The Coastal Change Analysis Program (C-CAP)

Susan Fox

NOAA Coastal Services Center

October 5, 2005
NE CZM Partners Workshop
Virginia Beach, Virginia

NOAA Coastal Services Center

Charleston, South Carolina

Mission: Linking People, Information, and Technology in the Coastal Zone

New Strategic Focus Areas

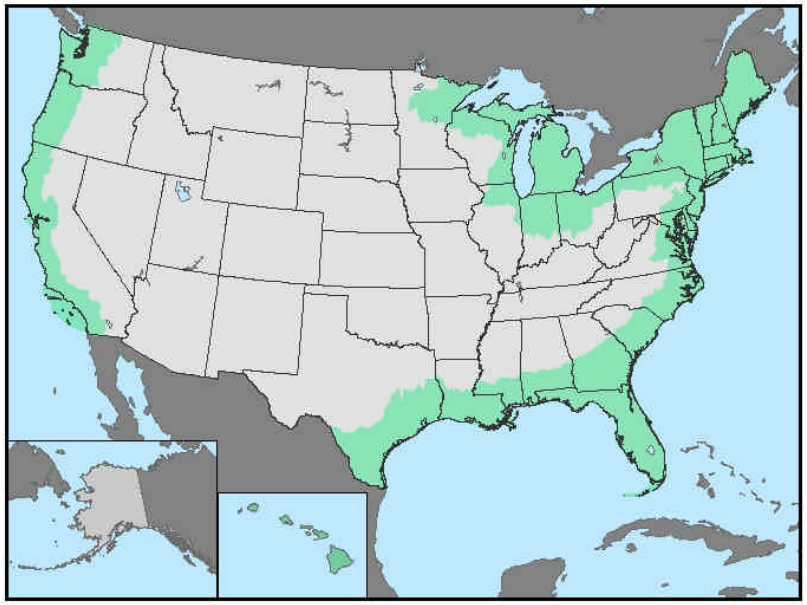
- Coastal Watersheds
- Coastal Hazards
- Integrated Ocean Observing System (IOOS)

Coastal Change Analysis Program

Coastal Land Cover and Land Change

What is C-CAP?

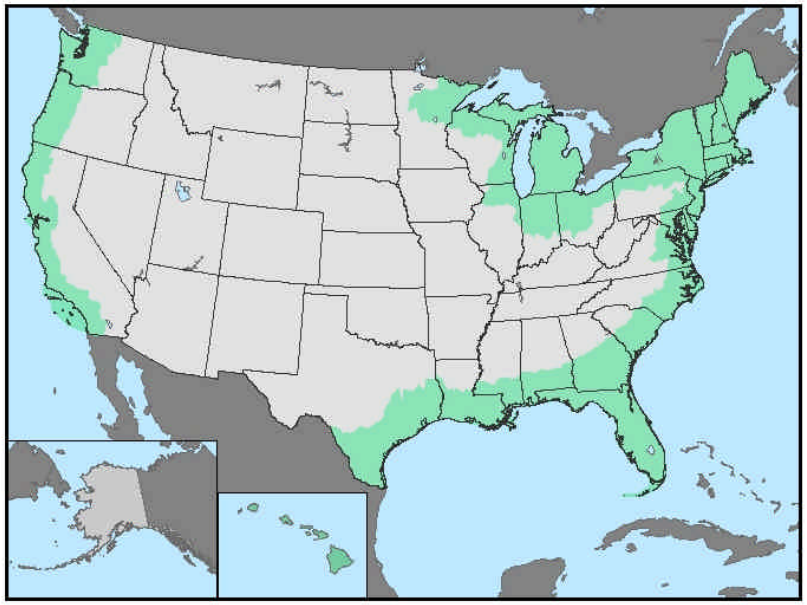
- Linkages between land change and the environment
- Satellite-based map products
- Standardized data and methods
- 5 year repeat mapping cycle



Coastal Change Analysis Program

Coastal Land Cover and Land Change

- Coordinated with multi-agency Multi-Resolution Land Characteristics (MRLC) consortium
- Contributing component of the National Land Cover Database (NLCD)



C-CAP Baseline

Vision: To provide the best possible national land cover data available to those that manage the nation's coasts.

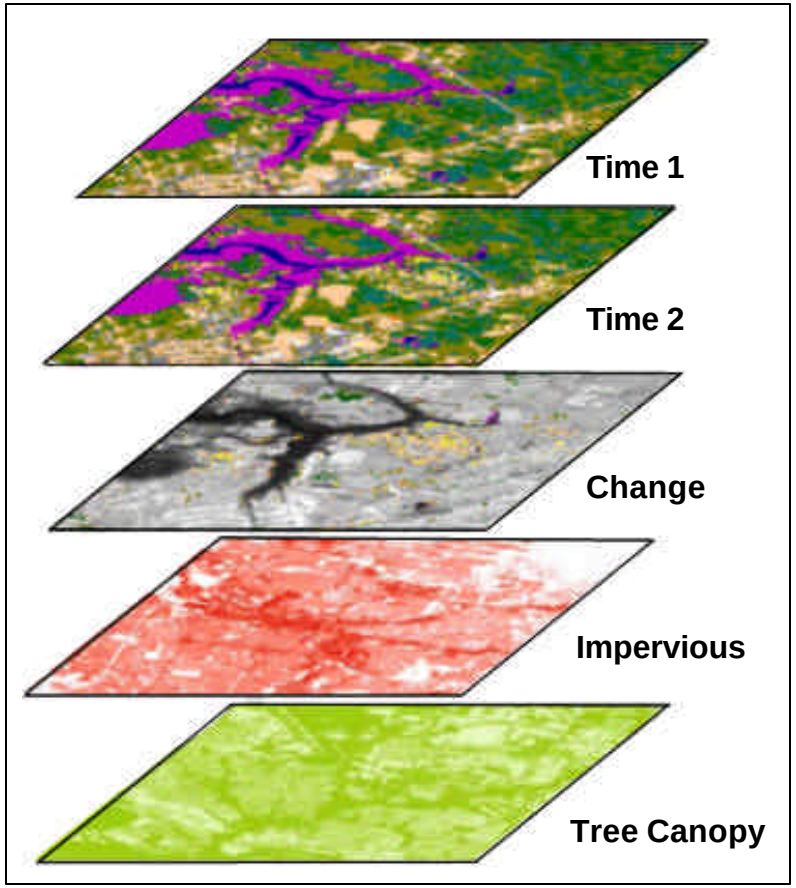
Goals/Objectives:

- Expeditiously complete national baseline
- Five-year update cycle
- Data available to the public
- State and regional advocacy
- Demonstrate the value of these data
- "Coastal" National Spatial Data Infrastructure
- Incorporate higher resolution solutions

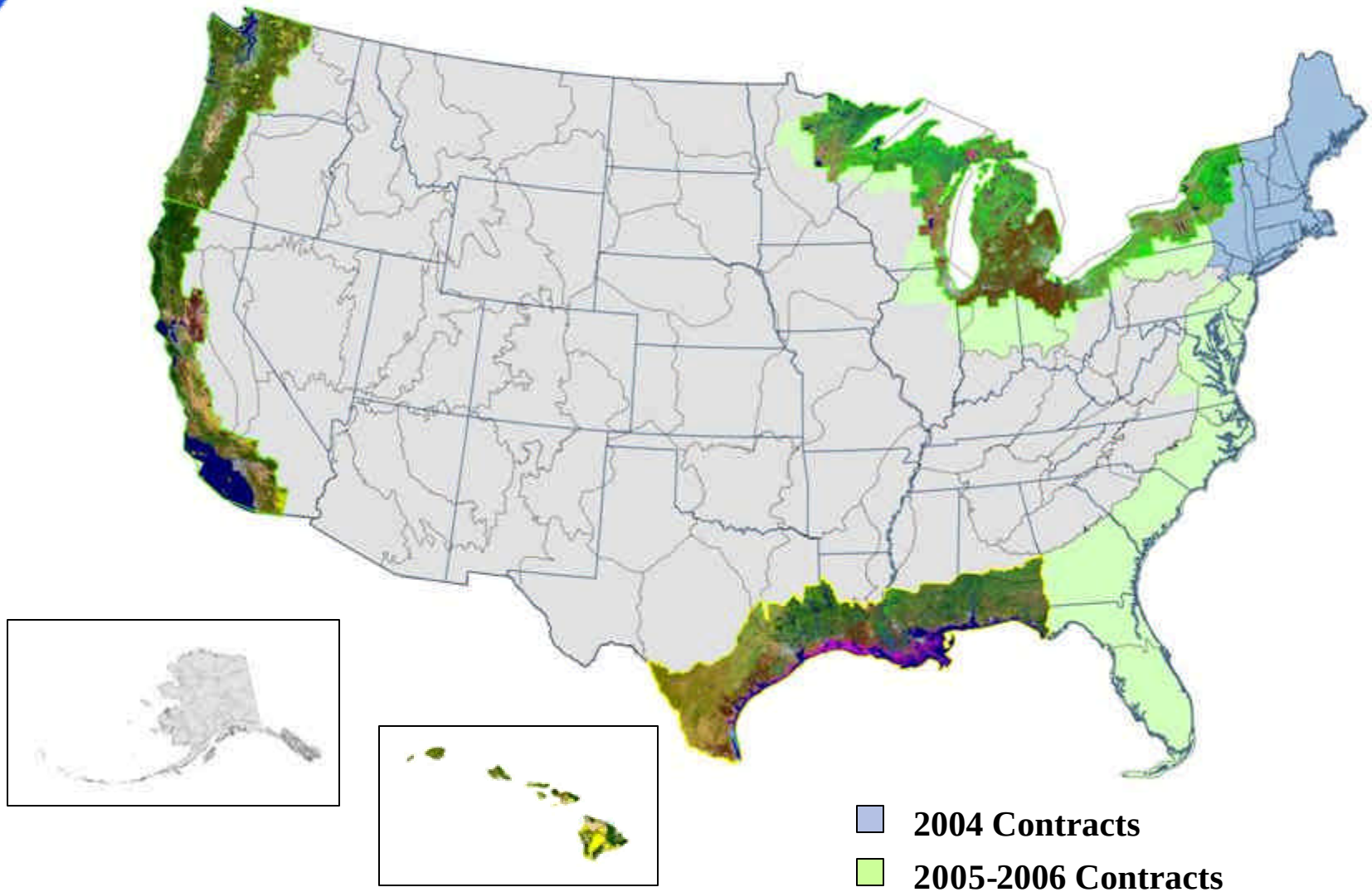
C-CAP Land Cover Products

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**



C-CAP Baseline Status



NOAA Coastal Services Center
LINKING PEOPLE, INFORMATION, AND TECHNOLOGY

C-CAP 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 and submerged land
- Open water
- Palustrine aquatic bed
- Estuarine aquatic bed

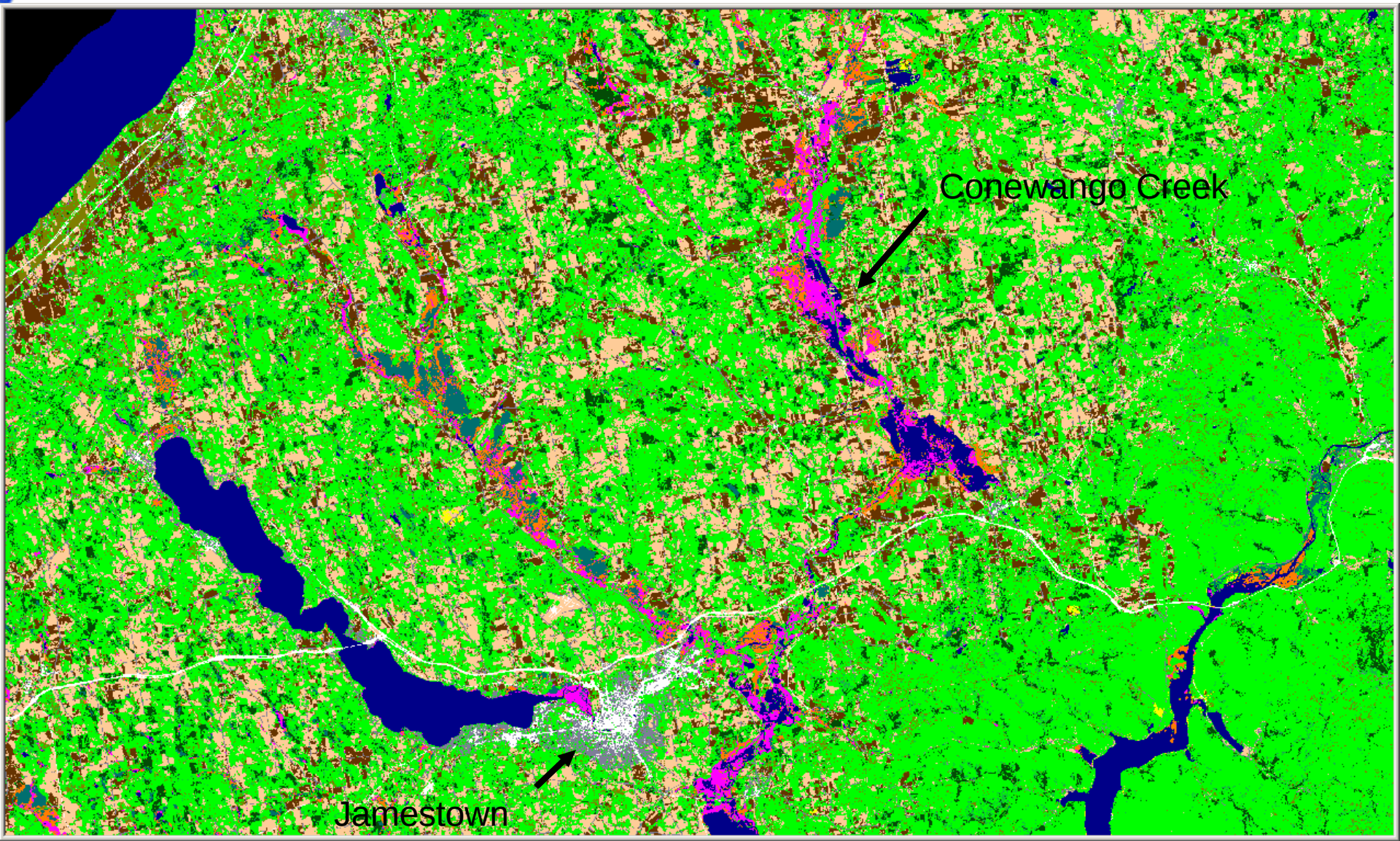
Wetlands
- ***Woody wetlands***
  - Palustrine forested wetland
  - Palustrine scrub/shrub wetland
  - Estuarine forested wetland
  - Estuarine scrub/shrub wetland
- ***Herbaceous wetlands***
  - Palustrine emergent wetland
  - Estuarine emergent wetland

Perennial ice/snow

Tundra/Alaska only classes
- Dwarf scrub*
- Sedge/herbaceous*
- Lichens*
- Moss*

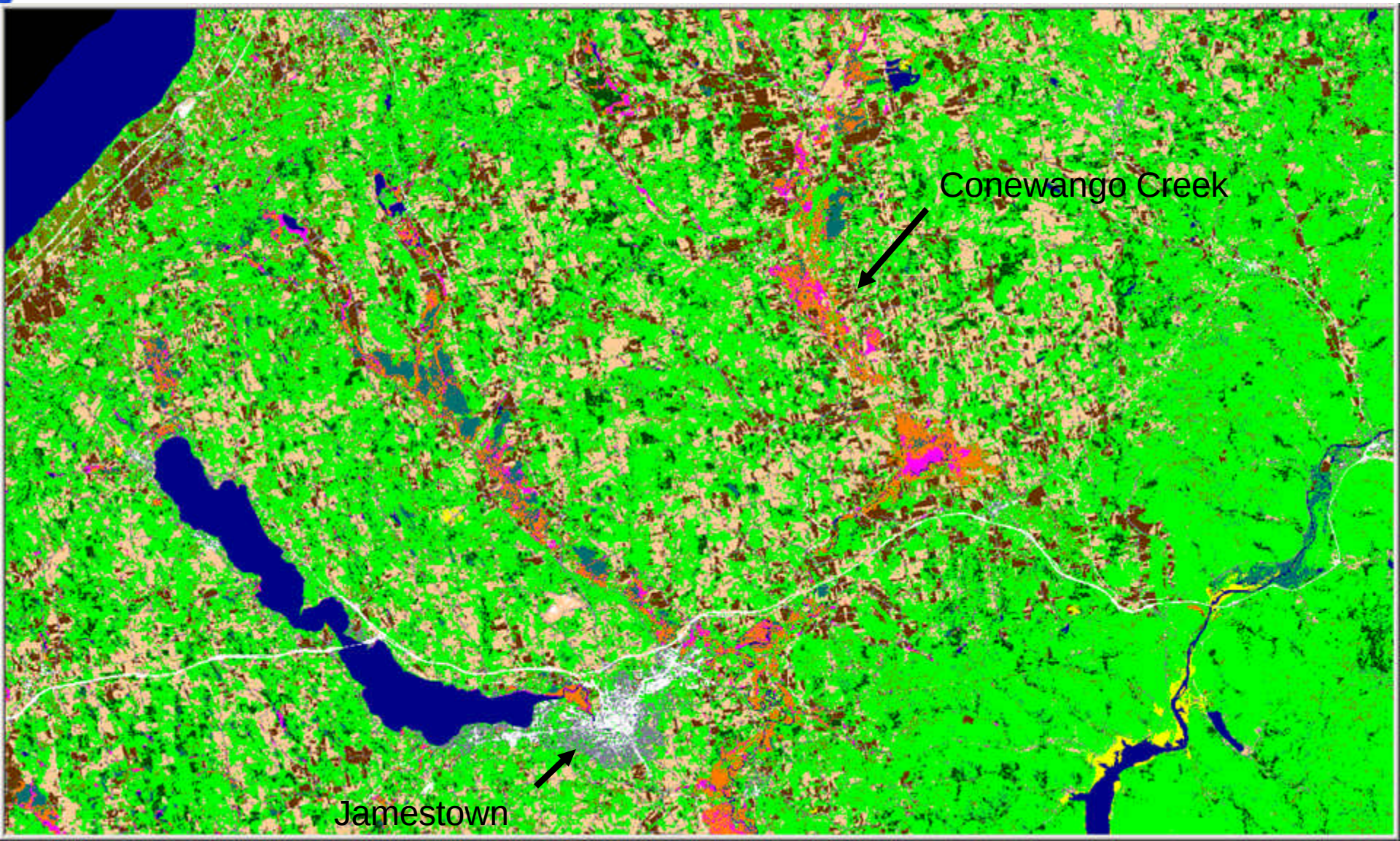
C-CAP Land Cover Products

New York 1996 Land Cover Example



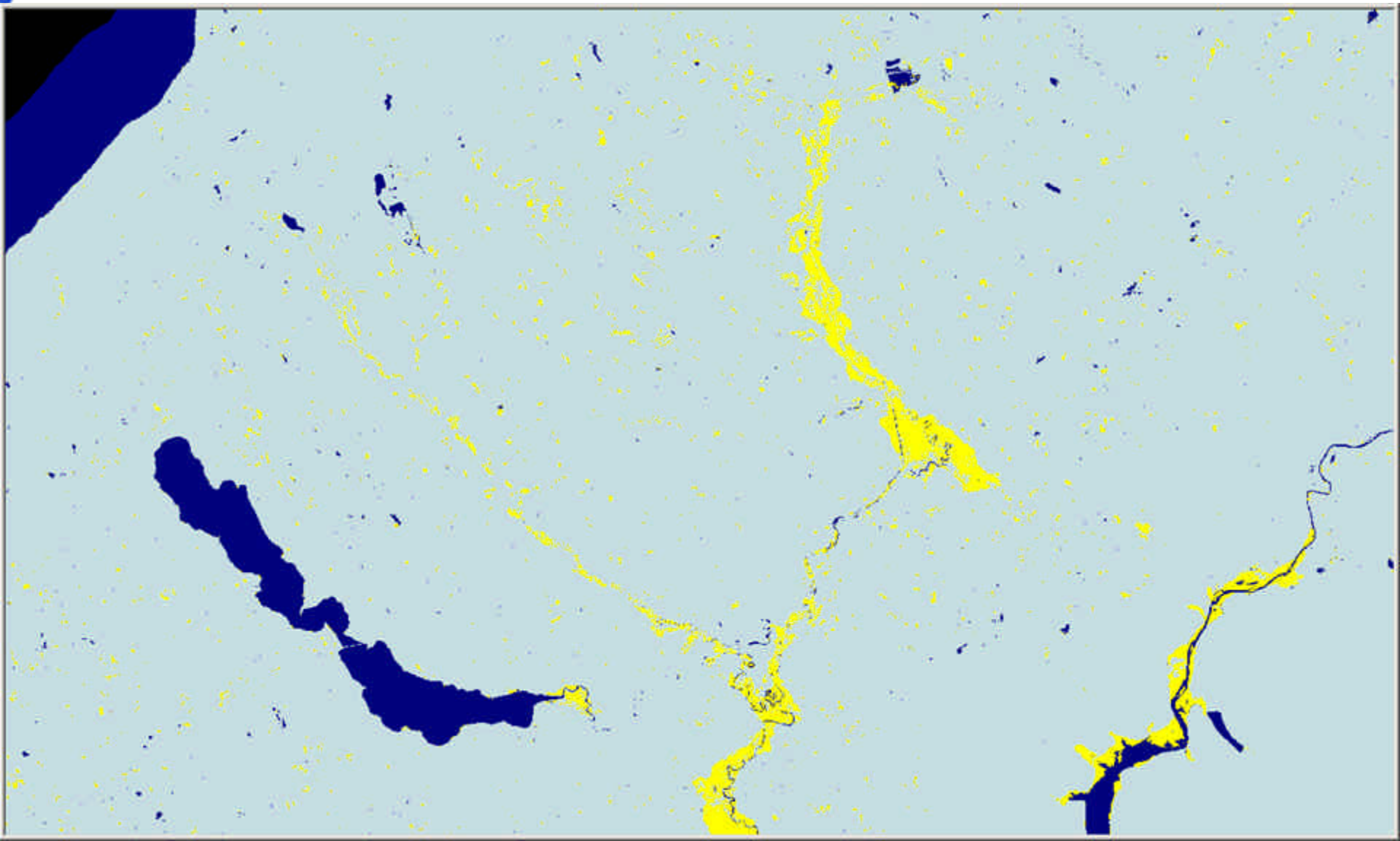
C-CAP Land Cover Products

New York 2001 Land Cover Example



C-CAP Land Cover Products

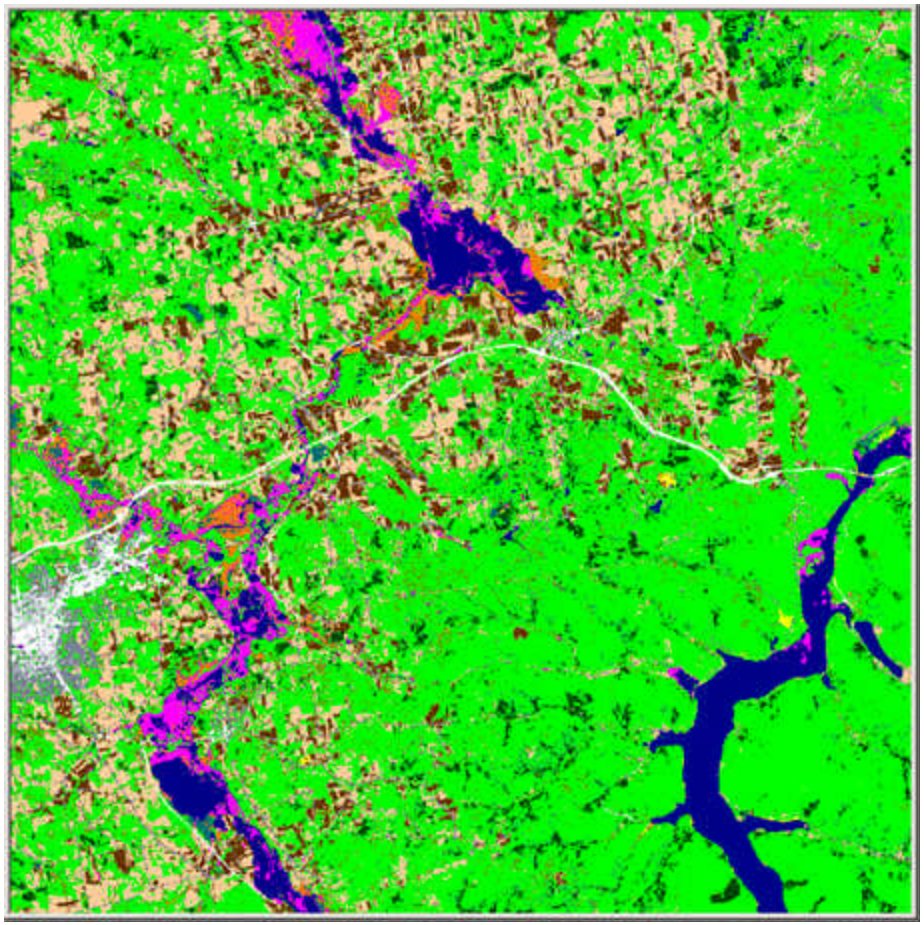
New York Change Detection Example



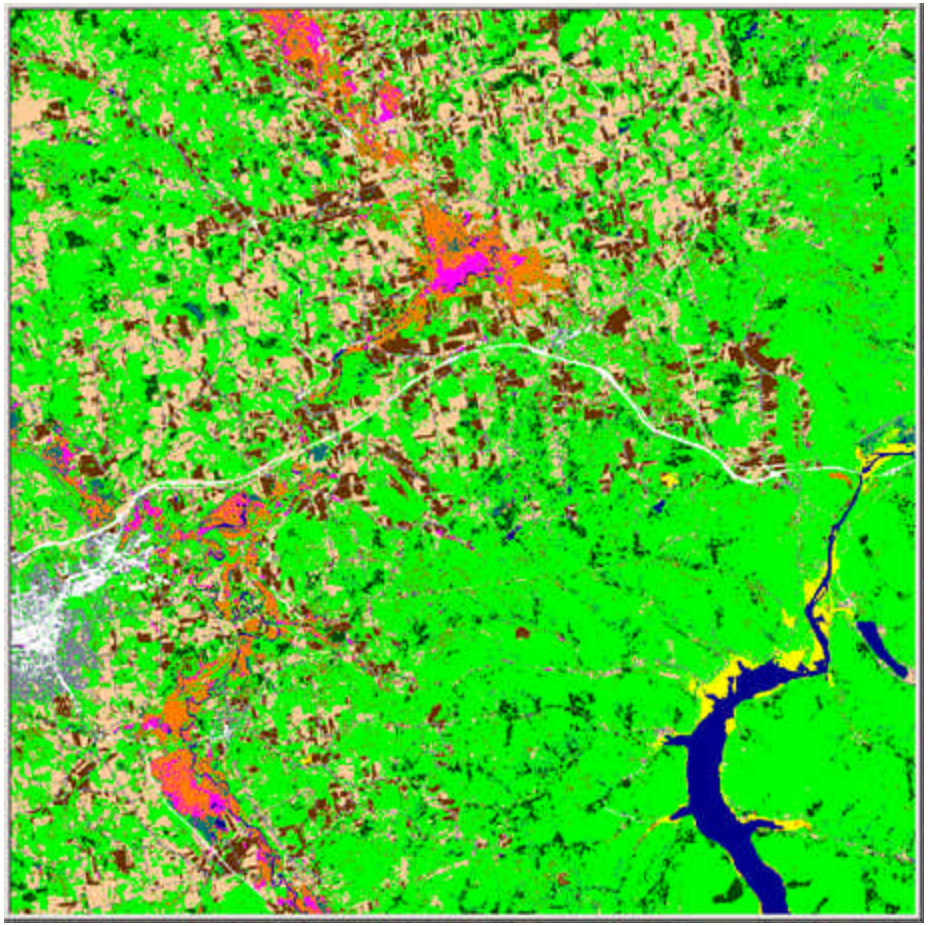
C-CAP Land Cover Products

New York Change Analysis Example

1996



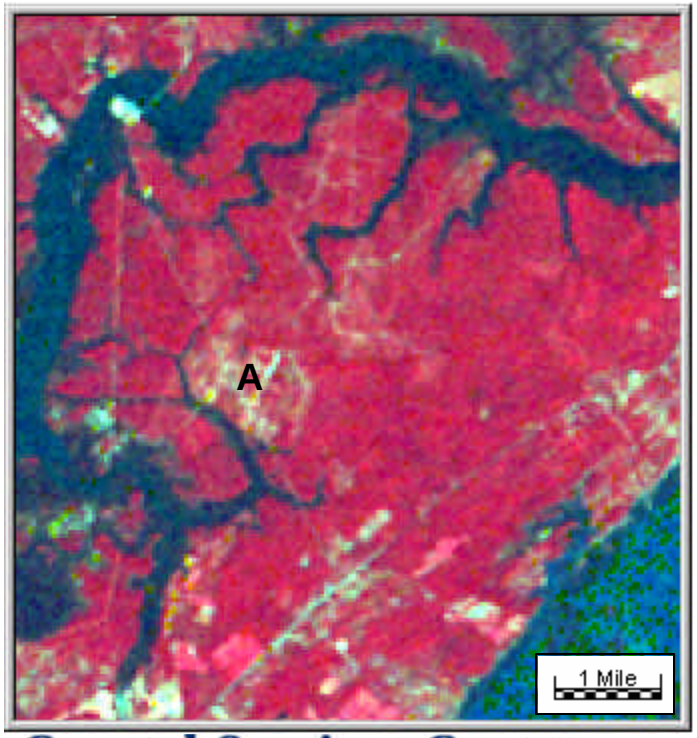
2001

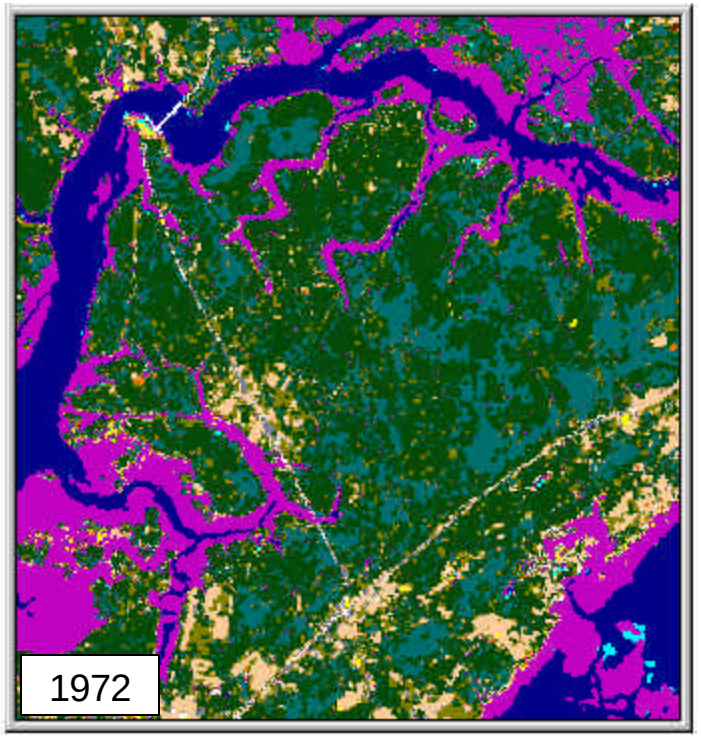


Trend Analysis - Suburban Development

Charleston, SC

A Small community

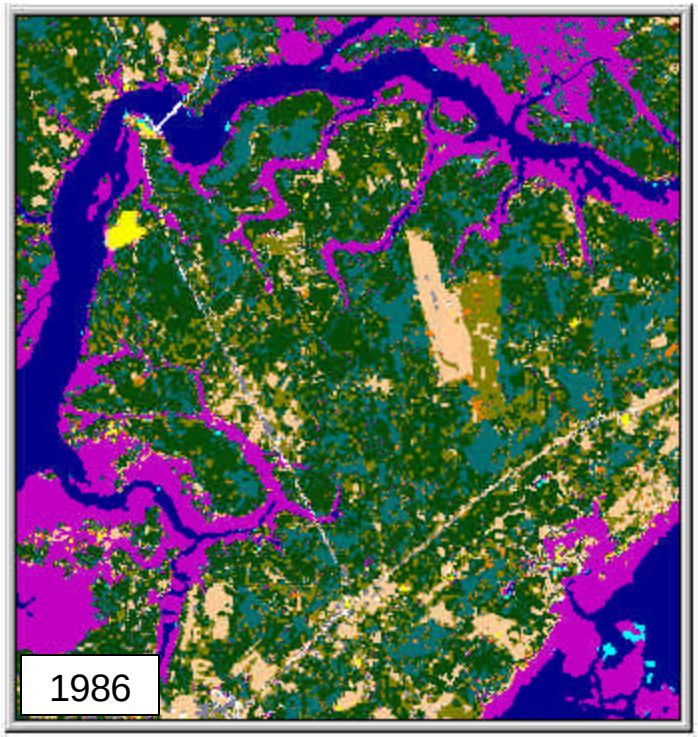




Trend Analysis - Suburban Development

Charleston, SC

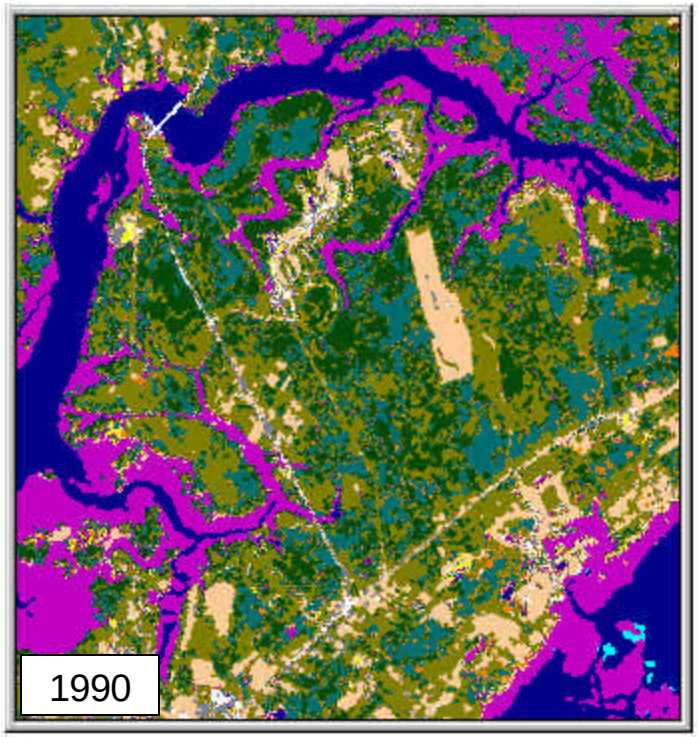
A Small community
B Local airport
C Shipyard expansion



Trend Analysis - Suburban Development

Charleston, SC

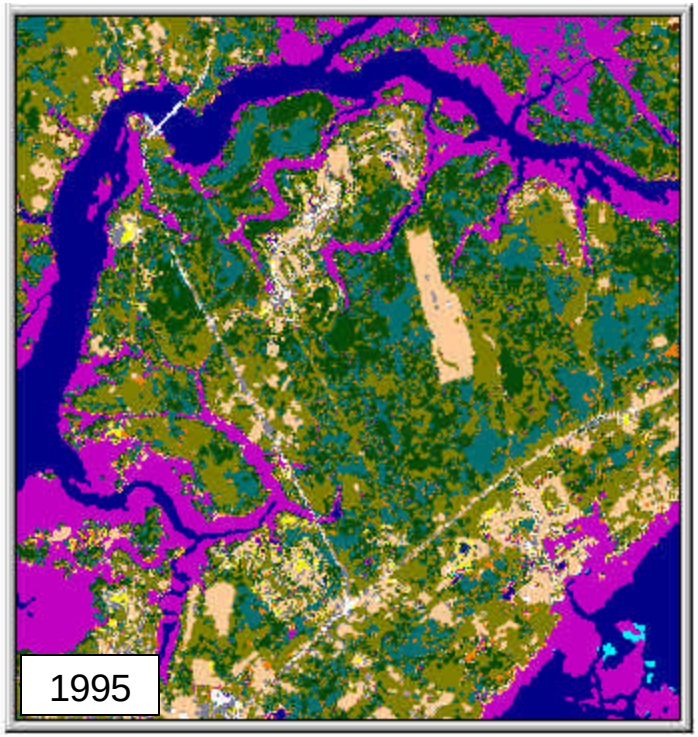
A Small community
B Local airport
C Shipyard
D Residential golf course development
E Residential golf course development



Trend Analysis - Suburban Development

Charleston, SC

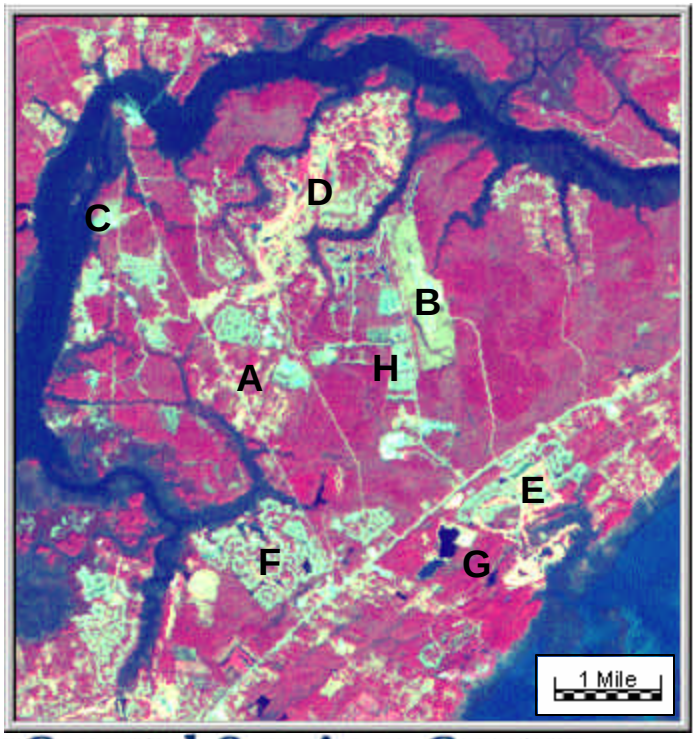
A Small community
B Local airport
C Shipyard
D Residential golf course development
E Residential golf course development
F Residential development
G Lake and campground

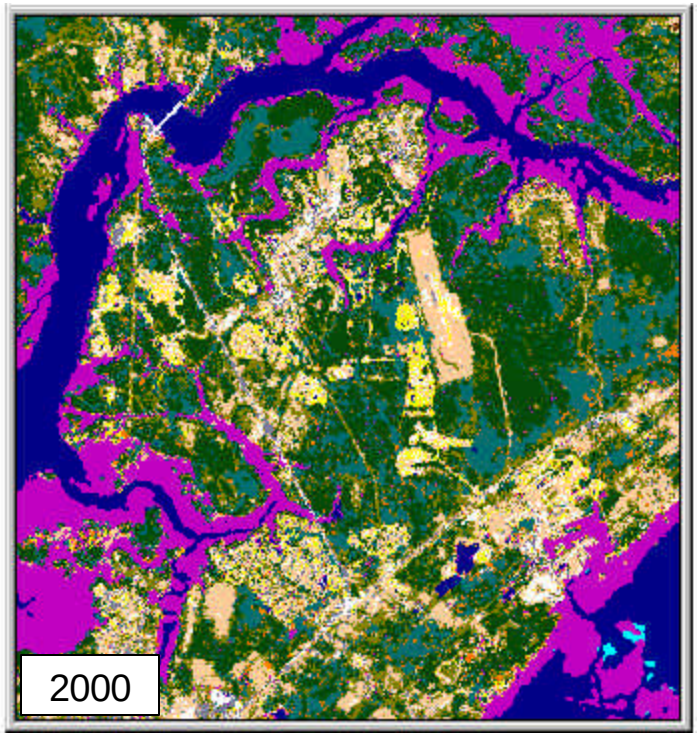


Trend Analysis - Suburban Development

Charleston, SC

A Small community
B Local airport
C Shipyard expansion
D Residential golf course development
E Residential golf course development
F Residential development
G Lake and campground
H Land clearing for residential development





Data Uses

C-CAP

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

Regional Remote Sensing

Remote Sensing is About Trade-offs!

Appropriate Uses

- Large-scale/regional applications
  - Watershed
  - County
  - State
- Resource inventories
- Population growth trends
- Habitat fragmentation studies

Limitations

- Jurisdictional wetlands legislation
  - 1 acre minimum mapping unit may overlook small, isolated wetlands or changes to wetlands
- Dock siting
- Parcel mapping
- Permitting
- Small-scale studies

Site Specific Remote Sensing

High Resolution Land Cover

- Long-term vision …

  and

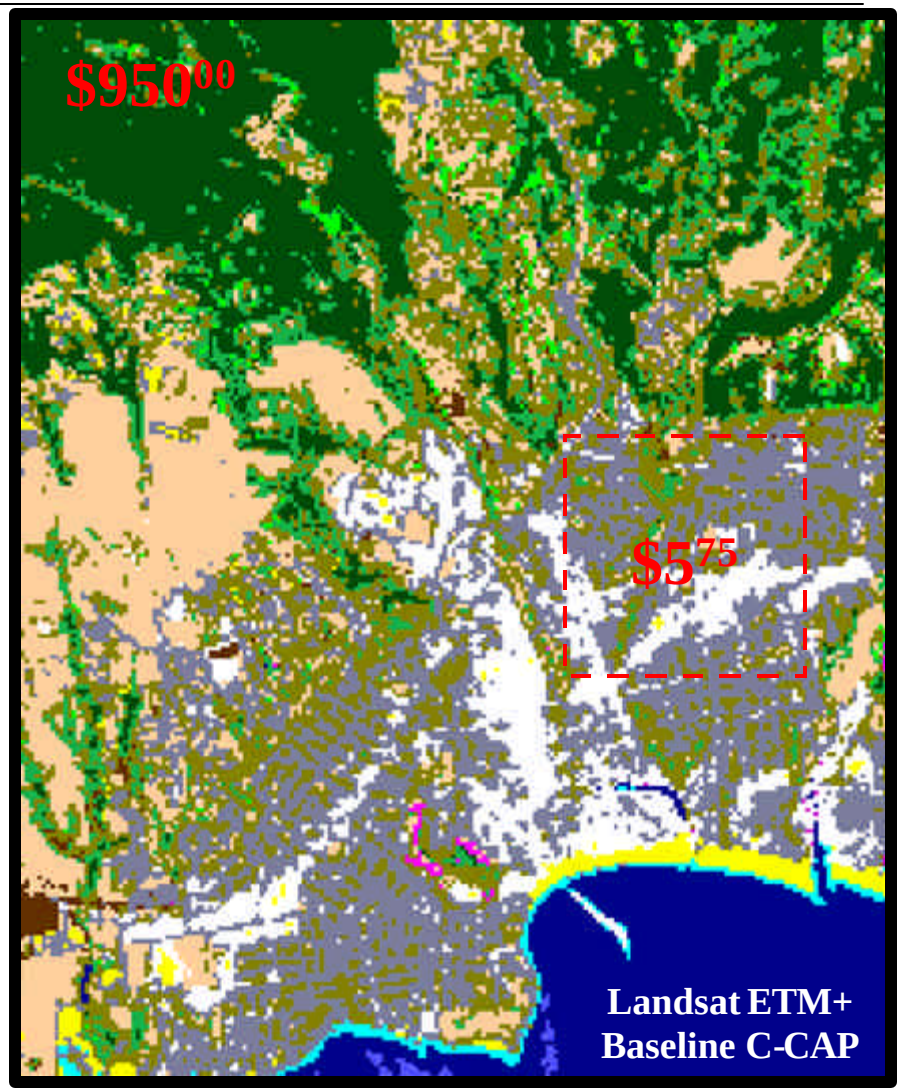
- Concerns for Landsat
- Increasing commercially available, high resolution imagery and supporting data

  provide

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

- Challenges
  - Technology
  - Classification scheme
  - Geography
  - Funding

High vs. Moderate Resolution



Scale 1:15,000

Study Area = 165 square miles

Santa Cruz Prototype Project

- Impervious Surfaces
- Unmanaged Grassland
- Mixed Forest
- Forested Wetland
- Scrub/Shrub
- Scrub/Shrub Wetland
- Emergent Wetland
- Bare Land

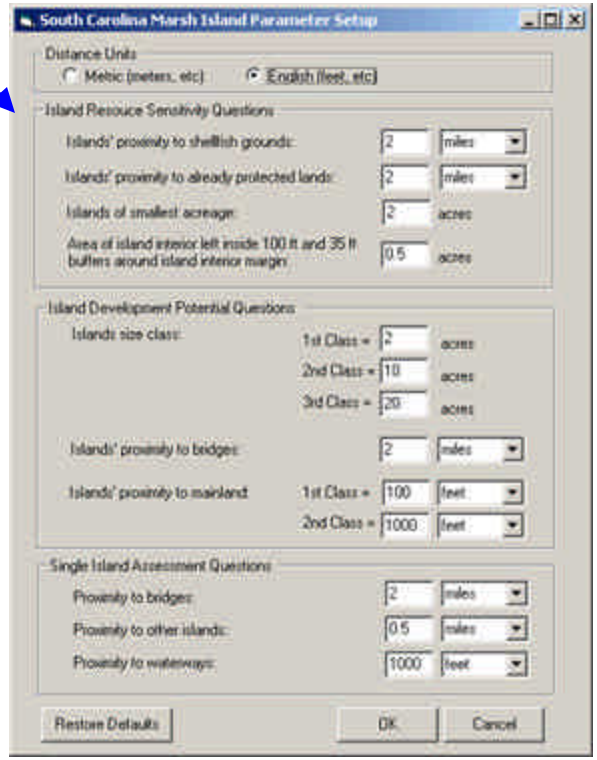
Decision-Support Tools

Decision Support Tools

Site Prioritization – Conservation

SC Marsh Islands Management

- Imagery from 1999 – identify bridges and marsh islands >1/8 acre
- Address development and preservation issues
- Flexible analysis to accommodate policy changes



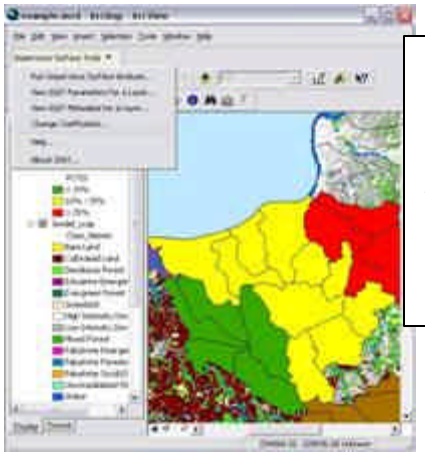
ME Coastal Land Conservation

- Capacity-building within land trusts to create and implement local plans
- Provides lessons and strategies for other regions
- Multiple land trust partners

Decision Support Tools

Impervious Surface Analysis Tool (ISAT)

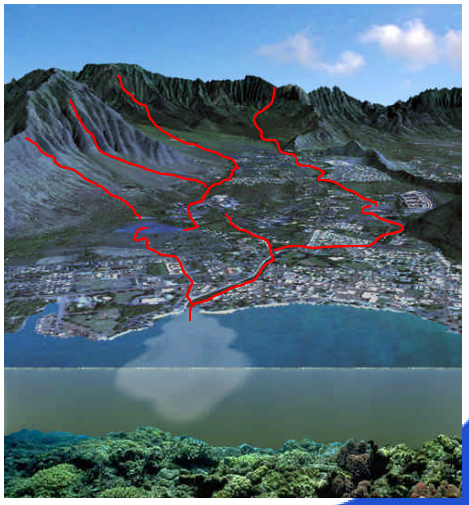
- Estimates impervious surface per analysis unit
- Data inputs
  - Uses land cover data
  - Impervious surface coefficients
- "What if?" scenarios
- Flexible user parameters
- Nonpoint Education for Municipal Officials (NEMO) partnership



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

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

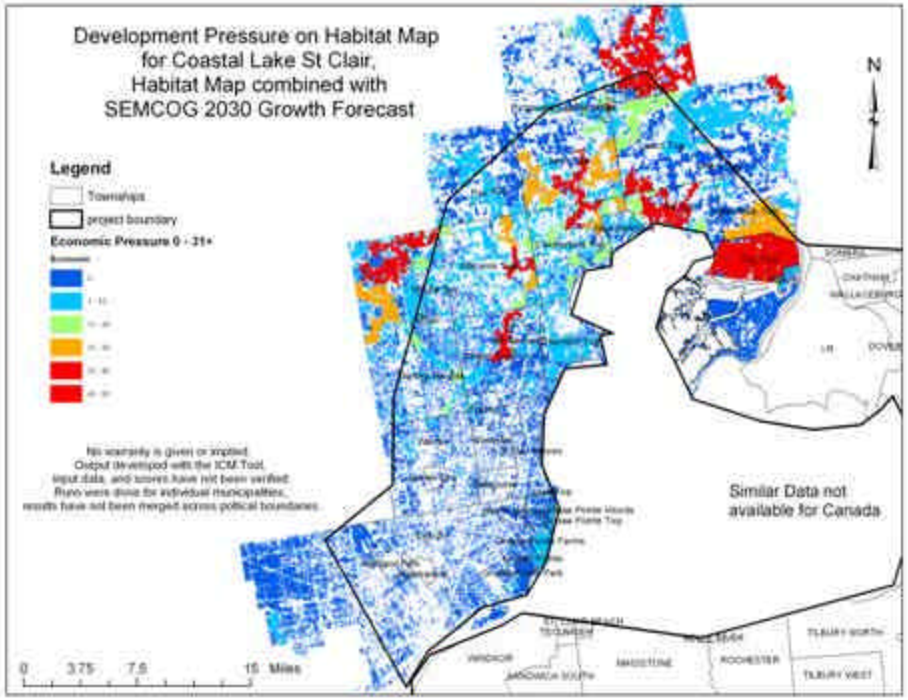
- Examines the relationship between land cover, nonpoint source pollution, erosion, and water quality
- ArcGIS extension
- Partner-identified needs including runoff, nonpoint pollution, and erosion/sediments



Decision Support Tools

Integrated Coastal Management Tool

- Evaluates habitat related decisions
- Assesses habitat quality, connectivity, economic pressures
- "What if?" scenarios
  - Conservation
  - Mitigation
  - Development
- Flexible user parameters
- Uses existing land cover data (C-CAP or other)
- Part of the Lake St. Clair ecological characterization



NOAA Coastal Services Center
LINKING PEOPLE, INFORMATION, AND TECHNOLOGY

Decision Support Web Site

ALTERNATIVES FOR COASTAL DEVELOPMENT

Key Components:

- Maps of each scenario design
- Indicator comparisons across scenarios
- Three-dimensional views
- Project methodology
- Background information

www.csc.noaa.gov/alternatives

Additional Information

www.csc.noaa.gov/landcover

Susan Fox, C-CAP Outreach Coordinator

Susan.Fox@noaa.gov

843-740-1144

Nate Herold, C-CAP Project Lead

Nate.Herold@noaa.gov

843-740-1183

Steve Raber, CRS Program Manager

Steve.Raber@noaa.gov

843-740-1239