



Friends of Penobscot Bay:

Tools for Assessing and Managing Human
Impact on Maine's Harbors

Today's Outline

1. Project Goals
2. Methods
3. Findings and Results
4. Conclusions
5. Recommendations for further research



Civic Software, Data Analytics & Research





B Corporation

- Civic / Social Apps
- Pro Bono Program
- Donate share of profits

Research-Driven

- 10% Academic Research Program
- Academic Collaborators
- Open Source
- Open Data

Data Analytics

- Identifying hidden patterns
- Prioritize and plan operations
- Streamline your decision making process
- Visually communicate these plans to other

The background of the slide features a dark grey map of a city grid. Overlaid on the map are several semi-transparent teal circles of various sizes, scattered across the upper half of the image. The text 'Kevin Frech' is written in a bold, white, sans-serif font in the upper left quadrant.

Kevin Frech

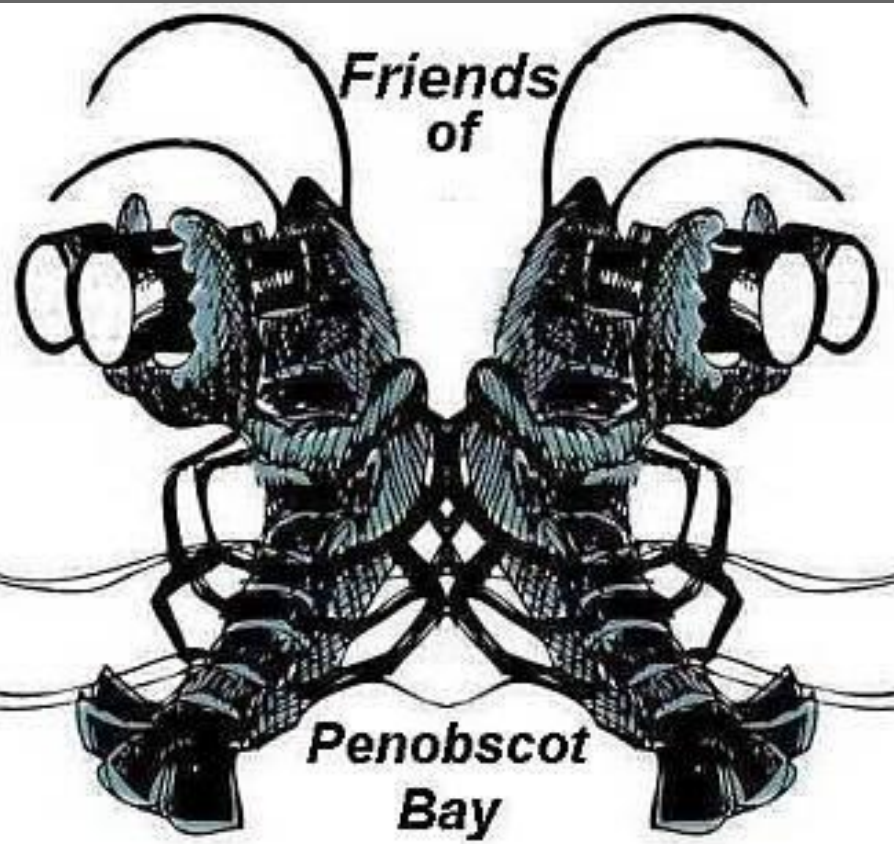
- College Graduate
- Avid Cartographer
- Certified Tree-Hugger

AZAVEA SUMMER *of* MAPS

- \$5,000 Fellowship for Student GIS Analysts
- Work on pro-bono projects for nonprofits
- Mentored by Azavea Staff



More at [Summerofmaps.com](https://summerofmaps.com)



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www.penbay.net

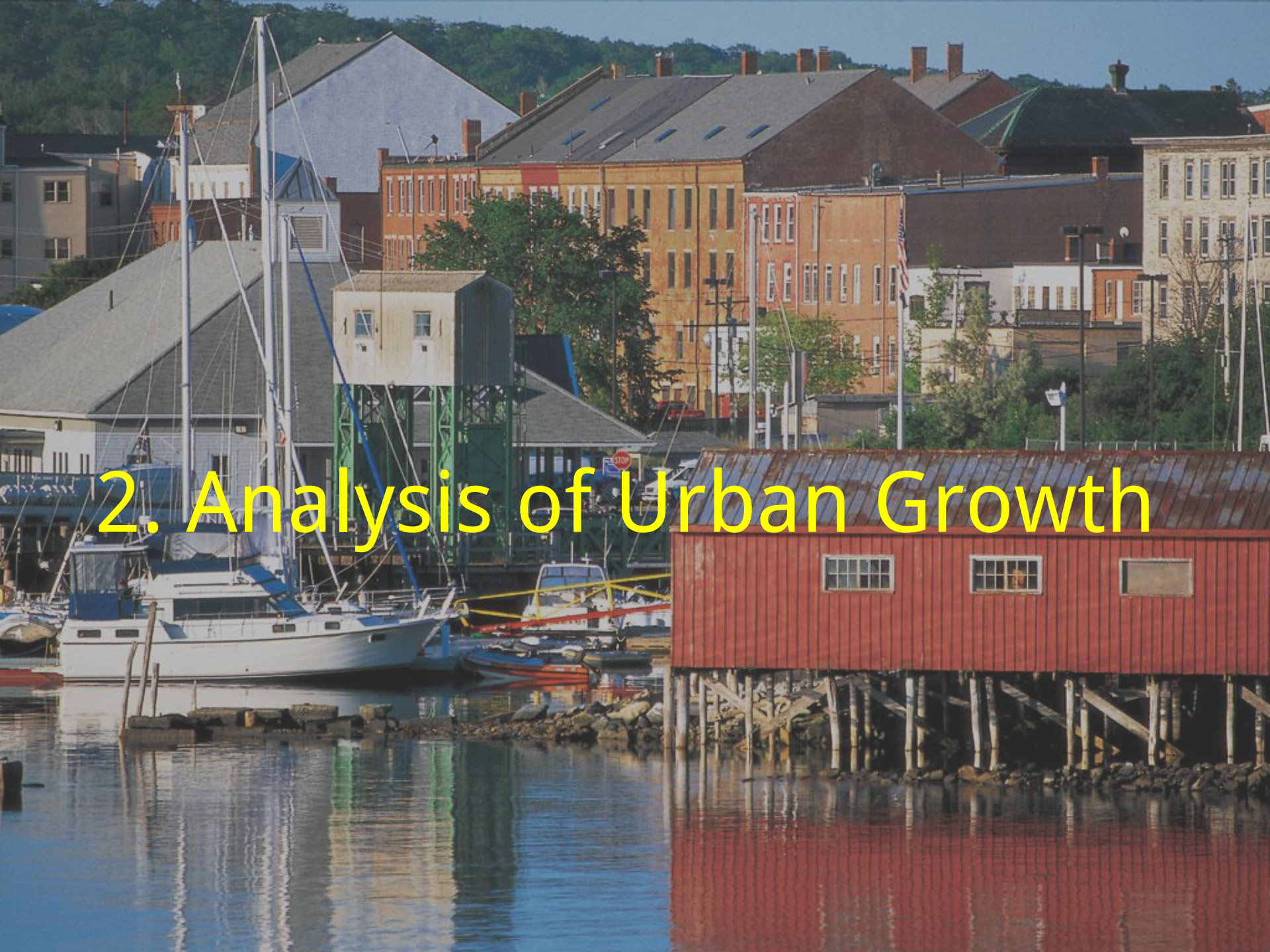


publiclab.org

Project Goals

A photograph of a dense forest. The trees are tall and thin, with a thick canopy of green leaves. The forest floor is covered in a dense carpet of green ferns. The lighting is soft and diffused, suggesting an overcast day or a misty atmosphere. The overall color palette is dominated by various shades of green.

1. Analysis of Forest Cover



2. Analysis of Urban Growth



3. Impact on Bay Wildlife

Methods

Methods

- Software: ArcGIS
- Study Area: West Bay from Stockton Harbor to South Thomaston

Data Sources: Maine Office of GIS, NLCD,
Friends of Penobscot Bay

National Land Cover Database (NLCD)

A comprehensive land cover dataset for the entire United States using satellite remote sensing technology

- Advantages
 - Free
 - Pre-classified
 - Available for any geography

Land Cover Classifications

- Water
- Developed
- Barren
- Forest
- Grassland
- Agriculture
- Wetlands

The National Land Cover Database

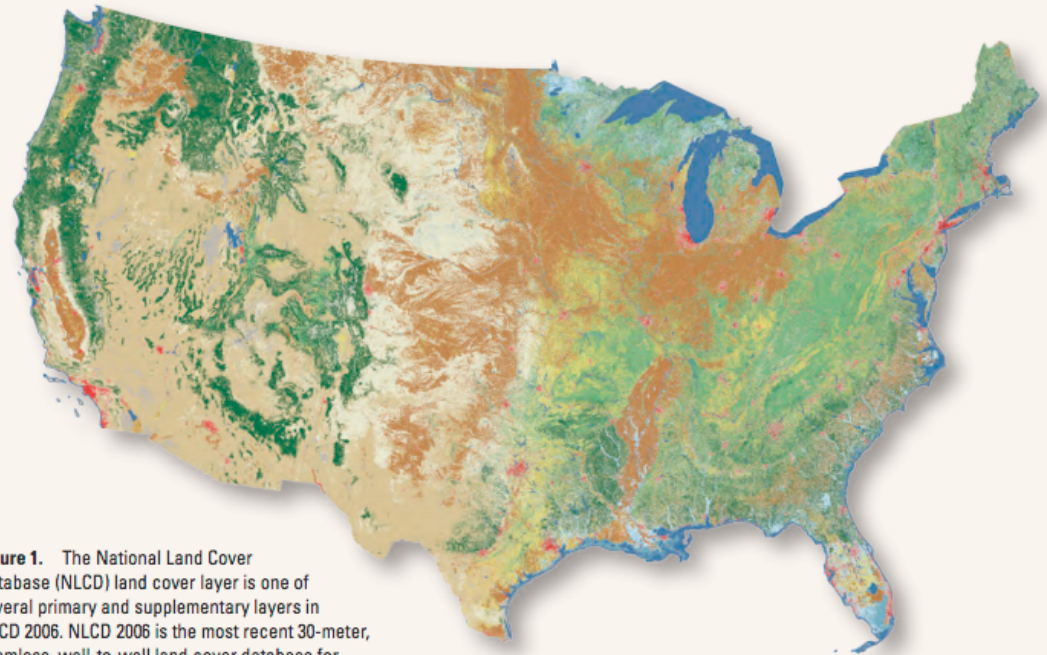
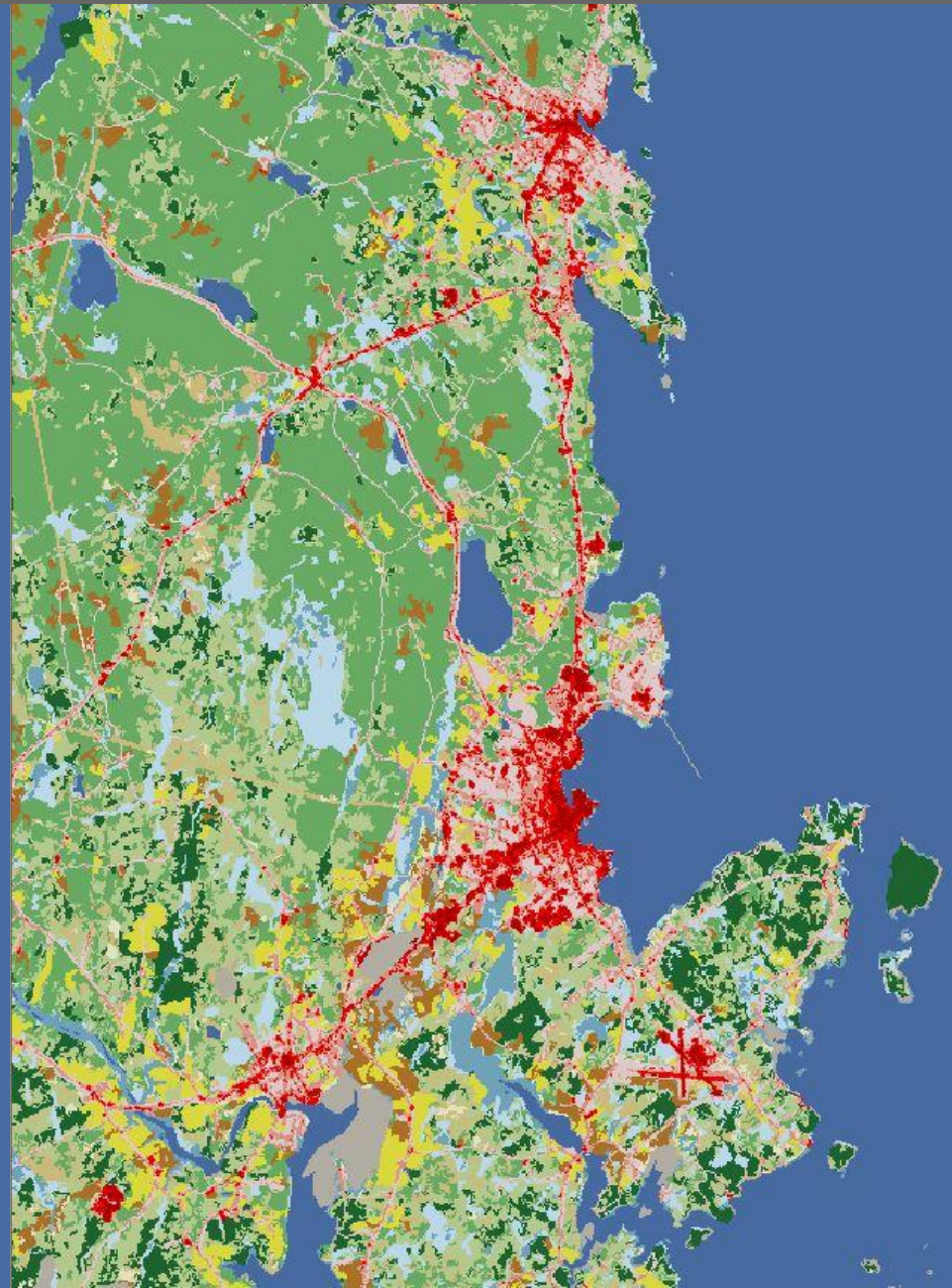


Figure 1. The National Land Cover Database (NLCD) land cover layer is one of several primary and supplementary layers in NLCD 2006. NLCD 2006 is the most recent 30-meter, seamless, wall-to-wall land cover database for the conterminous United States.



Penobscot Bay Reference Map



The background of the slide features a grayscale map of a city grid with several semi-transparent blue circles of varying sizes overlaid on it. The circles are scattered across the top half of the slide, with some overlapping the map lines and others appearing as solid shapes.

How was it used?

1. Calculating percent change

2. Cartographic Comparisons

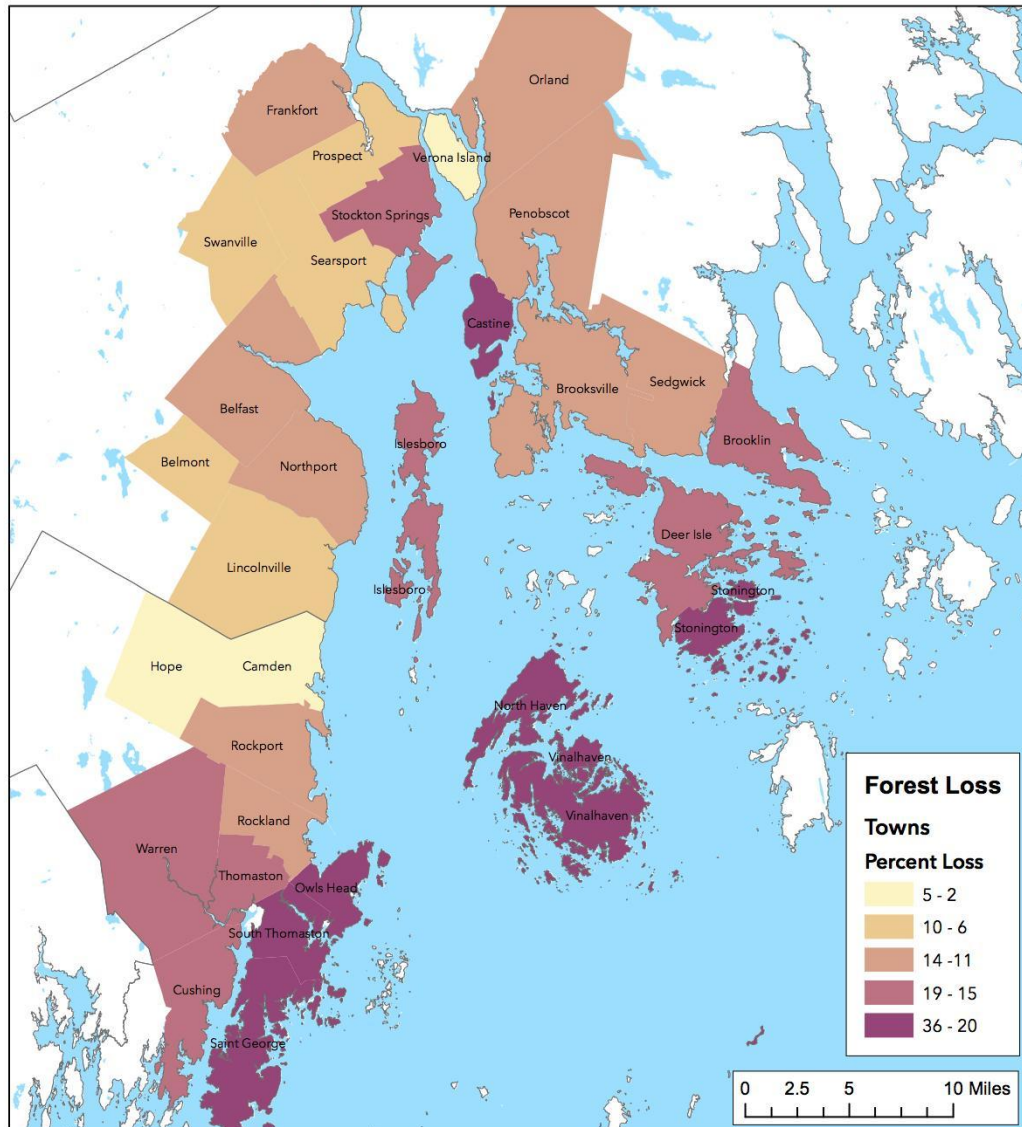
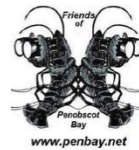
3. Raster Differencing

4. Land Cover Transitions



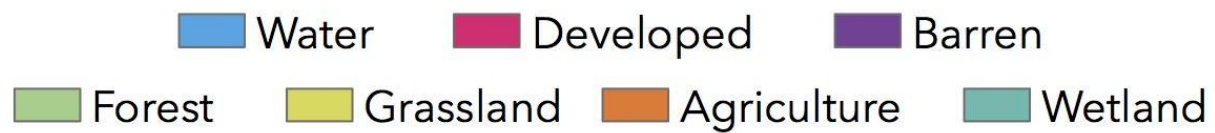
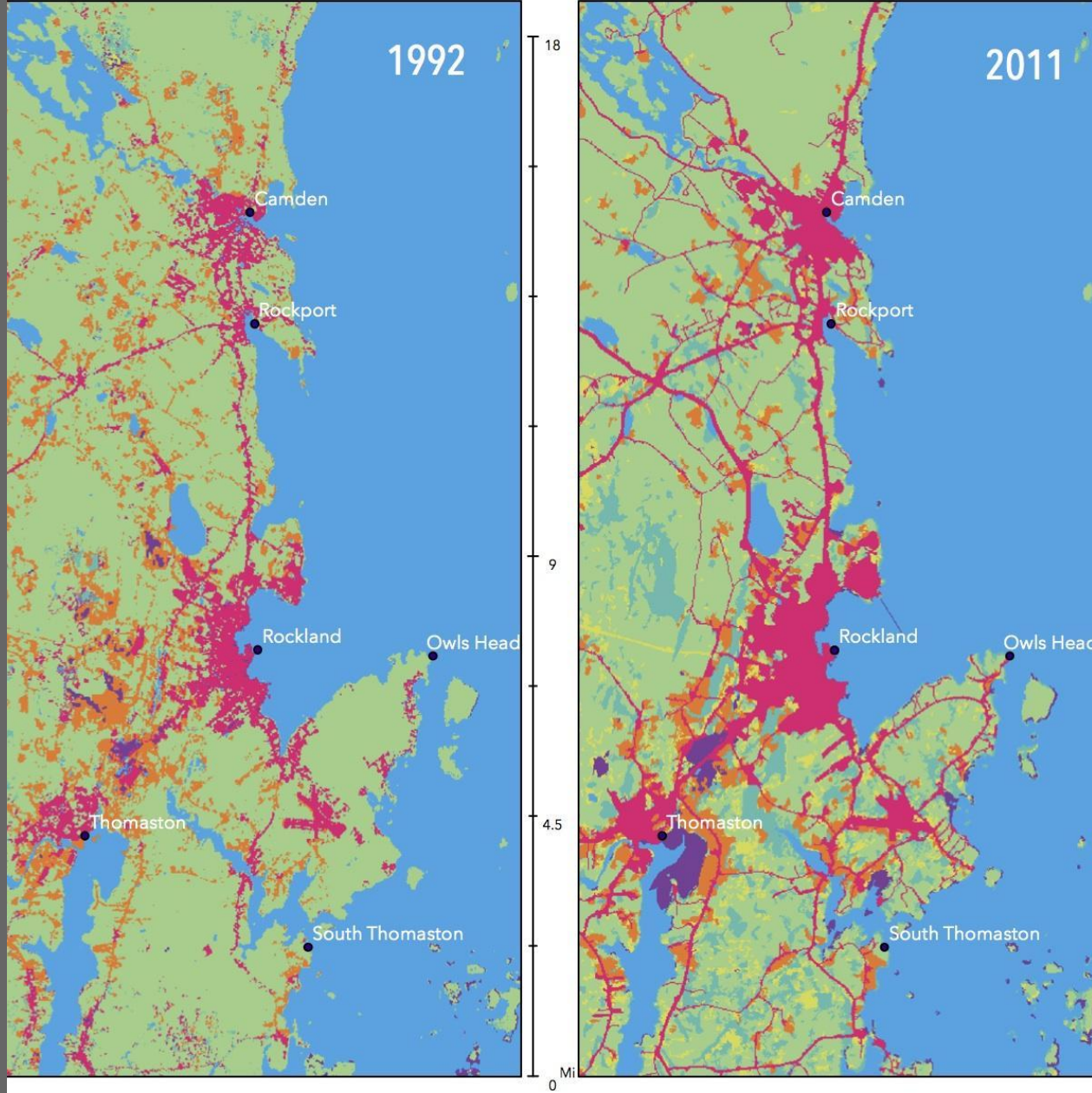
Percent Change

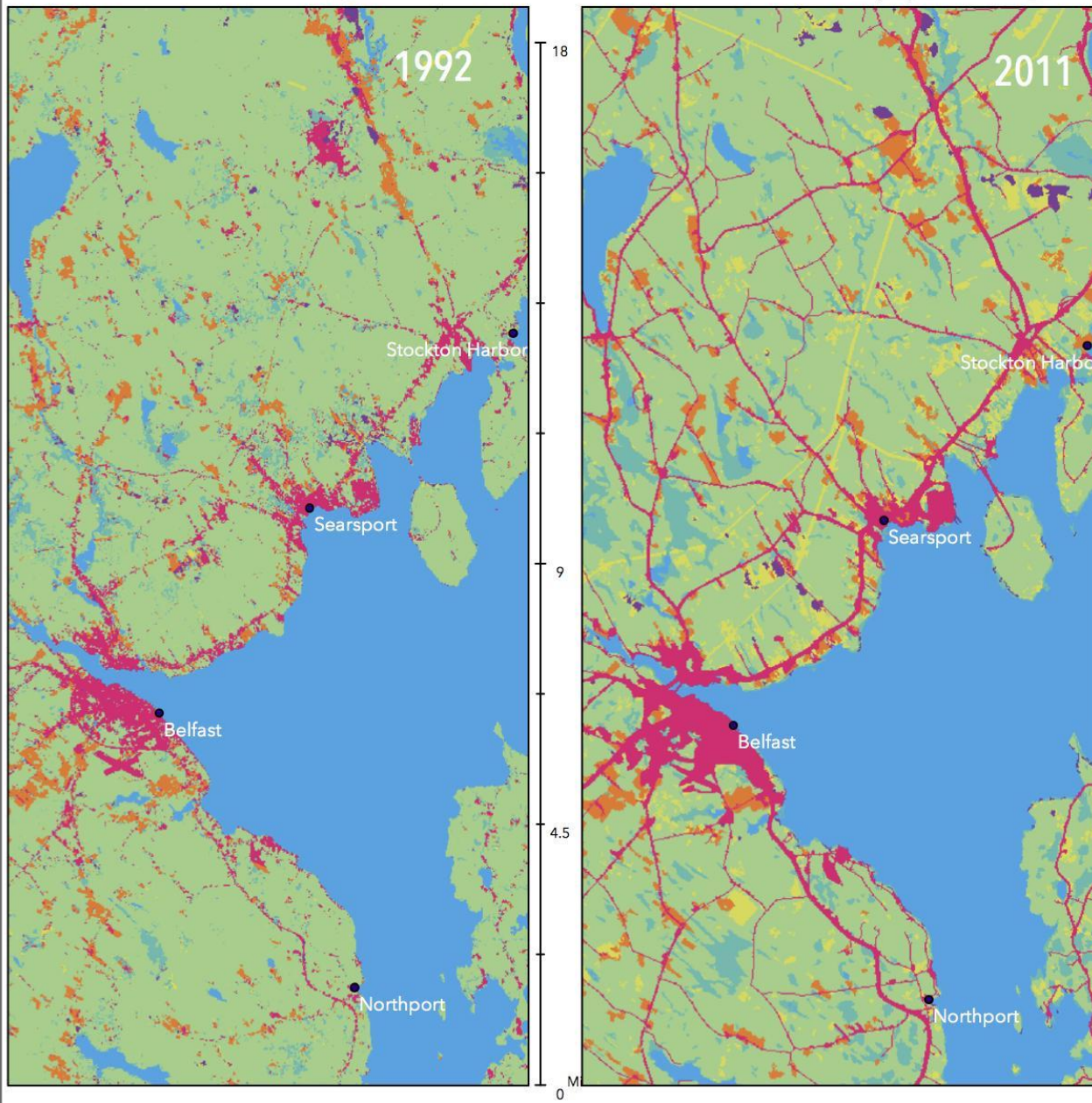
Penobscot Bay Forest Loss by Town





Cartographic Comparison



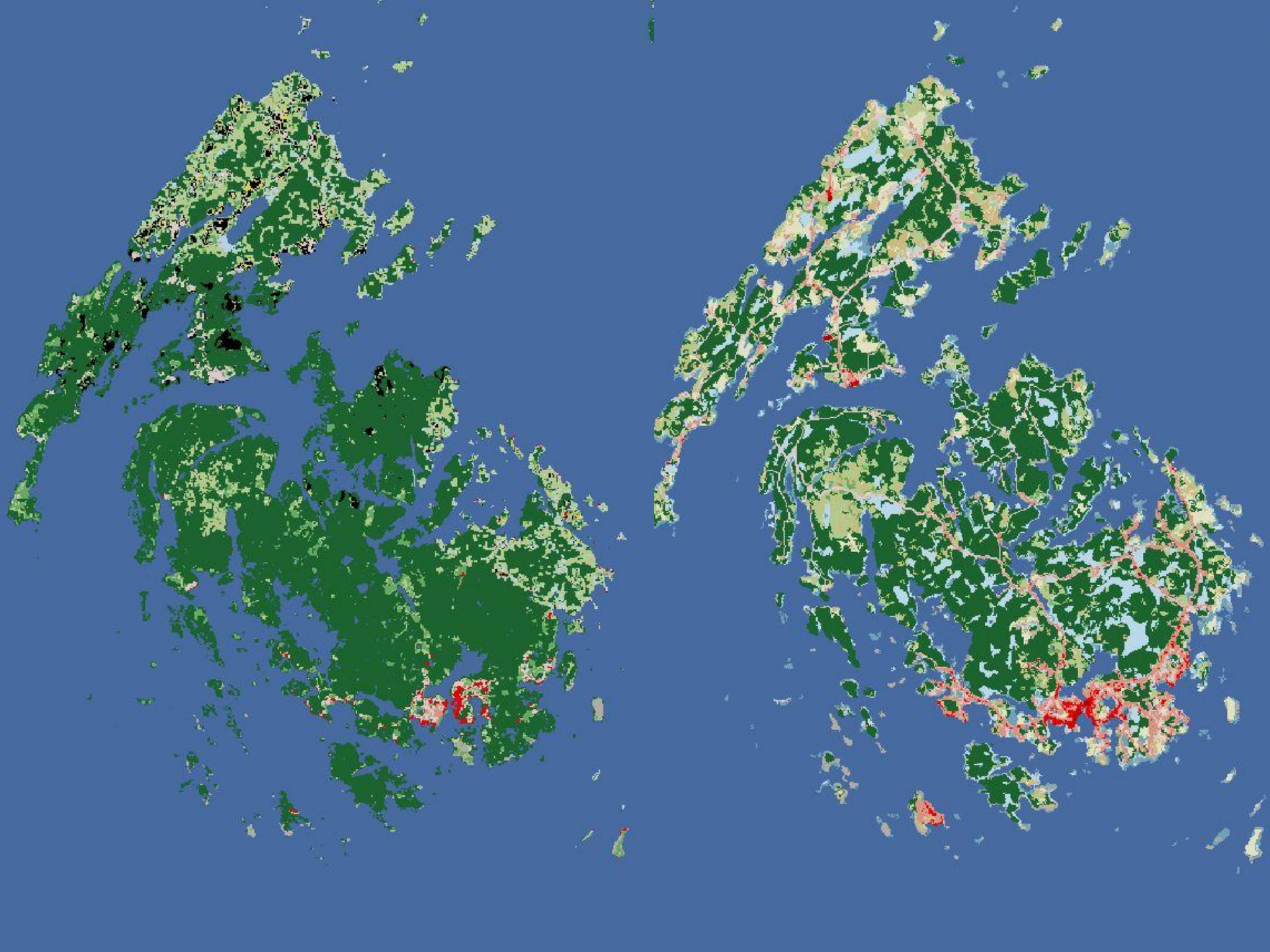


Water Developed Barren

Forest Grassland Agriculture Wetland



Raster Differencing

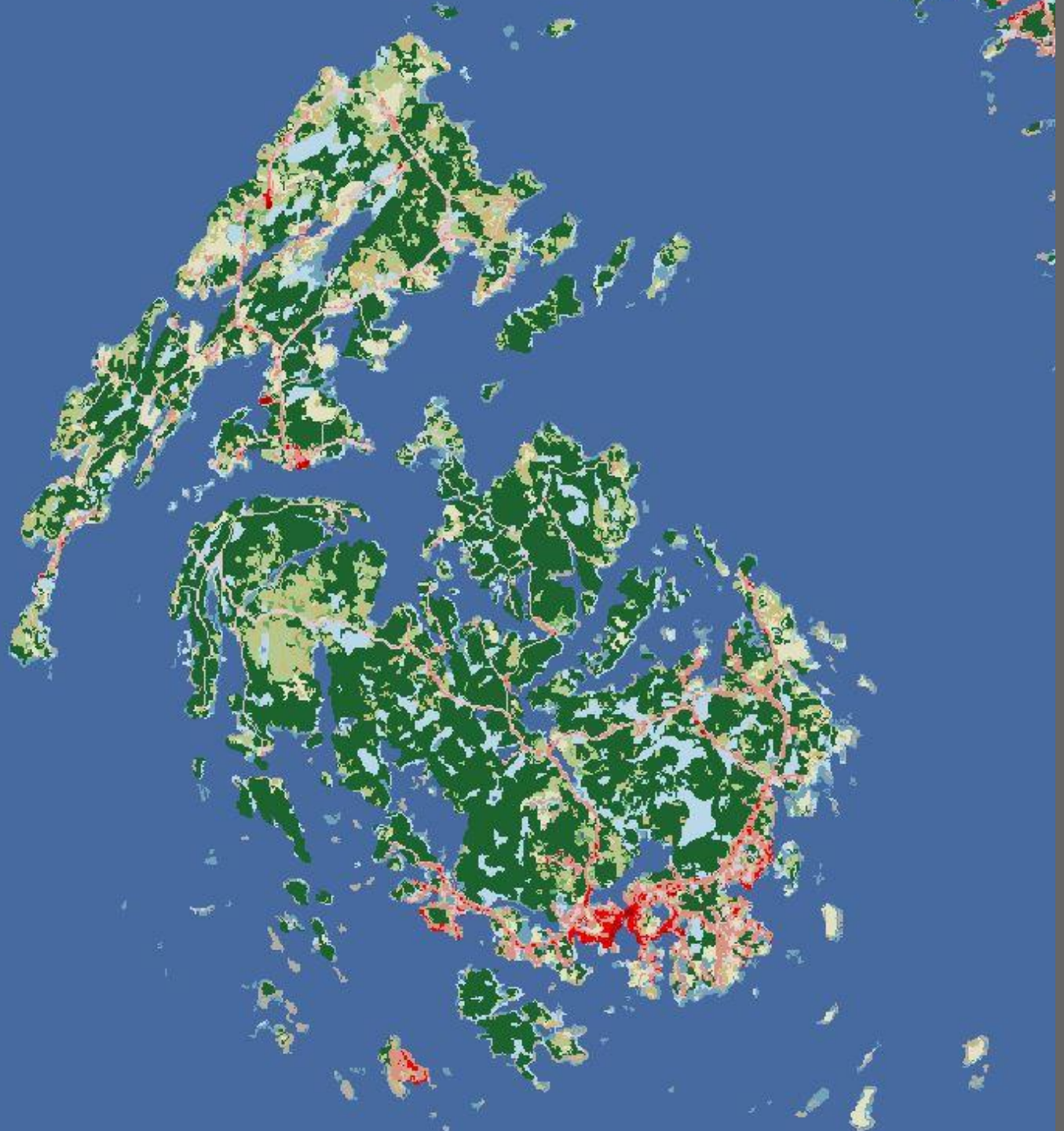


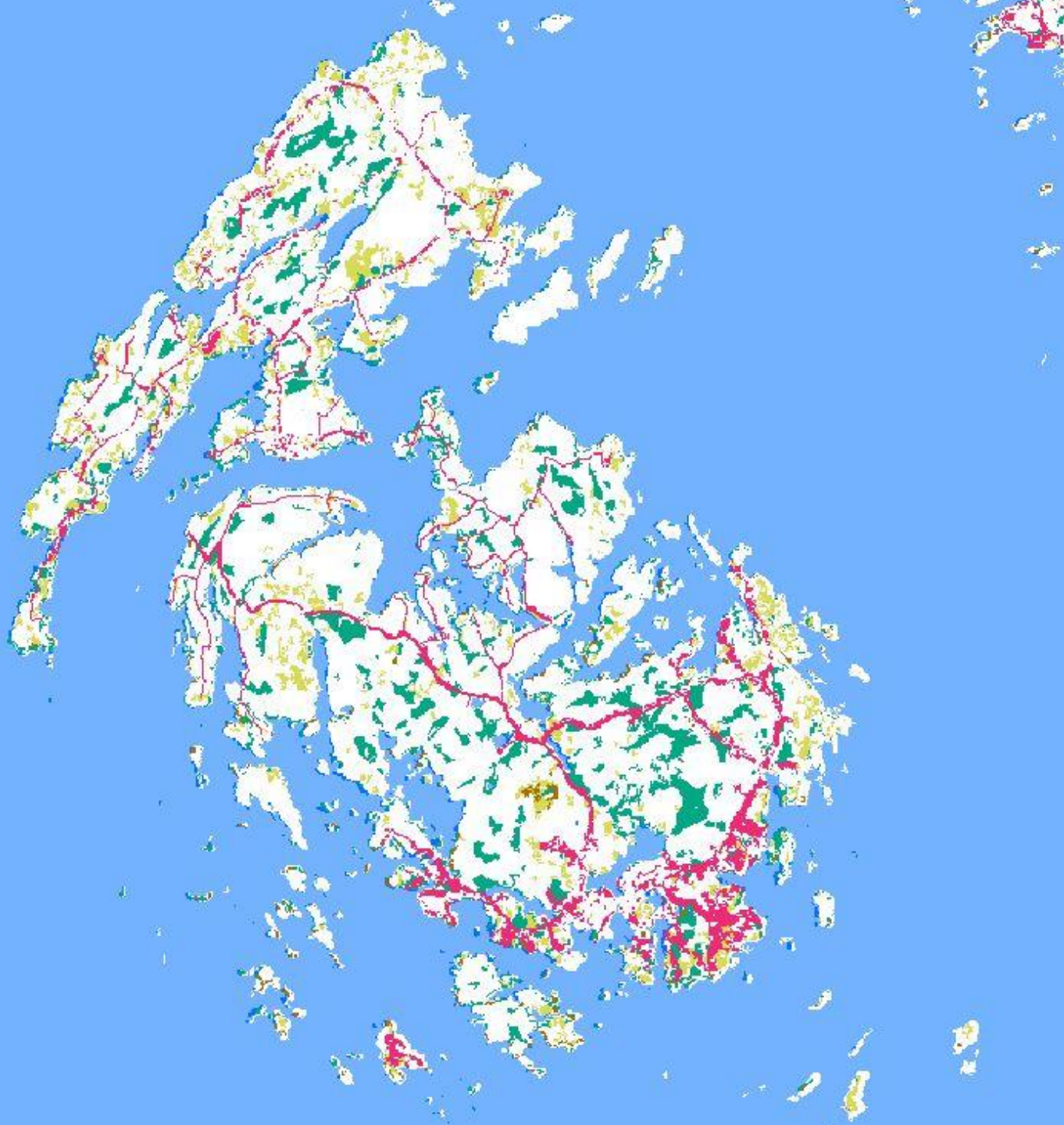






Land Cover Transition

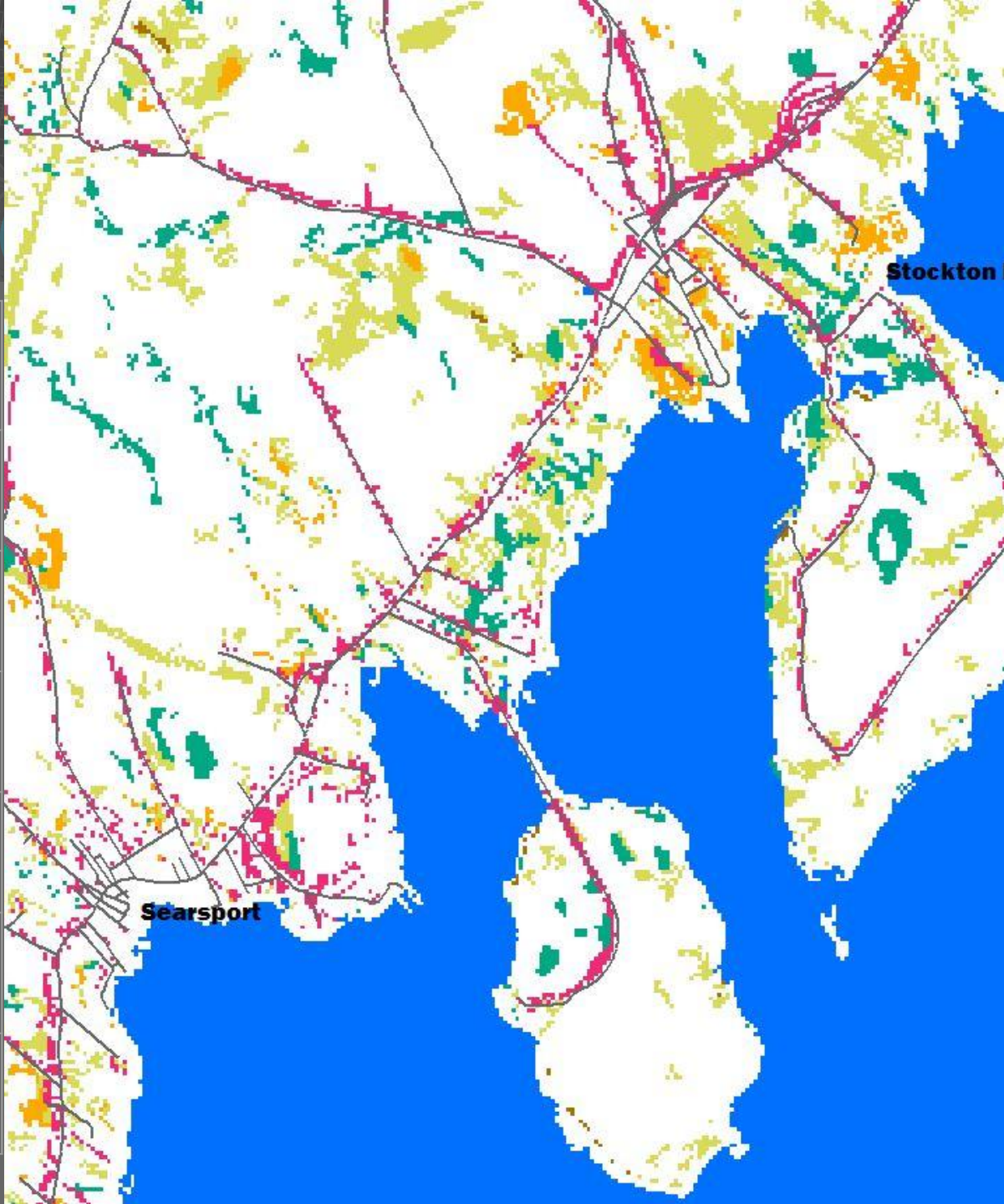




Results

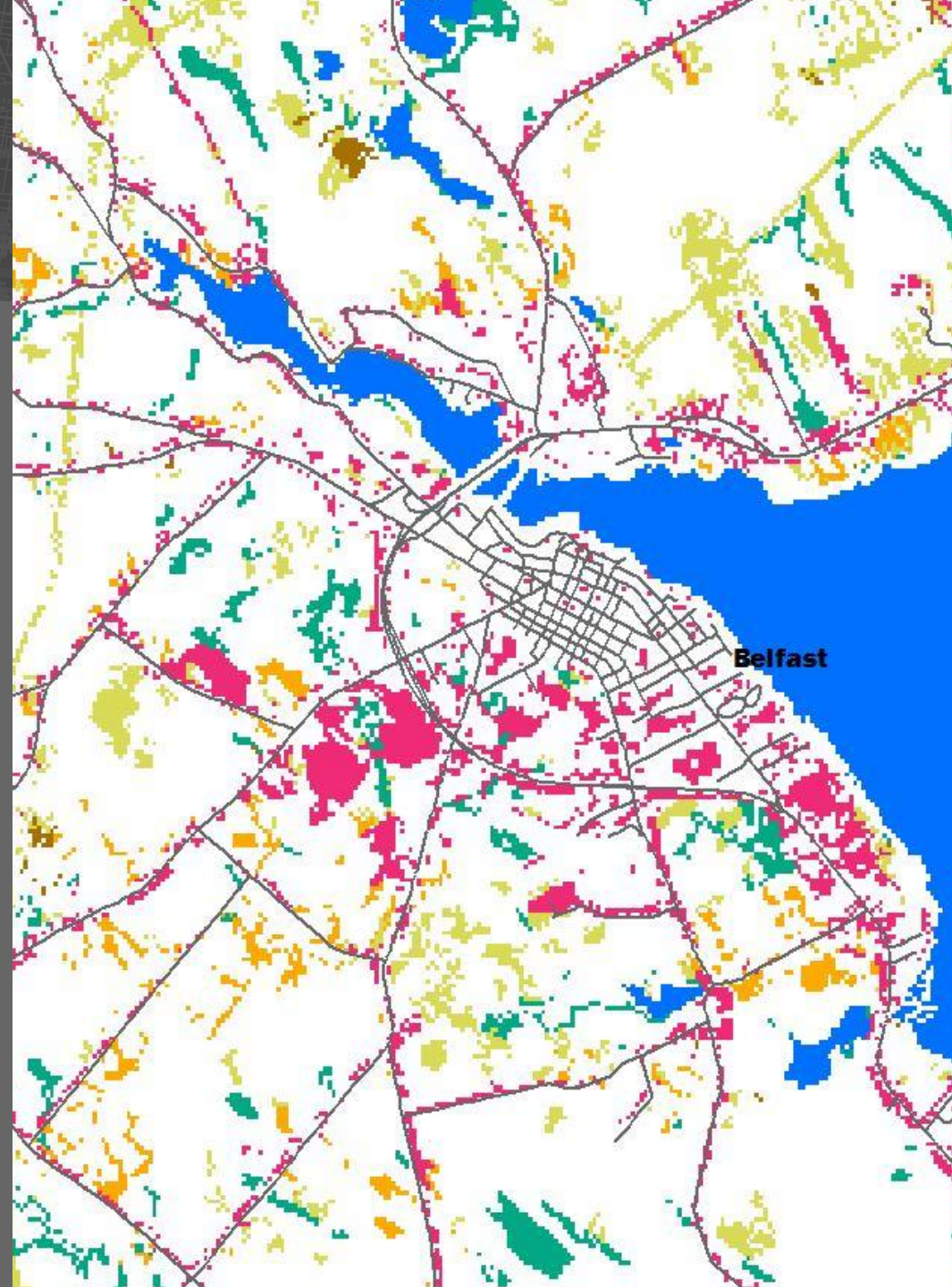
Searsport and Stockton Harbor

Land Cover	Change (Sq Mi)	Change (%)
Forest	- 5.6	-14%
Grassland	+ 3.7	+1500%
Developed	+ 0.8	+24%
Wetlands	+ 0.5	+17%
Agriculture	+ 0.3	+17%
Population	+84	+2%

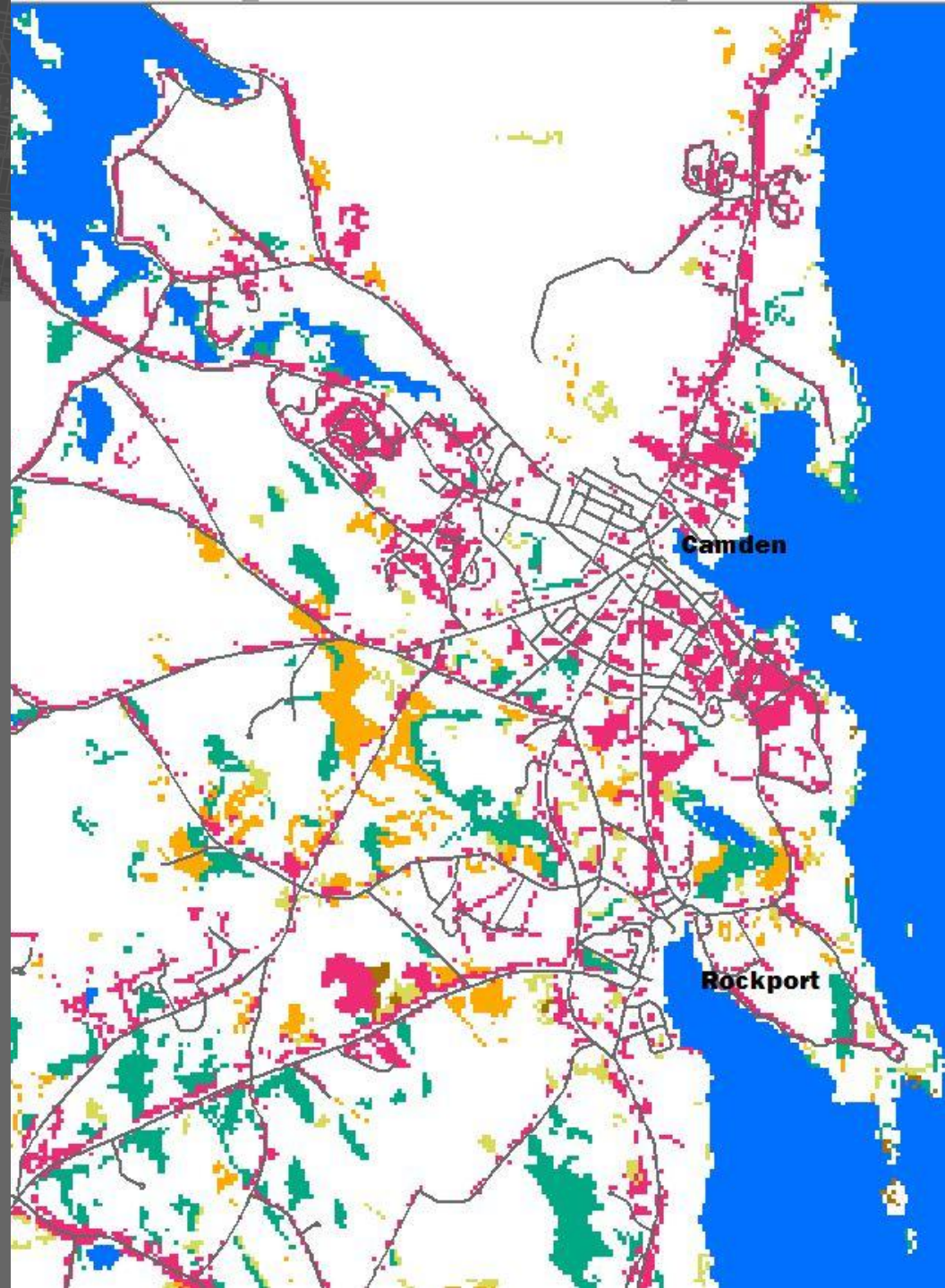


Belfast

Type	Change (Sq Mi)	Change (%)
Forest	- 3.7	-15%
Agriculture	- 0.2	-5%
Grassland	+ 1.9	+800%
Developed	+ 1.7	+44%
Wetlands	+ 0.9	+50%
Population	+287	+4.3%



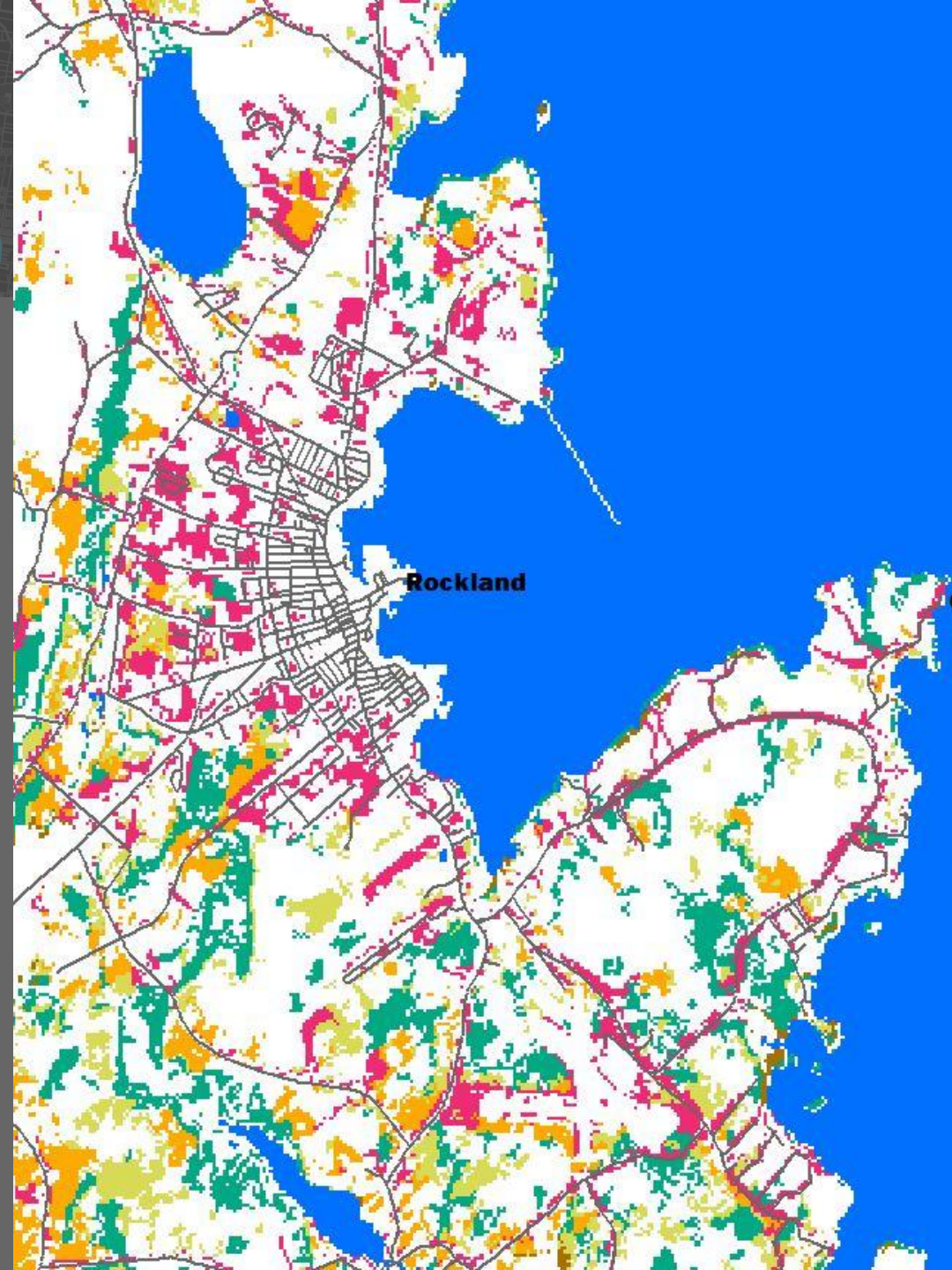
Camden and Rockport



Type	Change (Sq Mi)	Change (%)
Forest	- 2.8	-8%
Agriculture	- 2.8	-60%
Developed	+ 3.2	+100%
Wetlands	+ 1.6	+500%
Grassland	+ 1.1	+5000%
Population	+72	+0.1%

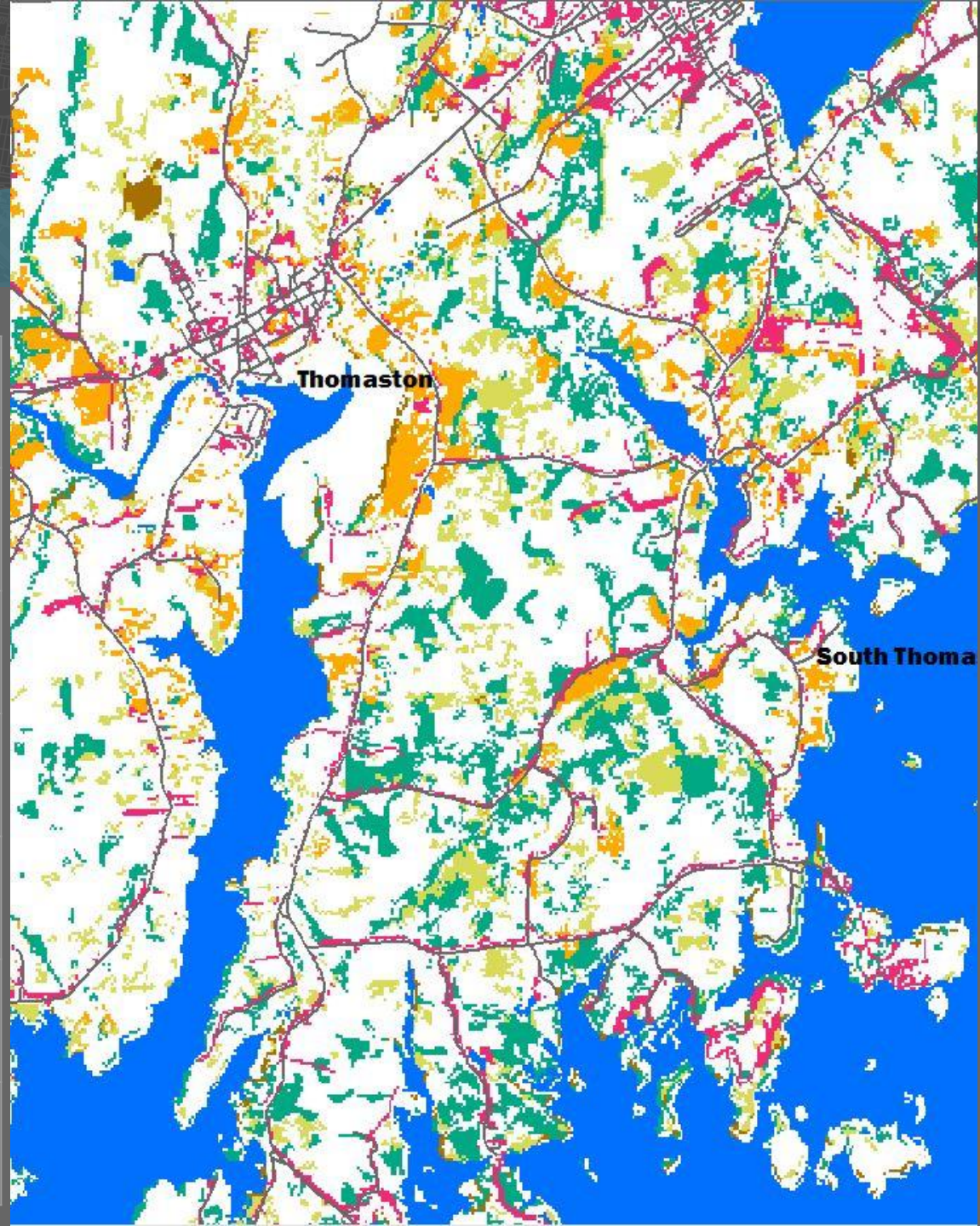
Rockland

Type	Change (Sq Mi)	Change (%)
Forest	- 4.4	-23%
Agriculture	- 2.8	-63%
Developed	+ 3.2	+45%
Wetlands	+ 1.6	+1000%
Grassland	+ 1.1	NA
Population	-675	-8%



Thomaston

Type	Change (Sq Mi)	Change (%)
Forest	- 5.9	-37%
Agriculture	- 0.4	-10%
Wetlands	+ 2.9	+1000%
Grassland	+ 2.0	+1000%
Developed	+ 1.4	83%
Population	- 525	-16%



Vinalhaven

Type	Change (Sq Mi)	Change (%)
Forest	- 5.9	-22%
Developed	+ 0.8	+250%
Grassland	+ 1.7	+1000%
Agriculture	+ 0.0	~
Wetlands	+ 2.5	+700%
Population	+87	+8%



Conclusions

A photograph of a lush forest. The foreground is filled with a dense carpet of green ferns. In the mid-ground and background, numerous tall, slender trees with dark trunks and vibrant green foliage rise up, creating a thick canopy. The lighting is soft and diffused, suggesting an overcast day or a misty atmosphere. The overall scene conveys a sense of a healthy, mature forest.

Forest Cover

Forest Cover

- Substantial Deforestation in all Towns
- Over 30 Square Miles
- Average of 23% Loss
- Emergence of Grasslands and Wetlands
 - +12 Square Miles of Grasslands
 - +13 Square Miles of Wetlands

A scenic view of a waterfront town. In the foreground, a large white sailboat is docked at a pier. To its right, a prominent red wooden building with a corrugated metal roof sits on wooden stilts over the water. The background is filled with a dense urban landscape of multi-story brick and stone buildings. The water in the foreground is calm, reflecting the sky and the buildings. The overall atmosphere is peaceful and picturesque.

Urban Growth

Urban Growth

- Growth of developed land much higher than population growth
- Average increase of 85%
- Over 12 Square Miles
- Average population decrease of 2%
- Development largely for Tourism, Commercial, Industrial purposes



Impact on Bay Wildlife

Wildlife Reference Map

Recommendations for Further Research

Nexts Steps

- EPA pollutants
 - Effect on wildlife
- Demographic Research
 - censusreporter.org
- Economic Impact
 - Is GDP increasing in line with development?
- Creation of online web map as tool for data exploration

Why a Webmap?



CARTODB
Geospatial on the cloud



Arc**GIS** Online



MapBox

The top portion of the slide features a dark grey background with a faint, light grey map of a city grid. Overlaid on this map are several semi-transparent blue circles of varying sizes, scattered across the upper right and center areas.

Next Steps

QUESTIONS!



Thanks for listening!

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bit.ly/DGDGIS