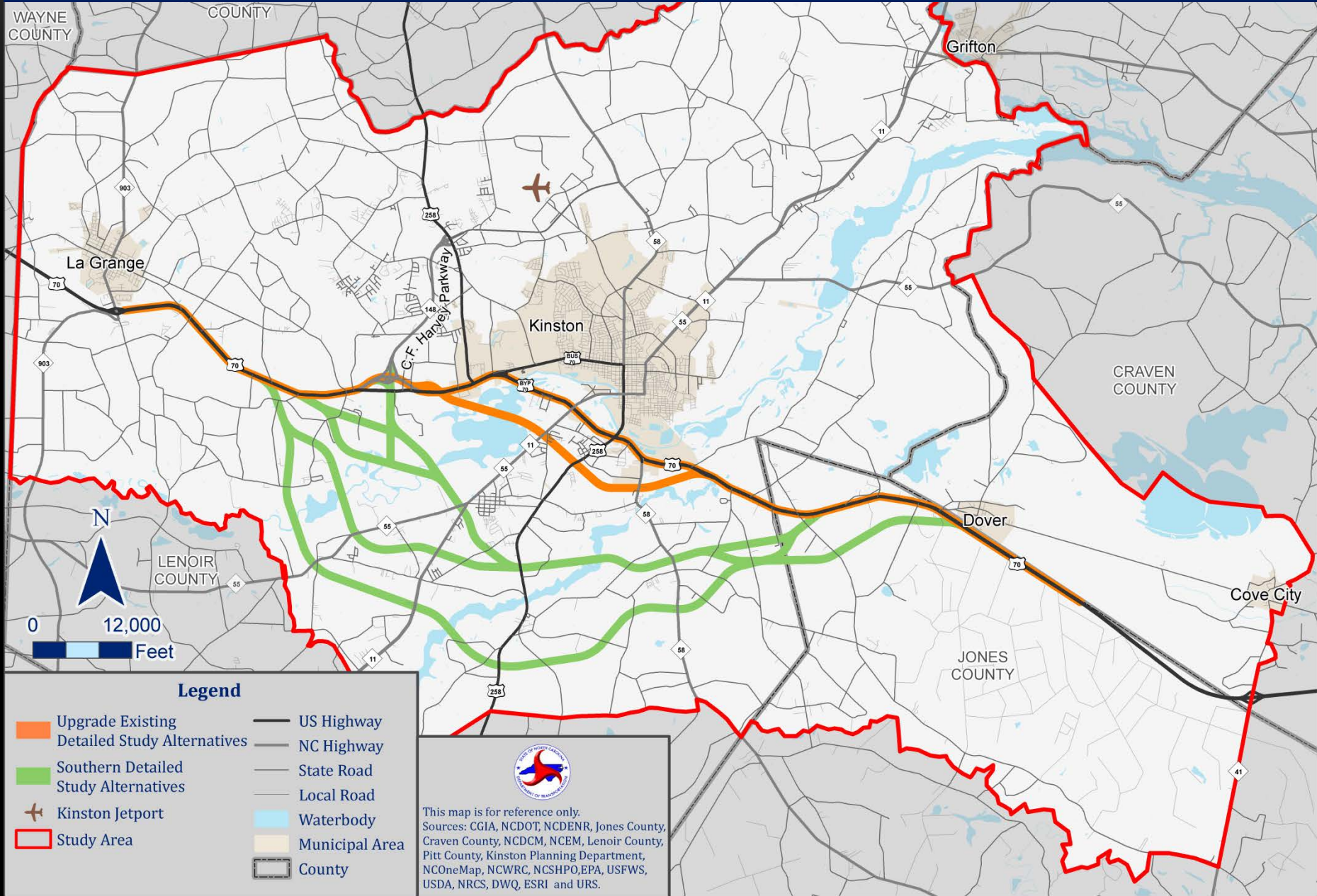
Initial Route Options Developed



21 DSAs Refined and Narrowed to 17 (follow-up to CP2)



17 DSAs Narrowed Down to 12 at CP2 Revisited



KINSTON BYPASS

- Allows for consideration/evaluation of a large amount of initial alternatives
- Can easily quantify impacts of new alternatives or revised alternatives
- Allows for design revisions “outside of the corridor” without the need for additional field work
 - Avoidance and minimization of impacts by shifting roadway and interchanges
 - Late addition of Shallow Bypass alternative based on public input

KINSTON BYPASS

Stream and Wetland LiDAR based models developed to produce GIS data layers

- Time and cost savings

\$250,000 = Stream and Wetland GIS data layers VS

\$600,000 = Traditional field delineation

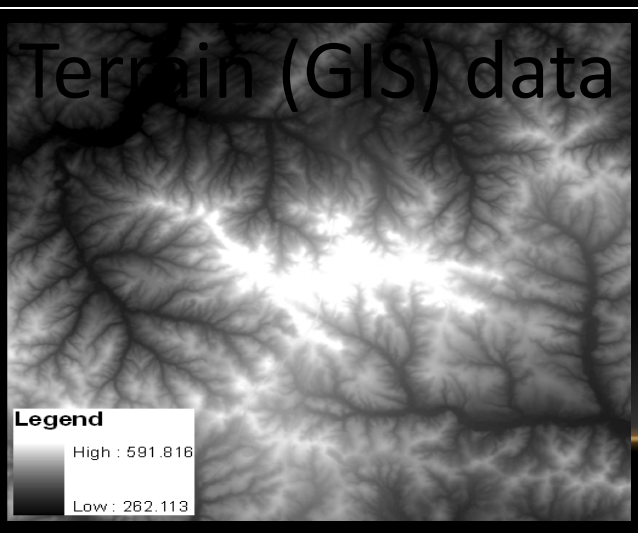
- Model results extend beyond project study area
- Can be used for other projects (Carey Road Ext)
- Kinston results applicable to three ecoregions
- SOS to CP2A (10/2009 to 4/2014)

53* months vs. 69 month avg. = a savings of 16 months

R-2609 - US 401 IMPROVEMENTS

- From Fayetteville to Fuquay-Varina
- Not Pilot Project
- Applying what was developed for Kinston Bypass
- Using to review alternatives for CP2
- Sandhills, SFLT, Rolling Coastal Plain, Northern Outer Piedmont

GENERAL METHODS



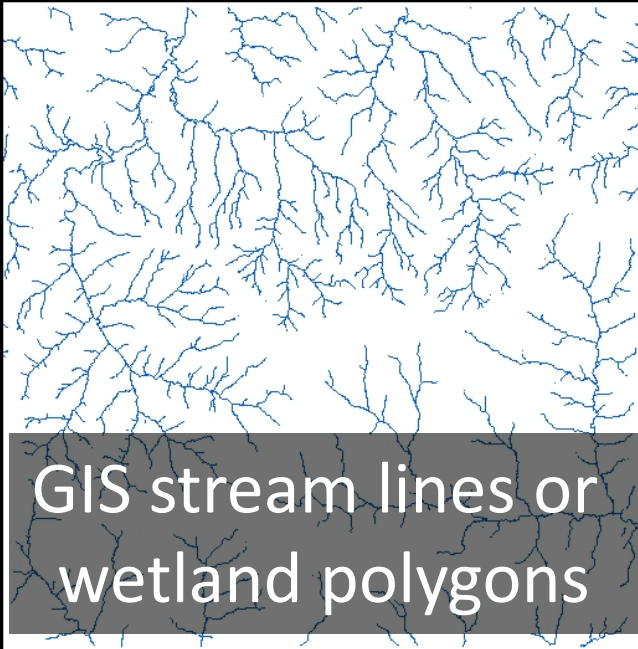
Model Development
(SAS, GIS)

Mathematical model

$$\frac{1}{1 + \text{Exp}(-39.1406 + ([\text{asp}] * -0.00214) + ([\text{avgasp}] * -0.00187) + ([\text{plan}] * 0.9620) + ([\text{avgplan}] * -104.7) + ([\text{avgprof}] * 47.9643) + ([\text{d8slp}] * -7.9884) + ([\text{avgd8slp}] * 79.0305) + ([\text{elev}] * -0.00321) + ([\text{plen}] * -0.00015) + ([\text{Intlen}] * 3.0704))}$$

GENERAL METHODS

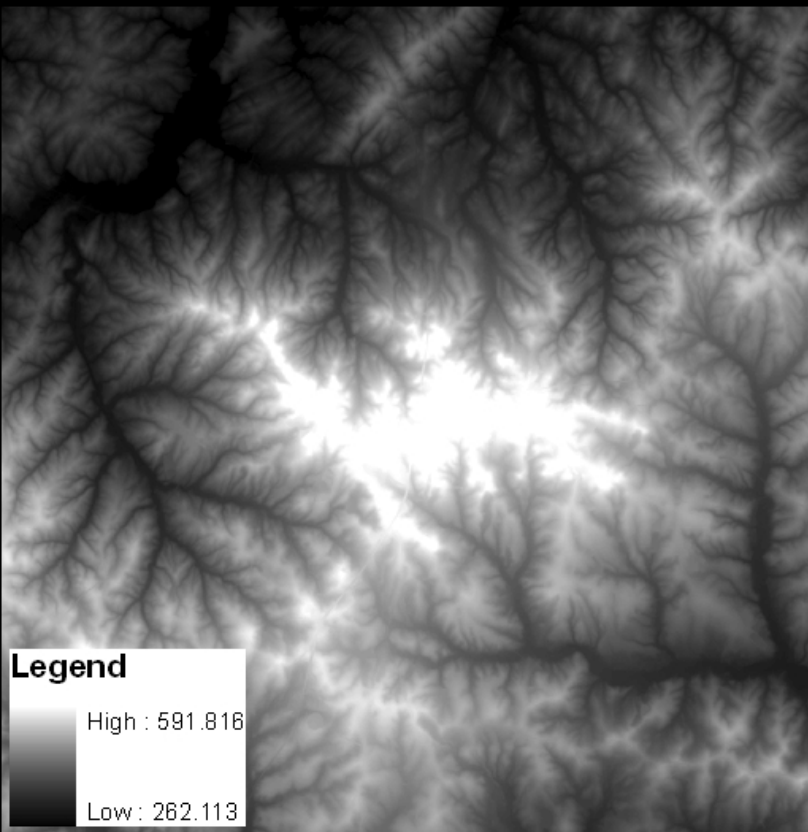
Model applied to
test area



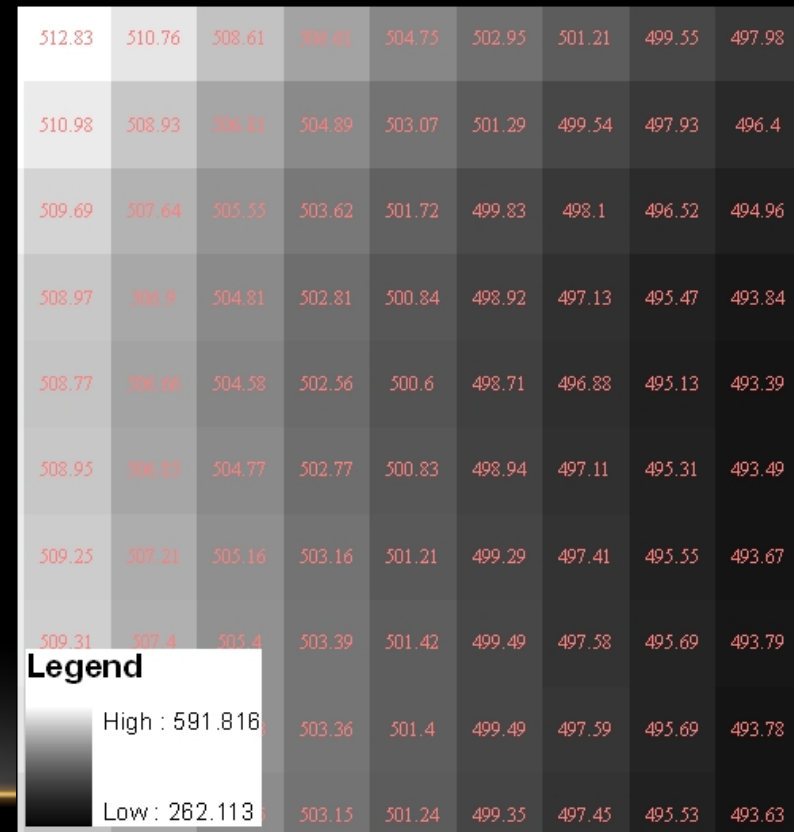
Accuracy

DIGITAL ELEVATION MODEL (DEM) RASTER

DEM overview (scale 1:100K)

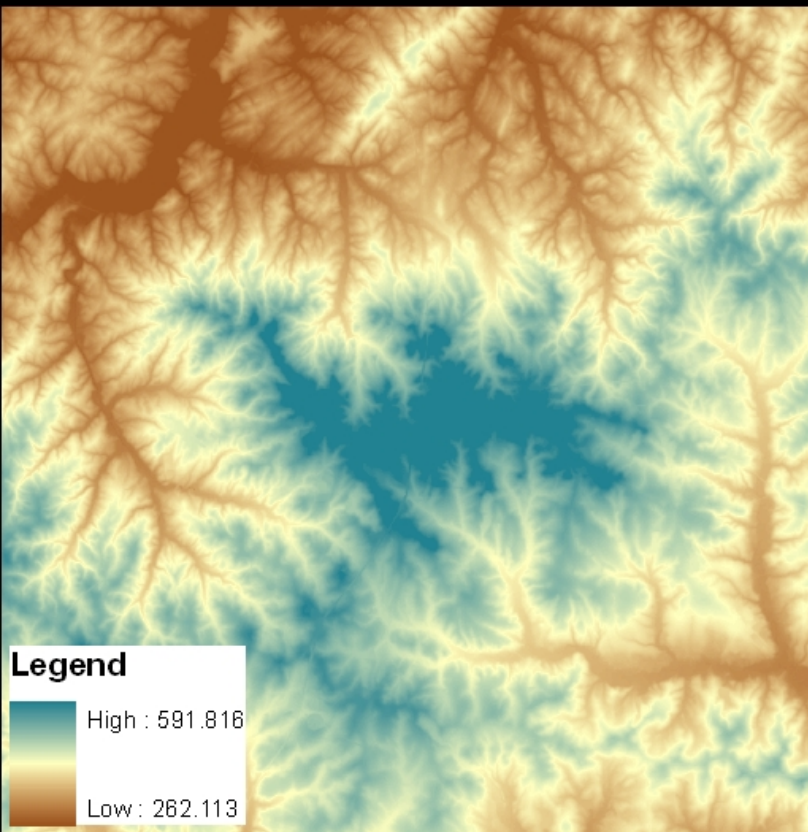


DEM detail (scale 1:285)

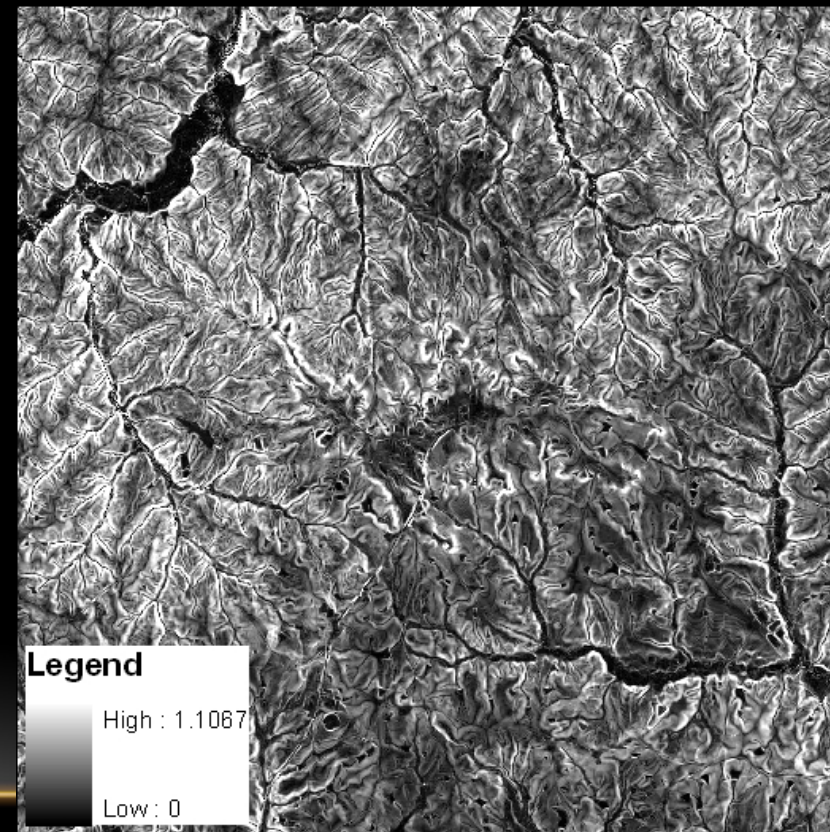


THINGS TO DO WITH DEMS: TERRAIN DERIVATIVES

Elevation

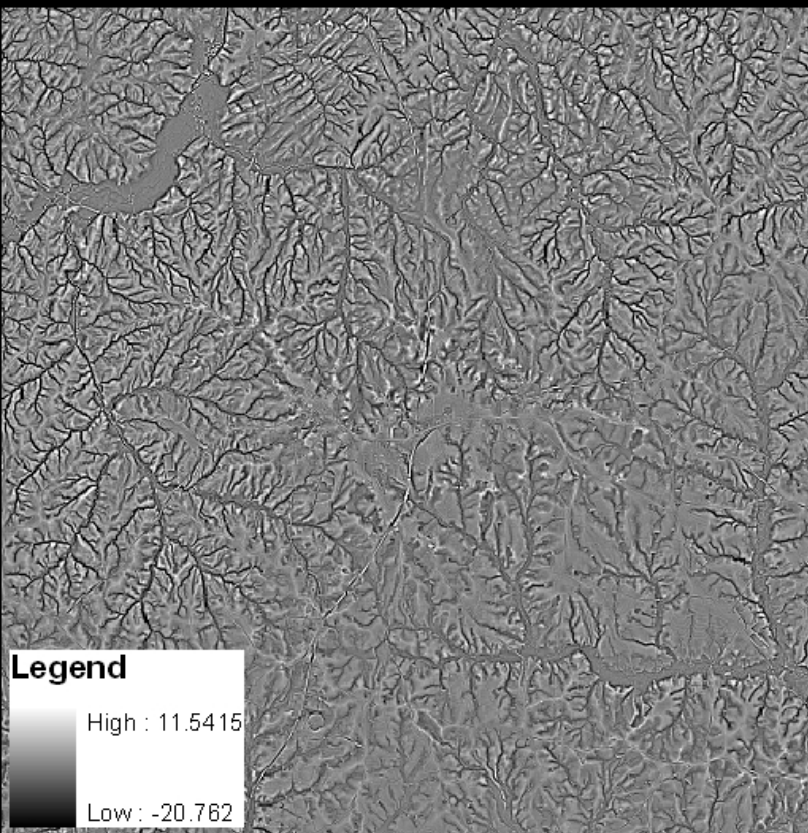


Slope

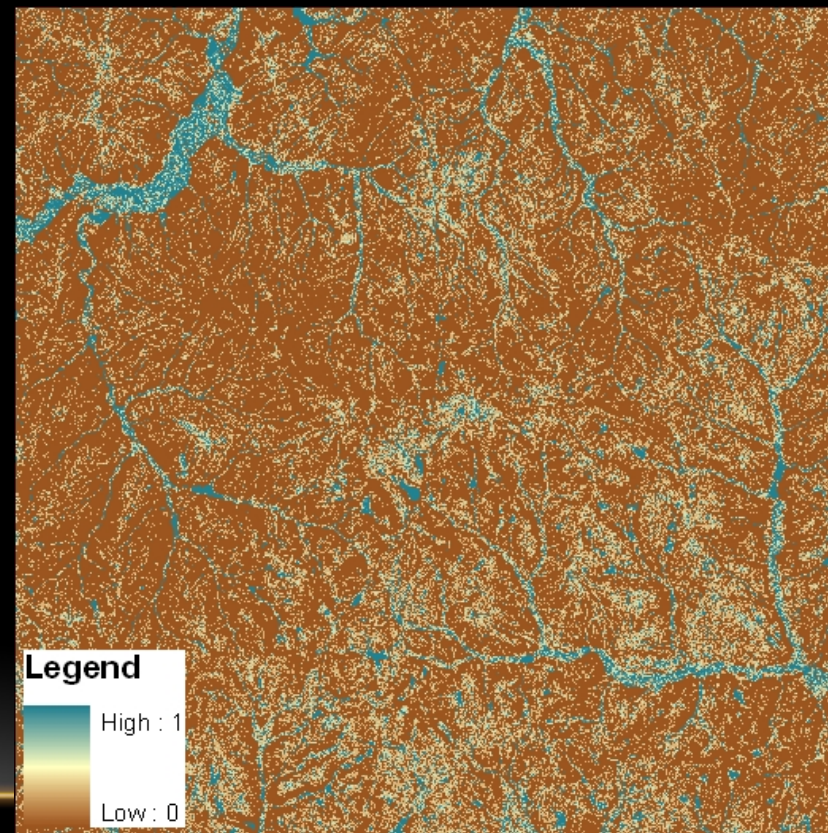


TERRAIN DERIVATIVE EXAMPLES

Curvature



Depression analysis



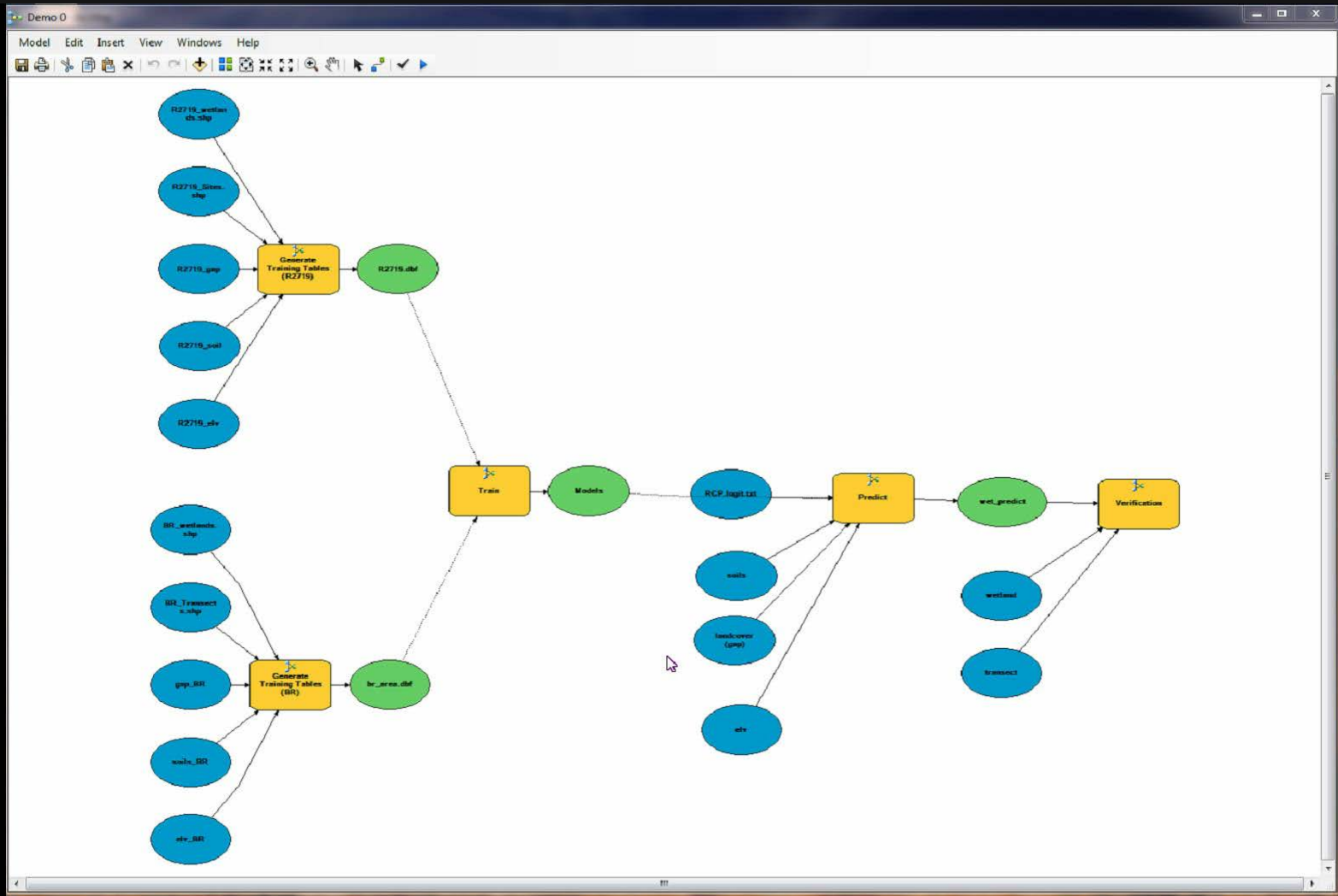
VARIABLES

- 12 Terrain Derivatives
 - Soils
 - LULC
 - Other Models
 - Post treatment variables
 - Requires ArcGIS w Spatial Analyst, Taudem, TAS, SAS
 - Can be time-consuming, need for automation
-

CURRENT RESEARCH PROJECT

- Automated generation of terrain derivatives
 - One click wetland prediction
 - Refinement stage
-

RESEARCH PROJECT



UPCOMING RESEARCH PROJECTS

- To expand on current wetland models
 - NCWAM wetland type
 - Functional assessment (Not trying to duplicate NCWAM in GIS)
- To predict tidal wetlands using the new QL2 LiDAR

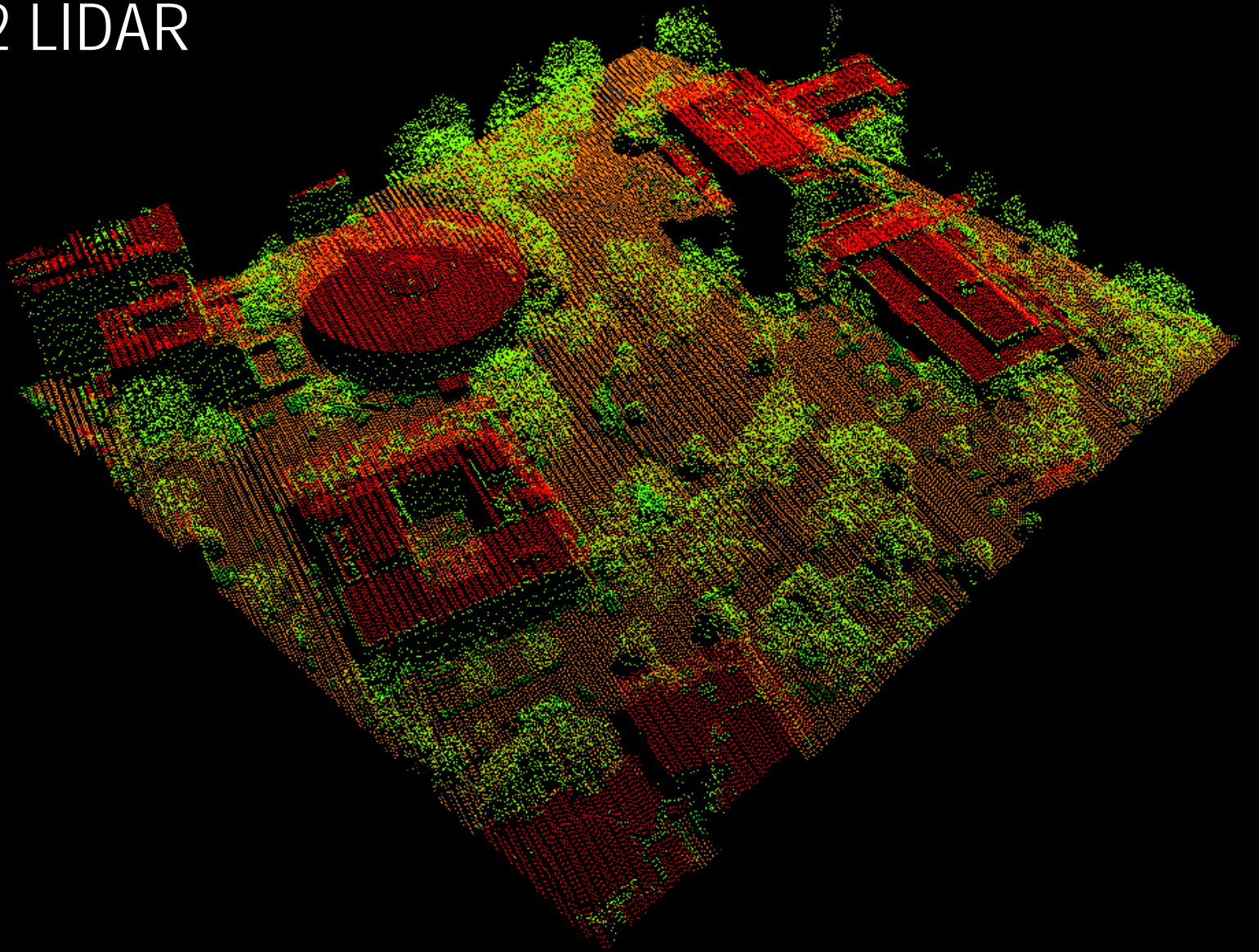
QL2 LIDAR

- USGS/FPM captured 20 coastal counties earlier this year
- 20 more counties (paid for by NCDOT) also earlier this year
- 20 counties each year for the next three years
- 0.59 ft. fundamental vertical accuracy at 95% confidence level (open terrain)
- Nominal 2 points per meter
- Intensity values
- Point cloud classification

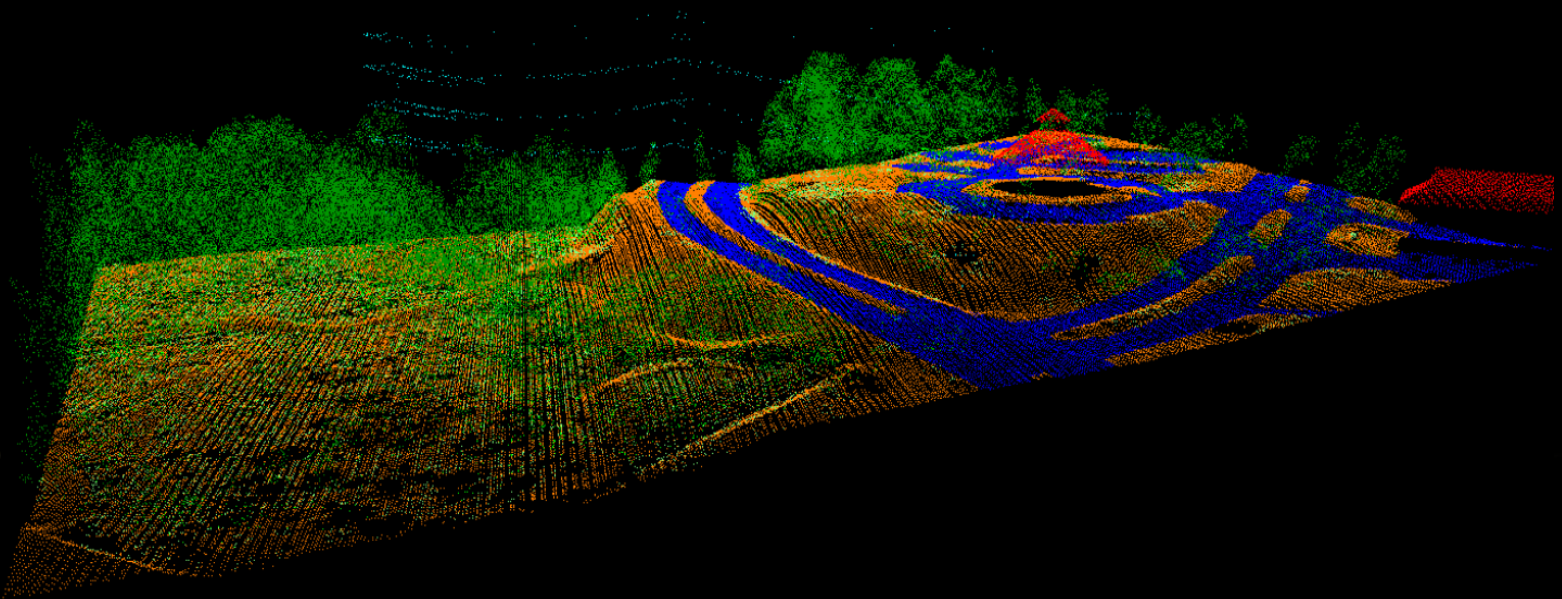
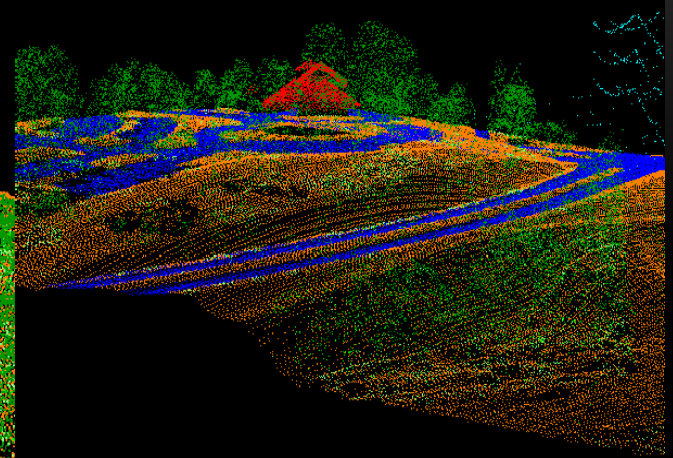
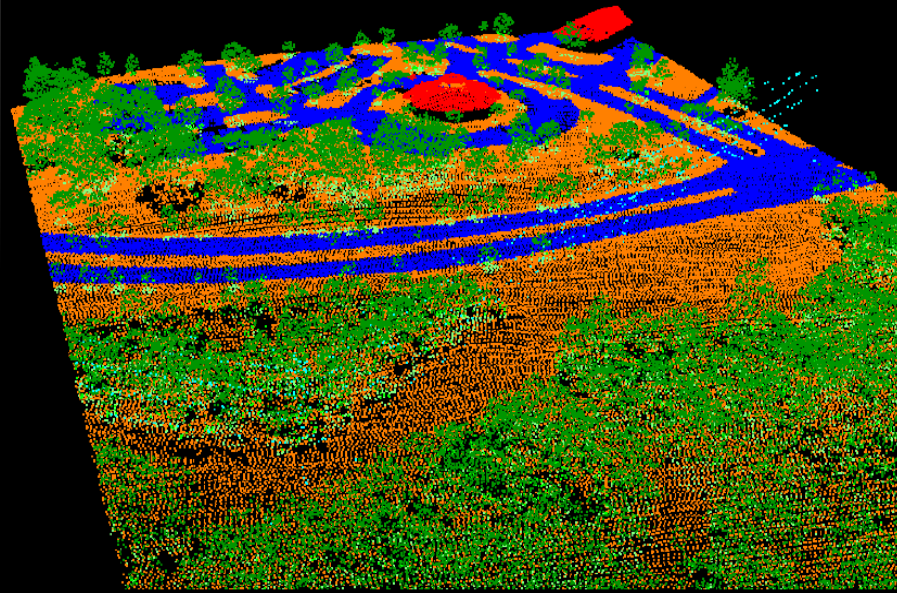
QL2 LIDAR



QL2 LIDAR



QL2 LIDAR



QUESTIONS?