Albemarle-Pamlico Watershed-Estuary Study (APWES)

Ecosystem services science to inform watershed & coastal management

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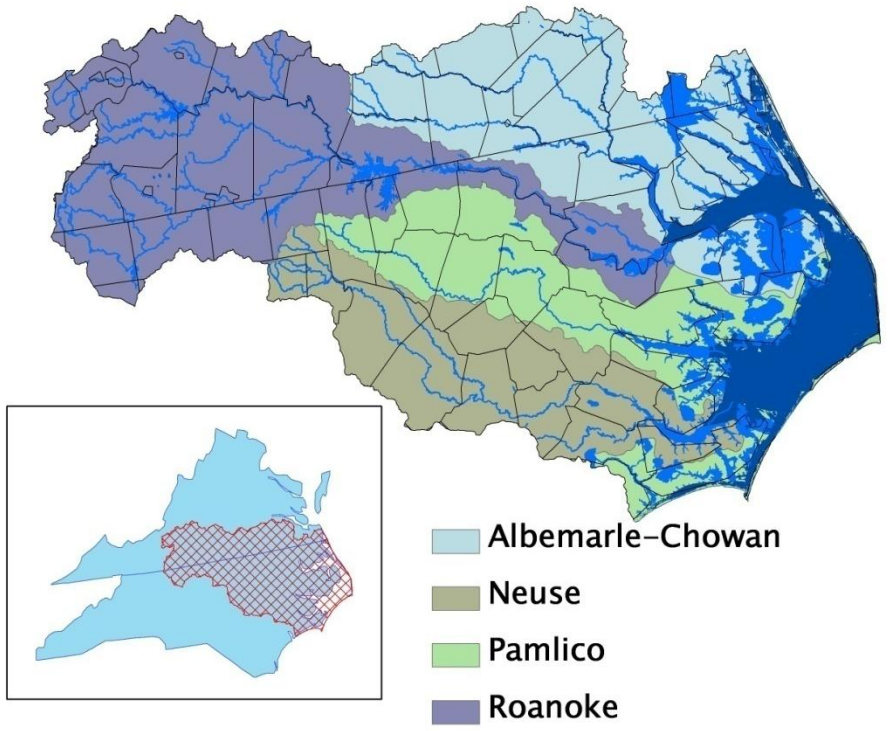
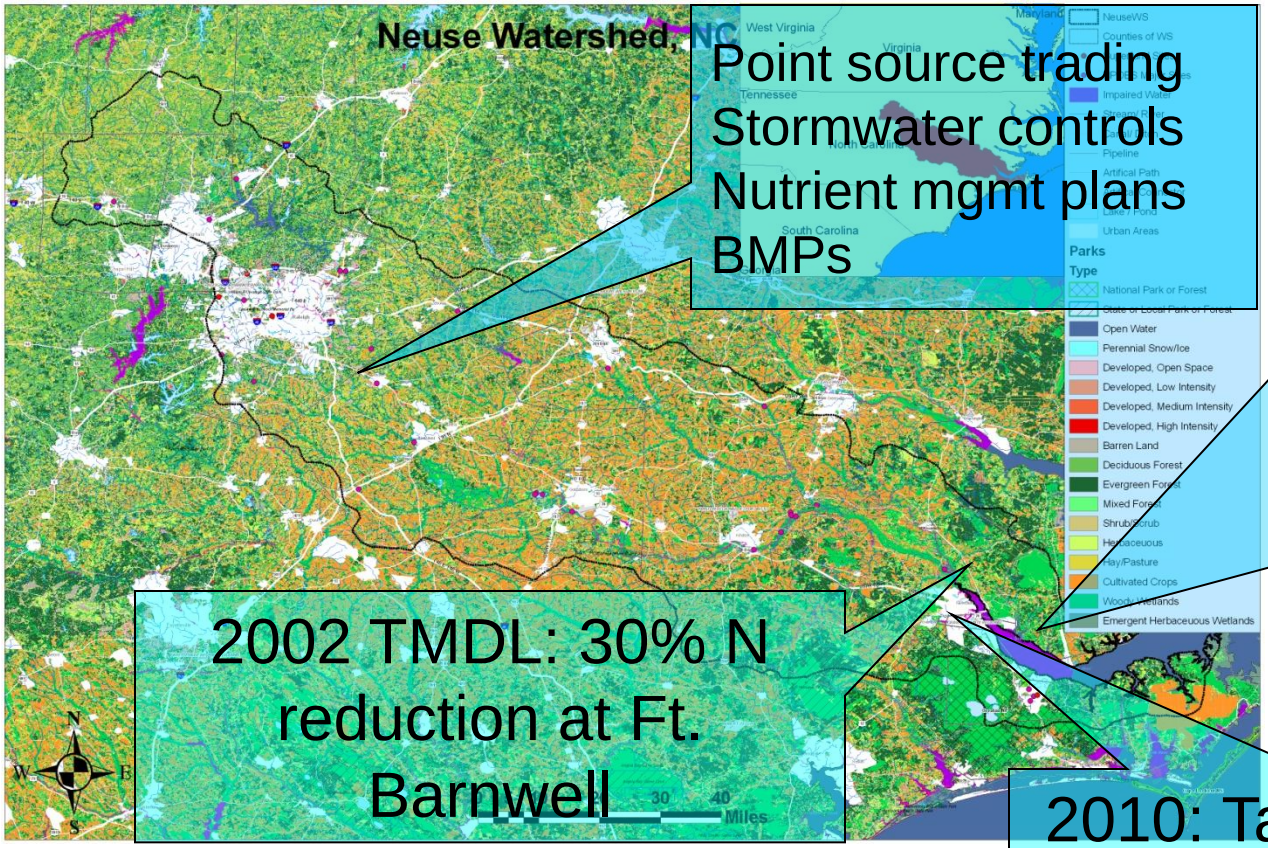
EPA's ESC: http:portal.epa.gov



Neuse River Estuary TMDL



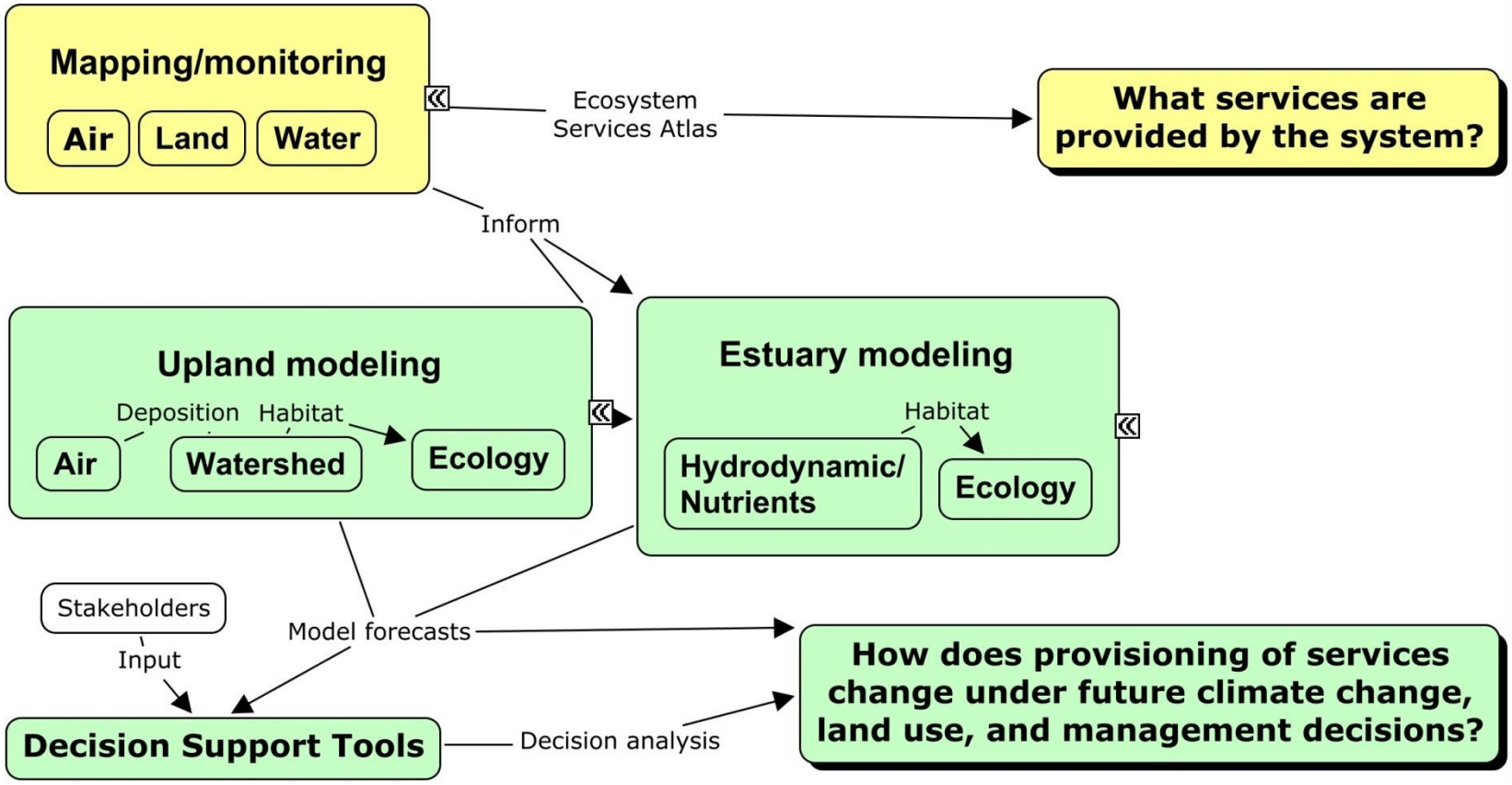
Point source trading
Stormwater controls
Nutrient mgmt plans
BMPs

2002 TMDL: 30% N reduction at Ft. Barnwell

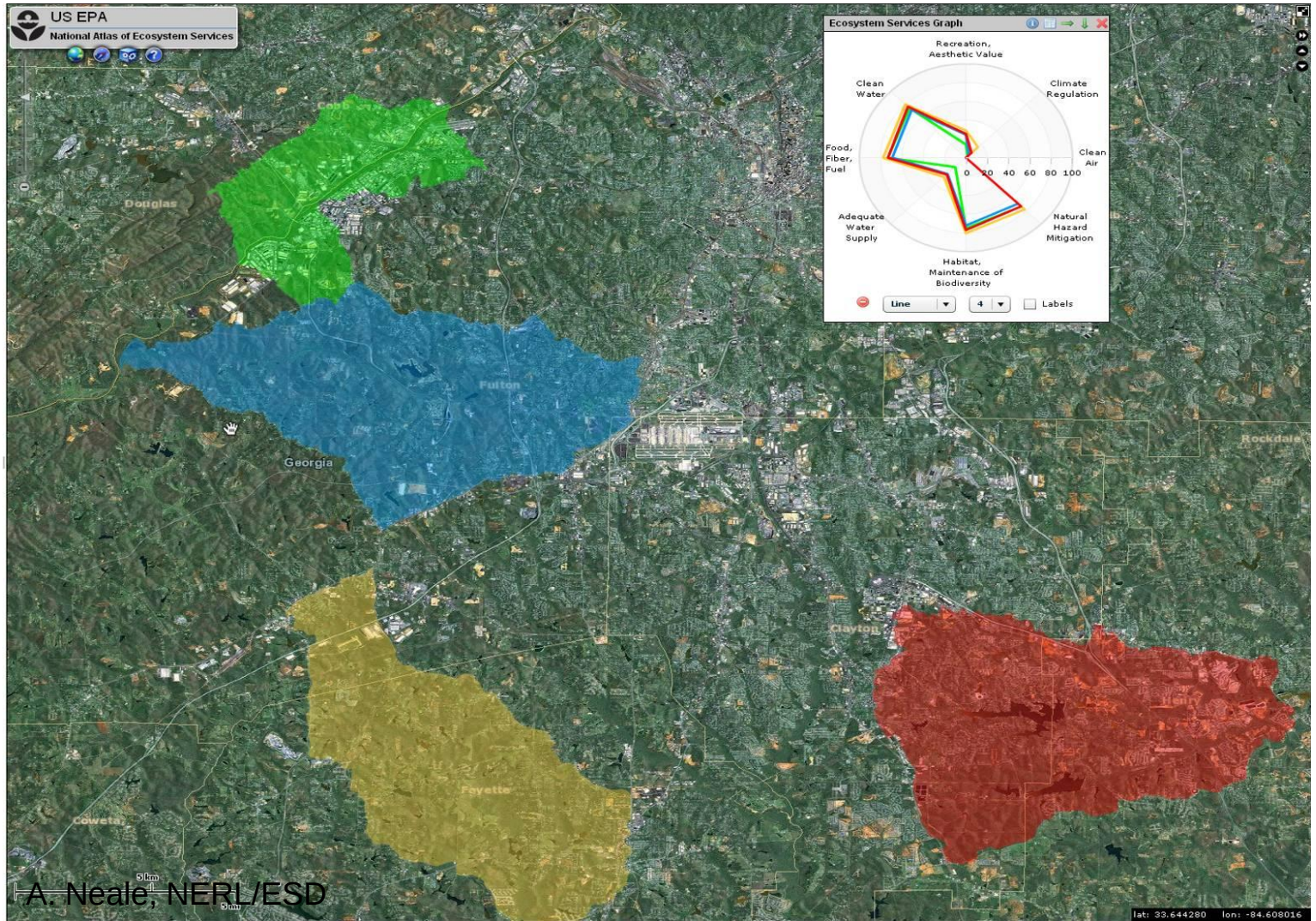
1995

2010: Target not met – how meet target and maximize services?

Research Efforts and Questions



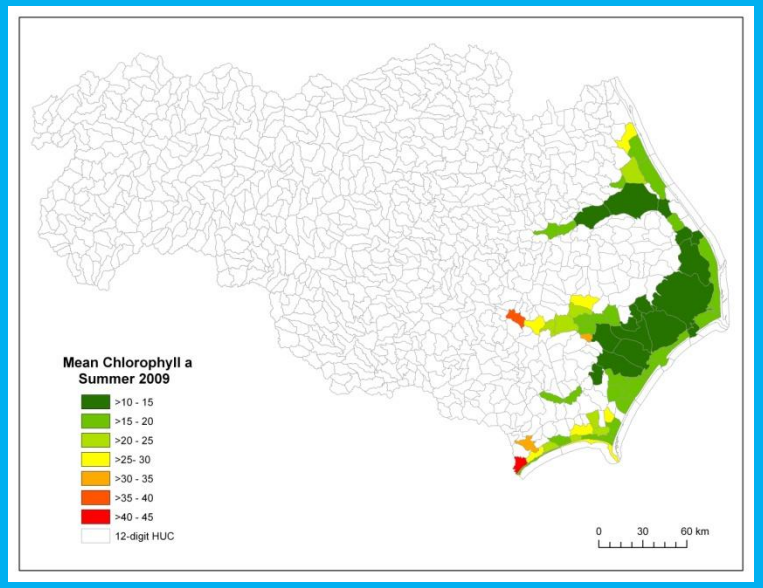
ESRP National Atlas



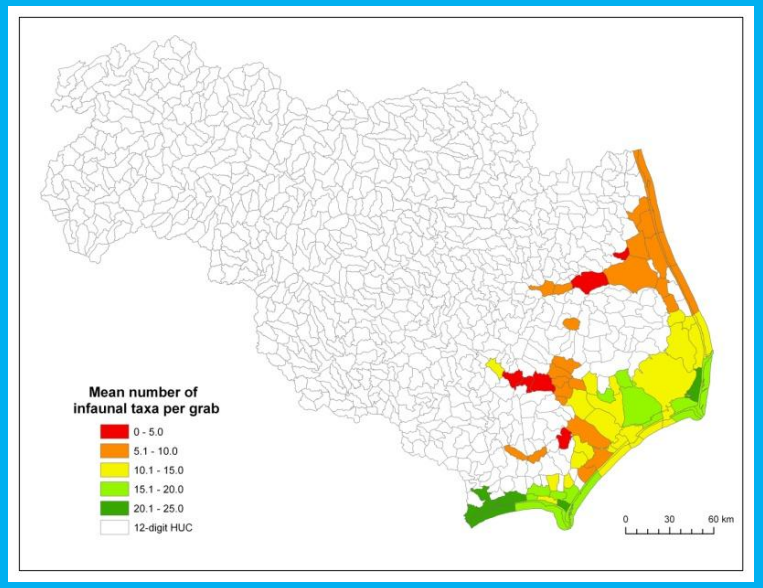
A. Neale, NERL/ESD

Albemarle-Pamlico Portal in Atlas

Clean Water



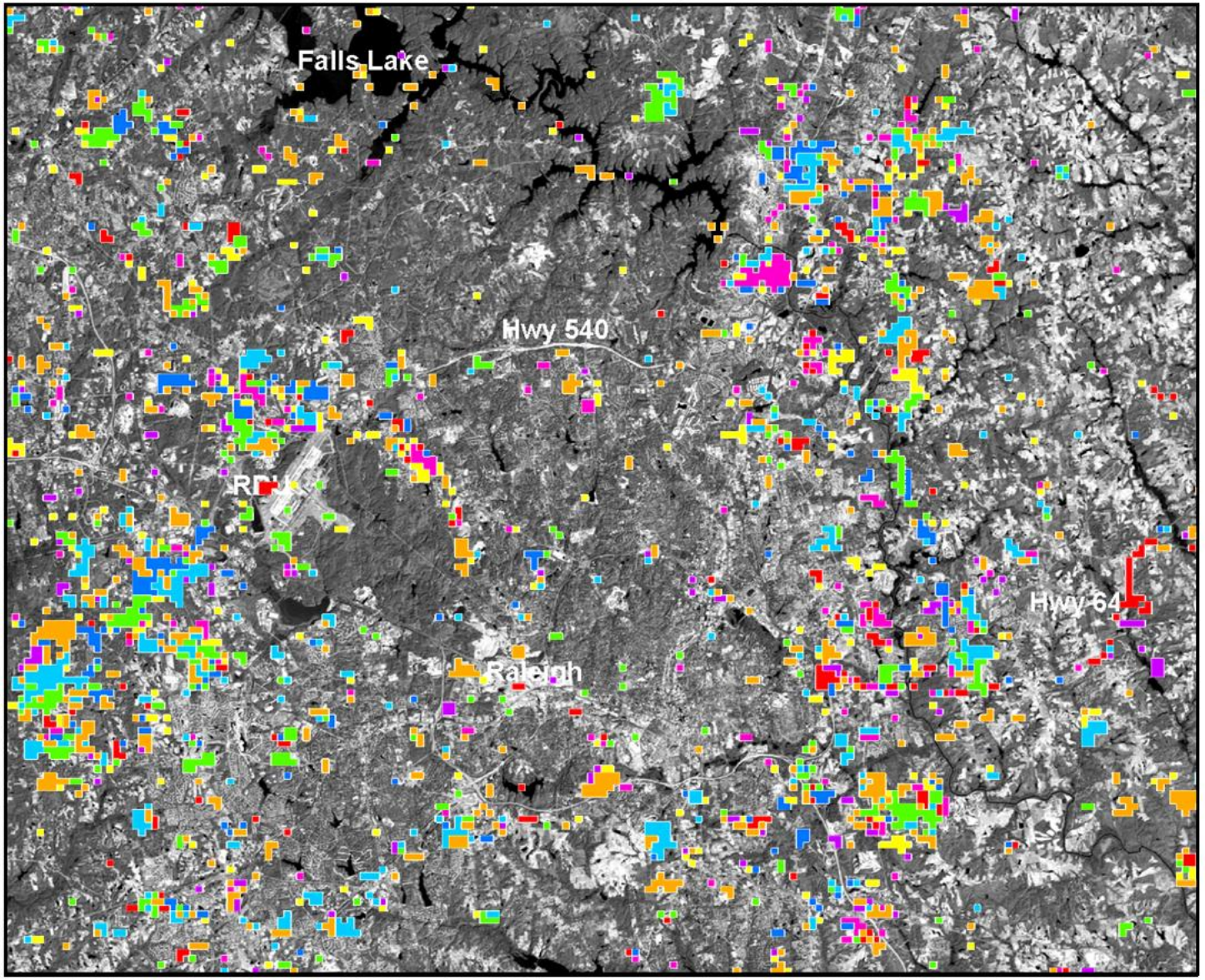
Biodiversity



MODIS Land-Cover Change

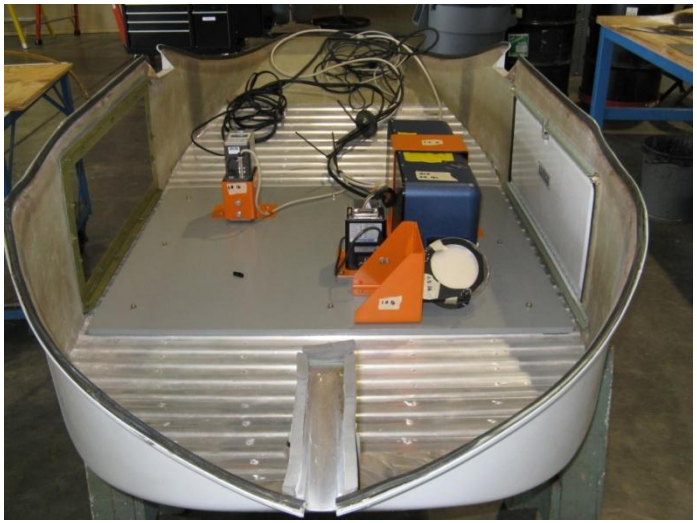
Raleigh, NC (2001- 2008)

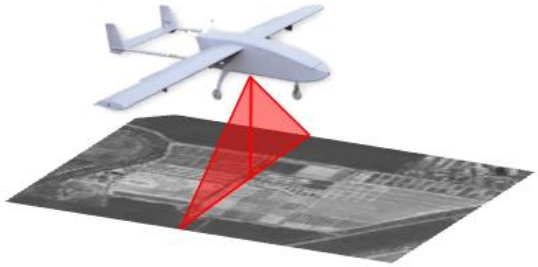
Landsat ETM+ Pan (15m) Backdrop

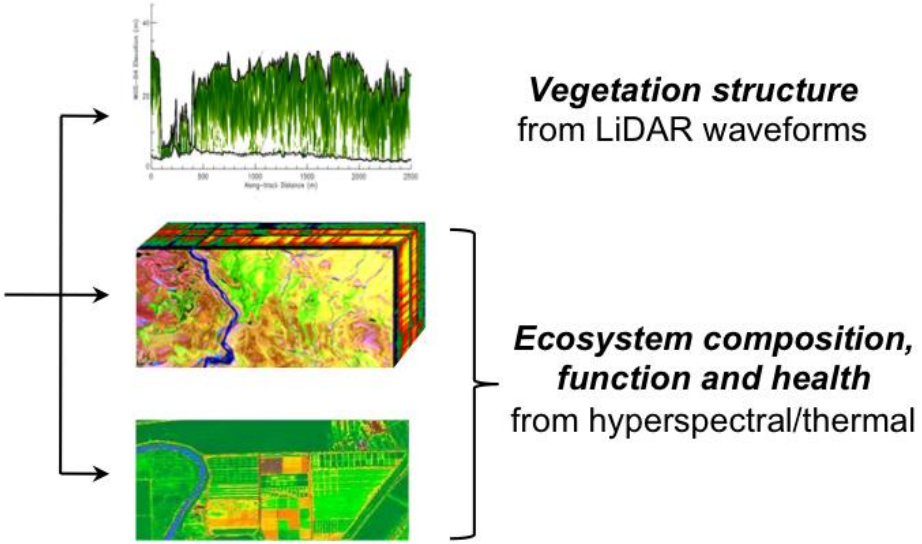


R. Lunetta, NERL/ESD

Hyperspectral and LiDAR Sensors





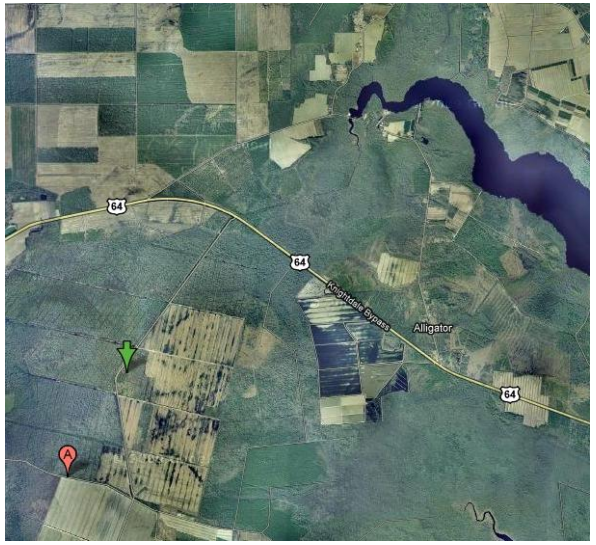


Vegetation structure
from LiDAR waveforms

Ecosystem composition, function and health
from hyperspectral/thermal

D. Williams, NERL/ESD

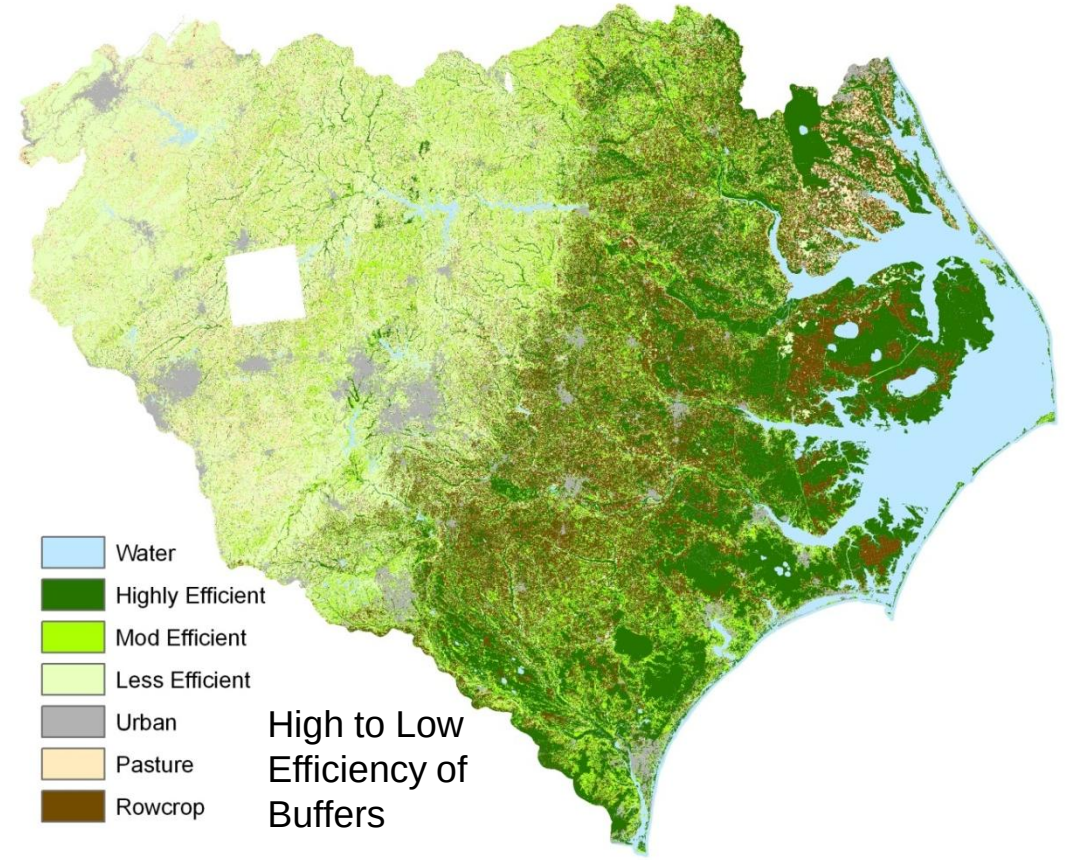
N_r Research in Tidal Wetlands



J. Iiames, NERL/ESD

Incorporating Landscape Components in GIS Riparian Models

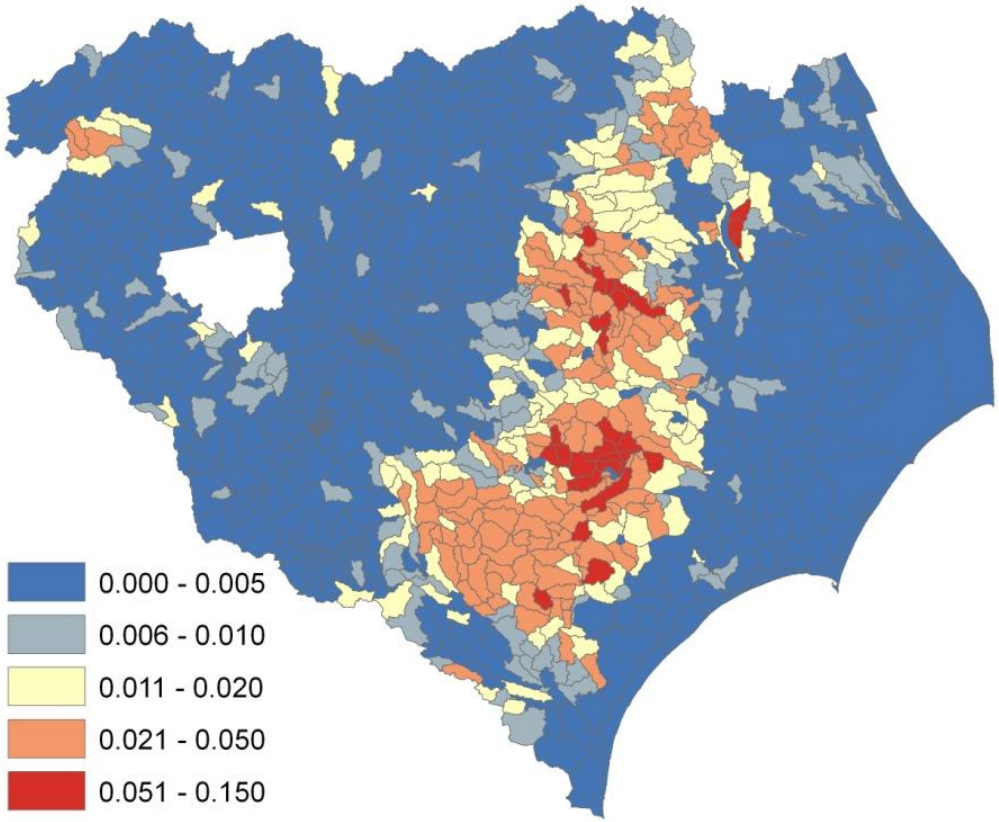
- Where are effective buffers?
- Influenced by:
  - Soil drainage, texture, carbon availability
  - Slope
  - Landscape position
  - Flows: surface vs. subsurface
- Combine data layers to map buffer effectiveness



J. Christensen, NERL/ESD

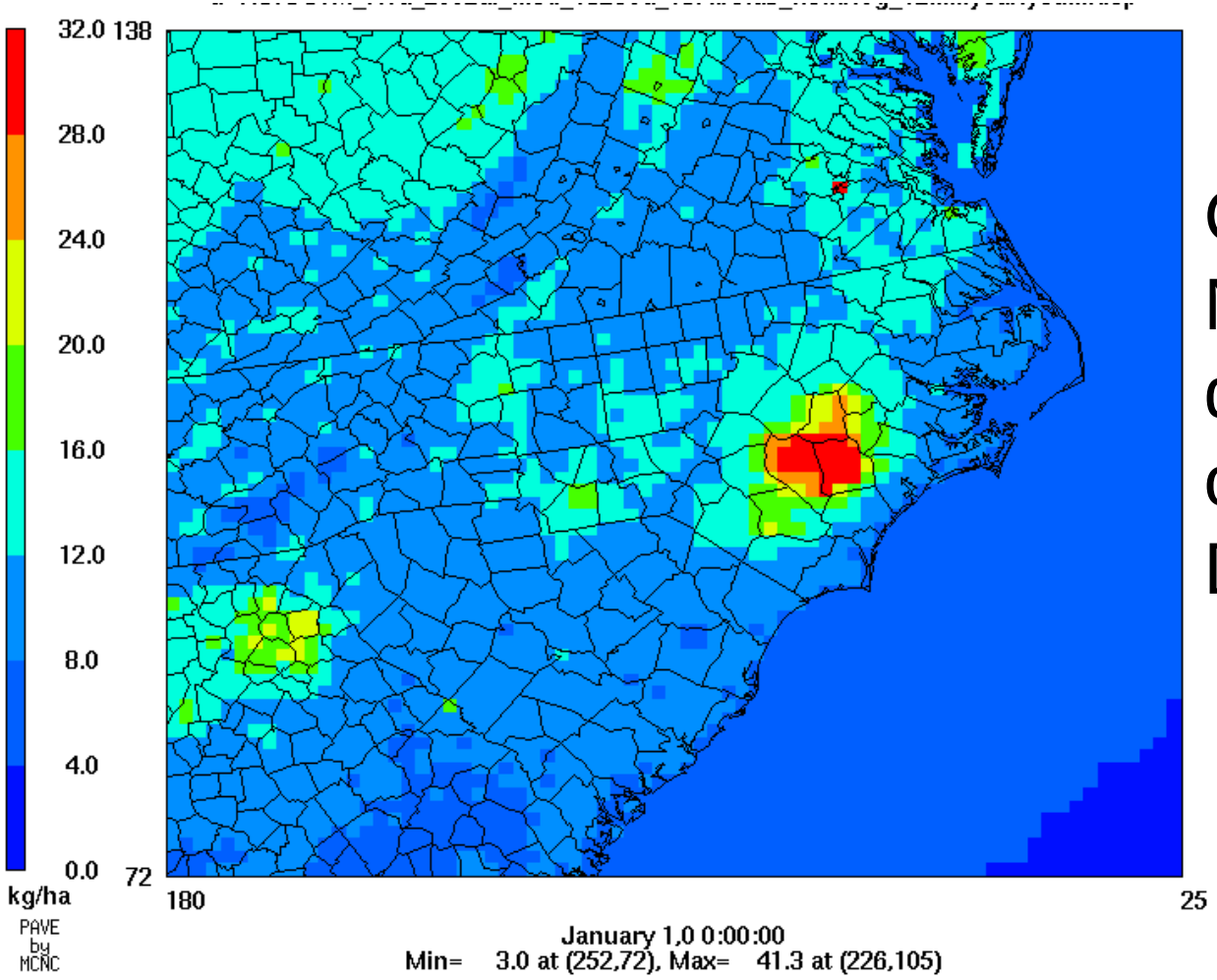
Incorporating Landscape Components in GIS Riparian Models

- Where does high-N Ag runoff interact with efficient buffers or lack buffers?
- High-N crops and CAFOs in well-drained fields identified
- Flow-path analysis connects crops to buffers & streams to determine buffer width
- Use to target conservation and buffer restoration



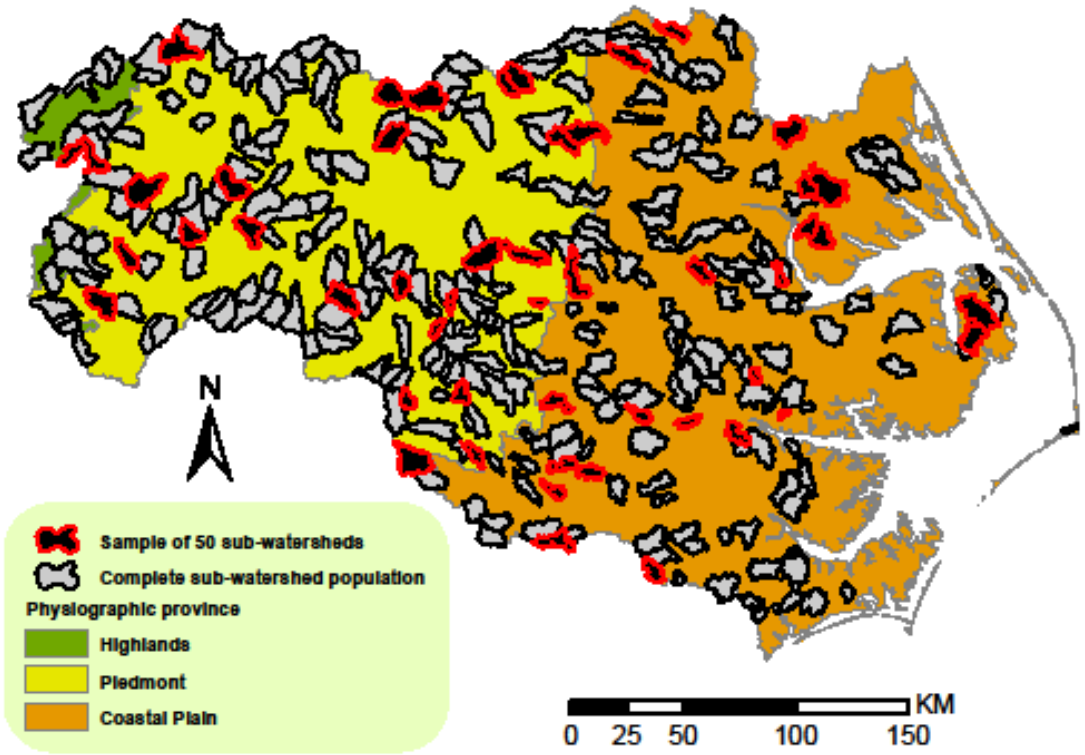
Proportion of HUC12 with High N and No Buffer

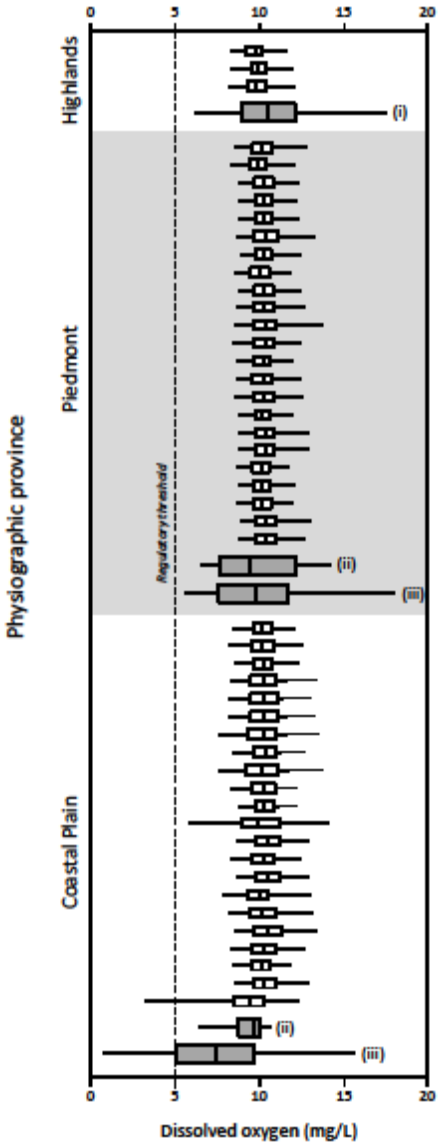
Air Quality Modeling



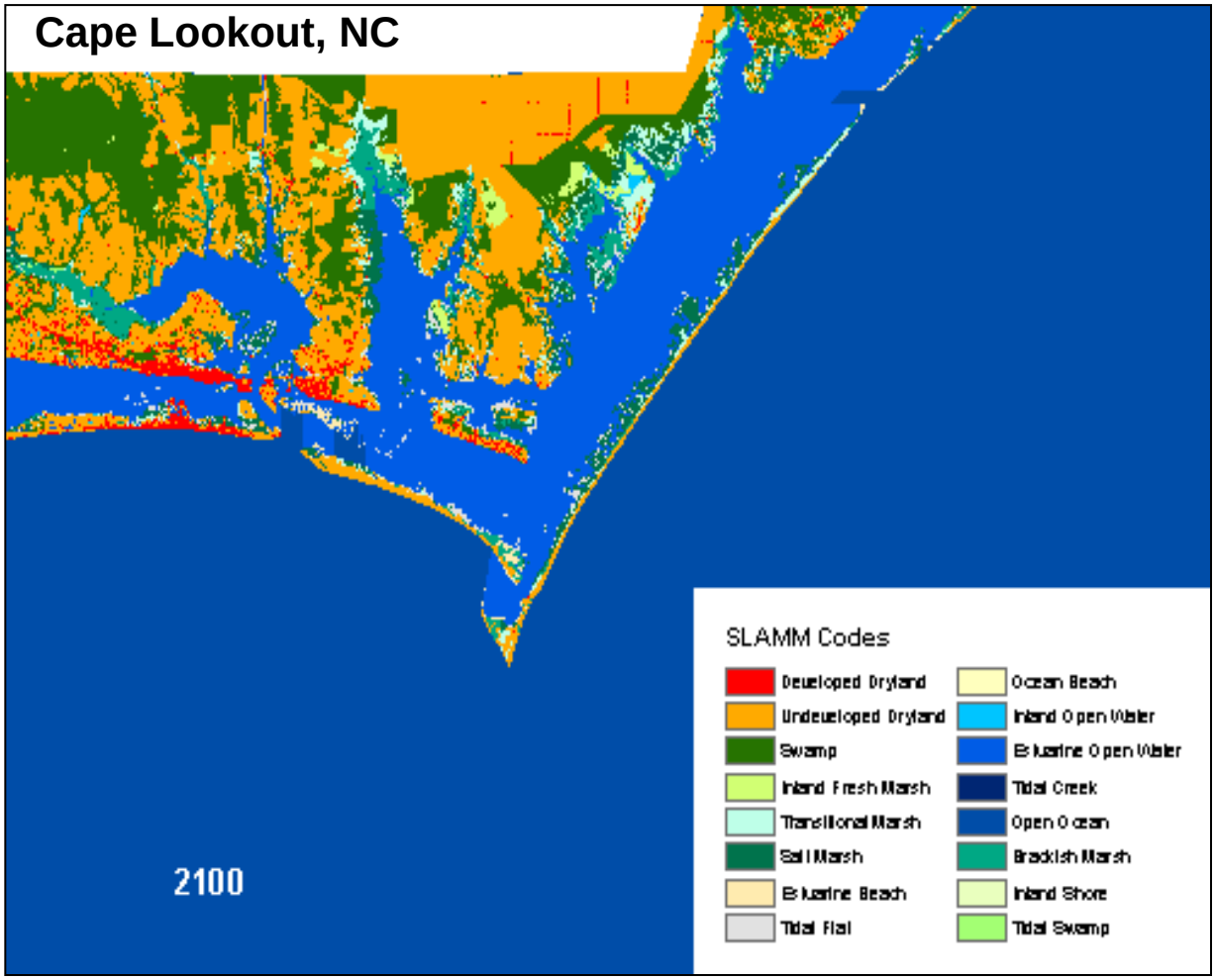
CMAQ Nitrogen deposition output (R. Dennis)

Integrated Watershed Modeling in FRAMES

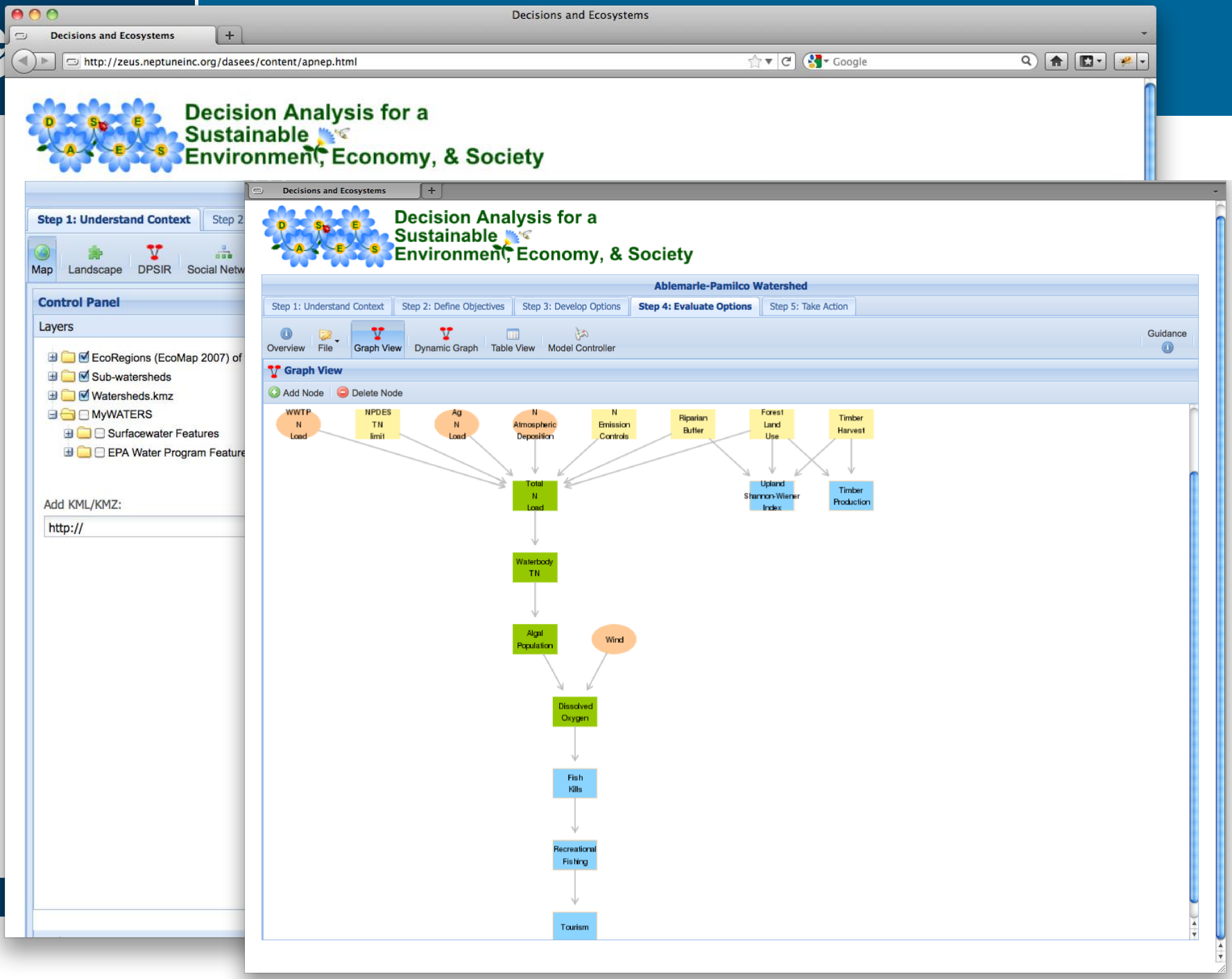




Sea Level Rise Modeling



SLAMM output - IPCC A1B 2100 predictions (C. Erickson)


Decisions and Ecosystems
http://zeus.neptuneinc.org/dasees/content/apnep.html
Decision Analysis for a Sustainable Environment, Economy, & Society
Step 1: Understand Context
Map
Landscape
DPSIR
Control Panel
Layers
EcoRegions (EcoMap 2007) of
Sub-watersheds
Watersheds.kmz
MyWATERS
Surfacewater Features
EPA Water Program Feature
Add KML/KMZ:
http://
Ablemarle-Pamlico Watershed
Step 2: Define Objectives
Step 3: Develop Options
Step 4: Evaluate Options
Step 5: Take Action
Overview
File
Graph View
Dynamic Graph
Table View
Model Controller
Guidance
Add Node
Delete Node
WWTP N Load
NPDES TN limit
Ag N Load
N Atmospheric Deposition
N Emission Controls
Riparian Buffer
Forest Land Use
Timber Harvest
Total N Load
Upland Shannon-Wiener Index
Timber Production
Waterbody TN
Algal Population
Wind
Dissolved Oxygen
Fish Kills
Recreational Fishing
Tourism

Products and Summary

- Products
  - Maps, models, and data
  - Portal in National Atlas - for APNEP
  - Coordinated nutrient work for NCDENR
  - DASEES Decision Support Tool for Neuse
- Summary
  - Informs management decisions
    - Adaptive management in a systems context (EBM)
  - Examines tradeoffs or synergies among services
  - New focus on sustainability - ecological, social, and economic benefit