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Very High-Resolution Land Use/Land Cover Data Project

Peter Claggett[1], Labeeb Ahmed[1], Elliot Kurtz[2], Sean MacFaden[3], Patrick McCabe[2], Sarah McDonald[1], Jarlath O’Neill-Dunne[3], Katie Walker[2]

[1] Lower Mississippi-Gulf Water Science Center, U.S. Geological Survey
[2] Chesapeake Conservancy’s Conservation Innovation Center
[3] University of Vermont’s Spatial Analysis Laboratory

Habitat Goal Implementation Team Meeting
April 25, 2023

U.S. Department of the Interior
U.S. Geological Survey

Proposed Land Characterization and Monitoring Plan 2024 - 2034

<u>Monthly</u>:

- Spectral indices of vegetation condition (e.g, greenness, wetness, moisture stress, bare soil). 10m-30m resolution.

<u>Every 4-5 years</u>:

- Land use/land cover and land change, 60+ classes, 1m resolution;
- Updated hyper-res hydrography.

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Chesapeake Bay 1-Meter Products for a 99,000 mi² Region

Land Cover (12-classes): 2013/14, 2017/18, 2021/22

Land Use (64-classes): 2013/14, 2017/18, 2021/22

Streams, ditches, and gullies (from LiDAR imagery)

- Watershed only (white boundary)

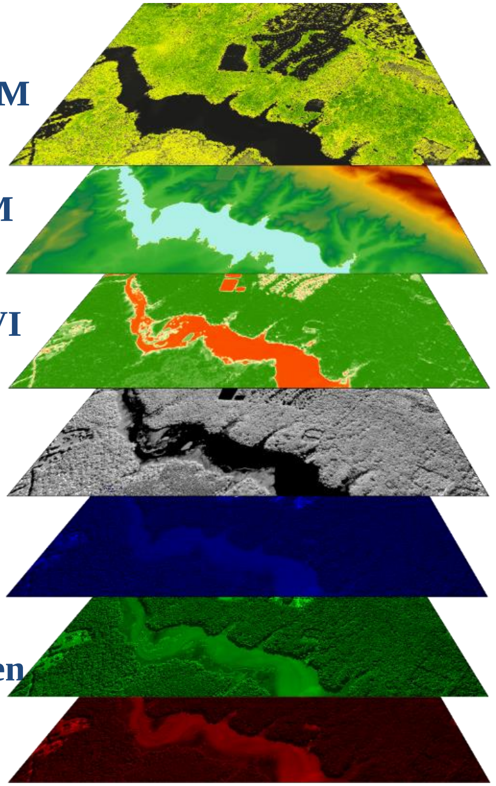
Stream channel and Floodplain Attributes (from FACET)

Remote Sensing

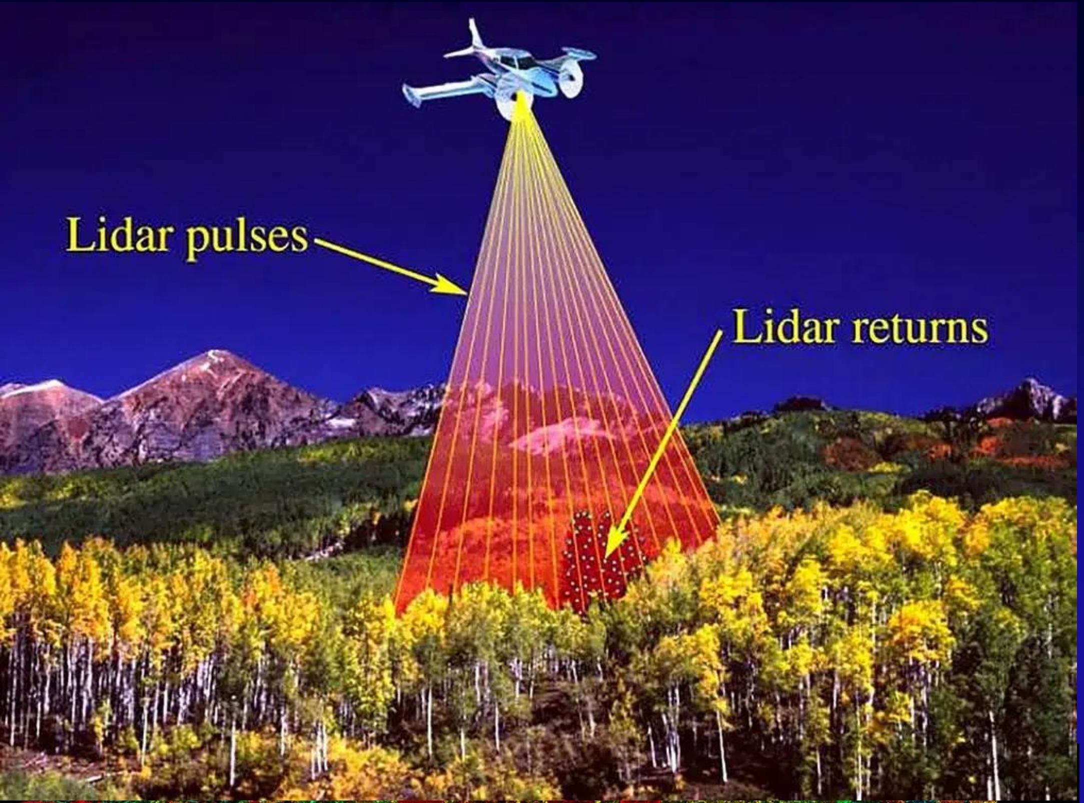
2013 NAIP

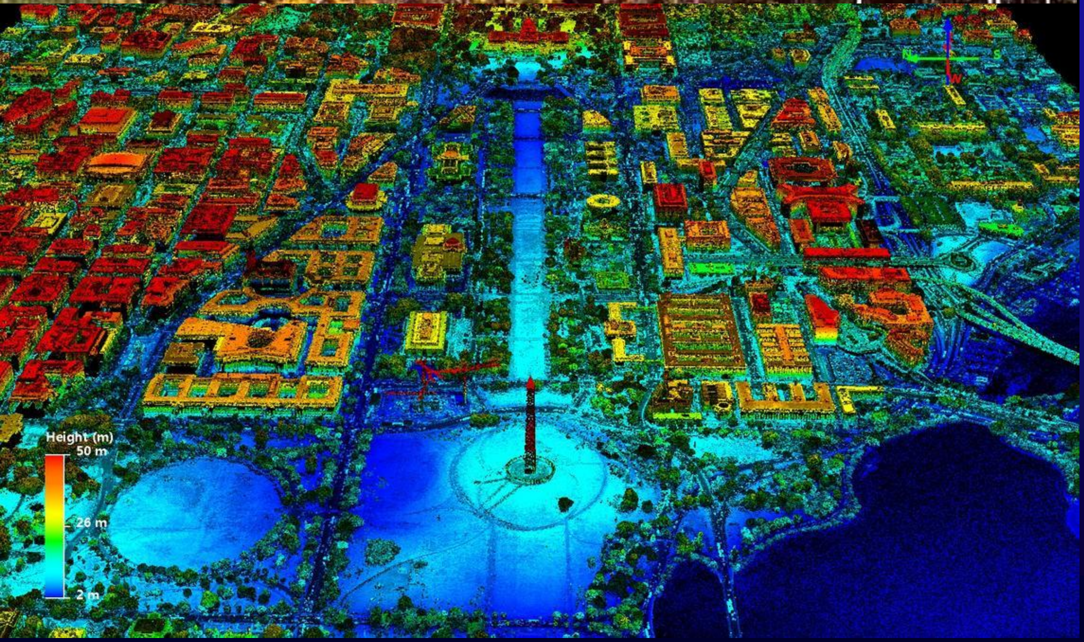
Ortho-imagery

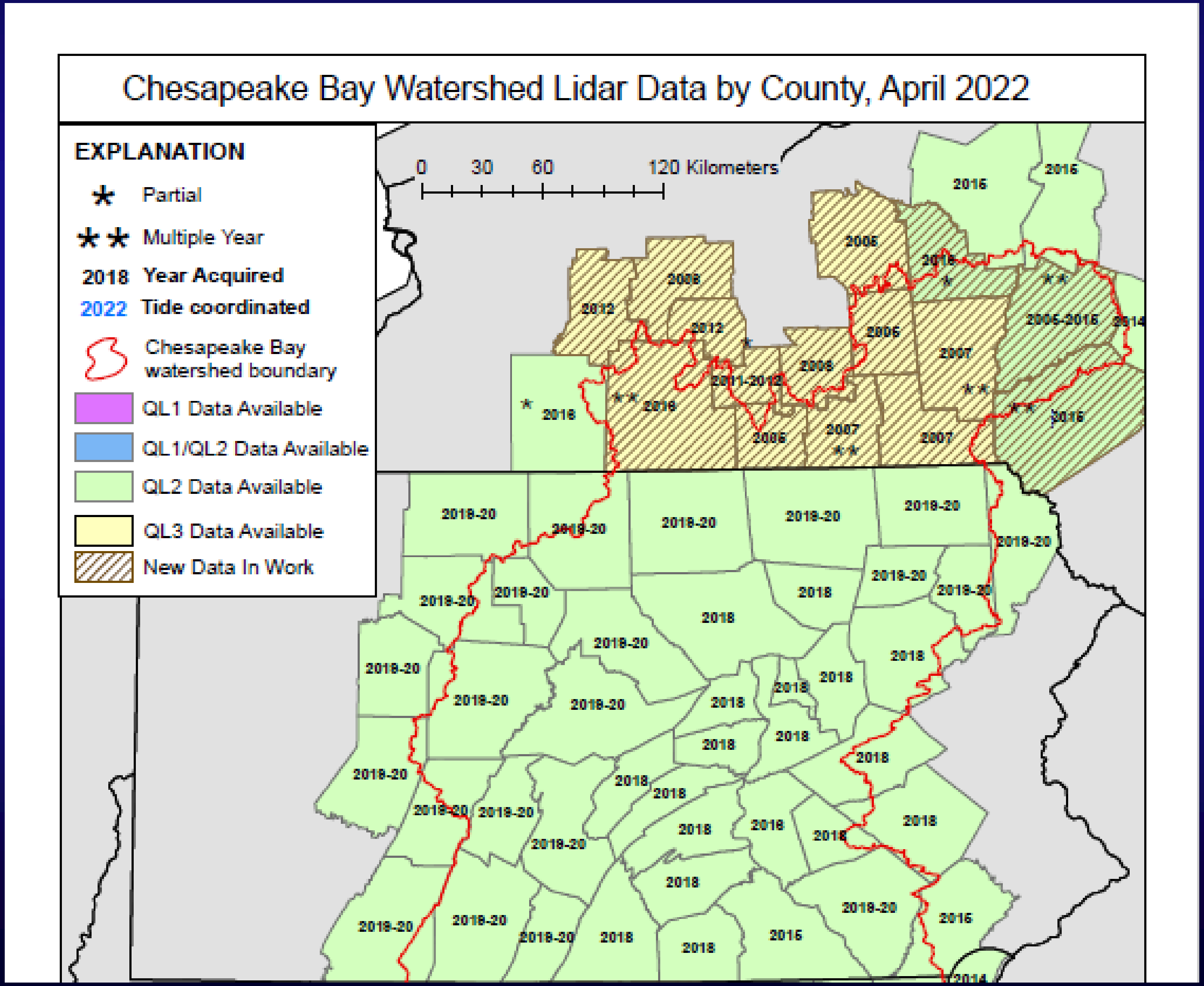
LiDAR



Light Detection And Ranging (LiDAR)







Frederick County, 340/85 wedge

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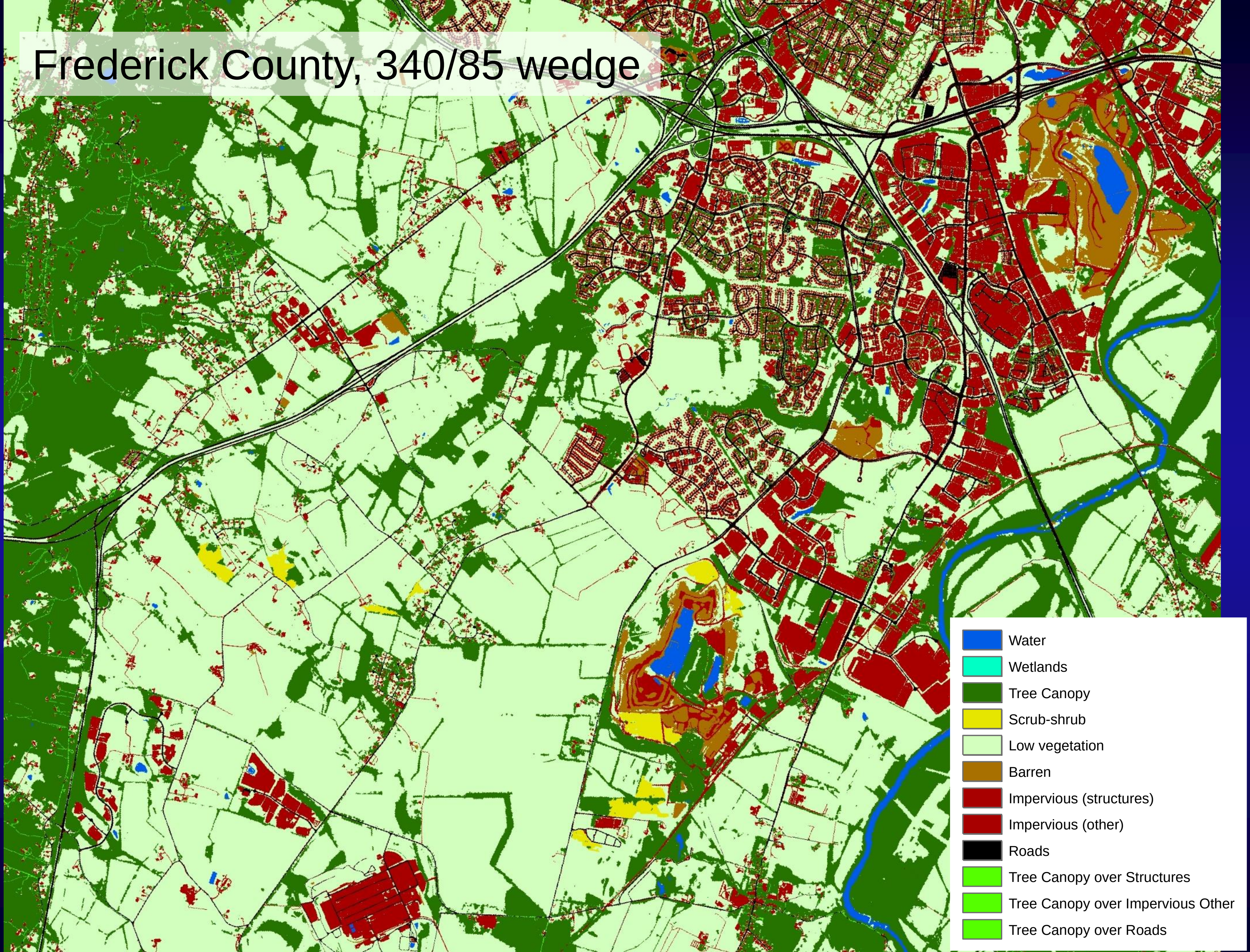
Frederick County, 340/85 wedge



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Local land use and parcel data

- Low-density Residential
- Recreation
- Agriculture
- Roads

High-resolution land cover data

- Impervious surfaces
- Tree canopy
- Low vegetation
- Water

CBP Land Uses

- Impervious-Roads
- Forests
- Turf Grass
- Open Space

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Chesapeake Bay 1-meter Land Use/Cover Classification (64 classes)

Water and Water Margins (6)

- 10 Tidal Waters
- Lentic
  - 11 Lakes & Reservoirs
  - 12 Riverine Ponds
  - 13 Terrene Ponds
- Lotic
  - 14 Streams and Rivers (visible water)
- 15 Bare Shore

Development (18)

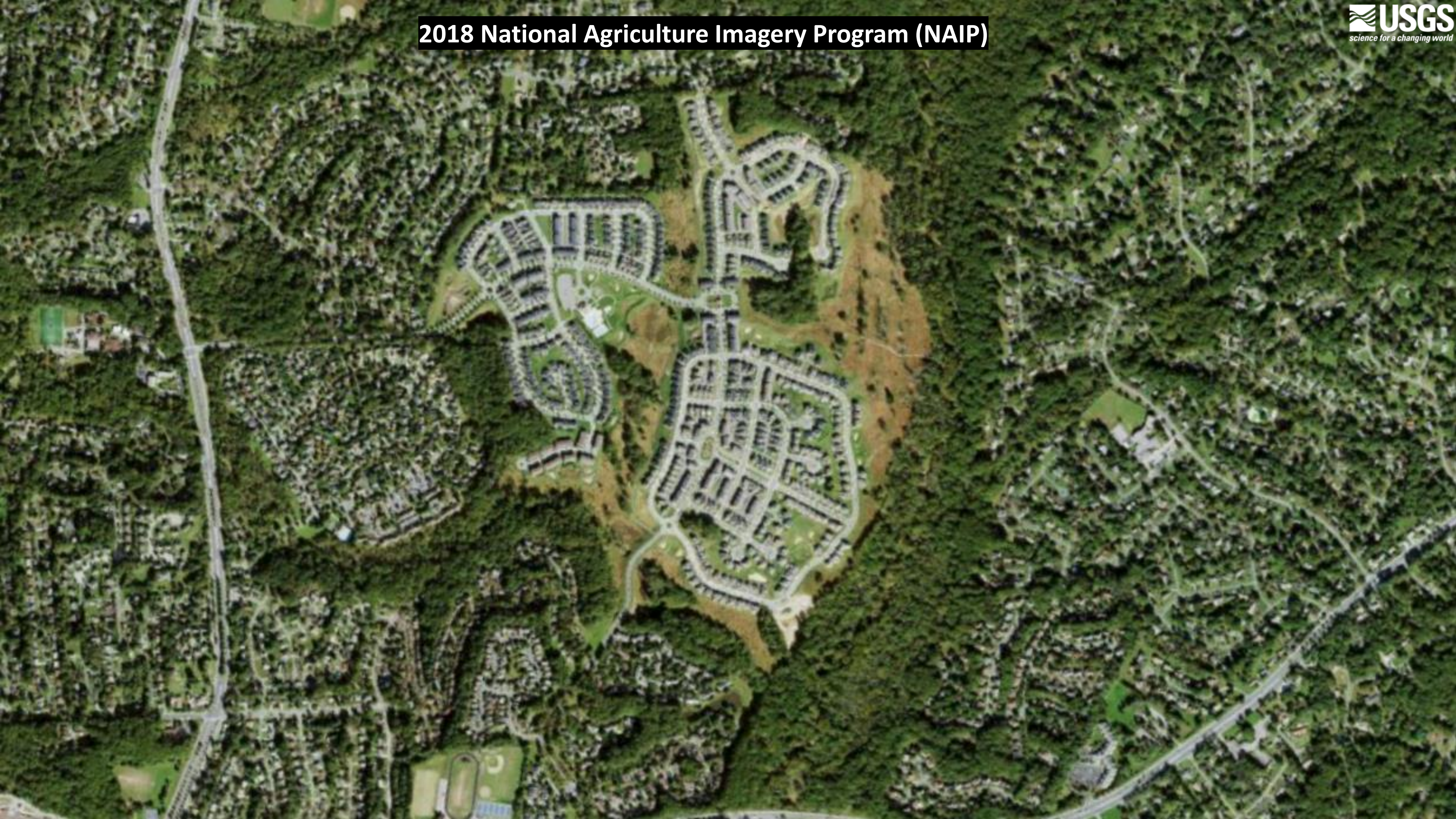
- Impervious
  - 20 Roads
  - 21 Structures
  - 22 Other Impervious (Parking lots, driveways)
  - 23 TC over Roads
  - 24 TC over Structures
  - 25 TC over Other Impervious
  - 31 Extractive Impervious
  - 32 Solar Field Panel Arrays
- Pervious
  - 26 Tree Canopy over Turf Grass
  - 27 Turf Grass
  - 28 Bare Developed
  - 30 Extractive Barren
  - 33 Solar Field Barren
  - 34 Solar Field Herbaceous
  - 35 Solar Field Shrubland
  - 36 Suspended Succession Barren
  - 37 Suspended Succession Herbaceous
  - 38 Suspended Succession Shrubland

Natural Lands (25)

- Tree Canopy
  - 40 Forest
  - 41 Tree Canopy, Other
- Open Space
  - 42 Natural Succession Barren
  - 43 Natural Succession Herbaceous
  - 44 Natural Succession Shrubland
  - 45 Harvested Forest Barren
  - 46 Harvested Forest Herbaceous
- Riverine Wetlands
  - 50 Riverine Wetlands Barren
  - 51 Riverine Wetlands Herbaceous
  - 52 Riverine Wetlands Shrubland
  - 53 Riverine Wetlands Tree Canopy
  - 54 Riverine Wetlands Forest
  - 55 Riverine Wetlands Harvested Forest
- Terrene Wetlands (isolated)
  - 60 Terrene Wetlands Barren
  - 61 Terrene Wetlands Herbaceous
  - 62 Terrene Wetlands Shrubland
  - 63 Terrene Wetlands Tree Canopy
  - 64 Terrene Wetlands Forest
  - 65 Terrene Wetlands Harvested Forest
- Tidal Wetlands
  - 70 Tidal Wetlands Barren
  - 71 Tidal Wetlands Herbaceous
  - 72 Tidal Wetlands Shrubland
  - 73 Tidal Wetlands Tree Canopy
  - 74 Tidal Wetlands Forest
  - 75 Tidal Wetlands Harvested Forest

Agriculture (15)

- Productive Lands
  - 80 Cropland Barren
  - 81 Cropland Herbaceous
  - 82 Orchards and Vineyards Barren
  - 83 Orchards and Vineyards Herbaceous
  - 84 Orchards and Vineyards Shrubland
  - 85 Pasture Barren
  - 86 Pasture Herbaceous
  - 87 Hay Barren
  - 88 Hay Herbaceous
- Agricultural Facilities
  - 90 Agricultural Structures
  - 91 Animal Operation Impervious
  - 92 Animal Operation Barren
  - 93 Animal Operation Herbaceous
  - 94 TC over Agricultural Structure
  - 95 TC over Animal Operation Impervious


2018 National Agriculture Imagery Program (NAIP)

2018 Land Use
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Riparian Zone
FACET Streams (1:100k)
GenLandUse
Water
Impervious Roads
Impervious Structures
Impervious, Other
Tree Canopy over Impervious
Turf Grass
Pervious Developed, Other
Tree Canopy over Turf Grass
Forest
Tree Canopy, Other
Harvested Forest
Natural Succession
Cropland
Pasture/Hay
Extractive
Wetlands, Tidal Non-forested
Wetlands, Riverine Non-forested
Wetlands, Terrene Non-forested


2012 Google Earth Imagery
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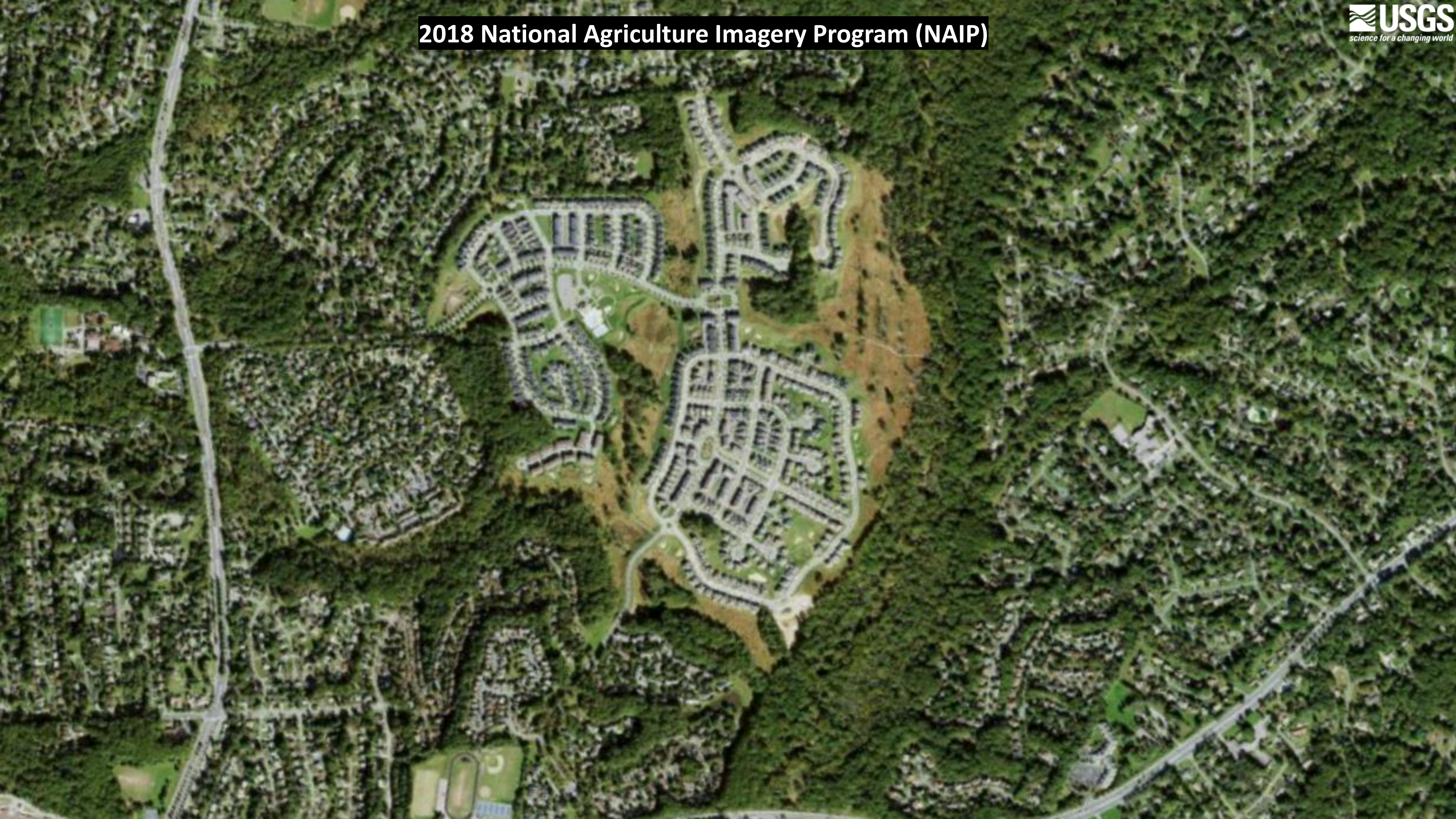
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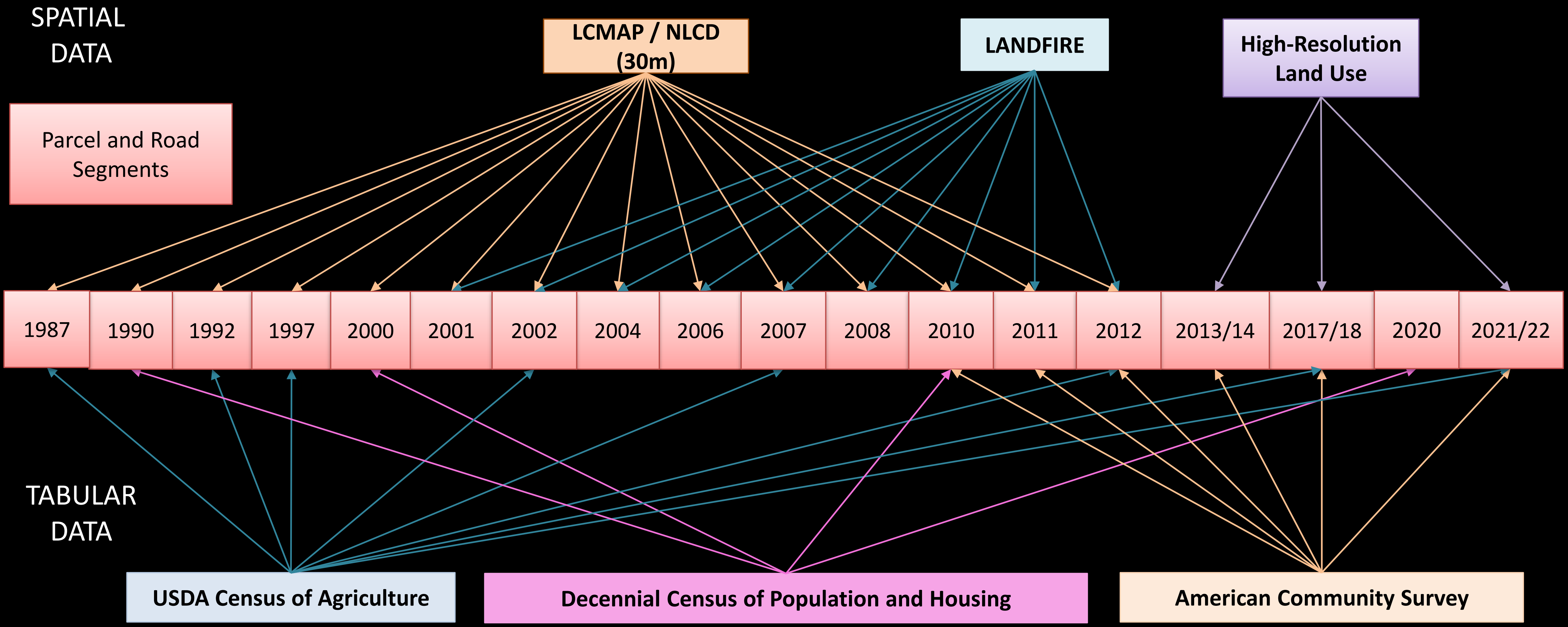
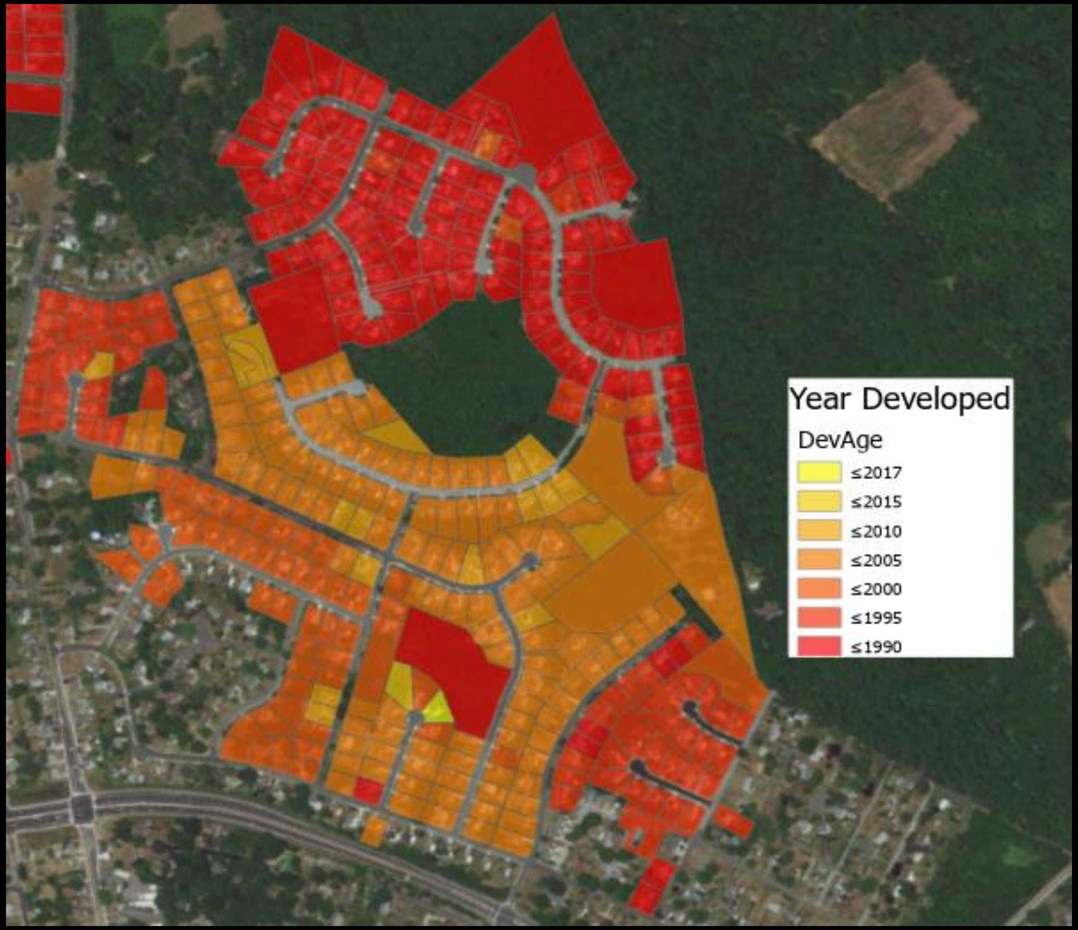
Historical Land Use: 1985 - 2012



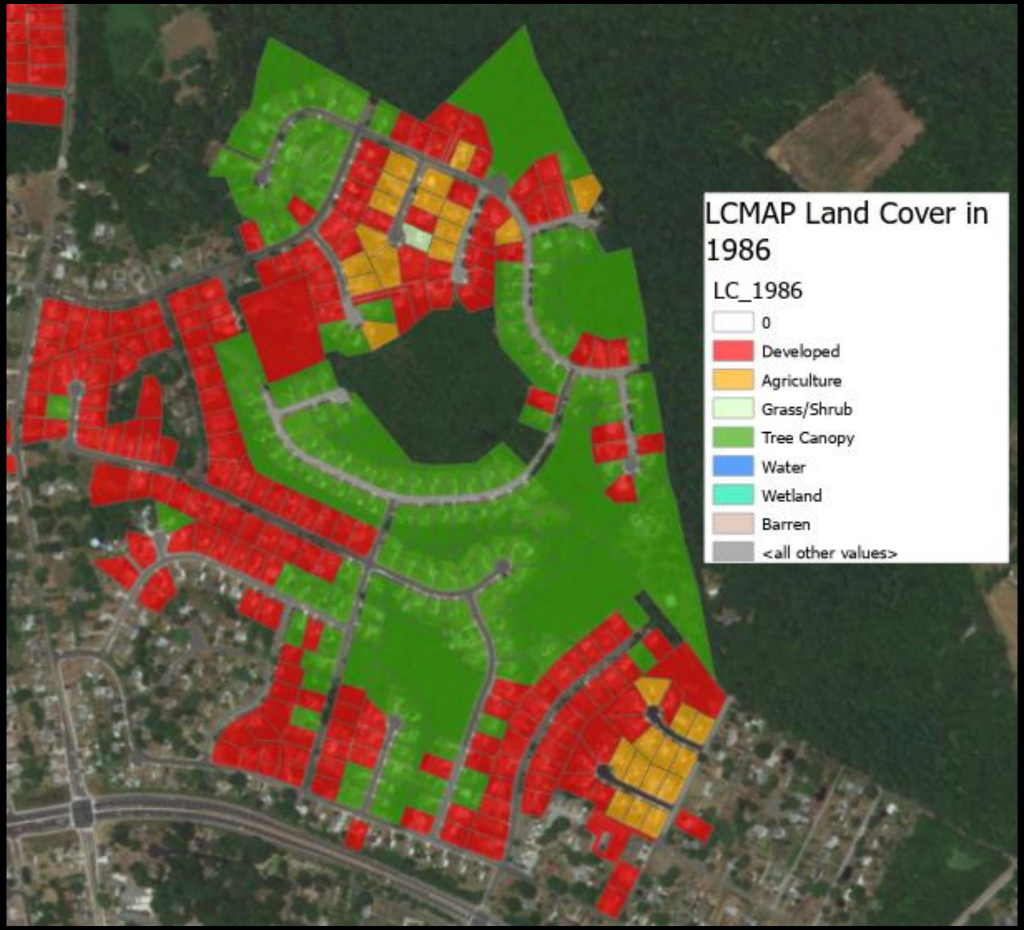
LCMAP: Land Change Monitoring, Assessment, and Projection; CBLCD: Chesapeake Bay Land Cover Data series; NLCD: National Land Cover Database

Back-Casting Development Example

Year Developed (LCMAP)



Land Cover 1986 (LCMAP)



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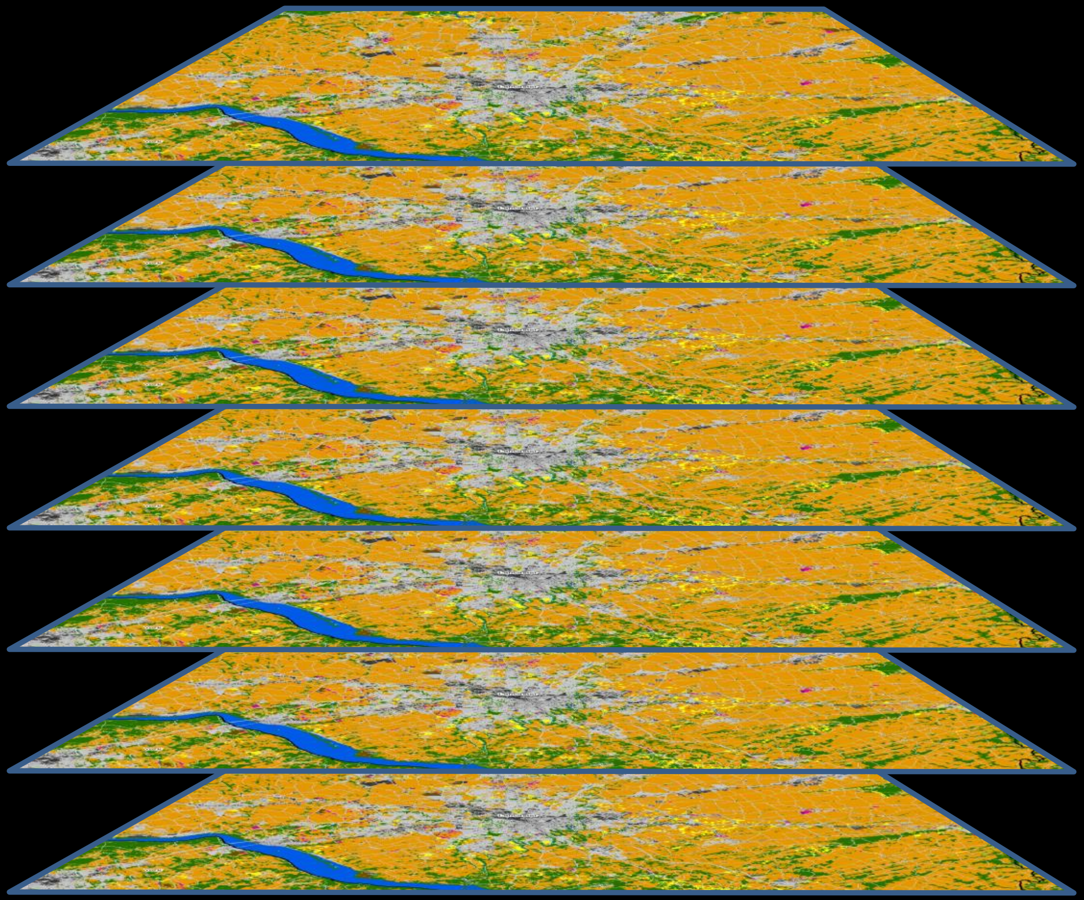
Assessing the vulnerability of habitats to land conversion

Use the Chesapeake Bay Land Change Model to:

- Forecast land use change from 2020 through 2075 in 5-year increments;
- Simulate residential, commercial, mixed-use, solar fields, and land conservation;
- Parameterize model using 1-meter land use change from 2013/14 to 2021/22;
- Improve the predictive power of the CBLCM through use of machine learning;
- Integrate hyper-temporal spectral indices into forecasts of vegetation condition.



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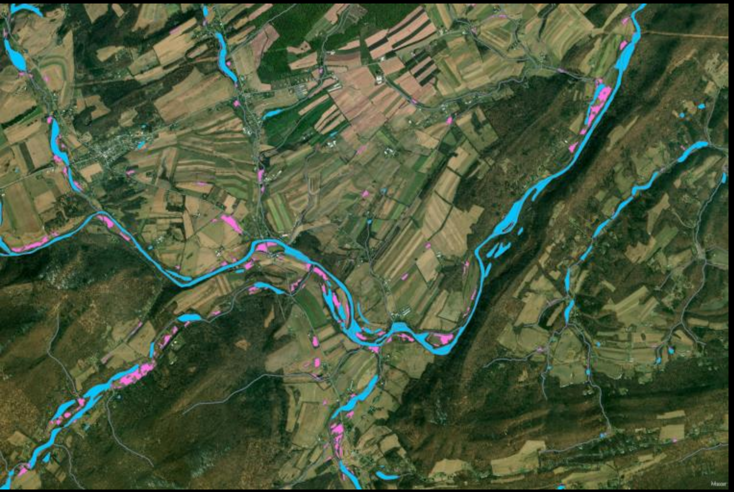
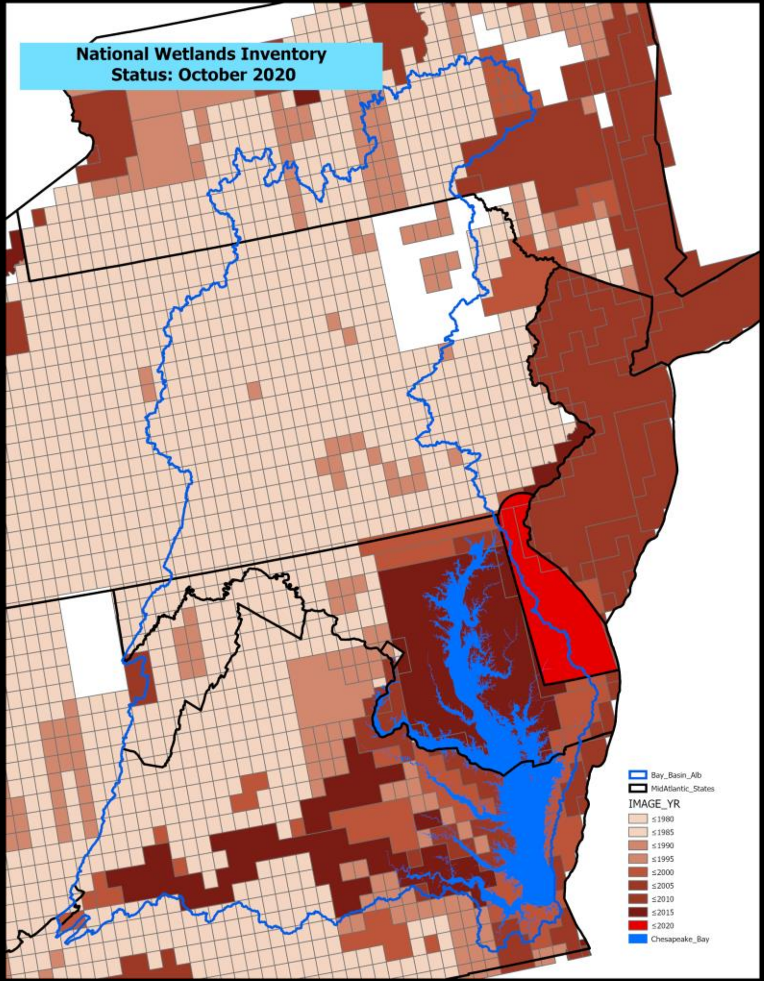
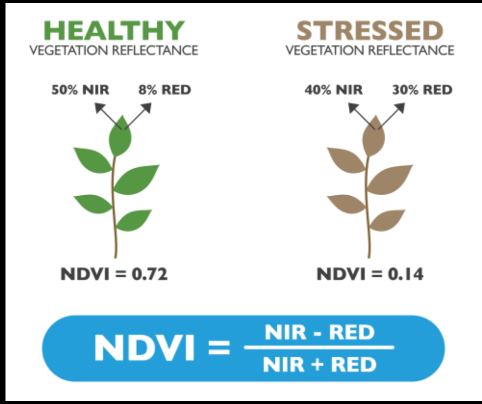
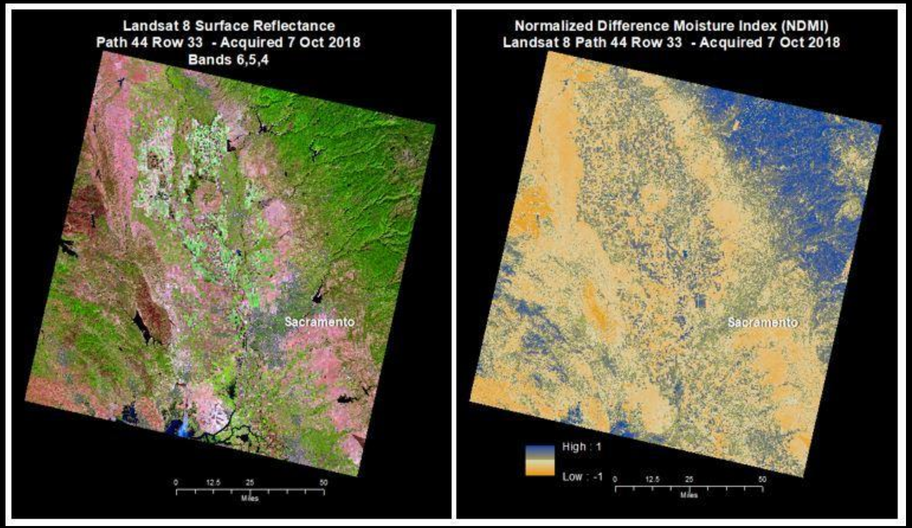
2024 GIT-Funded Projects: Scopes #5 and #6

- Monitoring vegetation condition throughout the DelMarVa peninsula
- Mapping non-tidal wetlands in areas with outdated wetland maps





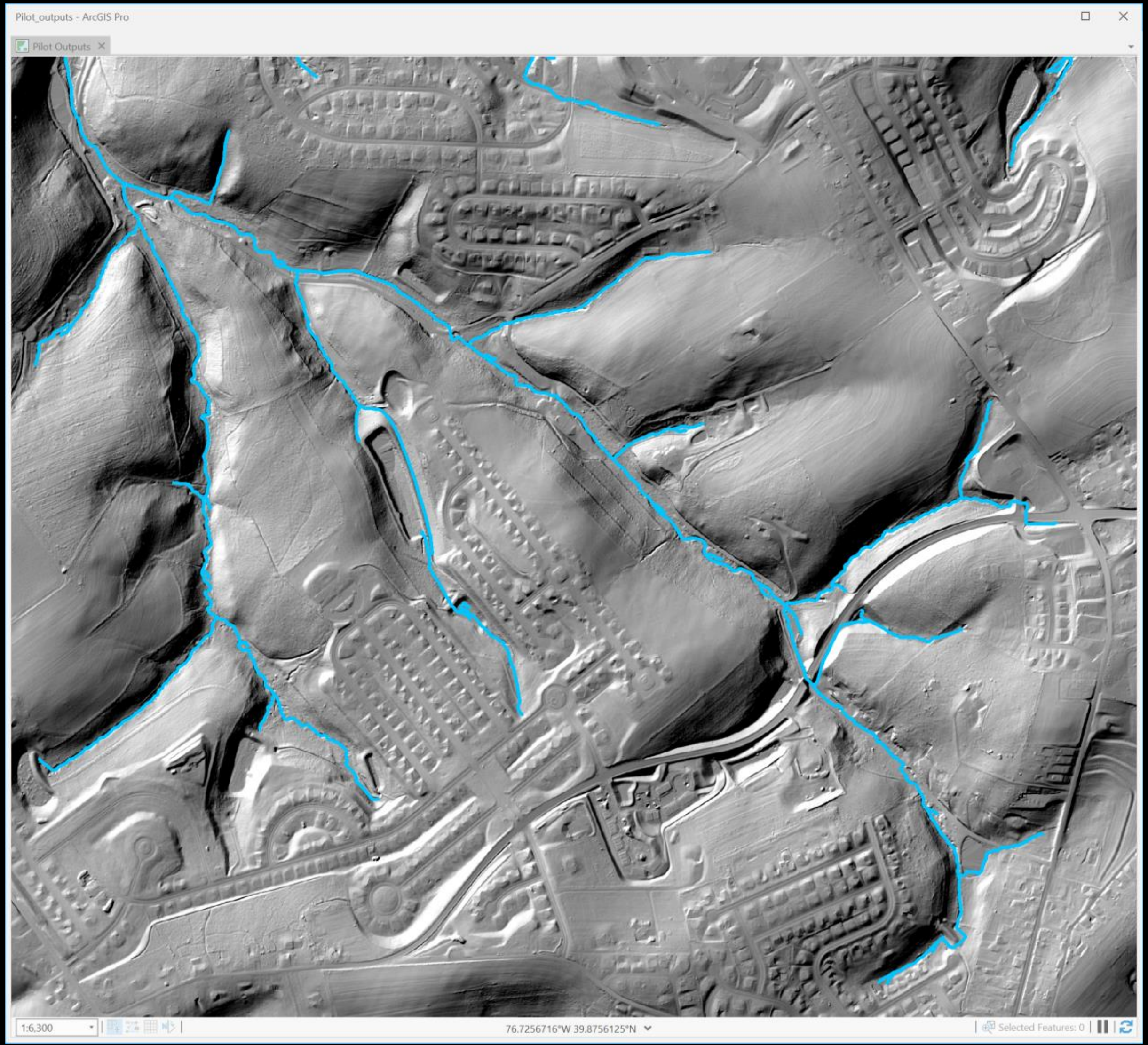




Hyper-Resolution* Hydrography

1. Lidar elevation
2. Valley-scale geomorphons
3. Channel-scale geomorphons
4. Extract valley network
5. Extract channels using valley network
6. QAQC channel skeleton
7. Connect stream network

Attributed with bank-height ratio, channel width, floodplain width, entrenchment ratio

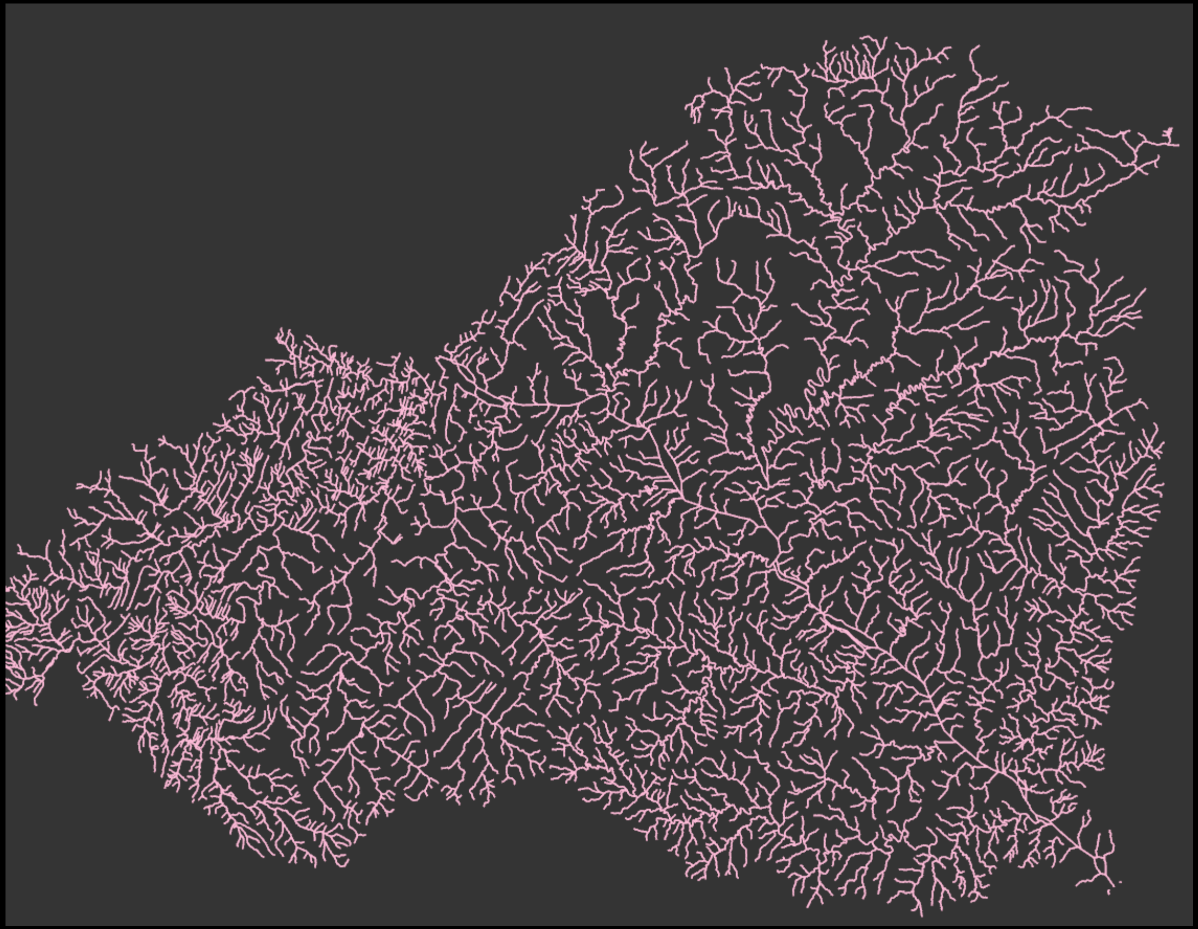


* 1-meter raster, 1:2000 scale

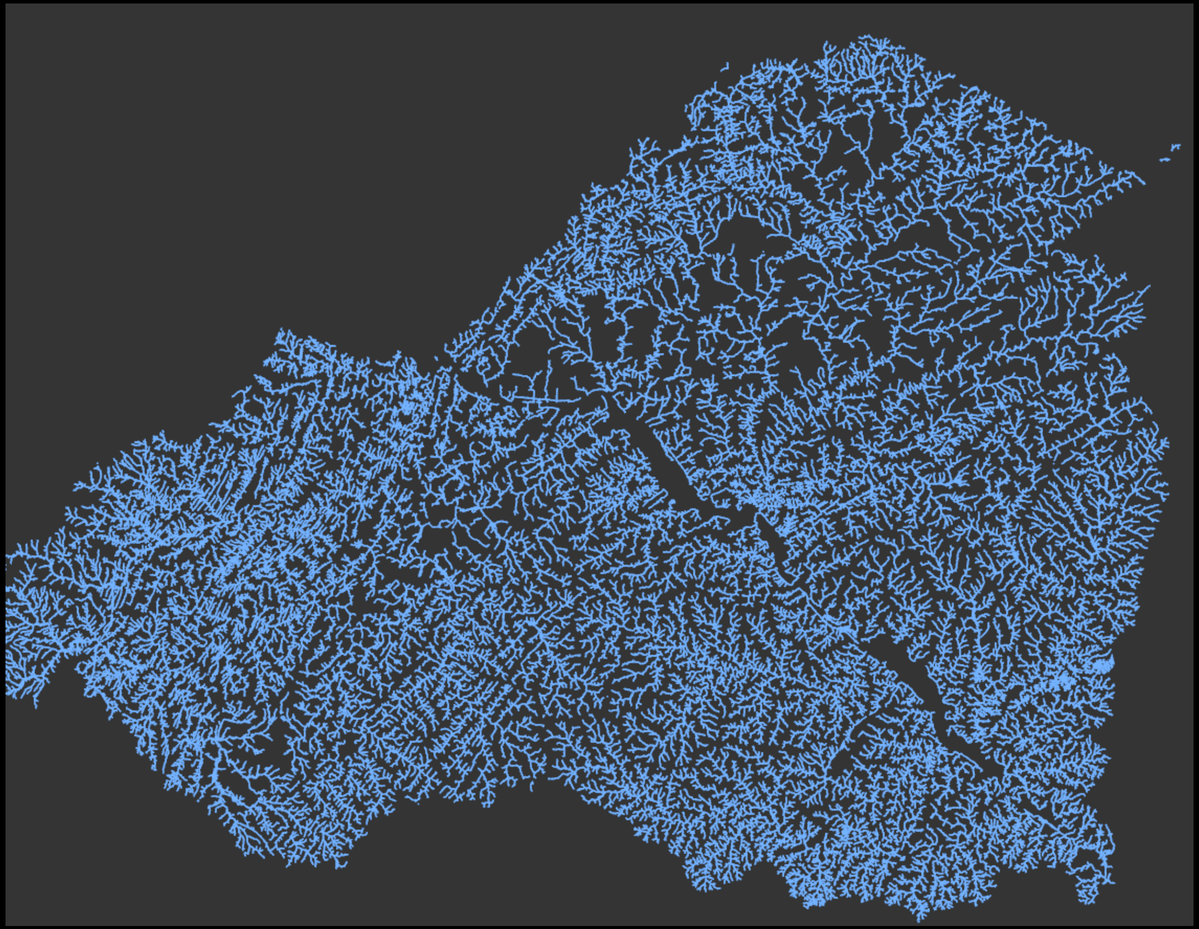
New Hyper-res Streams (1:2000 scale)

Lower Susquehanna Example

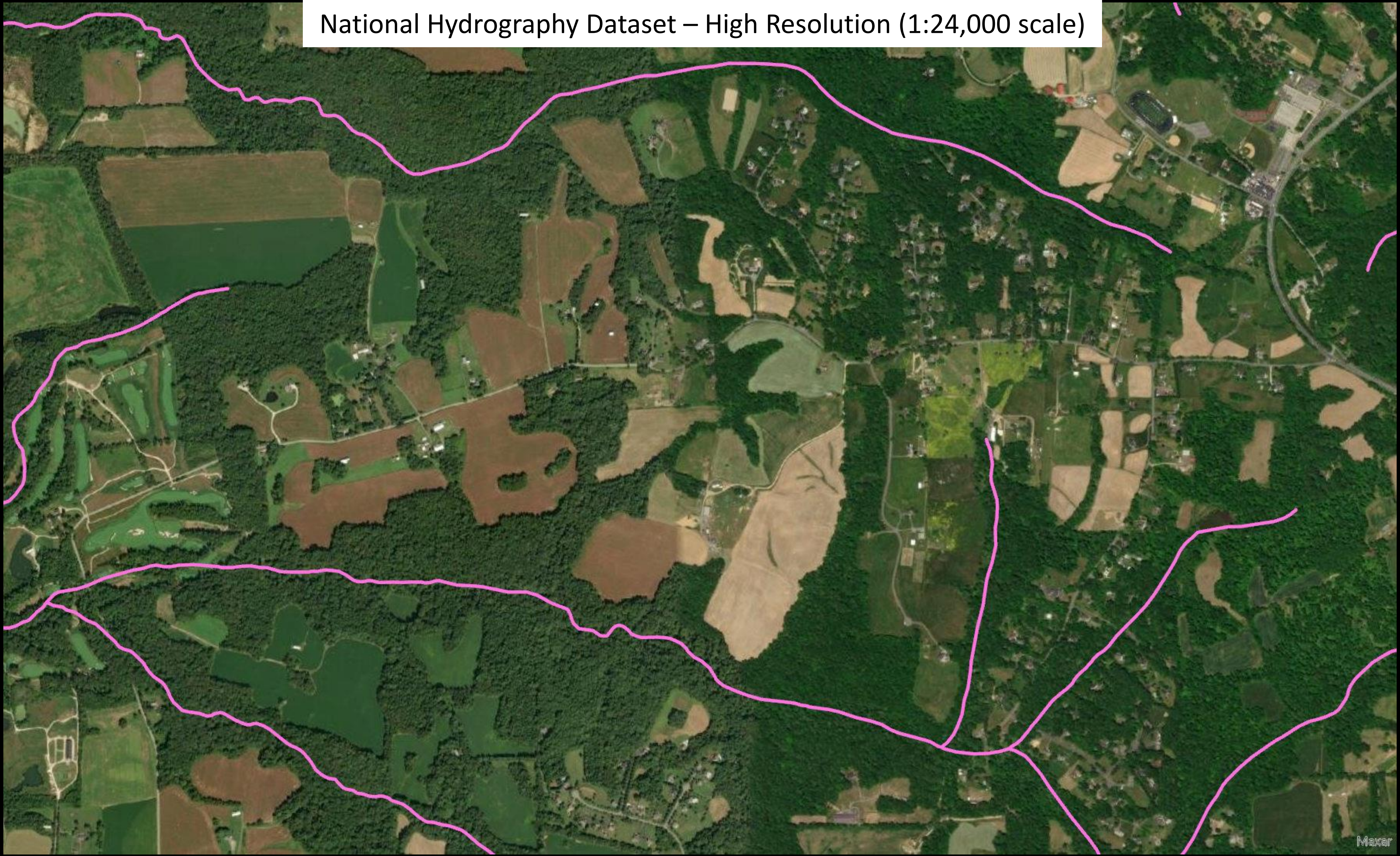
National Hydrography Dataset, 1:24,000
6,923.6 km



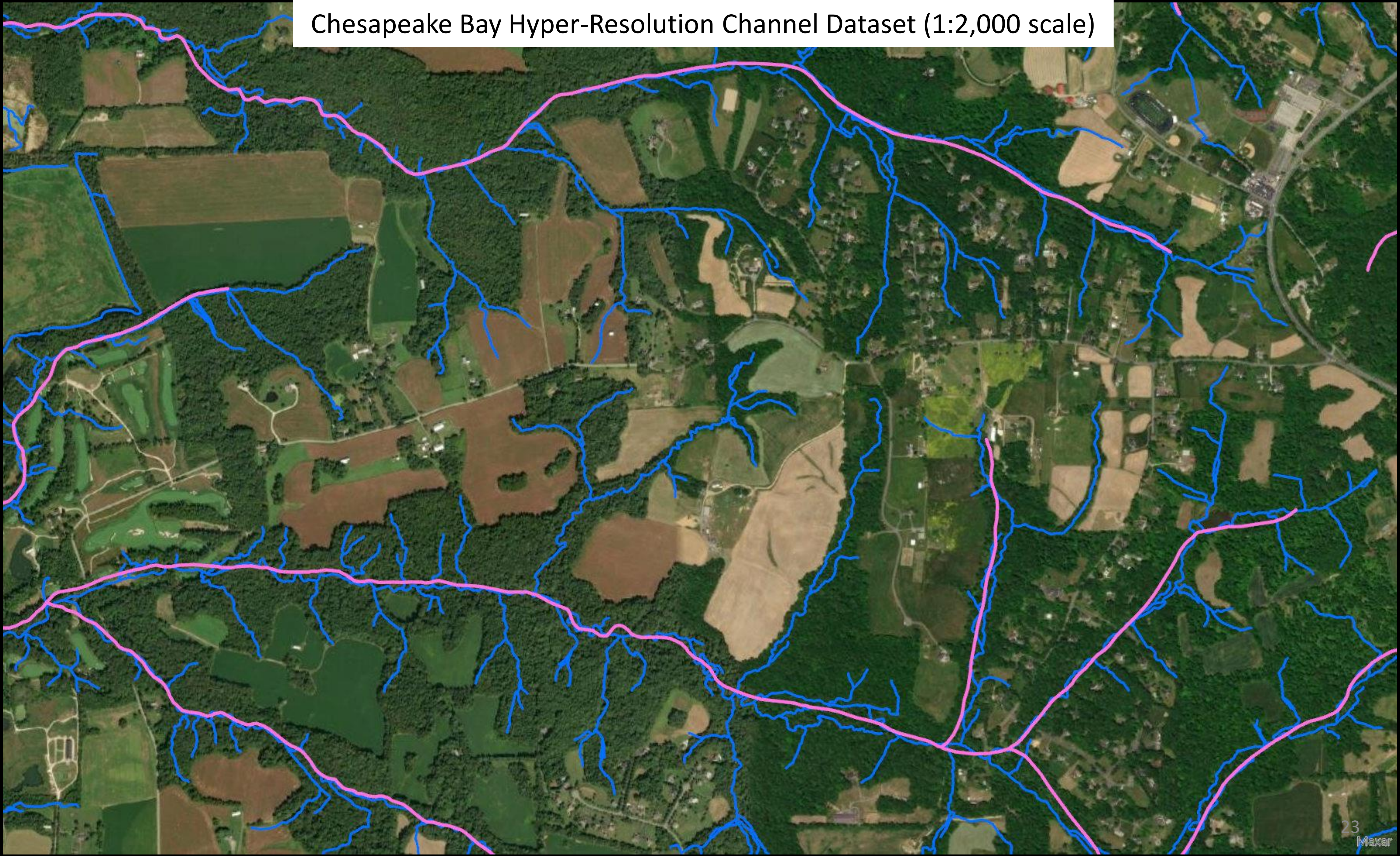
CBP Hyper-Resolution Streams, 1:2000
16,784.6 km



National Hydrography Dataset – High Resolution (1:24,000 scale)



Chesapeake Bay Hyper-Resolution Channel Dataset (1:2,000 scale)



Seeing through the trees…

FACET Output for HUC 0206000604 in Anne Arundel County, Maryland (Coastal Plain)

Datasets

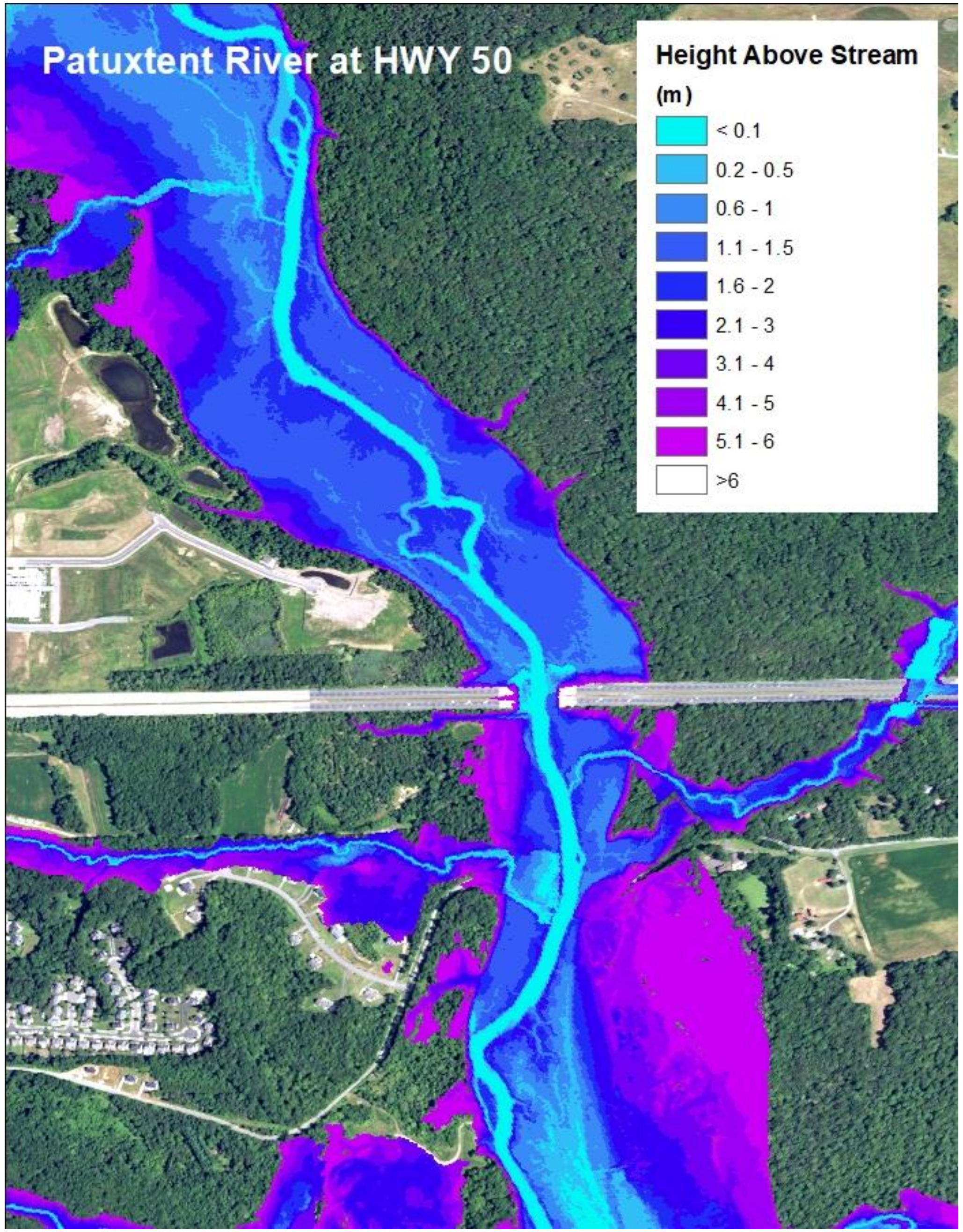
- Stream Network
- 1-D Cross Section Bank Points
- Raster-base Curvature Bank Pixels
- Floodplain Extent Raster (HAND)

Channel Cross-section Metrics

- Bank height (m)
- Bank angle, avg (deg)
- Bank angle, max (deg)
- Channel width (m)
- Channel length (m)
- Bank-full area (m^2)
- Floodplain width (m)
- Floodplain elevation, range (m)
- Floodplain elevation, sd (m)

Stream Reach Metrics

- Length (m)
- Profile slope (deg)
- Order (Strahler)
- Magnitude (Shreve)
- Upstream and downstream IDs
- Drainage area (m^2)



Data Release: Hopkins et al. 2020, https://doi.org/10.5066/P9RQJPT1

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