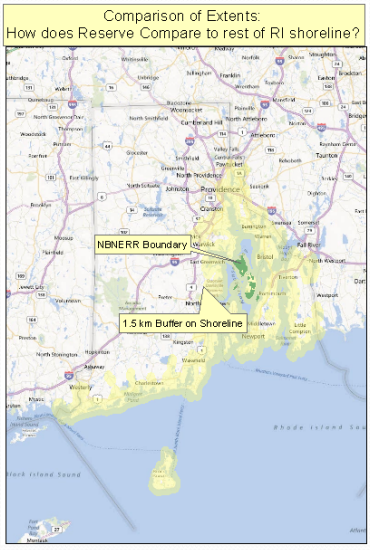
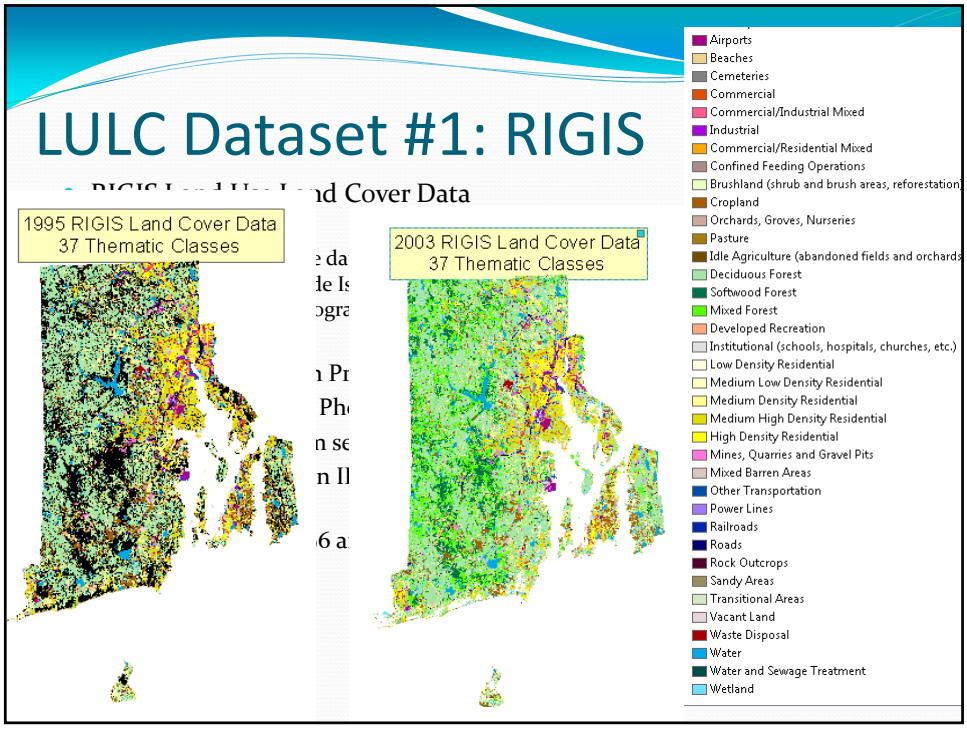
Landscape Metrics for Assessing "Representativeness" of Change within NERRS Sentinel Sites

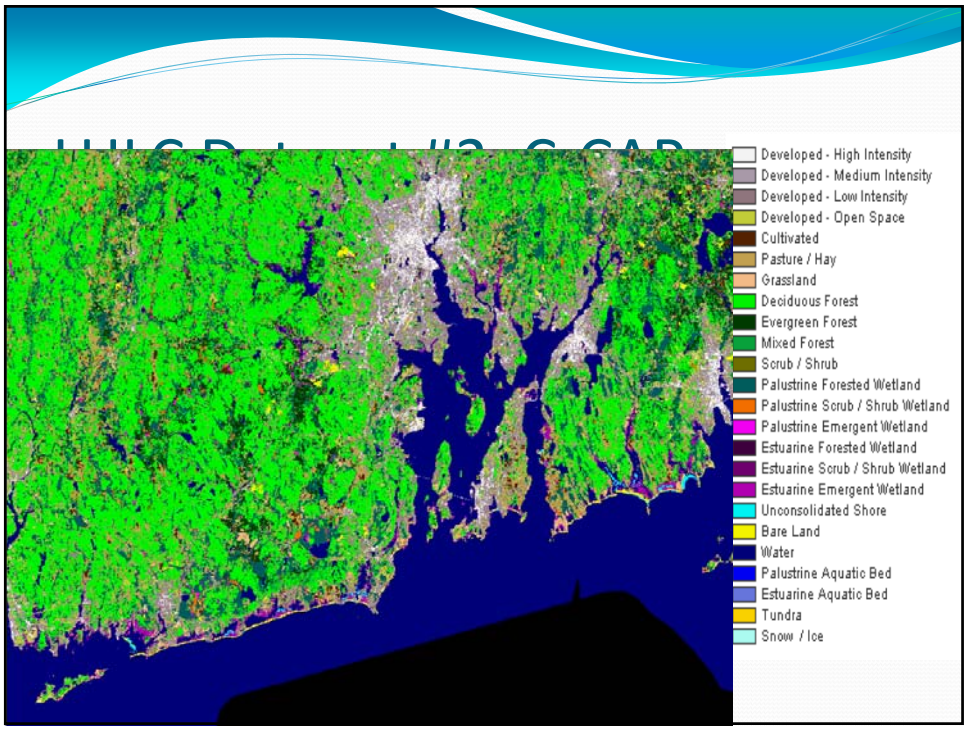
Exploring effects of classification schema modifications, and thematic and spatial resolution differences on landscape metric results .

Data Acquisition and Preparation with ArcGIS

- Three pairs of LULC datasets with different classification schemes and spatial resolutions
  - Need to quantify heterogeneity at each
- Create two data masks :
  - Narragansett Bay NERR Boundary
  - 1.5 km buffer along NOAA Composite Shoreline
- Intersect masks with 6 LULC maps to create input grids for Fragstats

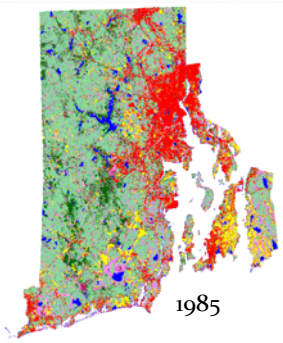



LULC Dataset #1: RIGIS
1995 RIGIS Land Cover Data
37 Thematic Classes
2003 RIGIS Land Cover Data
37 Thematic Classes
Airports
Beaches
Cemeteries
Commercial
Commercial/Industrial Mixed
Industrial
Commercial/Residential Mixed
Confined Feeding Operations
Brushland (shrub and brush areas, reforestation)
Cropland
Orchards, Groves, Nurseries
Pasture
Idle Agriculture (abandoned fields and orchards
Deciduous Forest
Softwood Forest
Mixed Forest
Developed Recreation
Institutional (schools, hospitals, churches, etc.)
Low Density Residential
Medium Low Density Residential
Medium Density Residential
Medium High Density Residential
High Density Residential
Mines, Quarries and Gravel Pits
Mixed Barren Areas
Other Transportation
Power Lines
Railroads
Roads
Rock Outcrops
Sandy Areas
Transitional Areas
Vacant Land
Waste Disposal
Water
Water and Sewage Treatment
Wetland

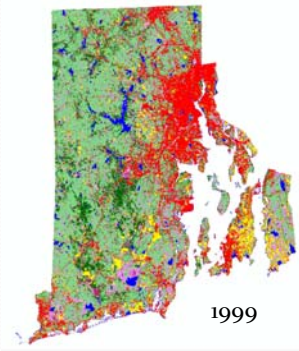

Developed - High Intensity
Developed - Medium Intensity
Developed - Low Intensity
Developed - Open Space
Cultivated
Pasture / Hay
Grassland
Deciduous Forest
Evergreen Forest
Mixed Forest
Scrub / Shrub
Palustrine Forested Wetland
Palustrine Scrub / Shrub Wetland
Palustrine Emergent Wetland
Estuarine Forested Wetland
Estuarine Scrub / Shrub Wetland
Estuarine Emergent Wetland
Unconsolidated Shore
Bare Land
Water
Palustrine Aquatic Bed
Estuarine Aquatic Bed
Tundra
Snow / Ice

LULC Dataset #3: Thumbdrive

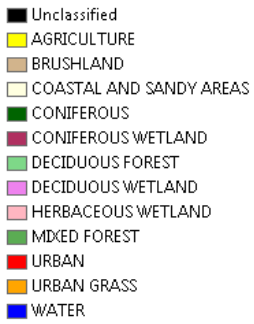
- Random RI Landuse Images from Dr. Wang
  - Purpose – ?
  - Base data is Landsat TM imagery – 30 meter pixels
  - Modified Anderson classification scheme (**12 classes**
  - 14 Year Period



1985



1999



Is it Representative?

Comparing metrics across Spatial Scales

Area of Interest =

Coastal Rhode Island

- 1.5 km buffer along RI Shoreline
- Total Area = 312,000 acres

Sample Area =

Narragansett Bay NERR

- Reserve Boundary
- Total Area = ~4500 acres

Wu 2004 shows that impacts of changes in spatial extent on metrics is much less predictable than changes in grain size.

Deciding on Landscape Metrics

- Compositional vs Configuration metrics

- Patch scale for site level analysis
- Class and landscape scales for "representativeness" and change detection

Matching scales (Bradshaw 2000)
- Heterogeneity & sampling
- Spatial Gradients
- Spatio-temporal Coherence

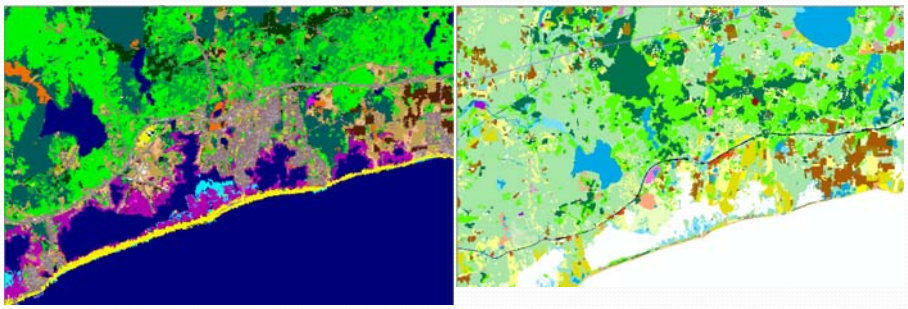
Landscape Decomposition to scales of patter(Chen 2000)

Consistent and Robust scaling relations (Type 1a - Wu 2004)

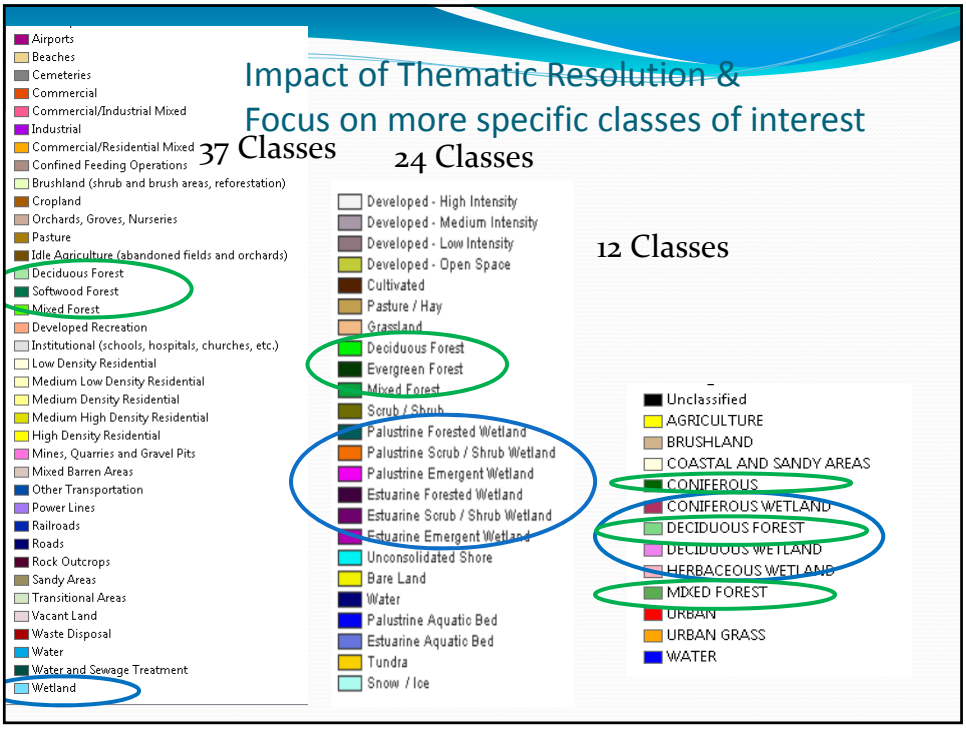
1. Number of Patches (NP)
2. Patch Density (PD)
3. Total Edge (TE)
4. Edge Density (ED)
5. Landscape Shape Index (LSI)

Impacts of Spatial Resolution & Data Aggregation

30m Pixels (C-CAP & #3) **2 foot Pixels (RIGIS)**



Impact of Thematic Resolution & Focus on more specific classes of interest



Conclusions

- The "right" landscape metrics and data processing and classification choices will be useful in quantifying the heterogeneity of land cover patterns
- Sentinel Sites and the long term monitoring data collected in them must be analyzed at multiple spatial scales to link landscape patterns with ecological processes.