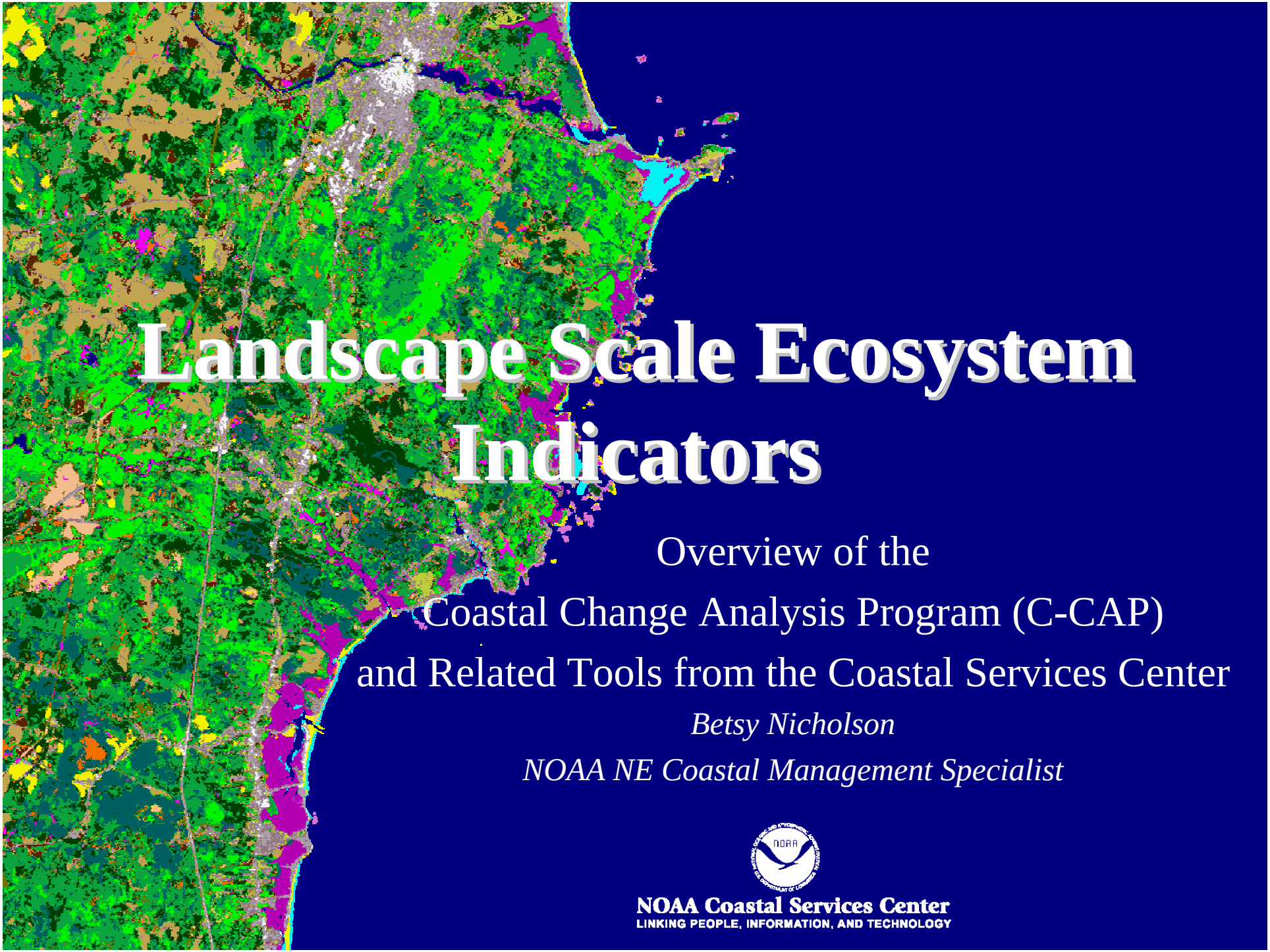


Landscape Scale Ecosystem Indicators

Overview of the
Coastal Change Analysis Program (C-CAP)
and Related Tools from the Coastal Services Center

Betsy Nicholson

NOAA NE Coastal Management Specialist

NOAA Coastal Services Center
LINKING PEOPLE, INFORMATION, AND TECHNOLOGY

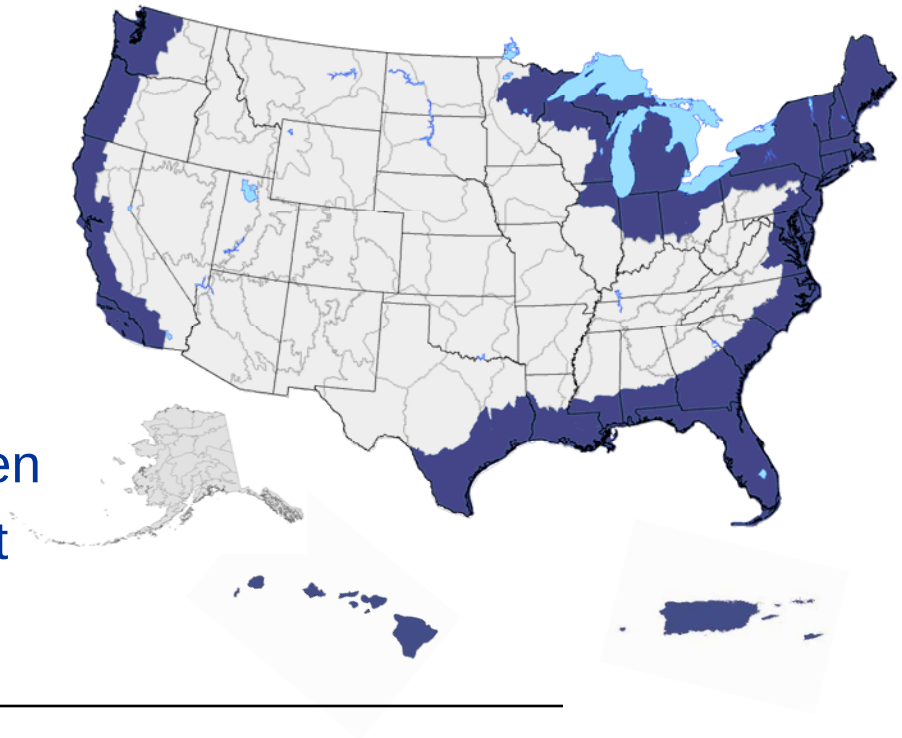
Outline

- Describe C-CAP
- C-CAP Products in Maine
- Application to coastal management issues
- Building block for decision-support tools
  - ISAT, N-SPECT, ICM

The Coastal Change Analysis Program

Monitoring the Nation's Coasts

- National coastal land cover and change mapping program
- Satellite-based map products
- Standardized data and methods
- Designed to help improve understanding of linkages between land change and the environment



C-CAP Vision: Develop national land cover change products on a 5-year repeat cycle (or less).

Partnering for Success

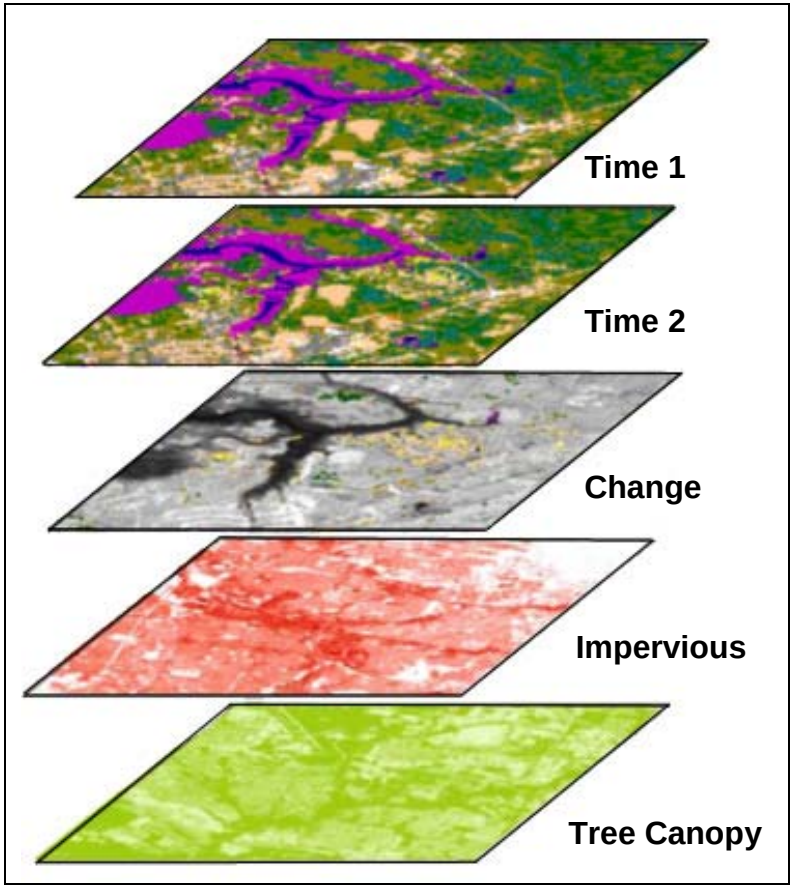
C-CAP New and Improved

- **Collaboration with MRLC/NLCD**
  - Utilize common, automated procedures
  - Standardized and accessible inputs
  - Combine existing classification schemes
  - C-CAP is the coastal expression of the NLCD
- **Private Industry Partnerships**
  - Performance based contracts (85% accurate)
  - QC by contractors/QA by NOAA
  - AA by contractors/Validation by NOAA
- **Extensive outreach effort**
  - Work with constituents to determine needs
  - Make all data available to the public
  - Development of tools to aid in use of data

C-CAP Land Cover Products

A digital-map product line

- **Land cover**: **time 1**
  (~ current year)
- **Land cover**: **time 2**
  (~ 5-year retrospective)
- **Retrospective change**
  (time 1 - time 2 change)
- **Percent impervious**
- **Percent tree canopy**
- **Metadata**



Common Classification Scheme

Developed
- Developed, High Intensity
- Developed, Medium Intensity
- Developed, Low Intensity
- Developed, Open Space

Agricultural
- Cultivated Crops
- Pasture/Hay

Rangeland
- Grassland/Herbaceous
- Scrub / Shrub

Forest Land
- Deciduous Forest
- Evergreen Forest
- Mixed Forest

Barren Land
- Barren Land
- Unconsolidated Shore

Water
- Open Water
- Palustrine Aquatic Bed
- Estuarine Aquatic Bed

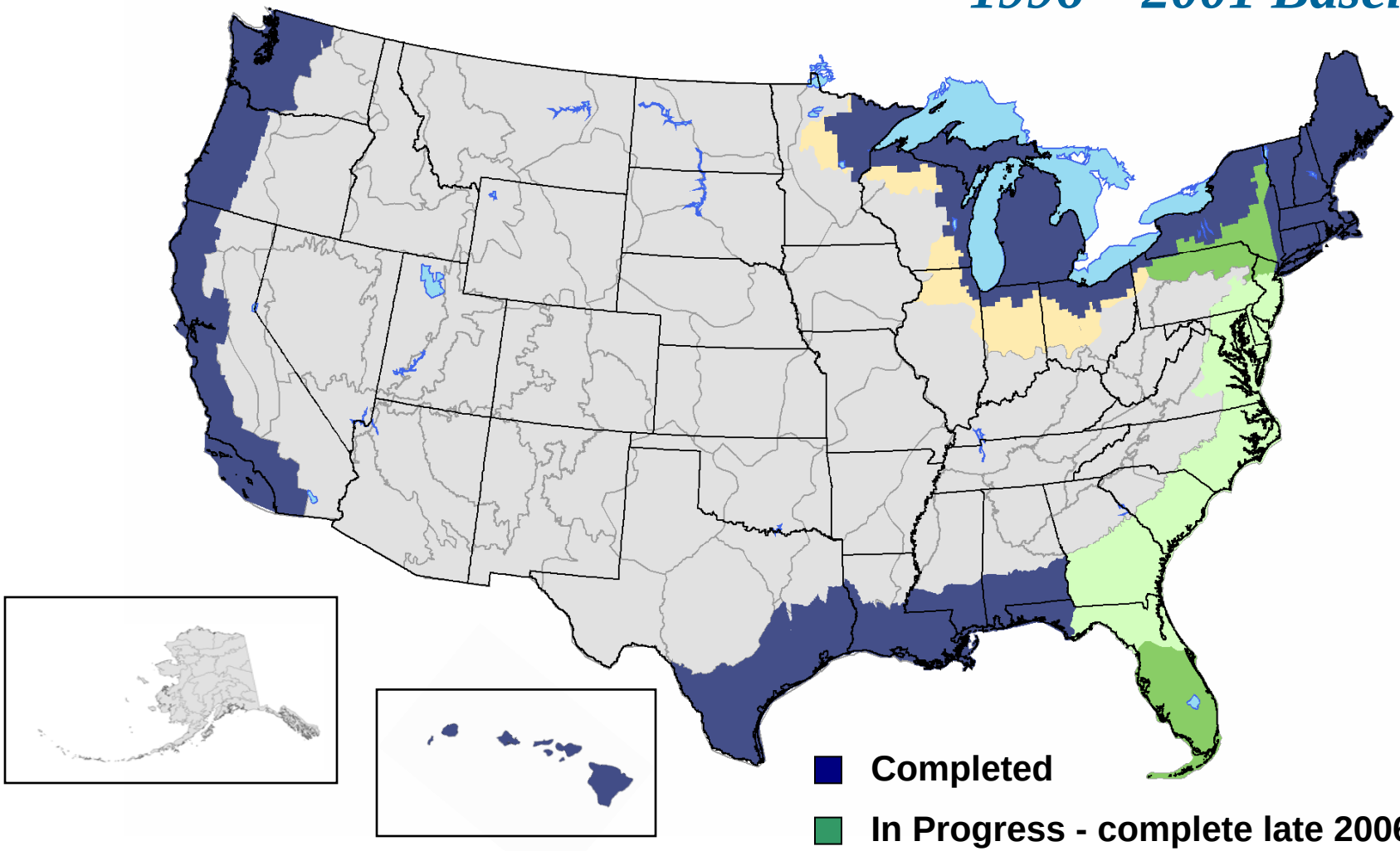
Wetlands
- ***Woody Wetlands***
  - Palustrine Forested Wetland
  - Palustrine Scrub/Shrub Wetland
  - Estuarine Forested Wetland
  - Estuarine Scrub/Shrub Wetland
- ***Herbaceous Wetlands***
  - Palustrine Emergent Wetland
  - Estuarine Emergent Wetland

Perennial Ice/Snow

Tundra/Alaska Only Classes
- Dwarf Scrub*
- Sedge/Herbaceous*
- Lichens*
- Moss*

C-CAP Status

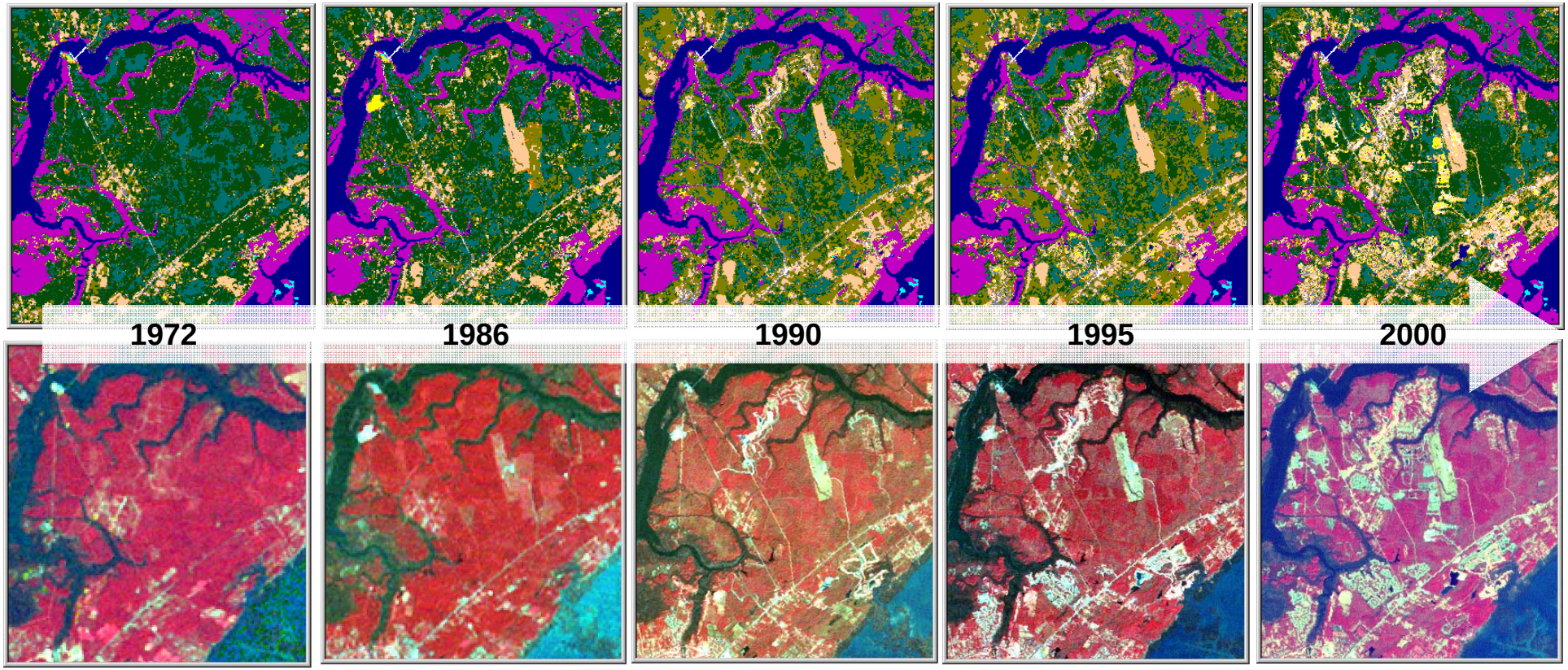
1996 – 2001 Baseline



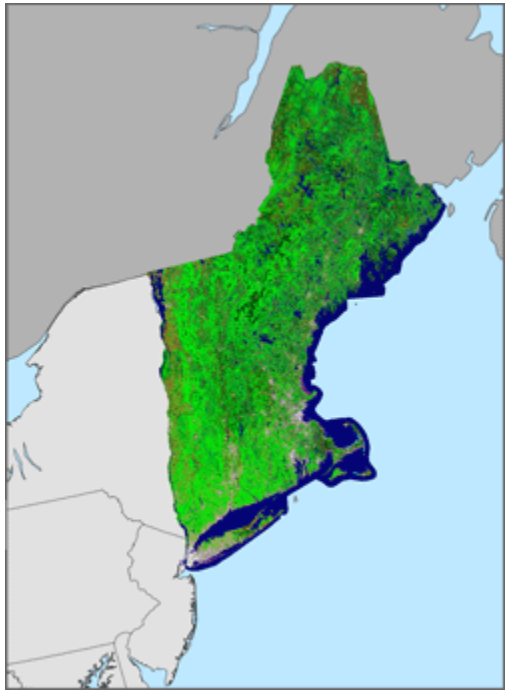
NOAA Coastal Services Center
LINKING PEOPLE, INFORMATION, AND TECHNOLOGY

Change and Trend Monitoring

Mount Pleasant, SC Example

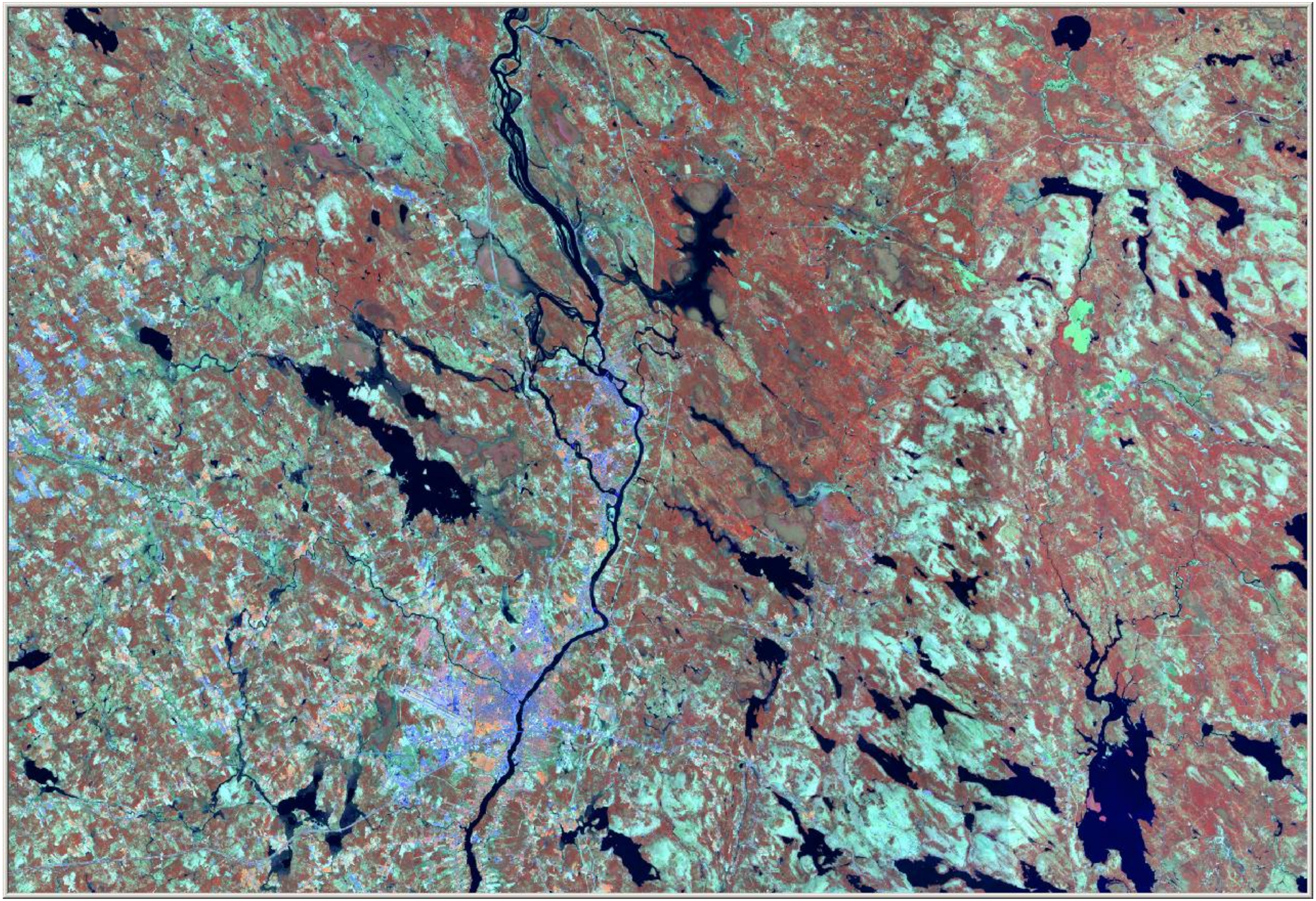


1972	1986	1990	1995	2000
Rural community	Small airport construction	Hurricane Hugo defoliates trees	Golf course community	Population expansion

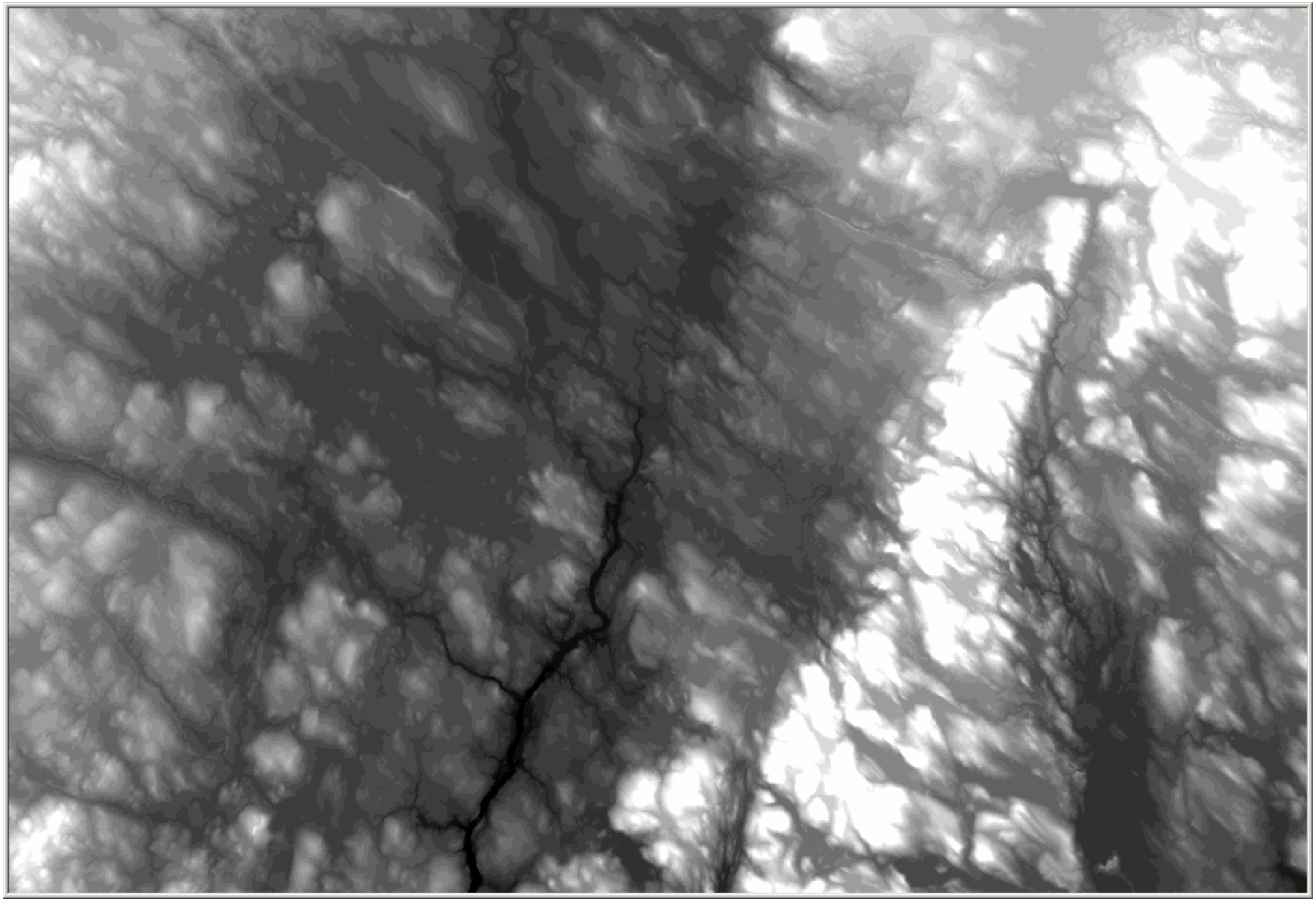


C-CAP Products in Maine

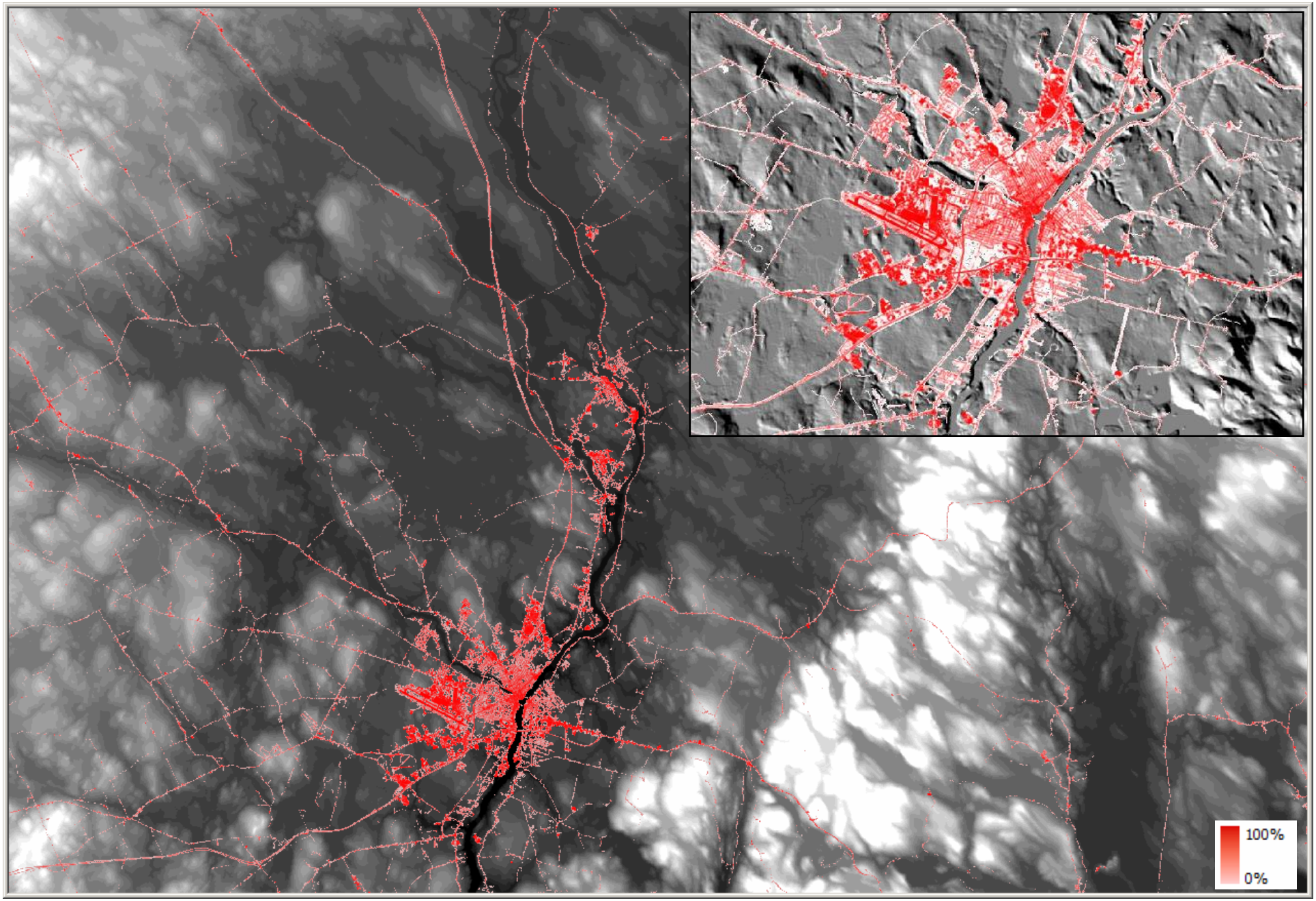
NOAA Coastal Services Center
LINKING PEOPLE, INFORMATION, AND TECHNOLOGY



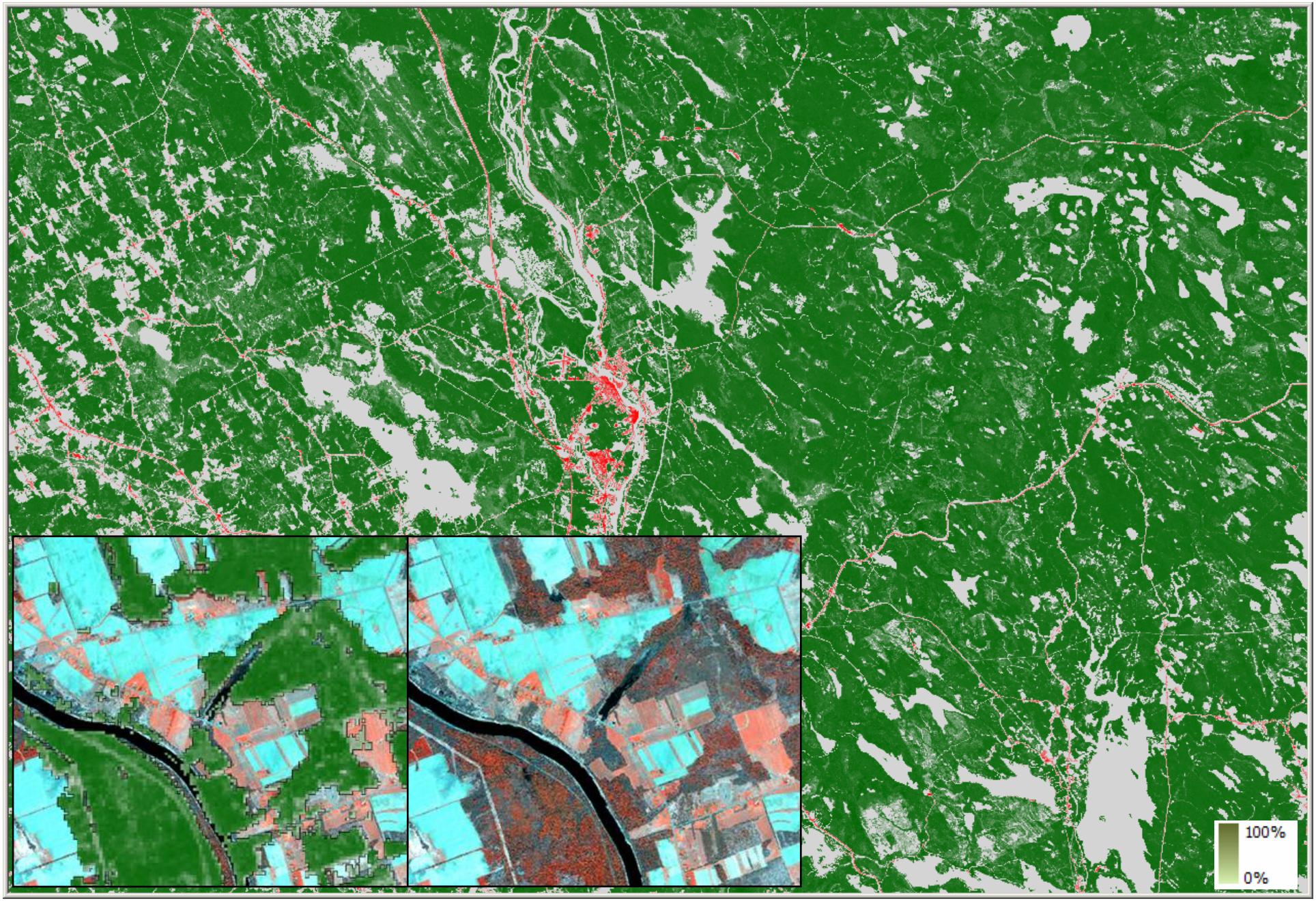
Landsat Satellite Imagery



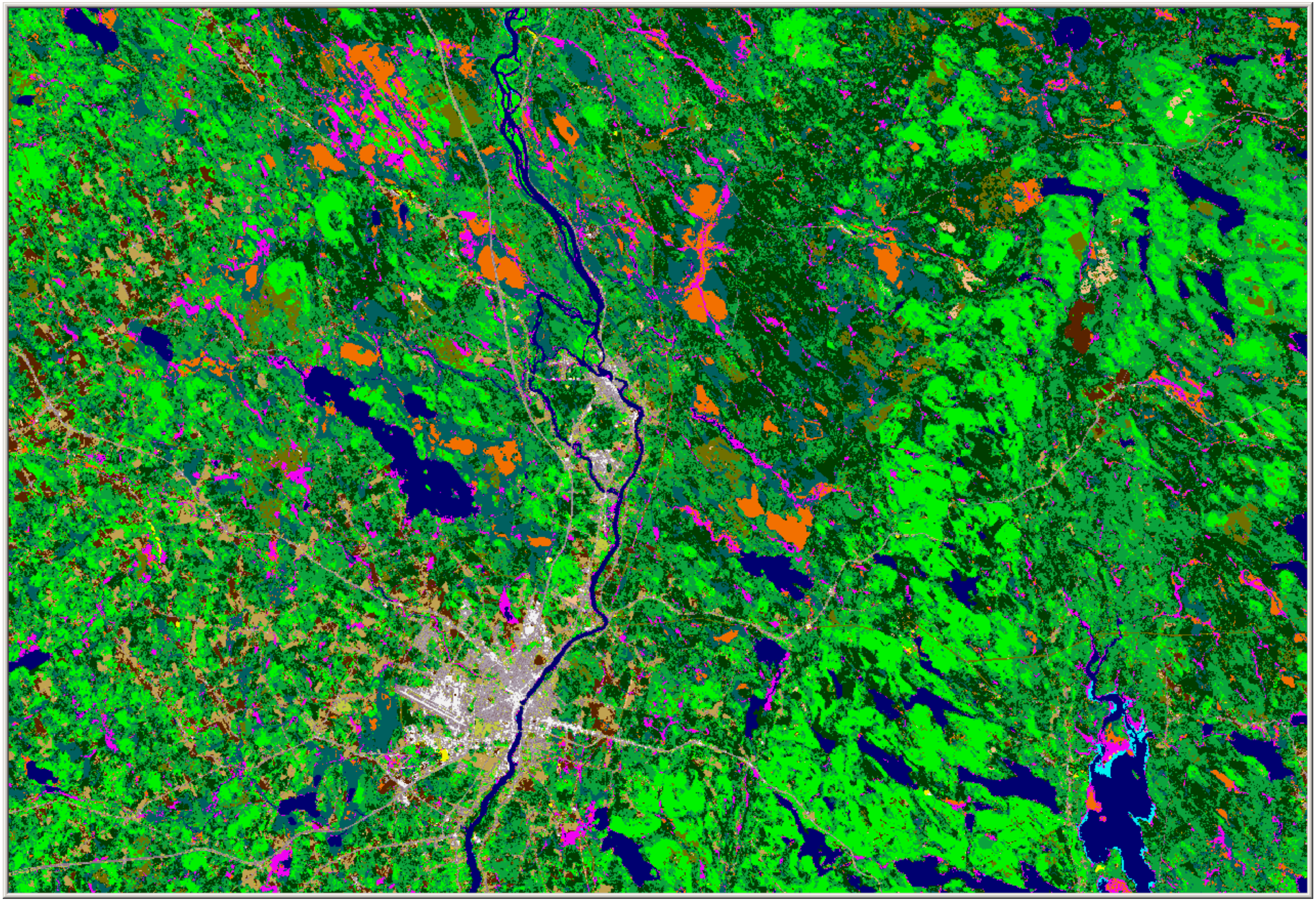
National Elevation Data



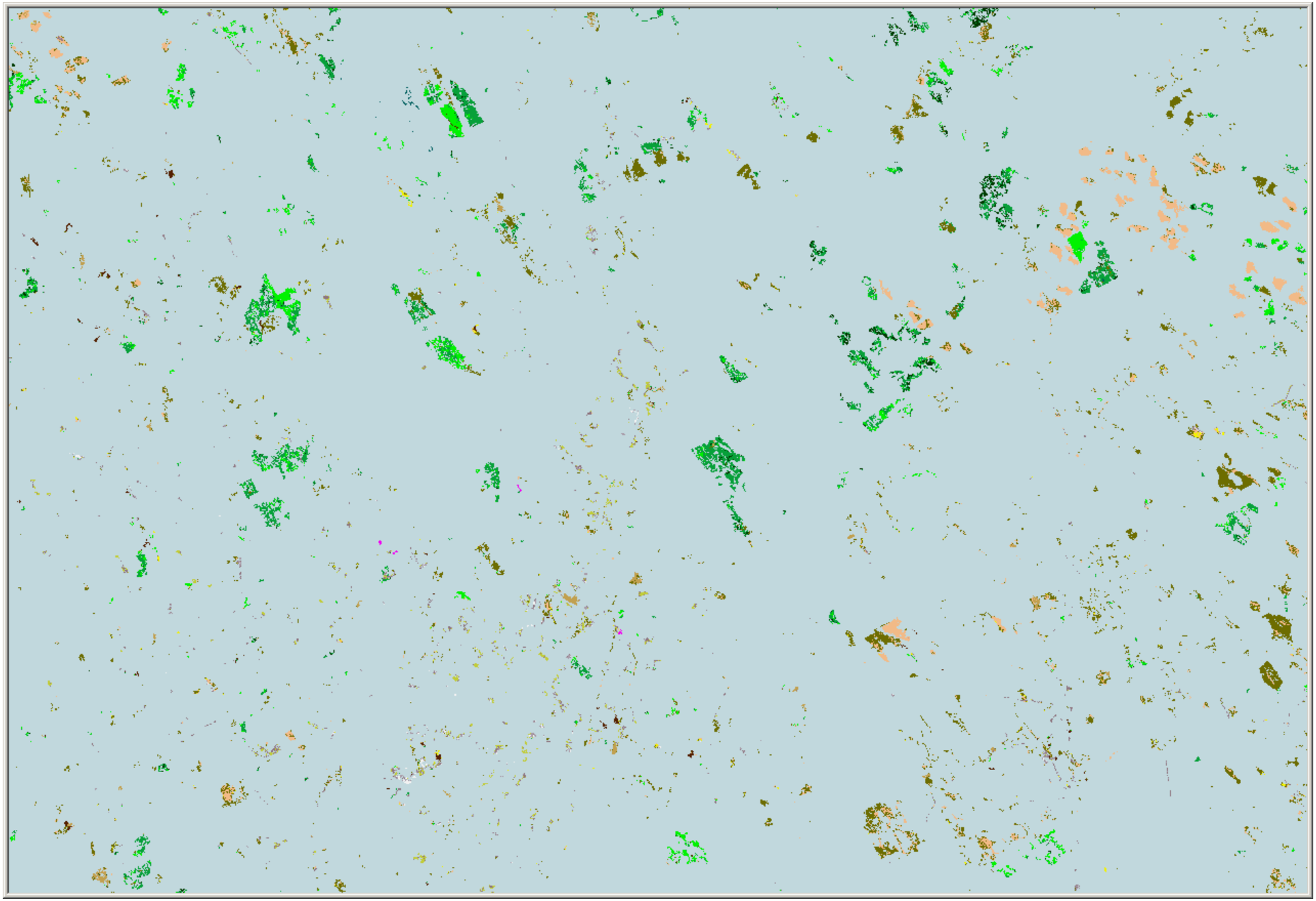
Percent Impervious Surface



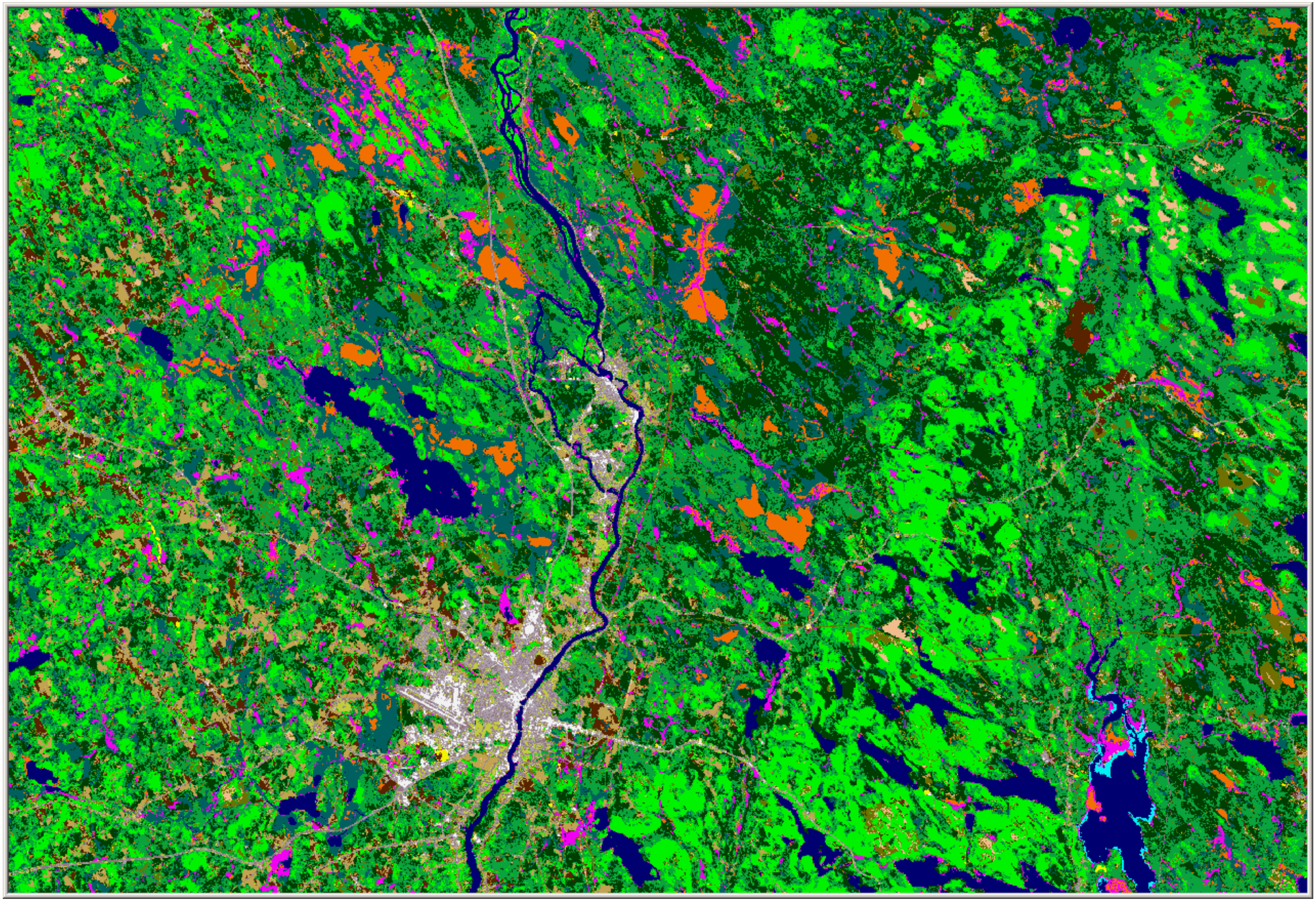
Percent Canopy Closure



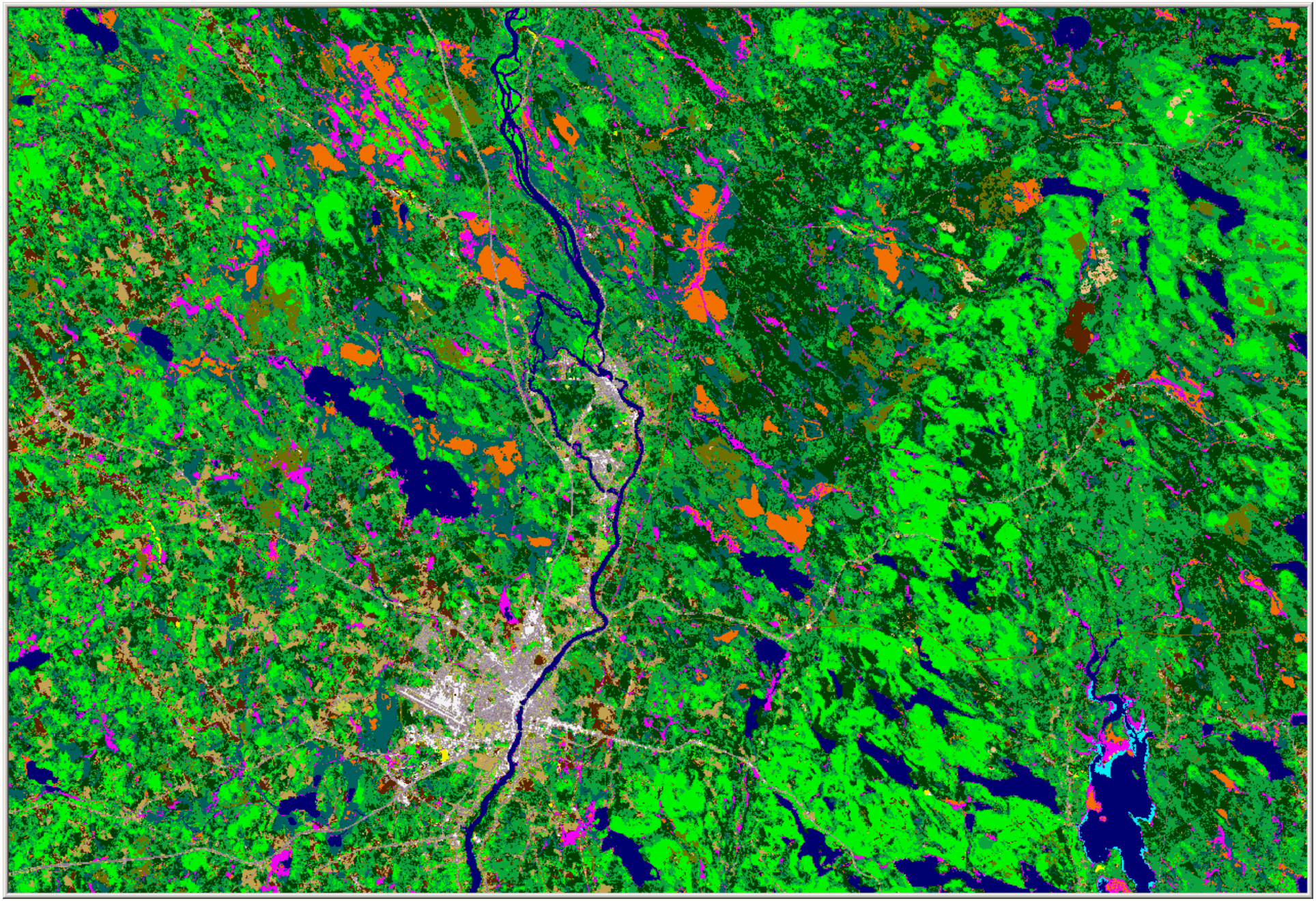
1996 Land Cover



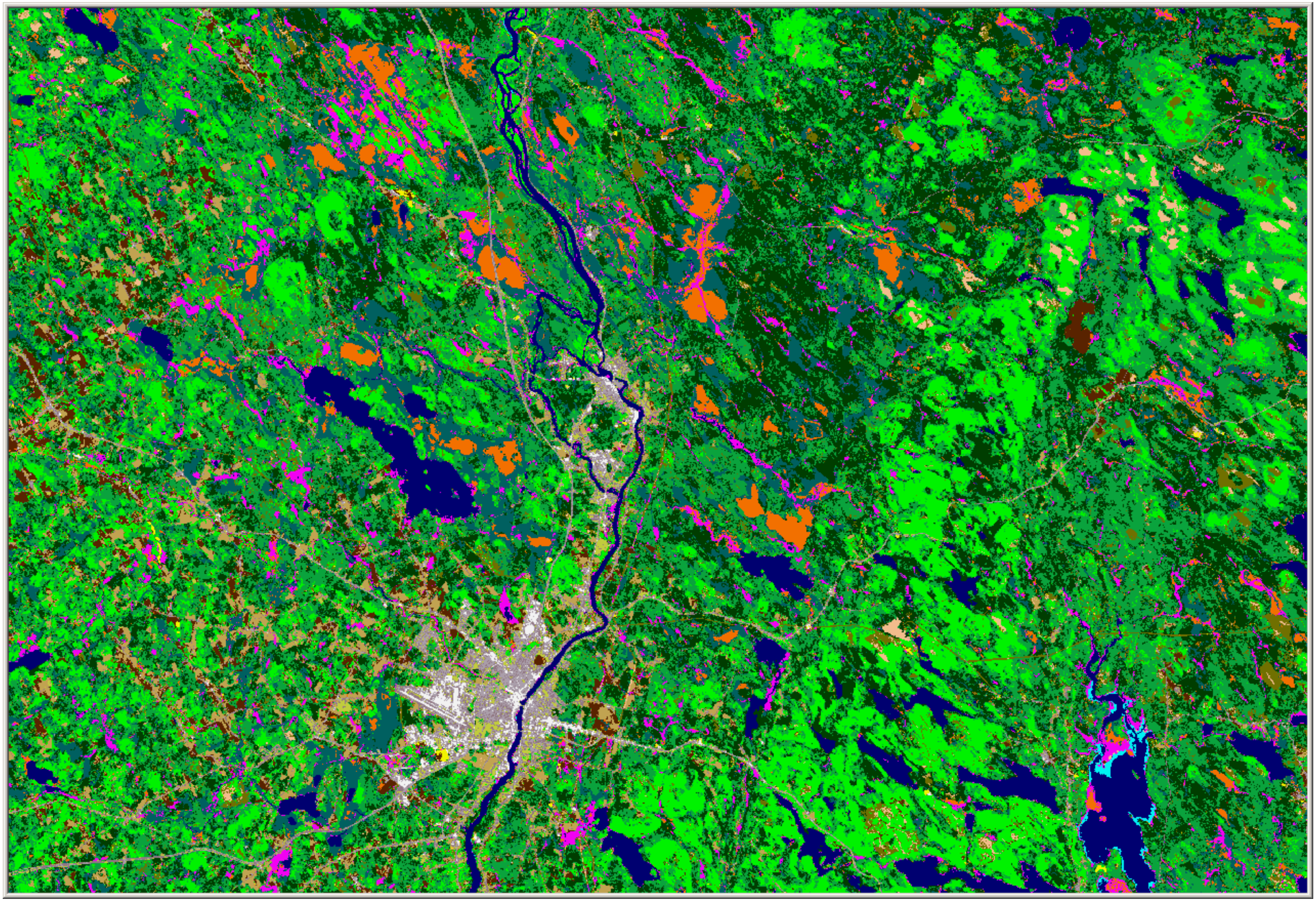
1996 to 2001 Land Cover Changes



2001 Land Cover

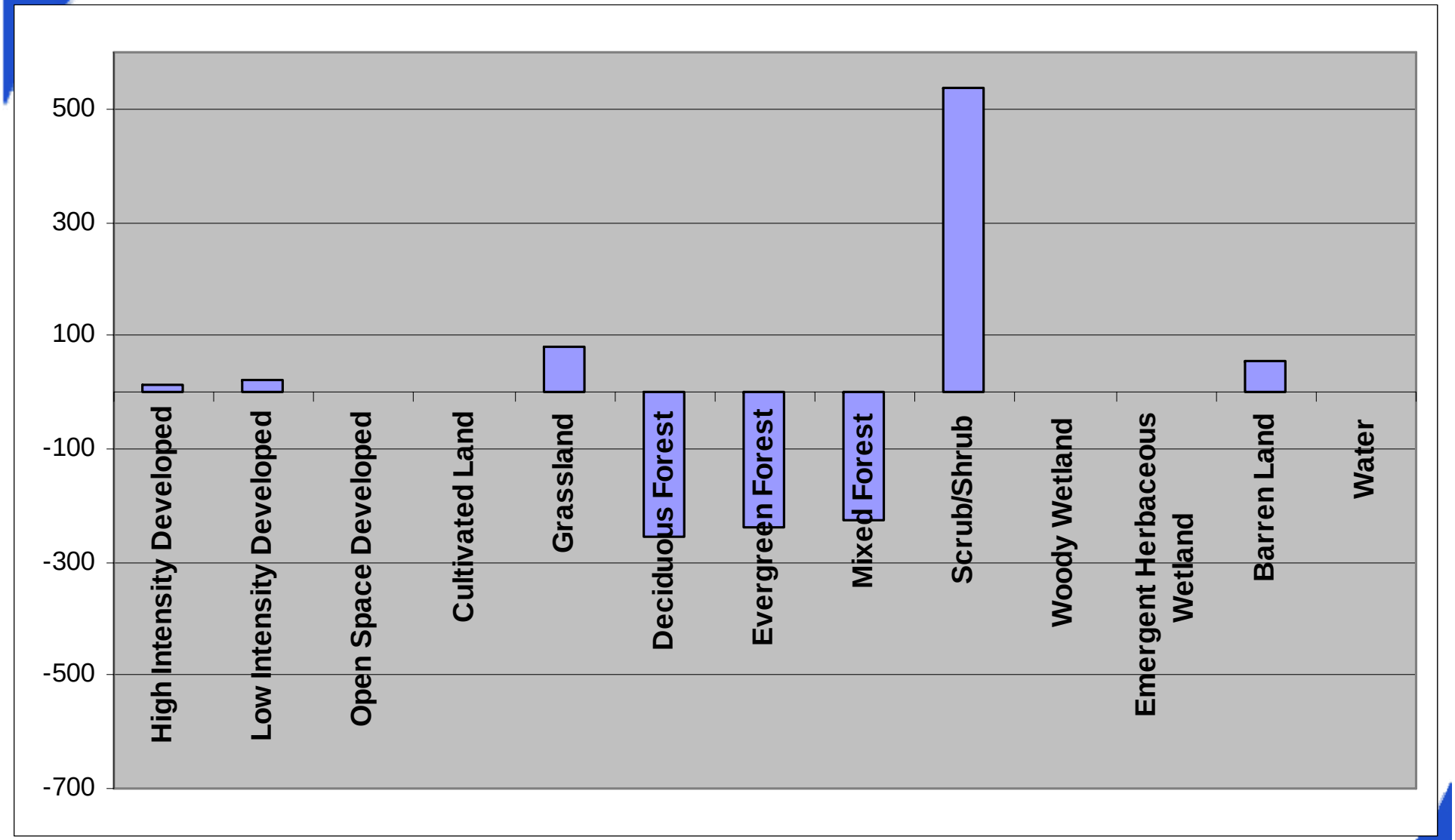


1996 Land Cover

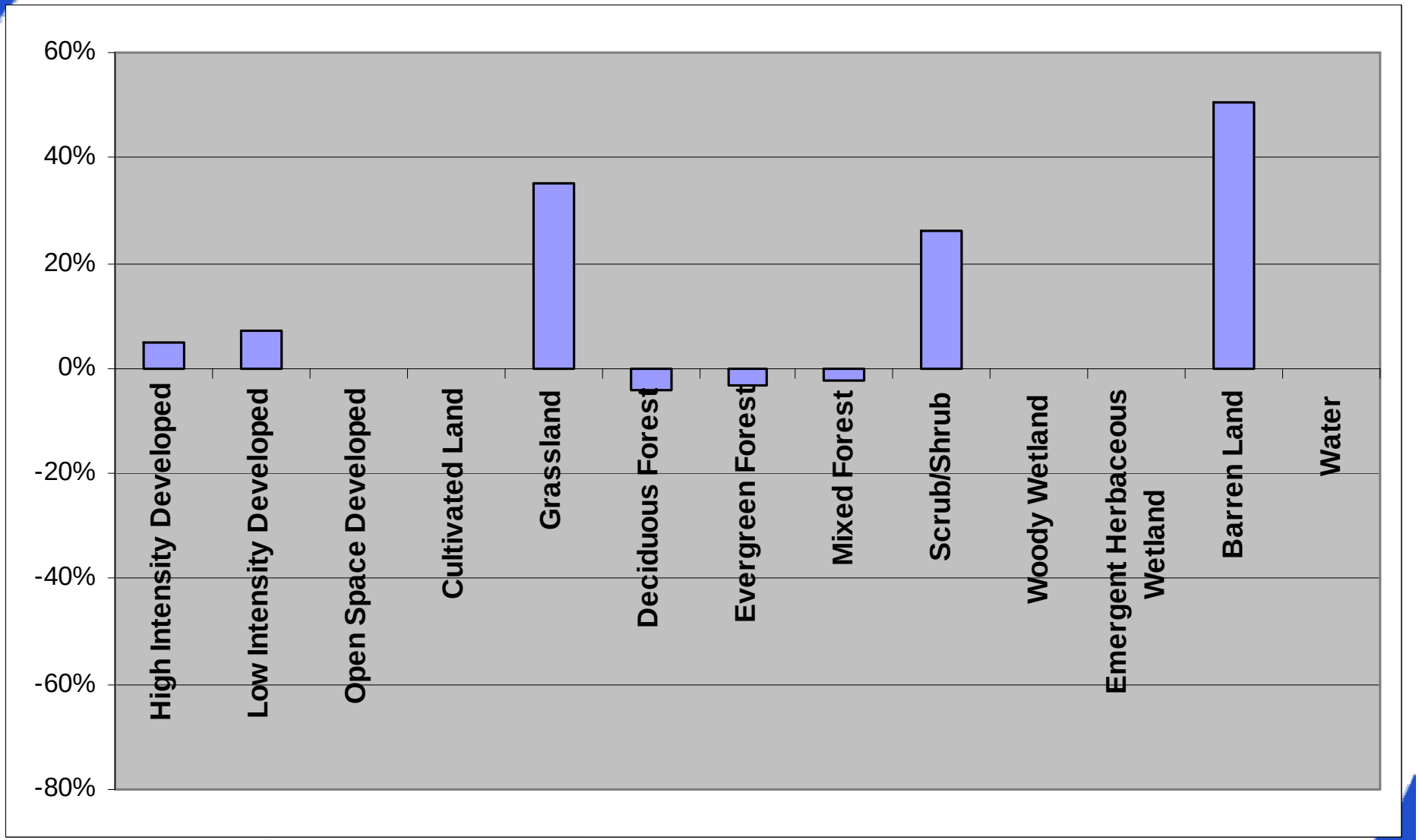


2001 Land Cover

Area of change in Maine (sq mi)



Percent Change per Category



Data Uses

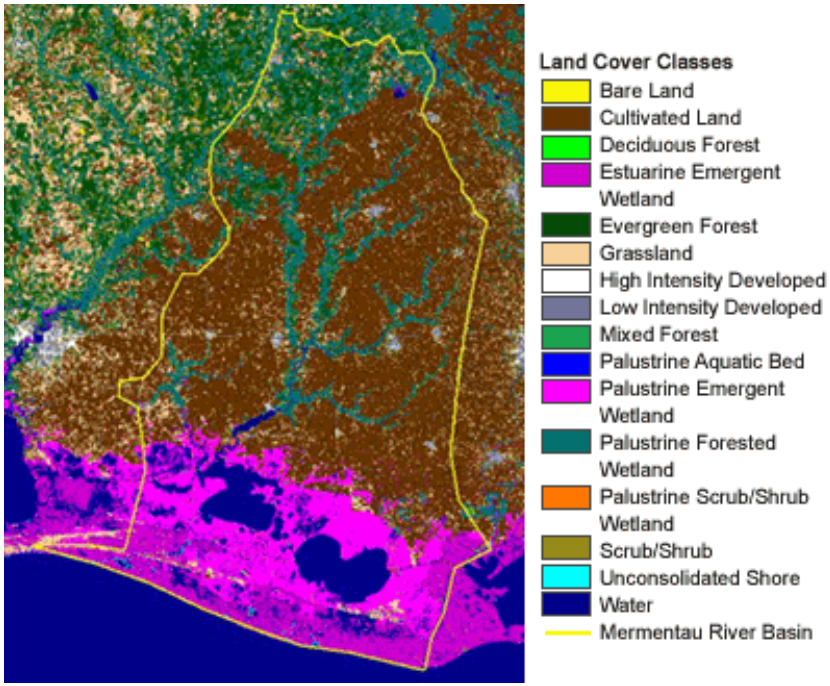
C-CAP

- Impervious surface estimates
- Regional planning and assessments
- Conservation site selection
- Habitat management
- Nonpoint source pollution assessment
- Habitat fragmentation analyses
- Model input; decision support tools/systems

Keeping Wetlands Healthy

Louisiana's Mermentau River basin

How do you identify and track deteriorating Wetlands?



By conducting a change analysis for the affected areas and comparing that to a baseline map of Louisiana's coast.

<u>Allows managers to determine:</u>

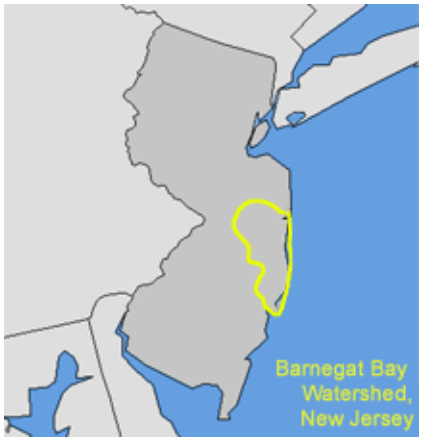
1) What is happening to the wetlands on a large scale.

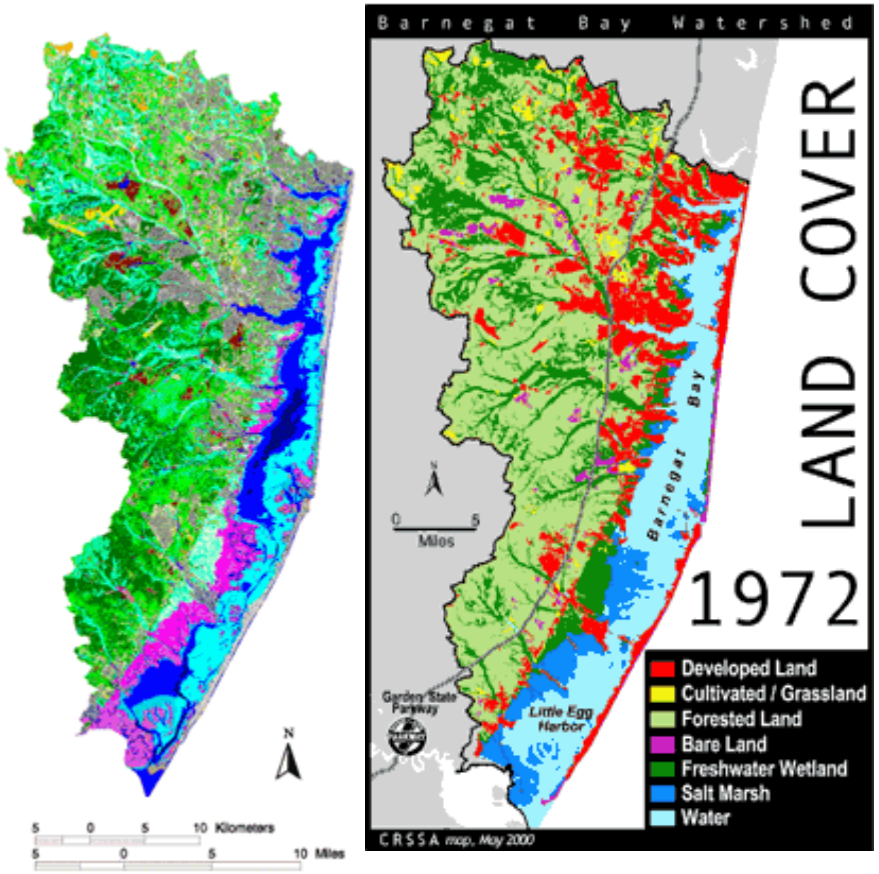
2) How fast and in what areas these changes have occurred.

Managing Coastal Estuaries

Barnegat Bay, New Jersey

How can organizations and agencies lessen the environmental impacts of future development?





Map composed at the Center for Remote Sensing and Spatial Analysis (CRSSA), Rutgers University, 09/99.

Integrate satellite imagery and additional data sets to derive a base map depicting habitat loss and long-term change trends in a watershed.

Allows managers to:

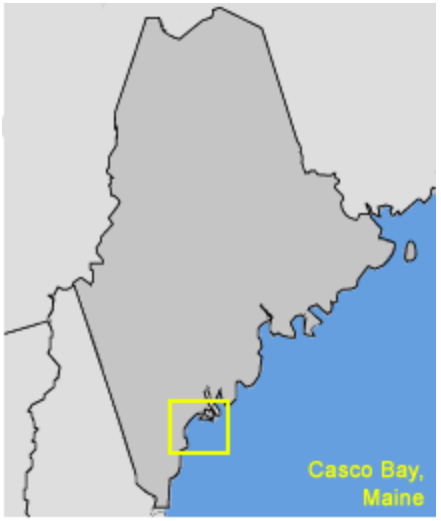
1) Grasp the extent of forest loss and fragmentation; and shoreline development.

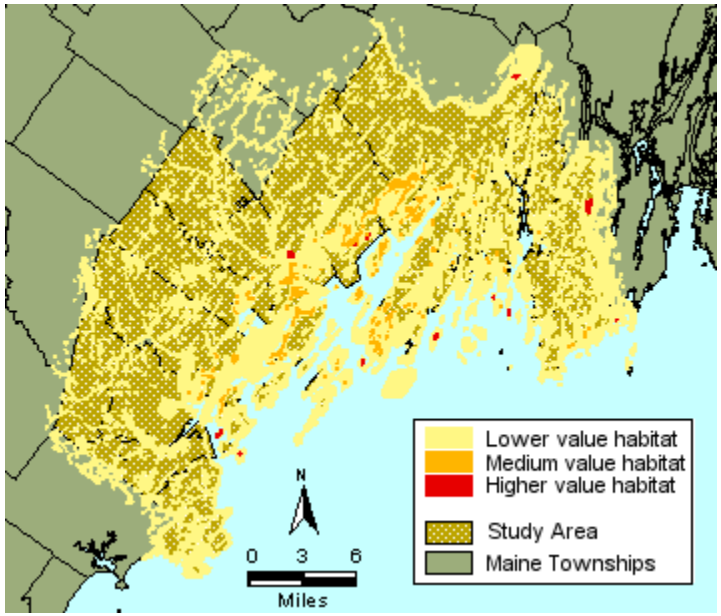
2) Examine current conservation protection and pinpoint gaps in these policies.

Balancing Watershed Growth with Habitat Impacts

Casco Bay, Maine

How do you identify and prioritize habitat locations and threats over a large area?





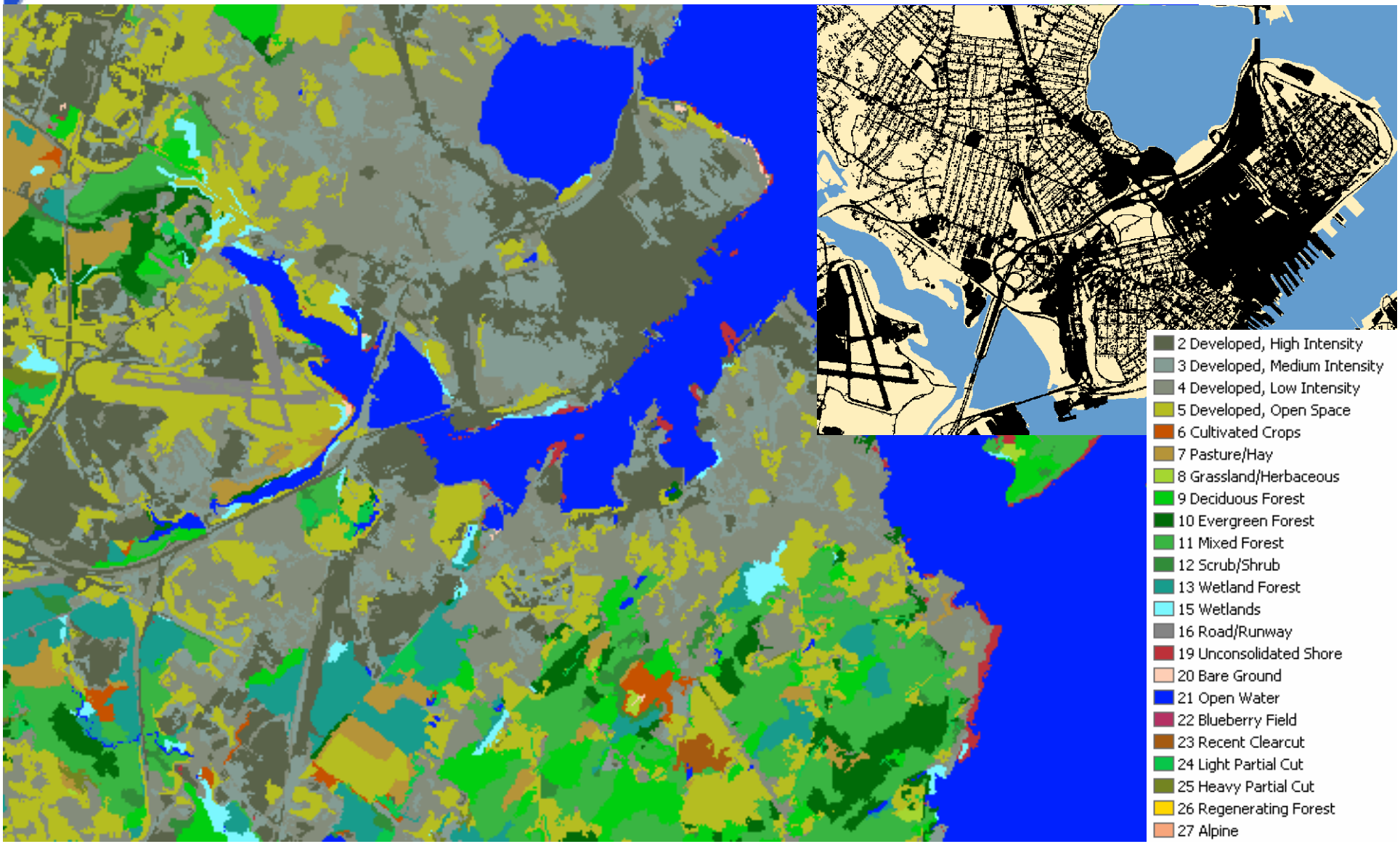
Allows managers to:

- Create a growth/development plan for a watershed that anticipates possible development-related impacts to fish and wildlife habitats

NOAA Coastal Services Center
LINKING PEOPLE, INFORMATION, AND TECHNOLOGY

Partnering with the State of Maine

Maine Land Cover Database (MELCD)



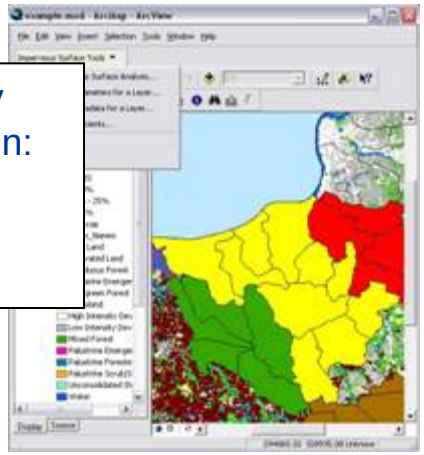
Decision Support

Water Quality

Impervious Surface Analysis Tool (ISAT)

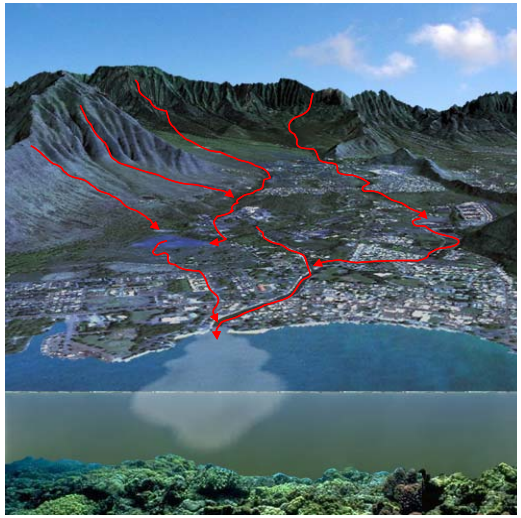
- Estimates impervious surface per area
- Utilizes land cover and impervious surface coefficients
- Permits “What if?” scenarios
- Flexible user parameters
- Nonpoint Education for Municipal Officials (NEMO) partnership

NEMO water quality impacts classification:
Green: < 10 %
Yellow: 10 to 25 %
Red: > 25 %



Nonpoint-Source Pollution and Erosion Comparison Tool (N-SPECT)

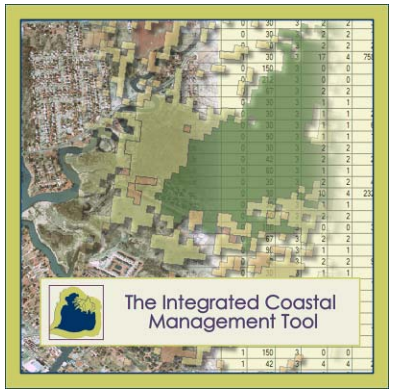
- Calculates nonpoint pollutant and sediment loads
- Utilizes land cover, topography, precipitation data, and soils data (incorporates SCS curve numbers)
- Compares output to water quality standard

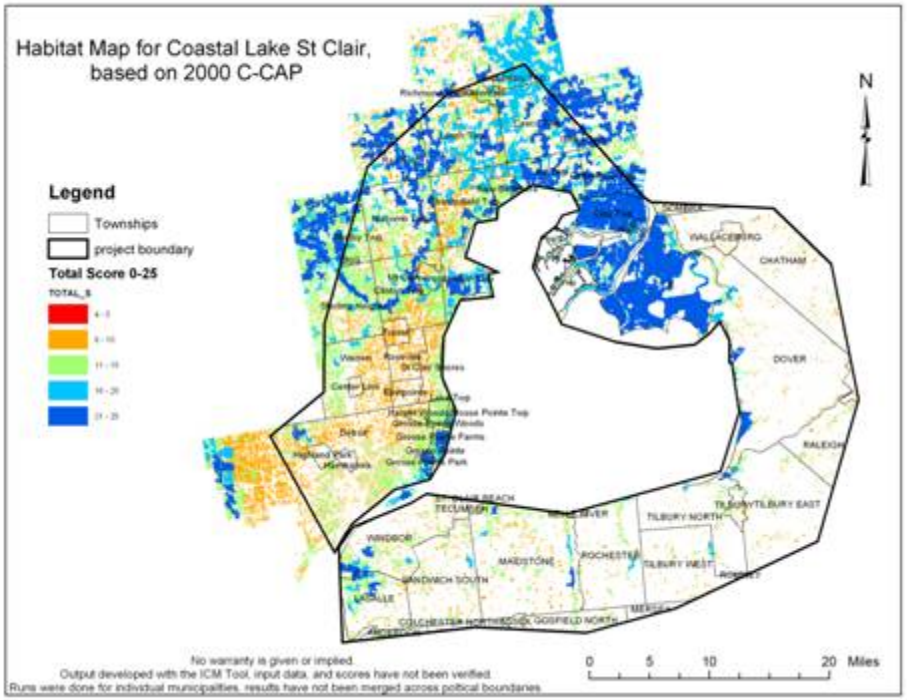


Habitat Conservation Planning

Integrated Coastal Management Tool

- Evaluates habitat quality, connectivity, and pressure for economic development
- Informs decisions related to conservation, mitigation and development
- Utilizes land cover data, and user defined inputs
- Permits “What if?” scenarios
- Part of the Lake St. Clair ecological characterization





NOAA Coastal Services Center
LINKING PEOPLE, INFORMATION, AND TECHNOLOGY

C-CAP as Landscape Scale Ecosystem Indicator

- Although 30m res, C-CAP is comprehensive and consistent land cover data layer for GOM coastal zone.
- ESIP focus areas (coastal development and aquatic habitat) can use C-CAP to flag areas in need of mgmt attention on a smaller scale.
- Trends in land cover/land use will drive coastal ecosystem health. Use C-CAP to connect coastal and nearshore/offshore knowledge.
- C-CAP captures land cover change, that is our human footprint on the coastal zone.
- CSC decision support tools (using C-CAP) can assist managers in using ecosystem indicator approach in land use decisions – that may have a cumulative effect on larger landscape.

For More Information

http://www.csc.noaa.gov/landcover

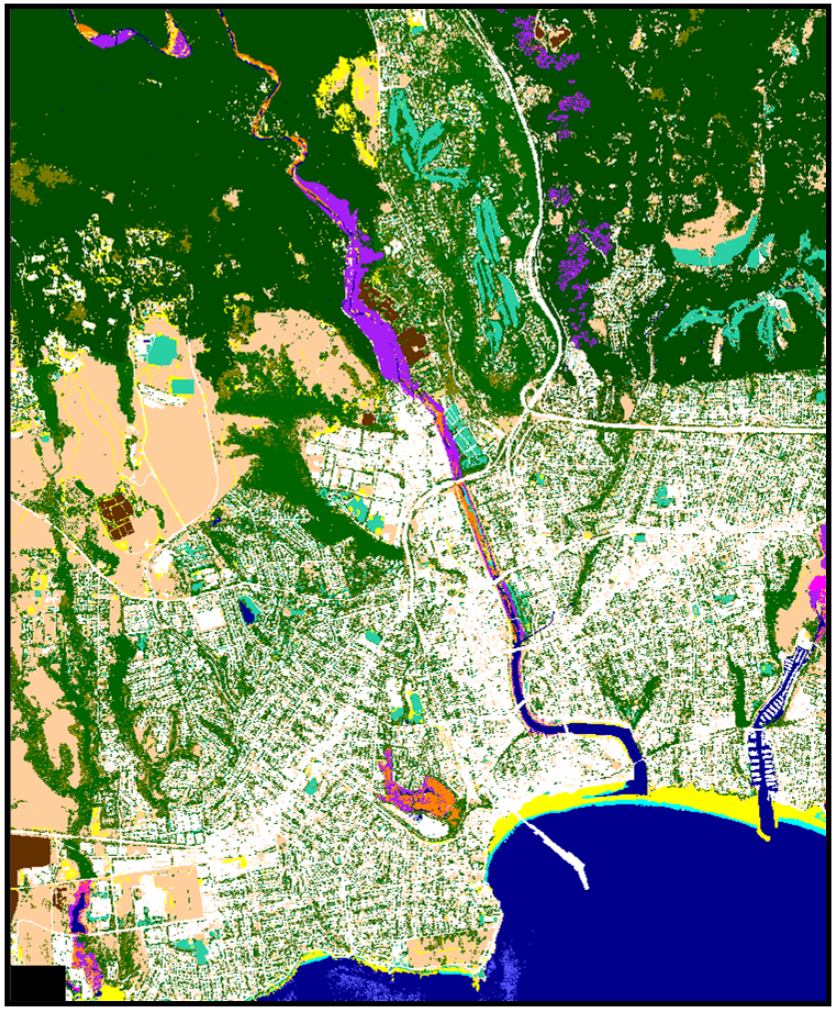
Or contact:

Nate Herold
Physical Scientist / C-CAP Manager
Coastal Remote Sensing Program
(843)740-1183
Nate.Herold@noaa.gov

High Resolution Land Cover

C-CAP Vision

Santa Cruz, CA



- Long term C-CAP vision / need…

  and

- Increasingly available, high resolution imagery and supporting data

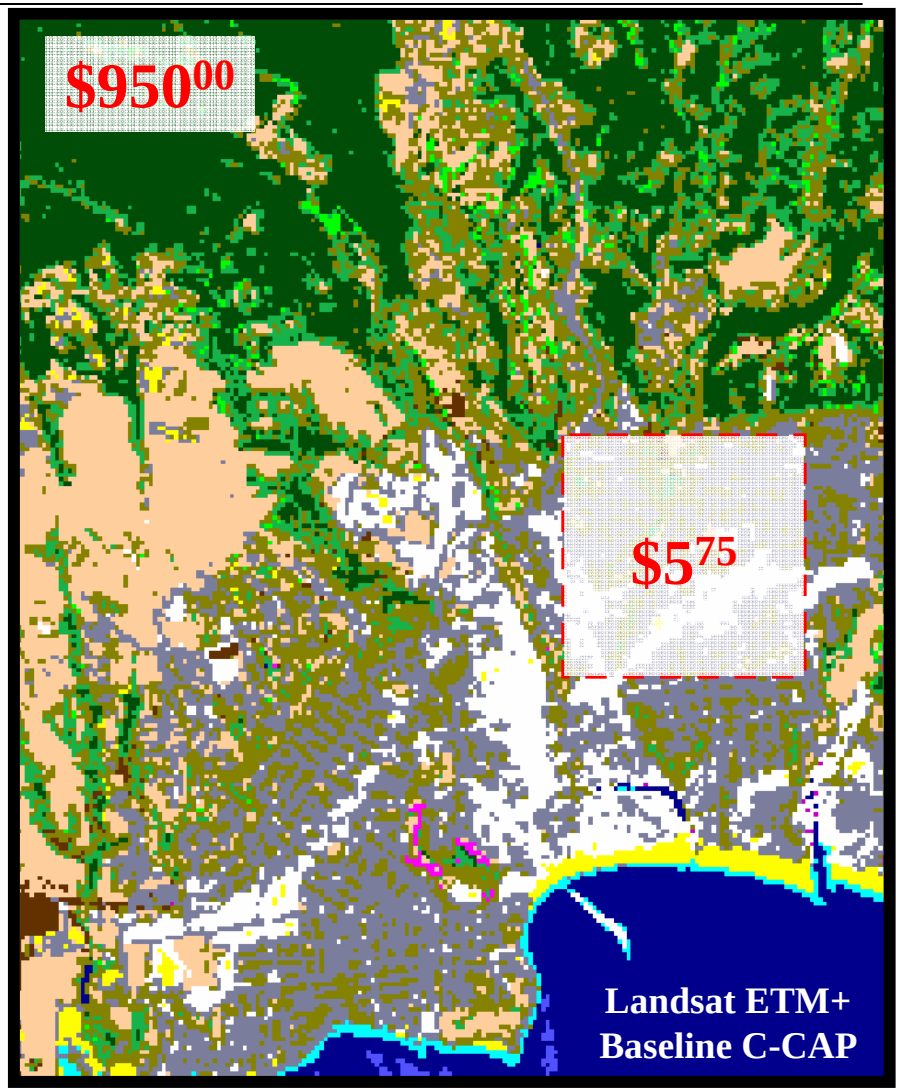
  provide

- New opportunities to
  - Introduce new data streams
  - Introduce new approaches
  - Increase focus on coastal issues

Provide data at a spatial scale more appropriate for use in support of increasingly detailed, site specific, management decisions.

NOAA Coastal Services Center
LINKING PEOPLE, INFORMATION, AND TECHNOLOGY

High Resolution Land Cover



Santa Cruz Salmonid Recovery Prototype Project

Study Area = 165 square miles

High Resolution Solutions

And the Maine Land Cover Partnership

NOAA Coastal Services Center
LINKING PEOPLE, INFORMATION, AND TECHNOLOGY

National Land Cover Database (NLCD) Design

Tiled by Mapping Zone

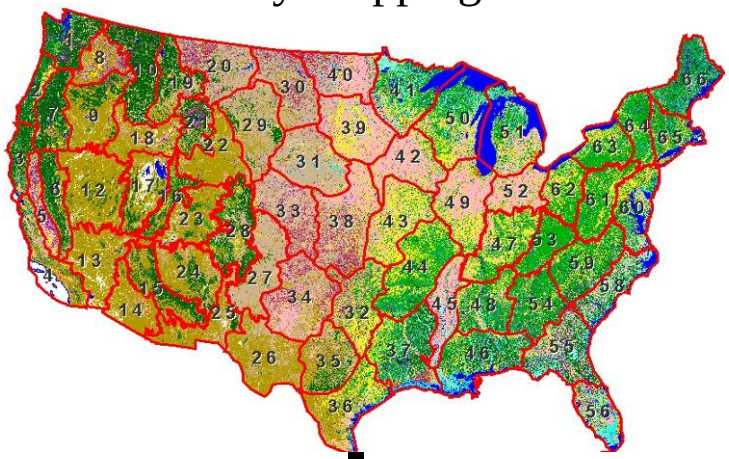
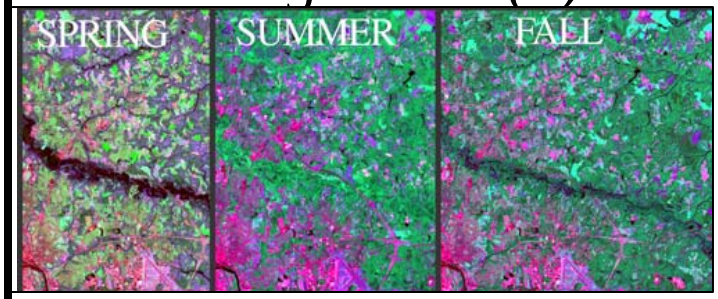
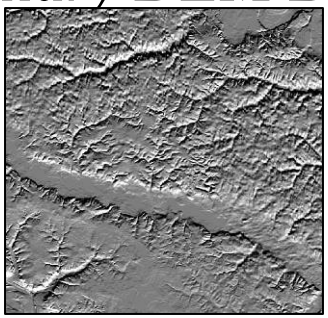


Image Data (1)

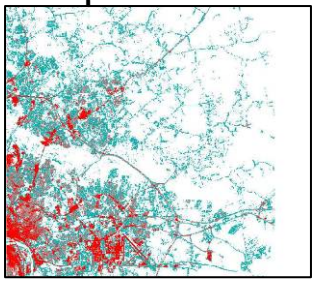


Ancillary DEM Data (2)

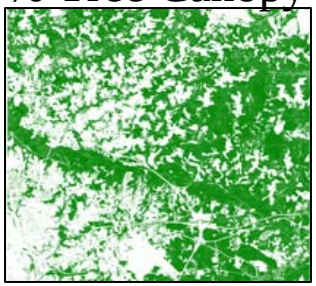


Derivatives (3)

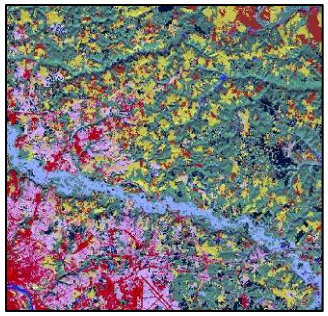
% Imperviousness



% Tree Canopy

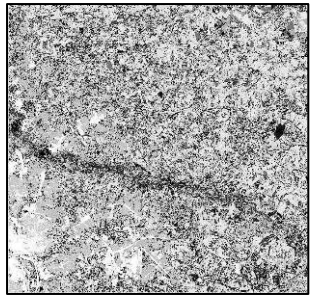


Land cover (4)

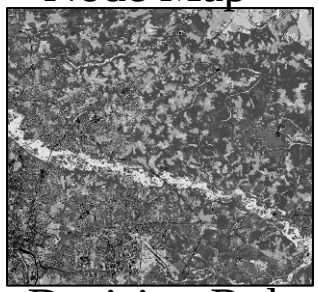


Metadata (5)

Confidence Estimate



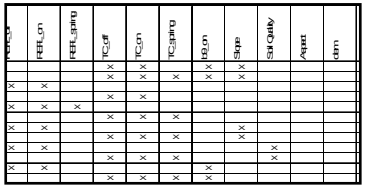
Node Map



Decision Rules

IF Node_map = 169
& spring TC_green < 73
& summer TC_green > 90
& DEM > 245
& aspect = 9
Then = Deciduous

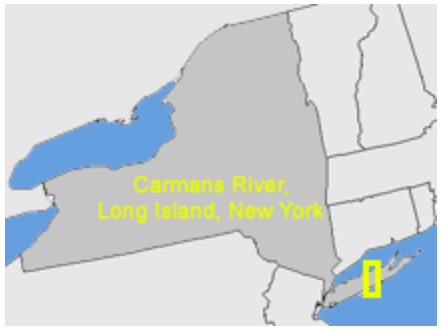
Cross-Validation Accuracy

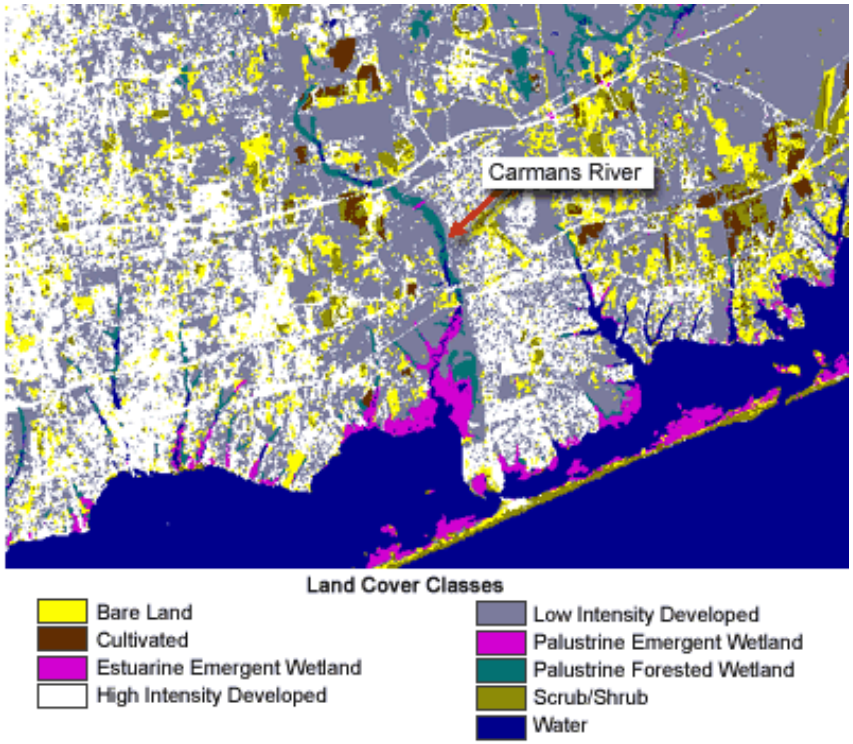


Controlling Runoff

Carmans River, Long Island, New York

How do you identify and assess the pollution from rainfall and runoff?





Develop a model that predicts the potential for pollution from storm water runoff based on the physical and biological characteristics of the land.

Allows managers to:

1) Base decisions on what if scenarios.

2) Move towards preventive, rather than corrective measures.