Using Ecological and Water Resources Planning Tools to Achieve Sustainable Development Outcomes

SCWRC

Charleston, SC

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Presented By: Ted Brown, P.E.

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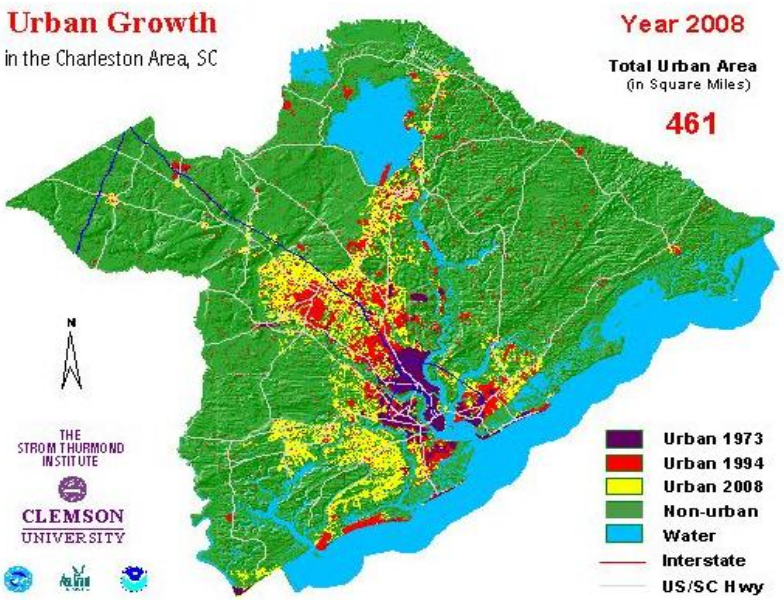
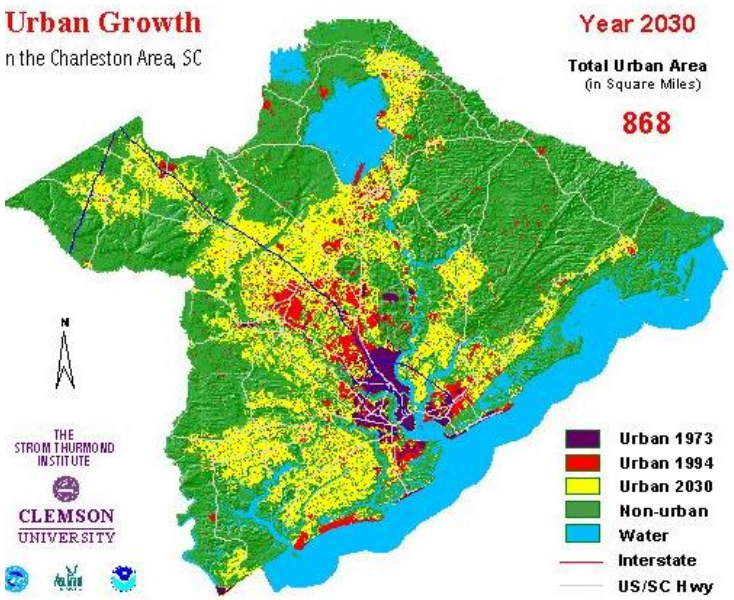
Overview

- System stresses
- Sustainable planning and design
- Case studies
- 8 tools to begin moving toward sustainable planning and design





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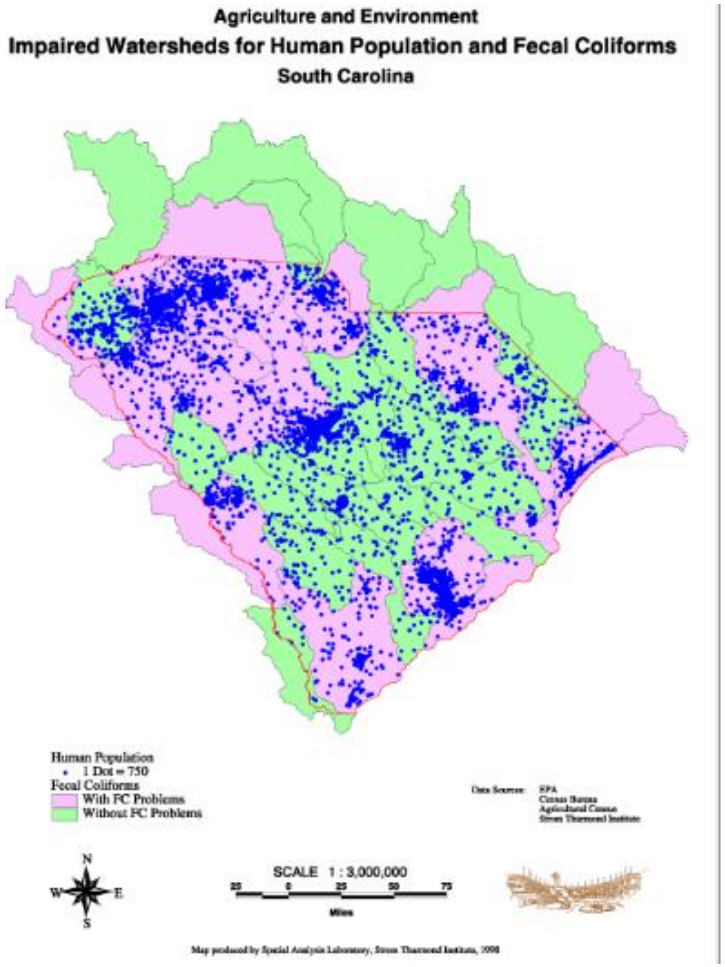
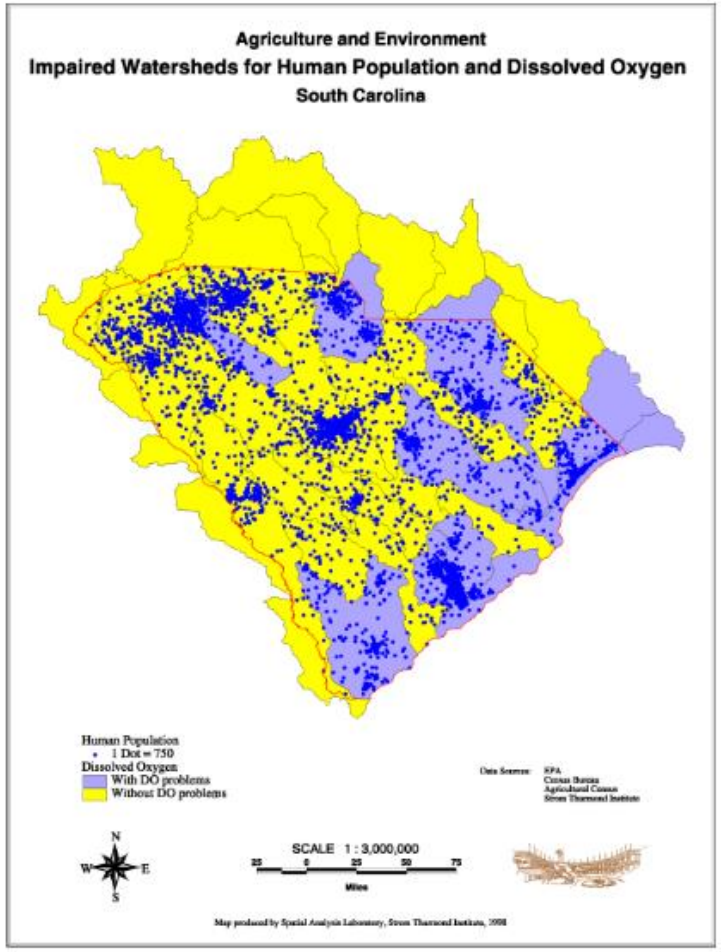
Source: http://www.strom.clemson.edu





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Source: http://www.strom.clemson.edu (Research by Allen and Lu)

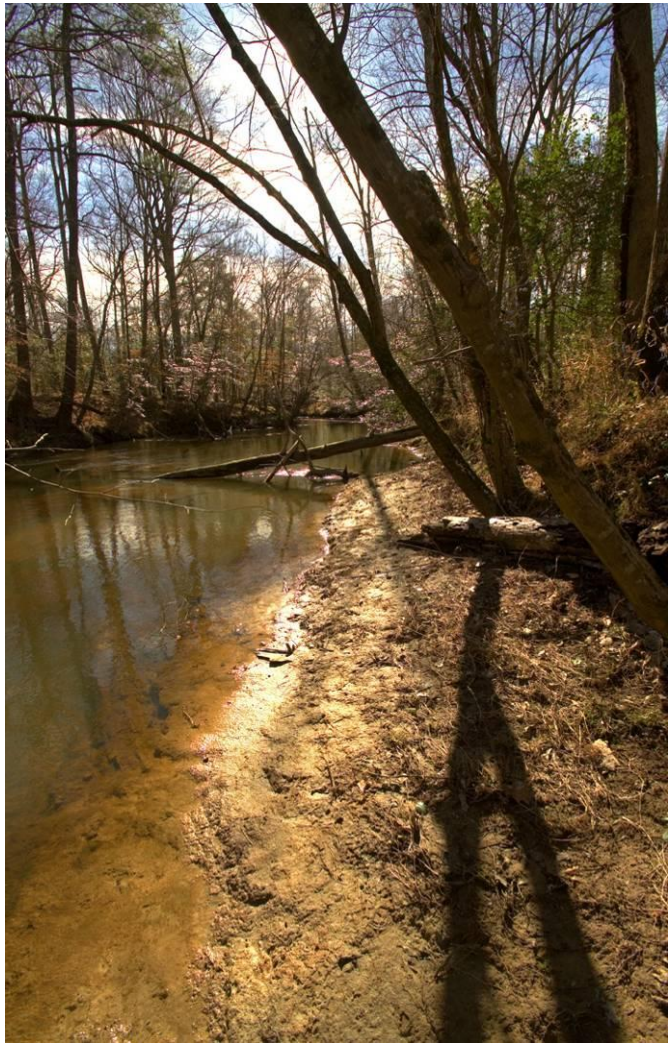

We Need a Paradigm Shift

Sustainable Planning and Design

- The objective of sustainable planning and design is to have a neutral impact on the environment and human health by sensibly using resources and limiting disturbances.
- Ecosystems provide critical services that represent the basic ingredients of life, including oxygen, fresh water, nutrients and energy. The natural environment, in essence, is comprised of a ***living infrastructure***.
- The concept of ***living infrastructure*** recognizes these vital contributions to human welfare and seeks ways and means by which ecosystem services can enhance both the built and natural environment concurrently.
- Incorporating a ***living infrastructure*** within areas of development also serves to restore processes that support conservation efforts adjacent to developed areas.
- To aspire toward sustainable, restorative or regenerative design, decisions must be informed by the general ecological processes occurring on the site, processes that represent a ***living infrastructure*****.**

Background

- Regional ecological assessment and land development suitability analysis.
- Goal of the analysis– Identify land areas that are most conducive for land conservation and land development with regards to regional and local ecological processes, functions and resiliency.
- Focus of approach:
  - regional
  - process and function
  - conservation > restoration > development



Methodology

- GIS mapping (existing data layers)
- Analysis
  - Scientific and value driven
  - Identify important ecological attributes based on:
    + relationship to regional landscape processes
    + role in governing ecological processes and resiliency (cause and effect relationships)
    + uniqueness and rarity

Methodology

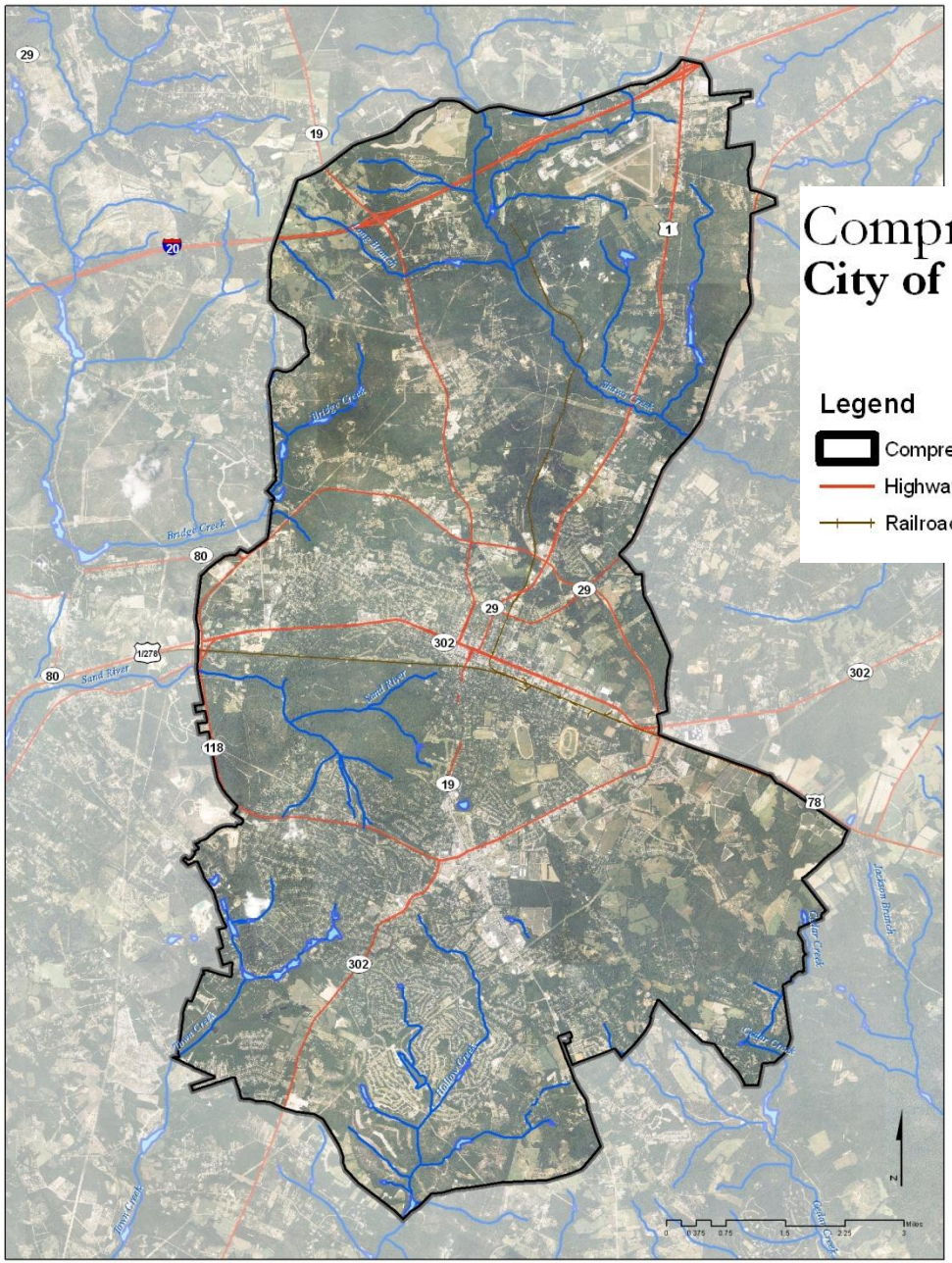
- GIS mapping
  - Soils
  - Wetlands
  - Flood Prone Areas
  - Habitat
  - Riparian Areas
  - Forests
  - Other Land Cover
  - Critical Areas

Case Studies

- City of Aiken, SC
- City of Cambridge, MD
- University of North Carolina at Chapel Hill

- Open Space Initiative in Comprehensive Planning Area (~70 mi^2)
- Want to know what is important, and rank areas for potential protection
- Less resolution due to budgetary constraints
- 2-dimensional analysis- one layer, no collapsing

Comprehensive Planning Area
City of Aiken Environmental Assessment



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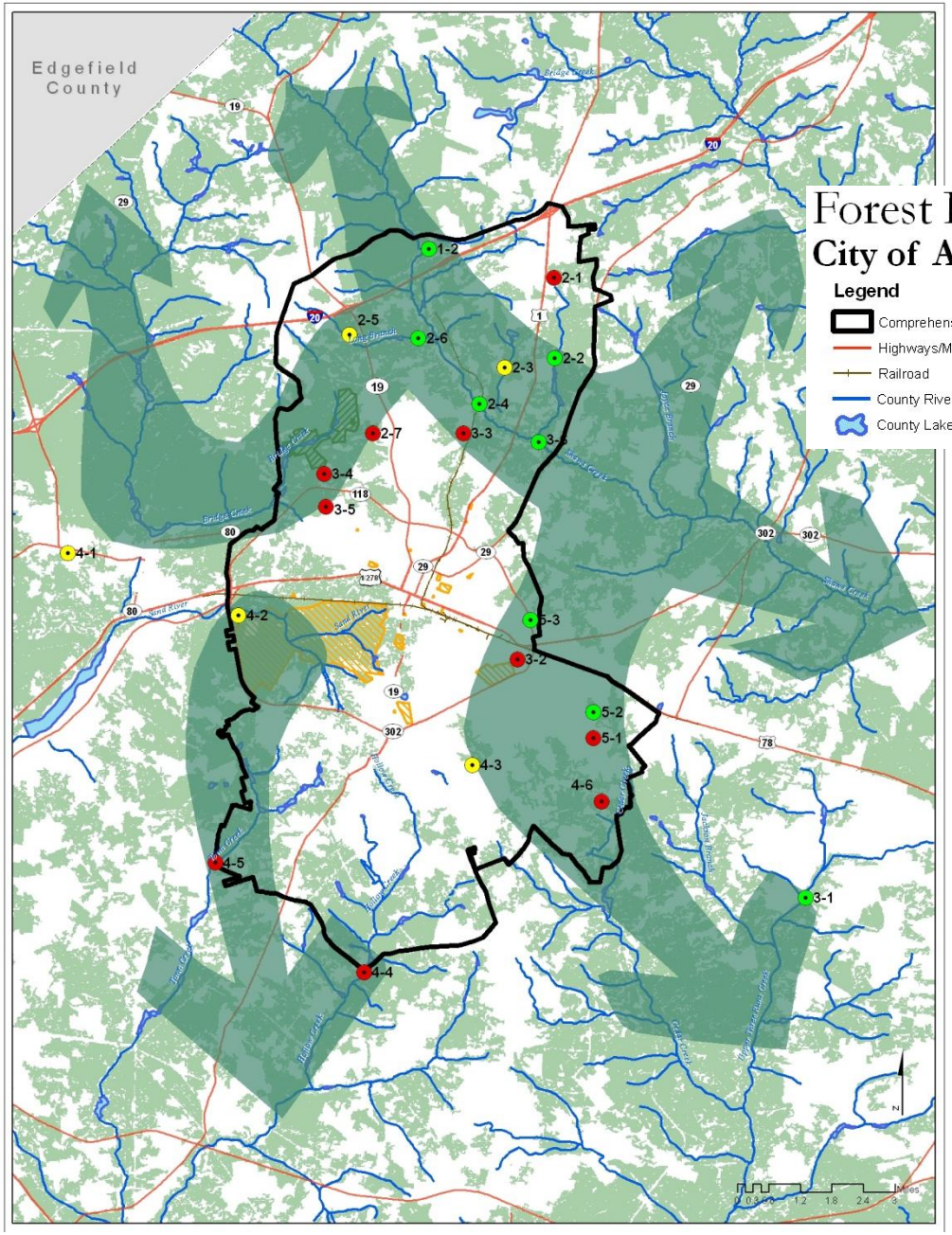

Forest Hubs and Linkages/Corridors

City of Aiken Environmental Assessment

Legend

- Comprehensive Planning Area
- Highways/Major Arterials
- Railroad
- County Rivers
- County Lakes

Field Evaluation Sites

Ecological Criteria Score

- Low
- Medium
- High

- Forested Areas > 40 acres
- Shrub/Scrub
- Pasture/Grassland
- Other Landuse

- Henderson Heritage Preserve
- City Parks
- Potential Hubs and Linkages

* Sample sites with a low score may have restoration potential or provide an important ecological function

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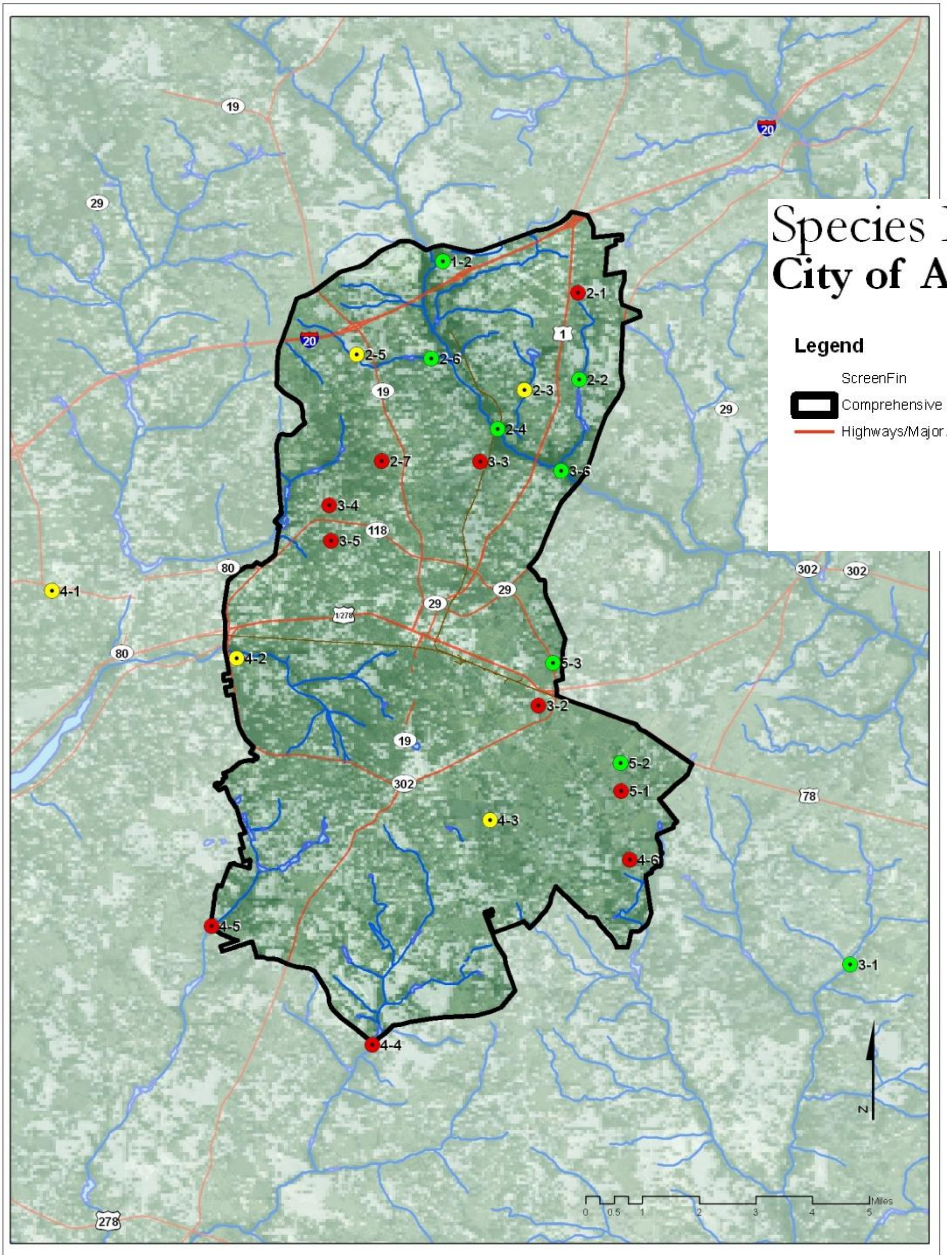
Species Richness
City of Aiken Environmental Assessment



Legend

ScreenFin
Comprehensive Planning Area
Highways/Major Arterials
County Rivers
Railroad
County Lakes

Field Evaluation Site
Ecological Criteria Score
Low*
Medium
High

Species Richness
Value
High : 241
Low : 0

* Sample sites with a low score may have restoration potential or provide an important ecological function.

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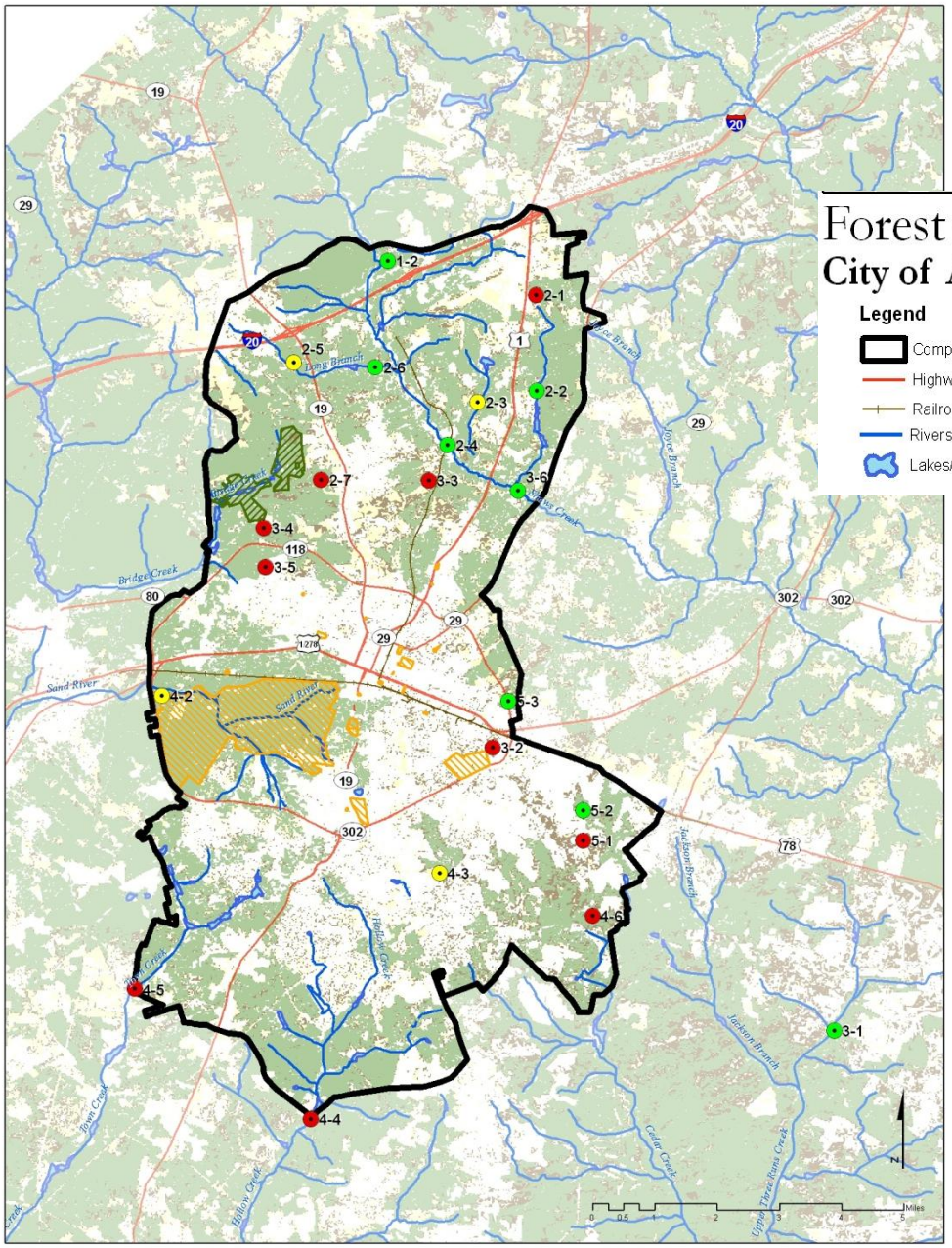
Forest and Open Space
City of Aiken Environmental Assessment



Legend

- Comprehensive Planning Area
- Highways/Major Arterials
- Railroad
- Rivers/Streams
- Lakes/Ponds

Field Evaluation Sites
Ecological Criteria Score

- Low
- Medium
- High

- City Parks
- Henderson Heritage Preserve
- Forested Areas > 40 acres
- Shrub/Scrub
- Pasture/Grassland
- Other Landuse

* Sample sites with a low score may have restoration potential or provide an important ecological function.

Methodology

- Analysis
  - Development of suitability metrics and values for various ecological attributes
  - Application of suitability values to the site

RESOURCE ELEMENT	**ECOLOGICAL ATTRIBUTE**	**VALUE**
Wildlife habitat	Hub	

Large
(at least 250 acres)
natural resource
areas

2 x

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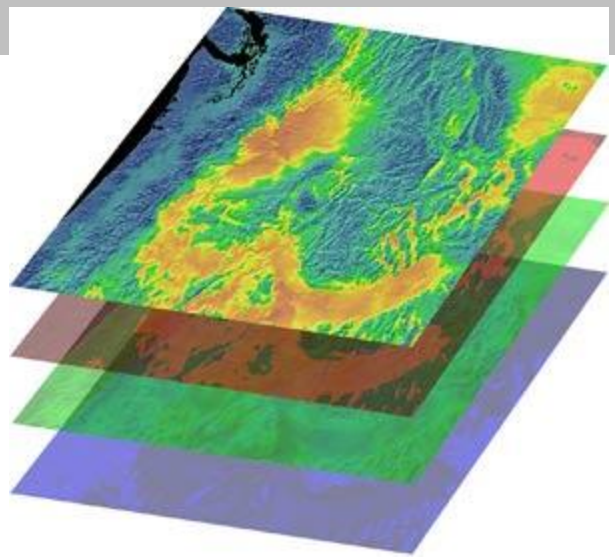
Methodology

- Analysis
  - Overlay and Identification of ecological suitability



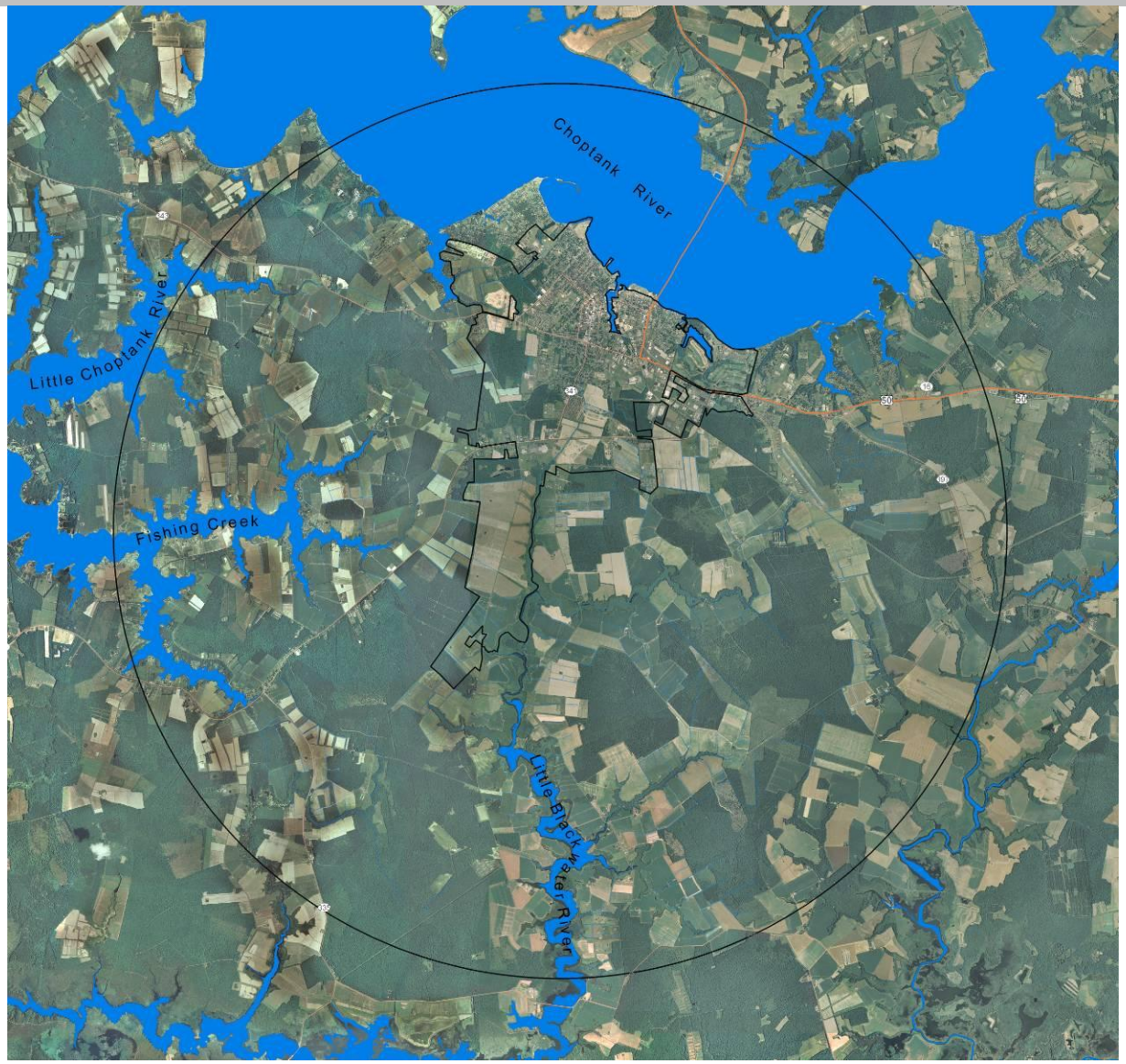
Disturbance will result in no or marginal ecological impact

Disturbance acceptable if BMPs or restrictions are applied

Disturbance will compromise ecological integrity

Regulatory restrictions or conservation area

Analysis Area



Resource Element – DNR Wetlands

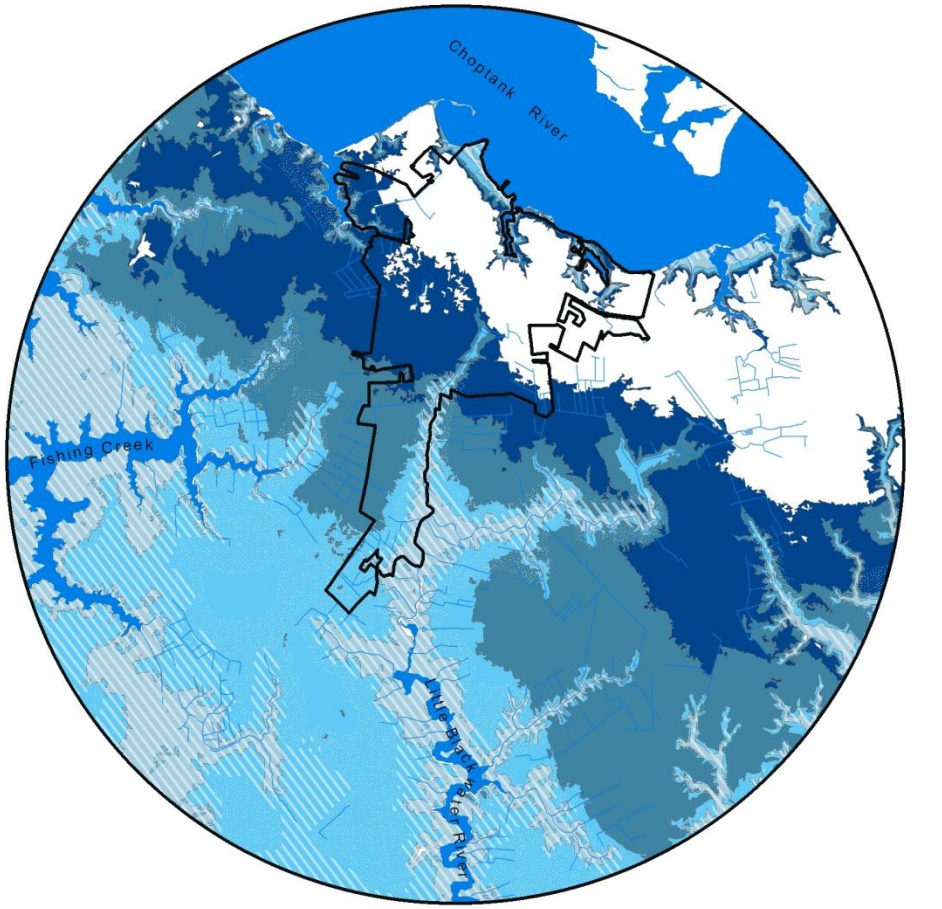
General Wetland Classification

- Estuarine
- Palustrine
- Riverine

Riparian Buffer

- 100 FT

Resource Element – FEMA Flood Zone and Storm Surge



FEMA Flood Zone Category

Hatch 100-yr Floodplain

Stipple 500-yr Floodplain

Storm Surge Category

Category 1 Storm

Category 2 Storm

Category 3 Storm

Category 4 Storm

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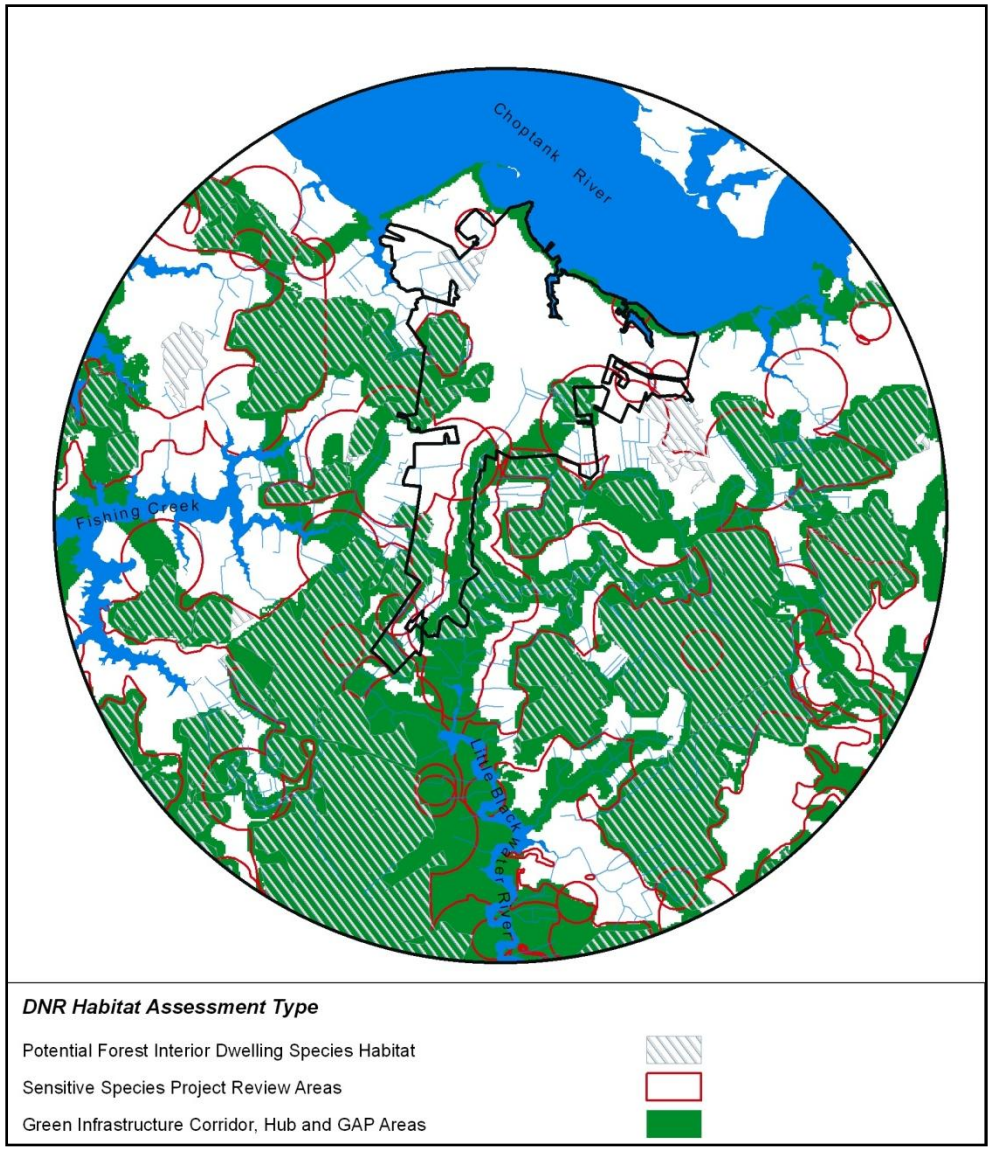
Resource Element – DNR Habitat Assessment



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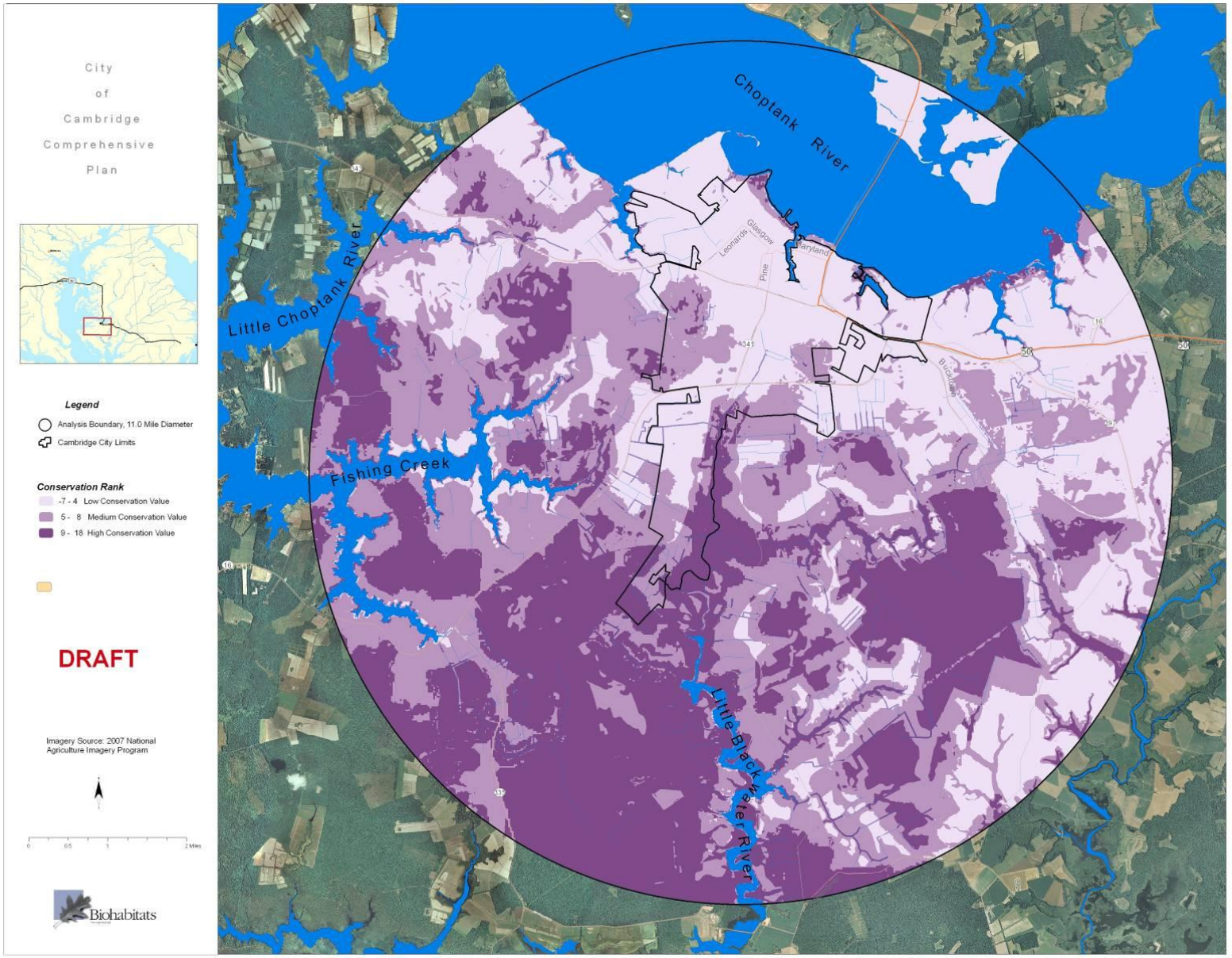
Analysis – Composite Metric Suitability Analysis

Restoring the Future
moving towards sustainability



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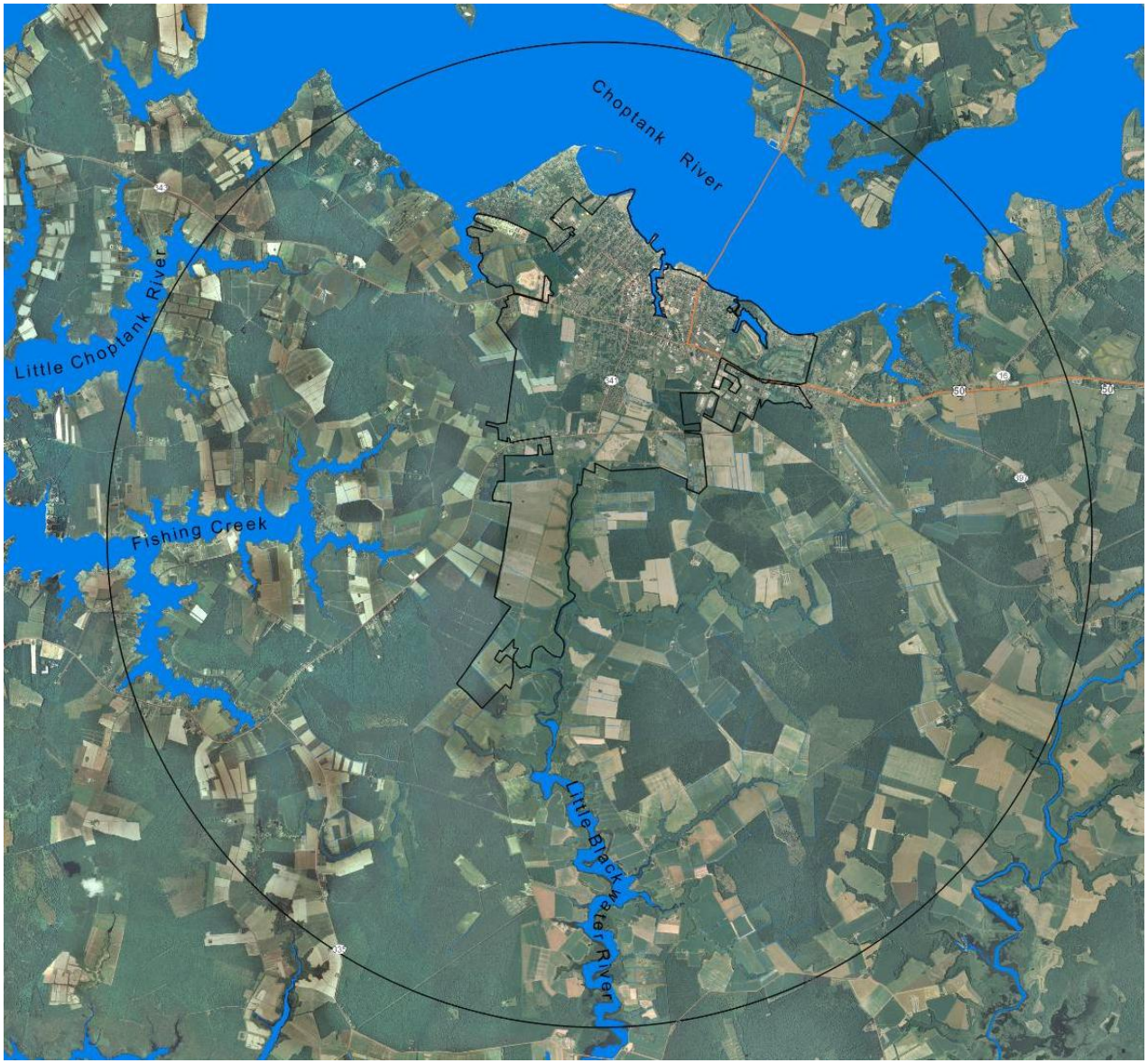
Analysis Area



University of North Carolina at
Chapel Hill, NC
Ecological Characterization

Restoring the Future
moving towards sustainability

- Up to 250 ac of a 1,000 ac parcel to be developed sustainably over next 50 yrs.
- Currently small regional airstrip surrounded by mixed hardwood and pine forest.

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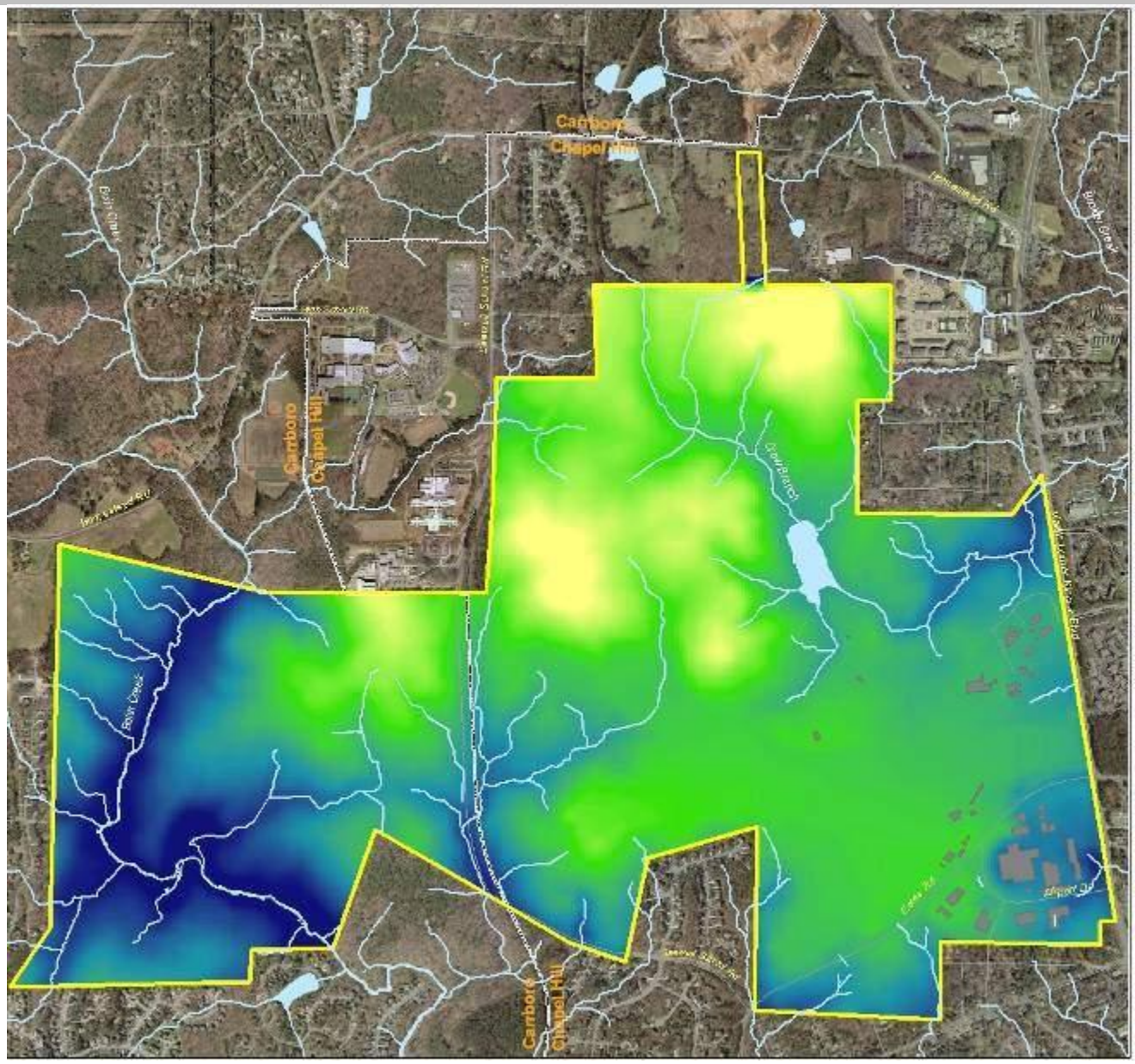
Inventory – Morphology



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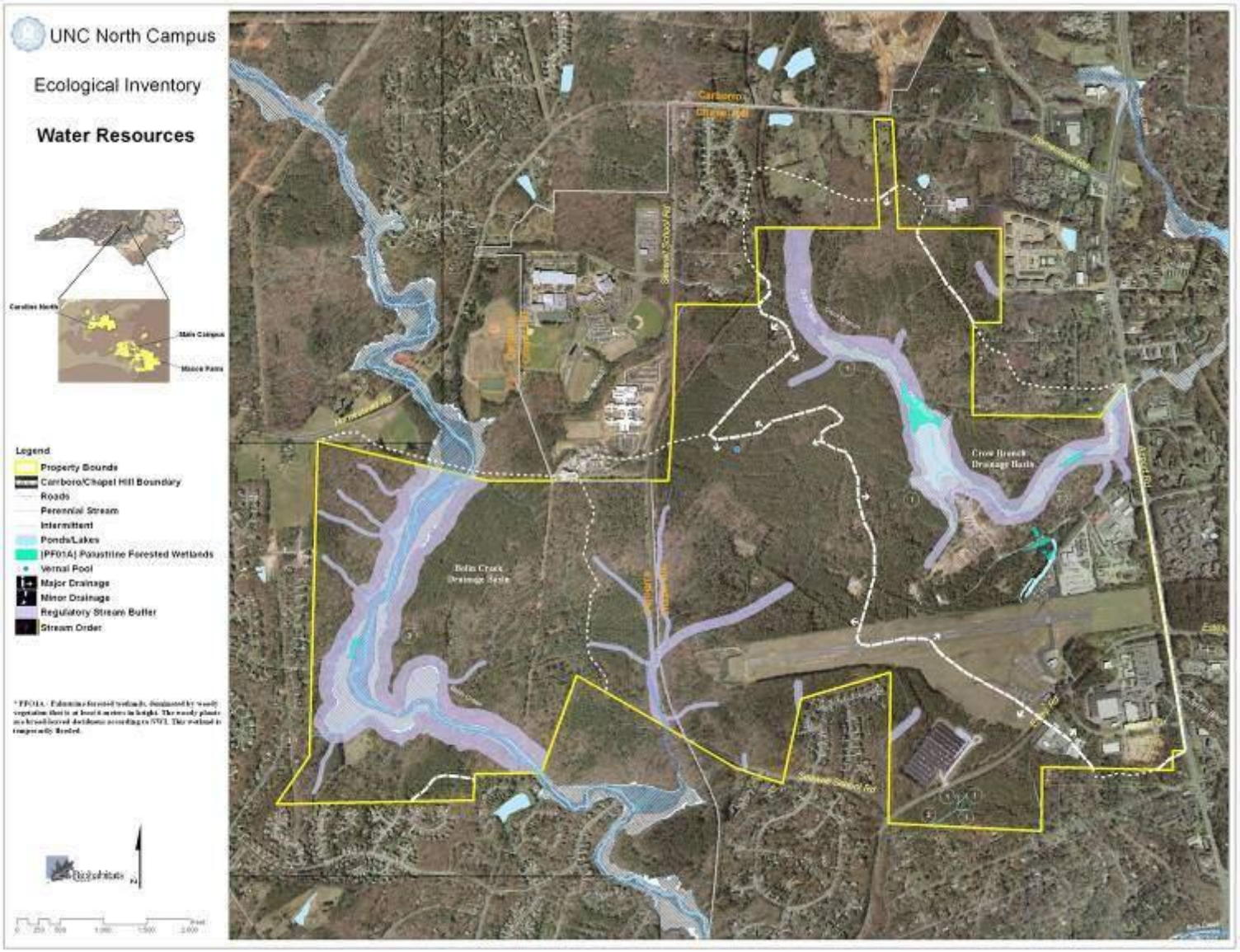
Inventory – Water Resources



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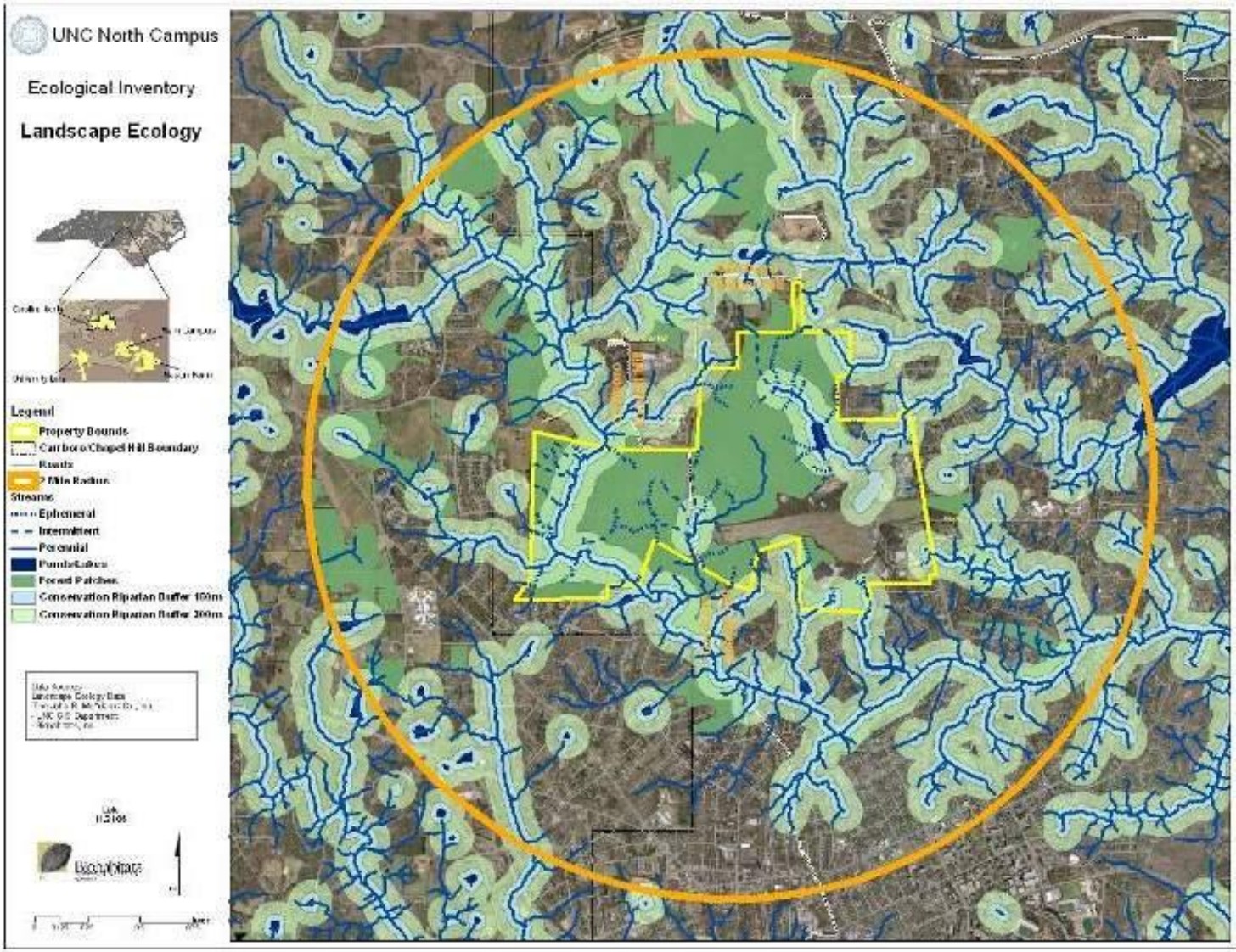
Inventory – Landscape Ecology



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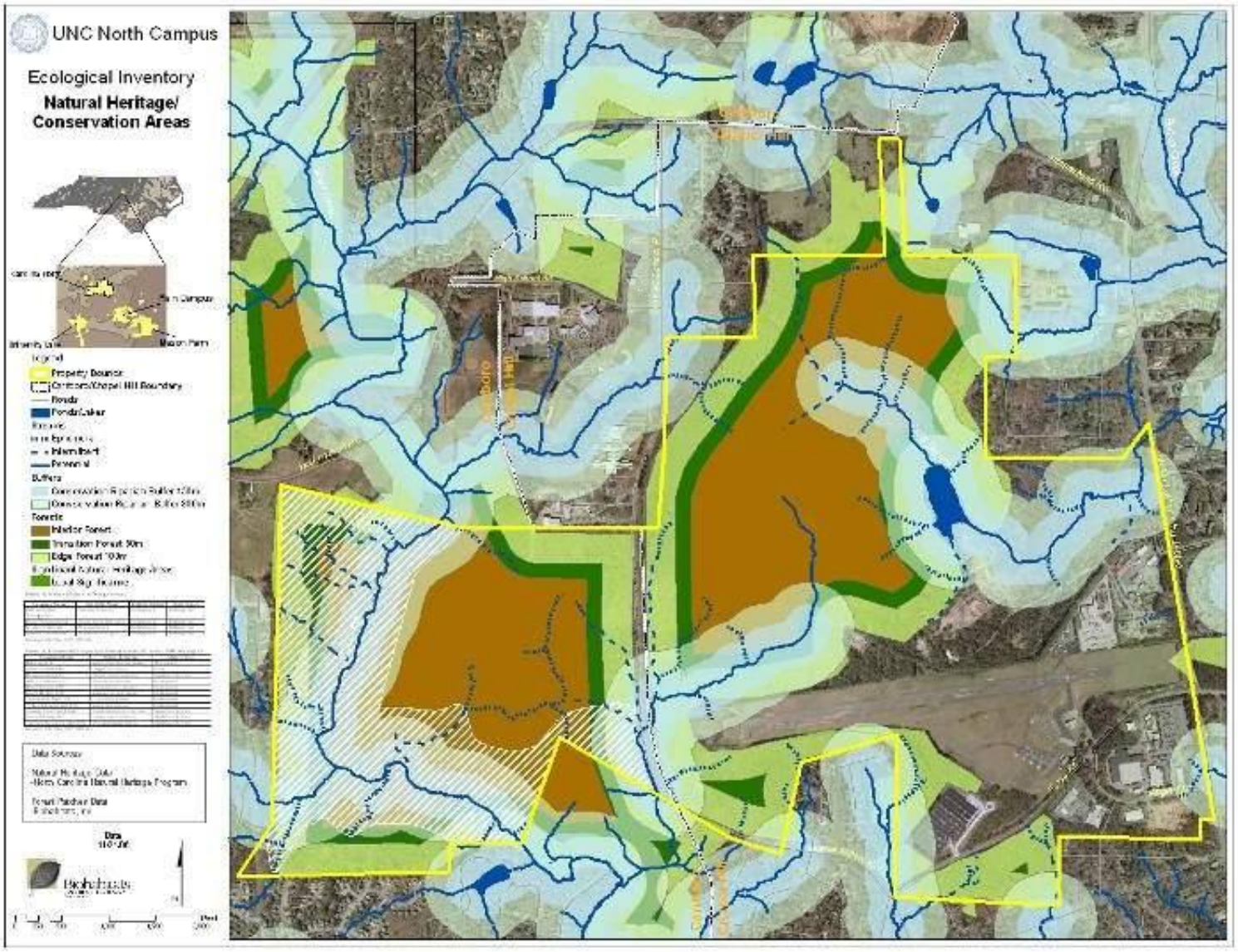
Inventory – Conservation Areas



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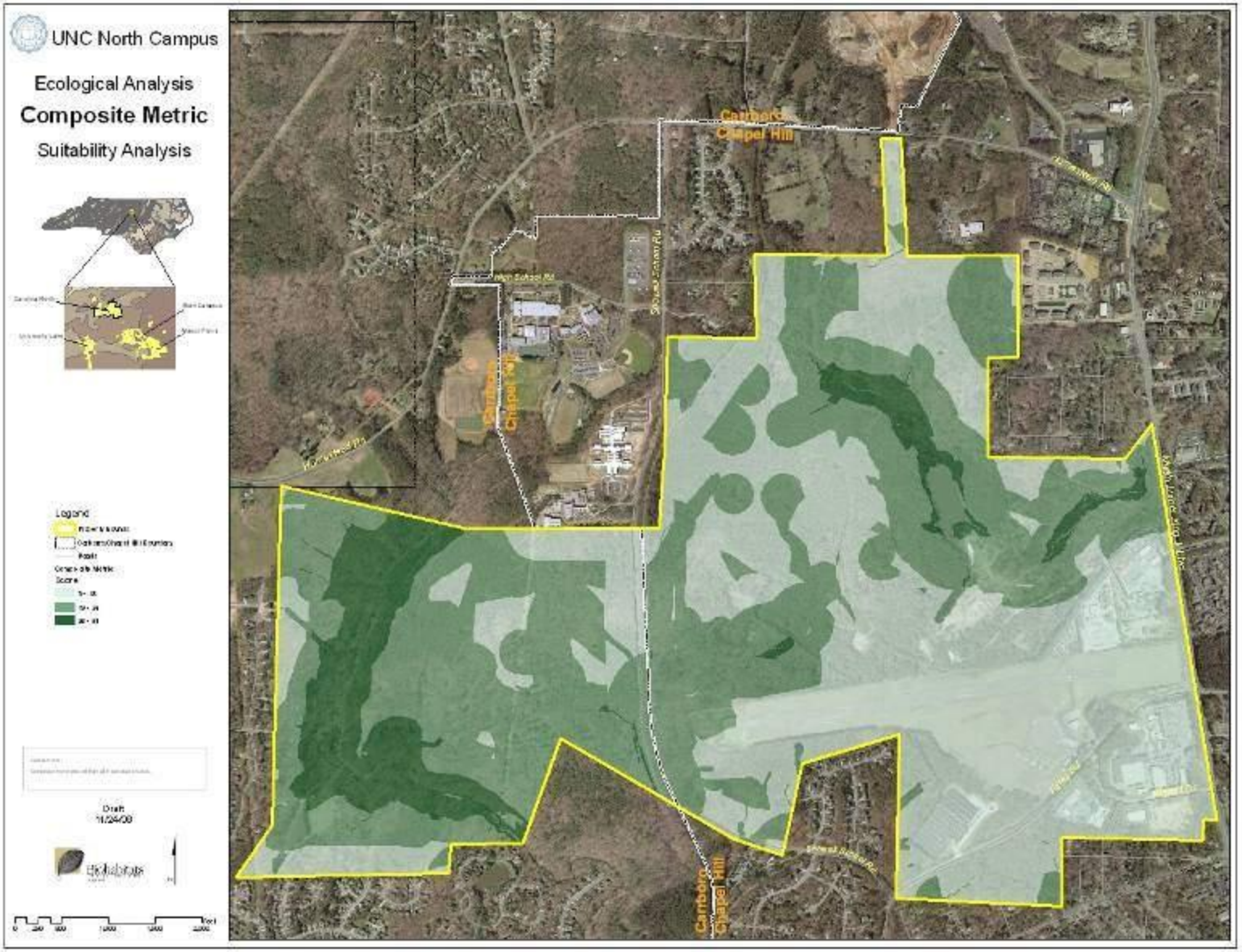
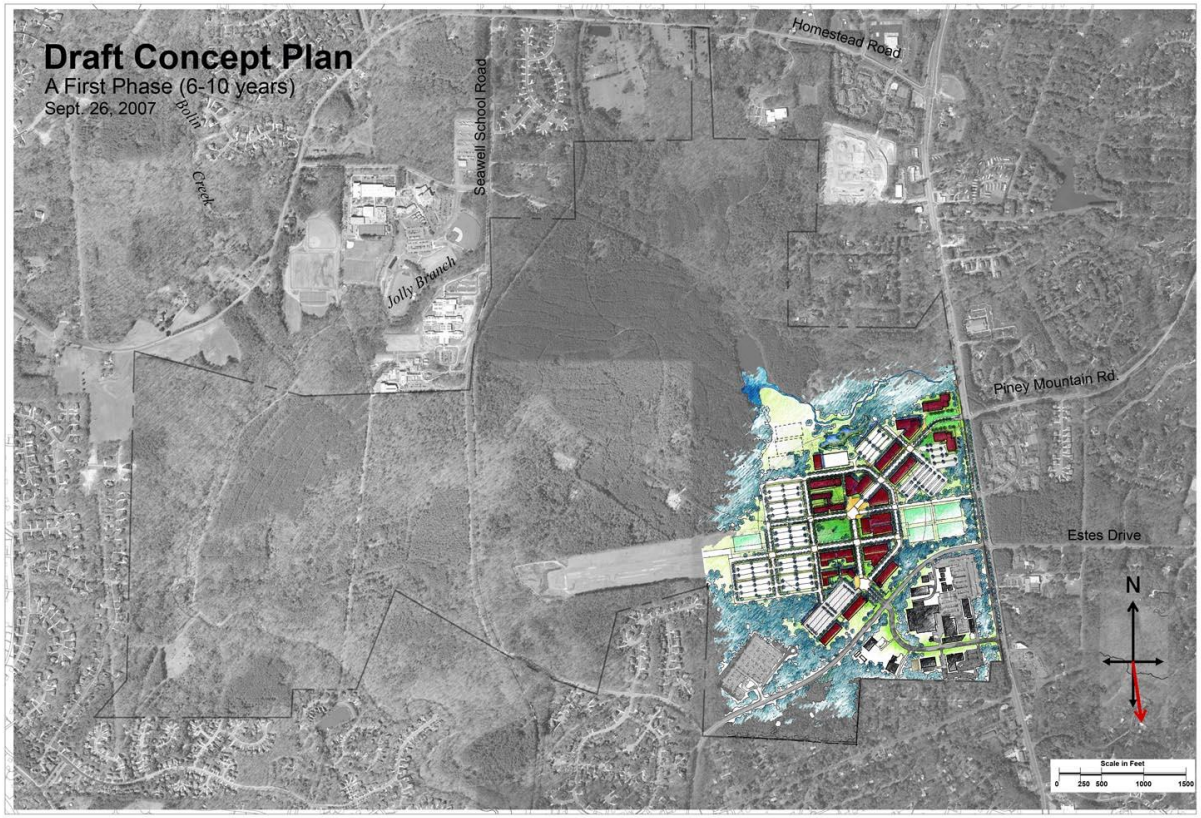
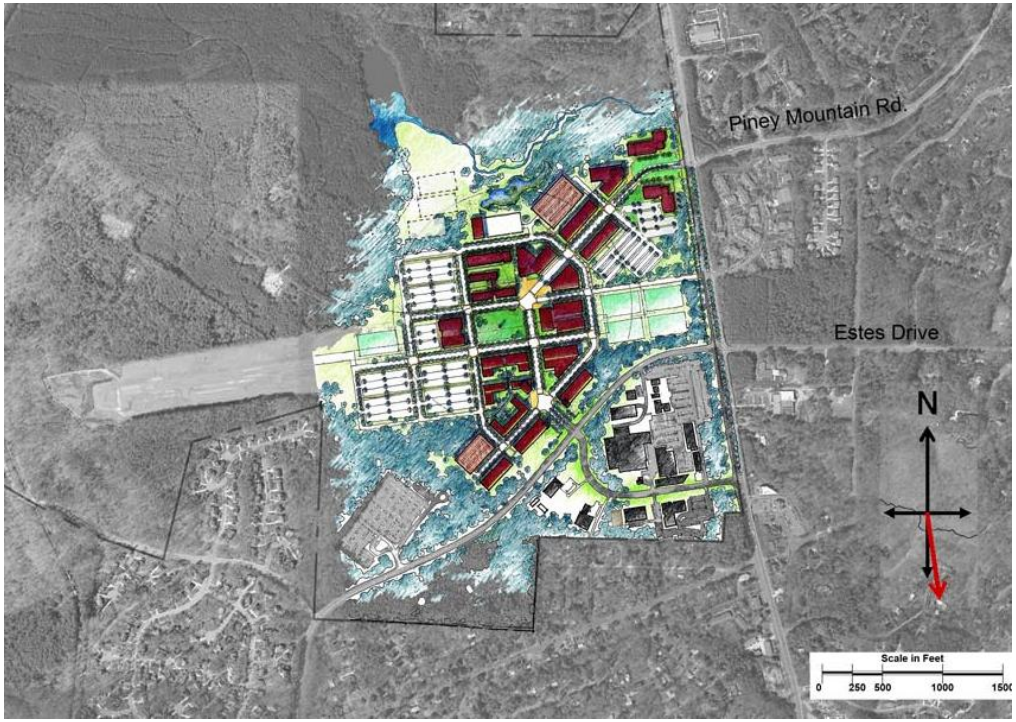

UNC North Campus
Ecological Analysis
Composite Metric
Suitability Analysis
Legend
Draft
11/24/08
Carrboro
Chapel Hill

Phase 1 – First 15 Years



Phase 1 Principles

- Respect the ecology of the site
- Focus on transit-oriented development
- Create a sense of identity and place
- Provide appropriate local connections for bike, pedestrian, transit & roadways
- Design for efficient land use with appropriate density
- Mimic the natural, undisturbed infiltration capacity of the land



Sustainable Planning and Design

…8 tools to consider

1. **Dialogue**
2. **Aspiration and Vision Setting**
3. **Story of Place**
4. **Scenario Planning**
5. **Process Assessment**
6. **Pattern Recognition**
7. **Whole Systems Understanding**
8. **Deep Integrated design**