ECOLOGICAL ASSESSMENT REPORT

CAROLINA NORTH

The UNIVERSITY of NORTH CAROLINA at CHAPEL HILL





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I. INTRODUCTION

Biohabitats was engaged to perform an ecological assessment of a tract of land, herein referred to as Carolina North, owned by the University of North Carolina at Chapel Hill.

A. BRIEF HISTORY OF CAROLINA NORTH

Part of the Carolina North tract was bequeathed to the University of North Carolina at Chapel Hill by Henry Horace Williams upon his death in 1940. Williams was Professor of Philosophy at the University from 1890-1940 and Chairman of the department from 1890-1935. He was a Kenan Professor from 1921-1935 and Professor Emeritus from 1936-1940. Other properties comprising the rest of Carolina North were aquired at later times.

University planning for the Carolina North property

began in the mid 1990s. The initial effort was completed in 1998 with the Johnson, Johnson and Roy (JJR) report, which established key elements of the planning and transportation systems for the development of the Horace Williams tract, now referred to as the Carolina North property. Then a Horace Williams Advisory Committee worked extensively with Ayers Saint Gross to develop a concept master plan using the JJR Report as a basis, for the highest and best use of the Horace Williams property to fulfill the strategic vision of the University over the near term (10-20 years) and long term (100 years). The work of this committee helped establish more specific design concepts for the type of innovative mixed-use research park that could be created at the property. Selected planning milestones from recent years are listed below.

NOTABLE PLANNING EVENTS

2003

Horace Williams Advisory Committee worked with Ayers Saint Gross architectural firm to design a conceptual plan for Carolina North

Initial planning sessions created several committees to address specific issues of the project-Executive Committee, Advisory Committee, External Relations, Infrastructure, New Business Development, and University Uses

Town of Chapel Hill's Horace Williams Citizens' Committee met and issued a report outlining the Town's goals for Carolina North

2004

The Horace Williams Citizens' Committee updated its report.

Ayers Saint Gross updated its conceptual plan.

2005

Talbert & Bright engineering and planning firm presented an airport relocation study to the Board of Trustees.

UNC Board of Trustees endorsed a vision for Carolina North

UNC responded to the Horace Williams Citizens' Committee report.

Chancellor Moeser calls for the formation of the Carolina North Leadership Advisory Committee (LAC), to provide input on how the site will be developed. Members included representatives from the Towns of Chapel Hill and Carrboro, Orange County, UNC-Chapel Hill administration and faculty, the Chapel Hill Carrboro School Board, the business community, EmPOWERment, the Orange Water and Sewer Authority, the N.C. Department of Transportation and a representative of the governor.

Dr. John P. Evans was named executive director of Carolina North.

Planning studies commence, reflecting new thoughts on vision for Carolina North as a sustainable campus.

The University created a website as a clearinghouse for information on the progress of Carolina North.

2007

LAC meetings ended in January. Guiding principles were issued by the LAC for the development of Carolina North.

B. SCOPE OF WORK, OBJECTIVES, AND SITE DESCRIPTION

Biohabitats was retained by Ayers Saint Gross in July, 2006 to perform an ecological assessment of the Carolina North property and, based on the ecological, cultural, historic and recreational characteristics of the site and to determine the suitability of the site to support development without compromising ecological stability and integrity. Biohabitats gathered pre-existing data, collected field data, inventoried and characterized the site, analyzed the data and generated inventory, analysis, and development suitability and resource conservation maps. Biohabitats used information gathered at a public review meeting on November 6, 2006 to inform the inventory maps. The assessment protocol and subsequent maps were peer reviewed by university professors and staff on November 28, 2006.

Two final public review sessions were held on December 13, 2006.

Biohabitats was assisted in this effort by the John R. McAdams Company, Inc. (JRM), who identified and documented federal, state and local environmental regulations pertaining to the site's development and identified potential regulatory features on the site.

The site encompasses approximately 1,000 acres. It is located west of Martin Luther King, Jr. Boulevard. and generally north of Estes Drive Extension, approximately 1.5 miles north of the main campus. The site is a mixture of disturbed areas (e.g., airport, Town of Chapel Hill operations, landfill, chemical waste site, railroad) and natural areas (e.g., woodlands, wetlands, and stream corridors). An informal network of trails is also present on the site.









II. DATA COLLECTION

Biohabitats collected existing digital information from federal, state, and local governments and agencies and the University. Information gathered from these sources included:

- Aerial photography (current and historic),
- Roads, railroads, utilities,
- Municipal boundaries,
- Hydrography,
- FEMA floodmaps,
- Cultural and historic resources,
- · Soils.
- · Geology,
- · Topography,
- · Wetlands,
- The chemical waste site boundary,
- Natural resource conservation areas (N.C. Natural Heritage Program, Town of Carrboro, Friends of Bolin Creek).

Additional print and graphical information gathered from various sources included:

- Characterization of the municipal landfill site,
- Wetland delineation on a portion of the property,
- Academic studies of fish and macroinvertebrate populations in local streams,
- · Geologic formation descriptions of Orange County,
- Topsoil fertility guidelines,
- Chemical and physical soil series information,
- Characterizations of the flora and fauna of Orange County,
- Local municipal stream buffer regulations,
- Local municipal steep slope development regulations,
- · Local greenway plans and,
- Ecosystem Enhancement Program Watershed Plan.

In addition to the above resources that were gathered, Biohabitats conducted a thorough literature search in peer-reviewed academic journals to document the latest scientific findings on topics including minimum wildlife corridor widths, minimum wildlife habitat patch size, minimum edge width ranges for interior forest habitat, and minimum width ranges for wetland buffers. A list of the peer-reviewed literature researched for this project is in **Appendix 1**. In addition, a list of reports and information from other sources such as local and state entities is included.

In August 2006, Biohabitats staff spent two weeks in the field with support from UNC staff to acquire more detailed information on the site and to ground truth conditions identified



through the previous information-gathering process. Biohabitats staff collected data in the field which included information on:

- Vegetation community descriptions,
- Vegetation community boundaries,
- Percent canopy cover (overstory, midstory, shrub and herbaceous layers),
- Dominant tree species and tree age,
- Estimated age class of the stand,
- Invasive species presence,
- Stream channel characterization,
- Degree of channel incision,
- General bank stability,
- General aquatic habitat quality.

JRM staff conducted a review of jurisdictional laws pertaining to ecological features on the site, jurisdictional feature searches on the site including threatened and endangered species surveys, identification of wetlands and delineation of streams. The information collected by JRM is integrated into the Biohabitats analysis throughout this document. The JRM report is included in **Appendix 2**.

As an additional last step in soliciting input and feedback from stakeholders, a public listening session was conducted on November 6, 2006 (See Section VII for more detail). Dialogue included asking stakeholders about specific ecological studies and reports that they were aware of pertaining to the site and region. Biohabitats staff cross-referenced and verified that all sources recommended at the listening session had been part of the data discovery process. Stakeholders were also encouraged to share views on what site features or experiences were meaningful to them.

III. ECOLOGICAL INVENTORY MAPPING

Biohabitats utilized the information gathered and an initial synthesis, integration and analysis of the data to produce a site base map (with aerial photography, site boundaries, roads, etc.), a site base map including a two-mile surrounding radius and site inventory maps for:

- Water Resources,
- Geologic Formations,
- · Soils Groups,
- Approximate Tree Stand Age,
- Land Use/Land Cover,
- · Morphology,
- Landscape Ecology,
- Regional Landscape Ecology,
- State and Local Government Natural Areas Designation,
- Cultural and Historic Resources.

The information included in the inventory maps consists of the previously mentioned digital, graphical, and print data, reviewed scientific literature information, and site data that was gathered in the field. This information was organized and incorporated into the inventory maps using accepted ecological principles and best professional judgment. Copies of the inventory maps are in **Appendix 3**. A description of each inventory map follows.

A. WATER RESOURCES

Information depicted on this map includes:

- 1. all streams and their flow regime (University shapefiles, JRM shapefiles and JRM field determinations),
- 2. stream order (Biohabitats analysis),
- 3. major and minor drainage divides (Biohabitats analysis),
- 4. wetlands (JRM and Arcadis analyses),
- 5. the impoundment on Crow Branch,
- 6. regulatory stream buffers for Carrboro and Chapel Hill (JRM, Town of Carrboro, and Town of Chapel Hill - Note: the Carrboro buffer boundaries are estimated based on slopes generated from digital topography and the Chapel Hill boundaries are based on estimates representing 3 feet above the elevation of the 100 year floodplain as determined by FEMA),
- 7. the FEMA 100-year floodway and floodplain and 500year floodplain.

B. GEOLOGIC FORMATIONS

Information depicted on this map includes:

- 1. small circular-shaped formations where specific field data were recorded by the N.C. Geological Survey staff,
- 2. larger non-circular and irregular shaped formations that

are interpretive estimations of the geology made by N.C. Geological Survey staff, and

3. the N.C. Geological Survey formation descriptive names.

C. SOIL GROUPS

Information depicted on this map includes:

- 1. individual soil series mapping from the Natural Resources Conservation Service and
- 2. soil series names, abbreviations and descriptions.

D. APPROXIMATE TREE STAND AGE

Information depicted on this map includes:

- 1. approximate tree stand age boundaries estimated from tree cores, field reconnaissance and analysis of historic aerial photography by Biohabitats,
- 2. stand age increments based on field data and historic aerial photography.

E. LAND USE/LAND COVER

Information depicted on this map includes:

- 1. project areas by land use cover type (system developed by Biohabitats based on field reconnaissance data and aerial photography),
- 2. the abandoned landfill boundary (estimated using the Phase I Remedial Investigation Report for UNC Old Sanitary Landfill Site, prepared by Rust Environment and Infrastructure, November 1997), and
- 3. the chemical waste site boundary (supplied by UNC).





F. MORPHOLOGY

Information depicted on this map includes:

1. topography and infrastructure footprint information from UNC (GIS analysis by Biohabitats).

G. LANDSCAPE ECOLOGY

Information depicted on this map includes:

- 1. streams and stream flow regimes (from UNC and JRM data),
- 2. riparian conservation buffers (150 and 300 meter widths, based on Biohabitats' scientific literature search and GIS implementation), and
- 3. forest interior areas, 50 meter forest/edge transition areas and 100 meter forest edge areas (based on Biohabitats' scientific literature search and GIS implementation).

H. REGIONAL LANDSCAPE ECOLOGY

1. streams and stream flow regimes (from UNC and JRM

- data) shown at the 2-mile radius scale,
- 2. conservation buffers (150 meter and 300 meter widths, based on Biohabitats' scientific literature search and GIS implementation), and
- 3. Forest patches (delineated by Biohabitats).

Note that stream data outside of the Carolina North property was not always complete with perennial, intermittent, and ephemeral designations. These stream lines are shown as undefined and do not have associated buffers shown.

I. STATE, LOCAL GOVERNMENT, AND CITIZEN GROUP NATURAL AREA **DESIGNATIONS AND PROPOSALS**

Information depicted on this map includes:

- 1. the N.C. Natural Heritage Program's Bolin Creek Natural Heritage Area,
- 2. area proposed by Friends of Bolin Creek, adopted by the Town of Carrboro, and subsequently updated for this assessment,
- 3. a federally protected species list (from the U.S. Fish and Wildlife Service). It should be noted that no federally protected species are known to be present on the Carolina North site.

J. CULTURAL AND HISTORIC RESOURCES

Information depicted on this map includes:

1. N.C. State Historic Preservation Office cultural sites and a list with comments.



IV. RESOURCE ANALYSIS-METRIC ATTRIBUTE DEVELOPMENT AND GIS ANALYSIS

To identify areas that are relatively more suitable for conservation or development, a process was developed and refined by Biohabitats that used landscape ecology principles, a site metric classification system, and GIS to facilitate resource valuation.

Physical and ecological site attributes identified in the site inventories were organized and Ecological Analysis Metric Attribute Maps were produced under the following metrics:

- Streams,
- Wetlands,
- · Groundwater,
- · Geomorphology,
- Vegetation,
- Landscape ecology,
- · Wildlife habitat, and
- Cultural and Historic.

Attributes were selected and assigned to each metric after considering the amount of available pertinent information and accepted ecological principles, and then applying best professional judgment. The objective of this process was to establish appropriate data coverage for each metric. As a result, different metrics have different numbers of attributes assigned to them. The attributes of each metric were then mapped in GIS (the GIS maps for each of the metrics attributes are located in Appendix 4). A brief discussion of the metric attributes mapping follows.

A. STREAM METRIC ATTRIBUTES

Information depicted on this map includes:

- 1. all streams and their flow regime,
- stream quality (habitat high, medium and low, as determined through visual assessments made in the field by Biohabitats),
- estimated regulatory stream buffers for Carrboro and Chapel Hill, and conservation buffers (150 and 300 meter), and
- 4. the 50 year floodplain (estimated as one third of the 100-year floodplain) and the FEMA 100-year floodplain.

B. WETLAND METRIC ATTRIBUTES

Information depicted on this map includes:

- 1. hydric soils,
- 2. special isolated wetlands such as vernal pools, and
- 3. conservation buffers (0-100 and 100-200 foot widths).



C. GROUNDWATER METRIC ATTRIBUTES

Information depicted on this map includes:

- 1. high, medium and low soil permeability (groundwater recharge) zones, and
- 2. high, medium and low depth to groundwater (<1.5 feet, 1.5-3 feet and >3 feet).

D. GEOMORPHOLOGY METRIC ATTRIBUTES

Information depicted on this map includes:

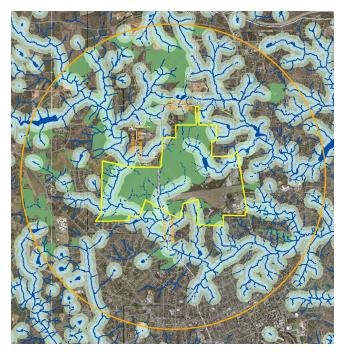
- 1. soil erodability (K factor*),
- 2. slope (0-15%, 15-25%, and >25%), and
- 3. morphological 50-year floodplain.

*Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

E. VEGETATION METRIC ATTRIBUTES

Information depicted on this map includes:

- 1. rare, threatened or endangered species or habitat,
- 2. tree age classes (0-50 years, 51-75 years, >75 years), and
- 3. relative species abundance (low, medium and high).



F. LANDSCAPE ECOLOGY METRIC **ATTRIBUTES**

Information depicted on this map includes:

- 1. habitat corridors (primary, secondary and isolated),
- 2. habitat corridor widths (0-150 meters and 151-300 meters), and
- 3. corridor structural integrity (solid->90% forest cover, porous-50-90% forest cover and stepping stone-<50% forest cover).
- 4. Natural Heritage Program or other designation,
- 5. total forested patch size (0-24 acres, 25-39 acres, and > 40 acres), and
- 6. interior forested patch size (0-24 acres, 25-39 acres, and > 40 acres).

G. WILDLIFE HABITAT METRIC ATTRIBUTES

Information depicted on this map includes:

- 1. identified endangered species critical habitat,
- 2. hardwood stands (<50 years old and >50 years old),
- 3. migratory bird habitat (pond), and
- 4. vernal pool.

H. CULTURAL AND HISTORIC METRIC **ATTRIBUTES**

Information depicted on this map includes:

1. historic sites (nationally registered and identified occurrences).

I. EDGE EFFECT-OUTPUTS OF CAROLINA NORTH TO THE REGION AND INPUTS OF THE REGION TO CAROLINA NORTH

During the public review sessions on December 13, 2006, two participants asked if Biohabitats had analyzed the effect that development on Carolina North might have on surrounding properties as part of the metrics and evaluation of the property.

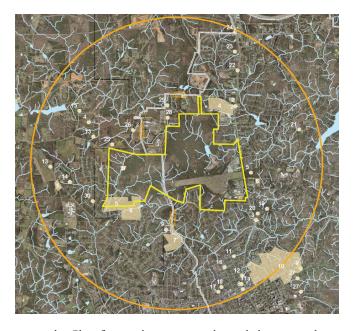
Development near borders of any site may affect other property, and development that could adversely affect stream quality could affect properties downstream from that development. For example, development in the Bolin Creek watershed, either upstream from or on the Carolina North property could affect Bolin Creek and its tributaries that are located on the Carolina North property. However, detailed data on ecological attributes outside the Carolina North property were not available and the collection of those data was beyond the scope of this study. An analysis of potential impacts based on the established study protocol and metric approach was thus not feasible. Consequently, the Ecological Assessment that was conducted considered only the Carolina North property itself.

V. METRIC CLASSIFICATION SYSTEM AND SUITABILITY ANALYSIS

A simplified system was developed that grouped similar ecological attributes into metrics and then classified each attribute so that they could be differentiated and assessed geospatially. The classifications and values assigned to them were constructed based on the information synthesized in the metrics, accepted ecological principles, and best professional judgment. The Classifications for attributes are:

- Classification 0 Disturbance will result in no ecological impact*,
- Classification 1 Disturbance will result in marginal ecological impact,
- Classification 2 Disturbance is acceptable if Best Management Practices (BMPs) or restrictions are applied**,
- Classification 3 Disturbance will compromise ecological integrity,
- Classification +1 Regulatory restrictions or conservation areas are present.
- Disturbance is defined as those activities related to construction, development, and operations and maintenance of the site. It does not include activities such as prescribed burning that are used to improve the ecological integrity.
- BMPs refer to structural and non-structural practices that are applied in these areas to protect existing ecological resources and processes. These BMPs go beyond the standard level of practice BMPs that may be associated with typical construction and development activities in areas of the site. Examples might include redundancy of erosion and sediment control practices, expanded tree protection zones, use of trenchless technologies, etc.

The Metrics and Classifications Table is included in Appendix 5. In this system, attributes in Classifications 0-3 may also occur where regulatory restrictions apply or where conservation areas have been proposed or identified. In those cases, the Classification +1 is also applied to the attribute. The result for each attribute is a Land Suitability Index (LSI), which is a value that is assigned to that particular attribute in the GIS analysis. In the case where attributes are



assigned a Classification between 0 and 3 and also assigned a Classification of +1, the Land Suitability Index is increased by one unit. The range of Land Suitability Index values in the Metrics Table is therefore 0-4. As an example, an attribute with a Classification of 3 and a Classification of +1 has a resultant LSI of 4, as in the case of perennial streams.

In the GIS analysis and mapping of each metric, Land Suitability Index categories were statistically derived in the ArcGIS software from the data. Each category was given a different, distinctive, light color shade for the category corresponding to the lowest index value areas (i.e., areas associated with the metric that are less sensitive to disturbance), and increasingly darker shades for the remaining index categories (i.e., corresponding to areas associated with the metric that are most sensitive to disturbance). The maps associated with the Metric Suitability Analysis are included in **Appendix 6**. It is important to remember that the ranges of sensitivity shown on each map are only with respect to the metric being analyzed. The full implication of the Metric Suitability Analysis is ultimately realized when all the metrics are combined, as is described and presented in the following sections.

VI. COMPOSITE MAPS

A summary of the ecological assessment methodology to this point may help clarify the purpose and usefulness of the composite maps discussed in this section. The steps in the analysis to this point have been:

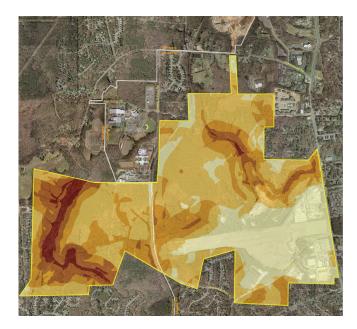
- data gathering-GIS, maps, narrative, and field data were compiled and analyzed
- · ecological inventory maps were made for pertinent ecological, and cultural and historic site characteristics
- similar ecological (and cultural and historic) attributes were combined to form site metrics
- · attributes within each metric were assigned to classifications
- · a Land Suitability Index was derived for each attribute based on classification(s)
- attributes were mapped in GIS for each metric using the Land Suitability Index, the lightest shading corresponding to the lowest Index value category, and darker shading corresponding to increasing Land Suitability Index category values.

When this basic approach is applied to all eight metrics it is then possible to use that data to conduct composite analyses, which merge metrics in various combinations. Several approaches and methods of analysis can be applied to render output, which in turn can effectively inform the master planning process in terms of identifying areas most suitable for conservation and areas most suitable for development. In the following sections, three different analysis methods are presented for consideration.

A. COMPOSITE MAP – BASELINE ANALYSIS

Using GIS, all the metric layers were brought together, by overlaying and collapsing on a single map all the Land Suitability Index values for all the attributes in all the metrics. The Land Suitability Index values for all the respective metrics were then compiled onto a composite map. The Land Suitability Index values generated by the compilation of metrics on the composite map ranged from 1 to 56.

An algorithm in ArcGIS software (Natural Breaks-Jenks Classification) was used to create 5 statistical Land Suitability Index categories for this 1-56 value range. The algorithm combines two methods. The first is Natural Breaks, where the data is partitioned into categories based on natural groups in distribution (low points in the data histogram). The second is the Jenks Classification, a method



of statistical data classification that partitions data into classes using an algorithm that calculates groupings of data values based on the data distribution. Jenks optimization seeks to reduce variance within groups and maximize variance between groups.

With the five categories generated by the algorithm, GIS was then used to create a map with different color shades for each Land Suitability Index Category (LSIC). The LSIC's for the Composite Map are as follows:

Category A Disturbance will have marginal ecological impact,

Category B Disturbance will have relatively minimum to moderate ecological impact,

Category C Disturbance will have relatively moderate to high ecological impact unless BMPs or restrictions are applied,

Category D Disturbance will have relatively high ecological impact, even with BMPs or restrictions,

Category E Disturbance will compromise ecological integrity.

The lightest shading on the Composite Map corresponds to the lowest LSIC (i.e., Disturbance will have marginal ecological impact). With each subsequent LSIC category, the color shade is darker on the map, with Category E having the darkest shading (see Appendix 7 for the composite map). Table 1 shows the land area breakout for each LSIC.

TABLE 1. BASELINE ANALYSIS LAND AREAS BY LAND SUITABILITY INDEX CATEGORY

Category ID	Category Name	Area (Acres)	Area (% of Total)
А	Suitable for Disturbance	211	21%
В	Suitable for Disturbance with Limited BMPs	420	41%
С	Suitable for Disturbance with BMPs	282	27%
D	Suitable for Conservation	95	9%
Е	Most Suitable for Conservation	16	2%
Total		1,024	100%

B. COMPOSITE MAP – WEIGHTED ANALYSIS

In order to observe how category areas can change as a function of weighing certain metrics and attributes more than others, a weighted analysis was performed. This analysis places twice as much emphasis on all the Landscape Ecology metric classification values, and illustrates the effect this weighting has on the comprehensive suite of metrics. Specifically, the weighted analysis emphasizes wildlife corridor regional importance, width, and structural integrity, as well as forest patch and forest interior patch sizes. The Landscape Ecology Metric was chosen based on the data quality and reliability, recognition that the metric encompasses critical ecological attributes that are not afforded regulatory protections comparable to floodplains and stream buffers, input received from stakeholders, and from best professional judgment. GIS was used in a similar way as described for the Baseline Analysis to generate the output (see Appendix 7 for map), again presented as five Land Suitability Index Categories. Table 2 shows the land area breakout for each LSIC.

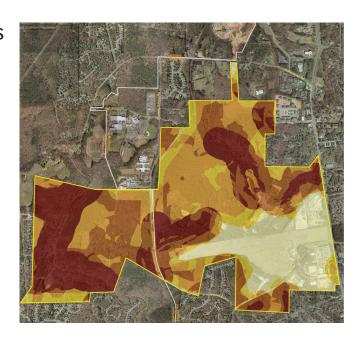


TABLE 2. WEIGHTED ANALYSIS LAND AREAS BY LAND SUITABILITY INDEX CATEGORY

Category ID*	Category Name	Area (Acres)	Area (% of Total)
AW	Suitable for Disturbance	181	18%
BW	Suitable for Disturbance with Limited BMPs	94	9%
CW	Suitable for Disturbance with BMPs	322	32%
DW	Suitable for Conservation	228	22%
EW	Most Suitable for Conservation	199	19%
Total		1,024	100%

^{*} The "W" notation in the Category ID signifies it is the weighted analysis

C. COMPOSITE MAP – VERTICAL ANALYSIS

During the peer review session on November 28, 2006, it was suggested by a participant that another analysis of the metric ecological attribute data should be performed in which all areas of the site that had received a classification of 3 are identified (see Section VII for more detail on the peer review session). Some areas received a classification of 3 more than once within a single metric (e.g., Landscape Ecology) and some areas received a classification of 3 more than once across all the metrics. GIS was used to count the number of instances that the classification of 3 was assigned to a particular area and delineate areas with similar numbers of counts or occurrences. Since all areas of the site that received a classification of 3 at least once are identified, this analysis is called a vertical analysis, which infers a concentration of attention on attribute areas in the classification 3 column (Disturbance will compromise ecological integrity) of the metrics Table (Appendix 5). Similar to the Overlay Composite analysis described above, GIS-based statistical procedures were used to develop three Land Suitability Index Categories, and color shading schemes (see Appendix 7 for the map).

Since this analysis is based only on the Classification 3 areas, defined as "Disturbance will compromise ecological integrity," the category names are as follows:



Category AV Disturbance will compromise ecological integrity - LOW

Category BV Disturbance will compromise ecological integrity - MEDIUM

Category CV Disturbance will compromise ecological integrity - HIGH

Table 3 shows the land area breakout for each LSIC.

TABLE 3. VERTICAL ANALYSIS LAND AREAS BY LAND SUITABILITY INDEX CATEGORY

Category ID*	Category Name	Area** (Acres)	Area (% of Total)
AV	Disturbance will compromise ecological integrity-LOW	489	57%
BV	Disturbance will compromise ecological integrity-MEDIUM	338	40%
CV	Disturbance will compromise ecological integrity-HIGH	29	3%
Total		856	100%

^{*} The "V" notation in the Category ID signifies it is the vertical analysis. In addition, approximately 165 acres of the site had no Classification 3 designations. These areas have no shading associated with them on the map in **Appendix 7**.

Designated conservation areas and areas with regulatory restrictions occupy approximately 197 acres of the site and are shown on a map in Appendix 7.

^{**}Total acreage of the site may vary based on measurement technique and analyses conducted and associated rounding errors.

VII. PEER REVIEW AND PUBLIC REVIEW

Four review sessions were held during the ecological assessment process of the site –

- A public listening session of November 6, 2006
- A peer-review session on November 28, 2006 and
- Two pubic review sessions on December 13, 2006

The public listening session on November 6, 2006 was held to gather information and input the public had on the site. Invited citizens and university faculty were shown maps of the site and were asked to write comments or indicate areas of interest on the maps. Biohabitats staff led the discussion, solicited pertinent information from the group, and recorded the major topics of discussion.

The peer review session on November 28, 2006 involved a more limited audience that included University professors, University staff, and invited members of the community. The process invited comments and suggestions from participants and provided a vetting process for the analyses completed to date. Excellent suggestions and recommendations were offered by attendees, which were factored into future analyses. Most notable of these was the suggestion to analyze the data as explained in the Vertical Analysis.

The final two public review sessions were held at different times on December 13, 2006. A broad group of interested parties attended and contributed useful insight and thoughtful questions. Where relevant and appropriate, Biohabitats incorporated suggestions into the analysis and this report (e.g., edge effect discussion).

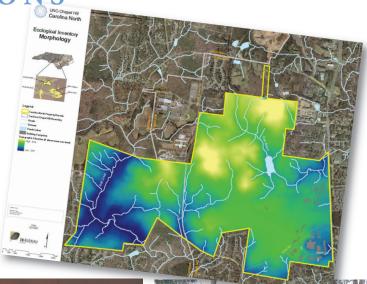
Attendee lists and other information pertaining to the Public and Peer Review sessions is in Appendix 8.



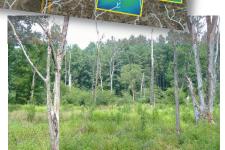


VIII. CONCLUSIONS

Biohabitats has conducted an ecological analysis and assessment of the Carolina North property to inform the master planning effort that is currently underway. The analysis relied on GIS as a powerful tool to compile, analyze and present a broad set of metrics and associated attributes. Three composite analyses were developed that can be used to determine areas most suitable for conservation, areas most suitable for development, and areas suitable for development with appropriate BMPs or restrictions.













APPENDIX 1

Literature Review List-Peer-Reviewed and State and Local Sources

CAROLINA NORTH ECOLOGICAL ASSESSMENT BIBLIOGRAPHY

RESEARCH JOURNAL ARTICLES

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APPENDIX 2

John R. McAdams Company, Inc. Report

November 22, 2006

Mr. Kevin Nunnery Biohabitats, Inc. Southeast Bioregion 8218 Creedmoor Road Suite 200 Raleigh, NC 27613

Re: UNC - Ecological Assessment for Carolina North

UNC-06010

Dear Mr. Nunnery:

The John R. McAdams Company conducted an investigation for possible jurisdictional wetland and stream features, threatened and endangered species, cultural and historic resources, and environmental regulations pertaining to the subject property located on the University of North Carolina at Chapel Hill – Carolina North property. The Carolina North property is an approximately 990-acre property in the general vicinity of Airport Road between Airport Drive and Estes Drive located in both Carrboro and the Town of Chapel Hill within Orange County, North Carolina. The review consisted of an examination of natural resource information sources and an on-site inspection for jurisdictional wetland and stream features and threatened and endangered species. The goal was to provide an initial field review of jurisdictional waters of the United States as defined by the 1987 U.S. Army Corps of Engineers (USACE) Wetland Delineation Manual, locate any threatened and endangered species, identify potentially significant cultural resource sites, and review environmental regulations pertaining to the subject property. We are pleased to forward a summary of our findings.

A review of the U.S. Geological Survey (USGS) quadrangle "Chapel Hill, NC", U.S. Fish and Wildlife Service "National Wetland Inventory" (NWI) Maps, the U.S. Department of Agriculture *Soil Survey of Orange County, NC*, and North Carolina Flood Insurance Rate Maps (FIRM map # 3710978900J, 3710977900J, and 3710988000J; preliminary 4/28/05) revealed two named streams located on the subject property (Crow Branch and Bolin Creek) and several unnamed stream features associated with each named stream.

Stream/Wetland Locations:

A series of on-site inspections were initiated from August 8th through August 22nd, 2006 with the intent of locating jurisdictional wetland and stream features located on the subject property. The origination point of each jurisdictional stream was identified and GPS surveyed. The approximate location of wetland boundaries was also noted. Detailed flagging of the jurisdictional wetland and stream boundaries did not occur. The attached

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2905 Meridian Parkway
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800-733-5646
919-361-5000

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Charlotte, NC

5311 Seventy-Seven Center Drive, Suite 66 Charlotte, North Carolina 28217 800-733-5646 704-527-0800 704-527-2003 Fax

Wetlands and Streams Exhibit depicts the approximate location and size prior to flagging and field surveying of the jurisdictional streams and wetlands located on the subject property.

Wetland Permitting

A Nationwide Permit (NWP) can be utilized if the project is designed to impact less than ½ acre of jurisdictional wetlands/waters of the U.S. including a maximum of 300 linear feet of important/mitigatable stream channel impact. A preconstruction notification to the USACE and DWQ will not be required for wetland impacts less than 1/10 acre. Pre-construction notification and approval will be required for wetland impacts that exceed 1/10 acre and/or any impacts to important/mitigatable streams. The processing time for a NWP pre-construction notification is 45 days with the USACE and 60 days for DWQ. All projects qualifying under a NWP are required to submit a report (post-construction notification) within 30 days of completing the construction activity describing and quantifying the impacts stating that the conditions of NWP have been adhered to.

Cumulative impacts for a project over the specific NWP thresholds of 0.5-acres of wetlands and/or 300 linear feet of stream channel will require an Individual Permit (IP). IPs require an analysis to determine that the proposed impact to waters of the U.S. is the least environmentally damaging practical alternative, typically require compensatory mitigation, notification to adjacent property owners, a public notice, and may require a public hearing. All projects, whether qualifying for a NWP or applying for an IP, require written justification for wetland impacts greater than 0.10-acres. In addition, any stream impacts within a buffered river basin require notification.

Development and land disturbing activity within the 100-year floodplain and floodway zones shall be prohibited, except as provided by certain development activities allowed in the floodplain and floodway zones, or allowed pursuant to a variance approved by the Board of Adjustment.

Wetland Mitigation

The USACE can require mitigation for any stream or wetland impacts. In most cases, stream mitigation is not triggered until impacts approach 150 linear feet; wetland mitigation is usually triggered when impacts exceed 1/10 acre. Table 1, below, is the current In-Lieu Fee Schedule (effective July 1, 2006) from the North Carolina Ecosystem Enhancement Program (EEP), in which monetary payment could be paid, to offset wetland and stream impacts. It should be noted, EEP is proposing to revise the In-Lieu Fee Schedule. Final revisions to

the In-Lieu Fee Schedule are forthcoming. Currently, fees are uniform across the state and reflect an average cost of mitigation. EEP proposes to specify three categories (Urban, Coastal, and Rural counties) based on varying costs incurred in different parts of the state in order to more accurately reflect actual costs. Table 1, below, indicates the proposed changes applicable to the subject property.

Table 1. EEP In-Lieu Fee Payments

Fee Category	Unit	Fee per Unit (Proposed Changes)
Stream	linear foot	\$232 (\$332)
Non-riparian wetland	acre	\$13,924 (\$21,000)
Riparian wetland	acre	\$27,847 (\$56,000)
Riparian Buffer	square foot	\$0.96

In addition to mitigation, demonstration of avoidance and minimization of impacts to waters of the U.S. will be required as justification for impacts requested, as noted above. This will all be required during the permitting process.

Natural Resource Areas within Municipalities:

The subject property is located within the Cape Fear River Basin. Currently, the North Carolina Department of Environment and Natural Resources – Division of Water Quality (DWQ) does not have buffer rules for the Cape Fear River Basin. Orange County Buffer Regulations do not apply to the subject property; however, municipal jurisdictions (Chapel Hill/Carrboro)have instituted their own natural resource buffers as described below.

Town of Chapel Hill

Resource Buffers

Within the Town of Chapel Hill, a Resource Conservation District (RCD) overlay is applied to all perennial streams, intermittent streams and perennial water bodies, and any areas within 3-feet above 100-year floodplain elevations. These areas within the RCD have limited allowable uses, and are buffered per buffered the requirements described below. Streams determined to be ephemeral are excluded from the RCD and have separate restrictions and are discussed below within the Stormwater Management Requirement section of this letter. RCD determinations are made by the Town of Chapel Hill staff.

Located on the subject property are Crow Branch and Bolin Creek which have 100-year floodplain associated with them. The RCD applies to all land area in the floodplain and land area within 3-feet above floodplain elevation. The Town of Chapel Hill adopted a Land Use Management Ordinance (LUMO, effective January, 2003) establishing riparian buffer requirements from the RCD. All perennial streams shall have a 50-foot Stream Side Zone, 50-foot Management Use Zone, and a 50-foot Upland Zone for a total of 150-foot riparian buffer from the top of bank. All intermittent streams and pond features shall have a 50-foot Stream Side Zone to serve as a riparian buffer from the top of bank. These varying stream buffers are depicted on the Wetlands and Streams Exhibit.

Allowable Uses

The Town of Chapel Hill has established a table of uses allowed within each zone of the stream buffers (see Appendix 1, Table 3.6.3-2: Permitted Uses within Resource Conservation District). For both intermittent and perennial streams, the 50-foot Stream Side Zone restricts most uses except for the following: a) public utilities and storm drainage facilities, b) trails and sidewalks, and c) streets and bridges. The 50-foot Management Use Zone associated with perennial streams allows the uses permitted in the Stream Side Zone with the following additional uses: a) play areas, pastures, plant nurseries, gardens, and other similar uses that do not require the use of fertilizers and pesticides, b) archery ranges, picnic structures, and playground equipment, and c) detention/retention basins and associated infrastructure. The 50-foot Upland Zone associated with perennial streams allows the uses permitted in the Stream Side Zone and Management Use Zone with the following additional uses: a) lawns and golf course fairways, play fields, and other areas that may require the use of pesticides.

Steep Slope Regulations

In accordance with the Chapel Hill LUMO, all developments shall comply with the provisions of applicable soil erosion and sedimentation control regulations located within Section 5.3. As part of this, there are Steep Slope regulations requiring special construction techniques in steeply sloped areas in order to protect water quality and water integrity, protect plant and animal habitat, and preserve natural beauty. Construction activities on slopes greater than 10% require site preparation techniques which minimize grading and site disturbance. Building and site preparation may occur upon demonstration of specialized site design techniques for slopes greater than 15%. Land disturbance

shall not exceed 25% of the area containing 25% or greater slopes unless a variance is granted by the Board of Adjustment.

Carrboro

Resource Buffers

The Town of Carrboro has also established riparian buffer rules within their Land Use Ordinance (Section 15-269, amended 11/19/02) The buffer rules area applicable to intermittent streams, perennial streams, and floodplains for a region known as the "Northern Transition Area", as depicted on Carrboro's Northern Transition Area Stream Buffer Map (NTA). Buffers on major streams and floodplains, as defined on the NTA map, are calculated by adding 100 ft plus (4 x slope x 100). The buffer is measured from the 100-year floodplain, or if no floodplain exists, it is taken from the stream bank. Bolin Creek and the perennial streams flowing into Bolin Creek are considered major streams within the NTA. Intermittent Streams flowing into Bolin Creek and its perennial tributaries require a 60 ft buffer from their stream bank. Minor intermittent streams within the NTA require a 30 ft buffer from their stream bank. Stream classifications and buffers distances/areas are normally submitted to the Town of Carrboro's consultant for final verification.

Allowable Uses

In accordance with the NTA buffer ordinance, existing natural vegetation in a buffer area shall not be disturbed unless it is permitted by the Town of Carrboro as one of the allowable uses. These allowable uses are limited to linear transportation and utility crossings.

Conservation Areas / Steep Slope Regulations

The Town of Carrboro has established restrictions for development impacts within conservation areas, to include steep slopes as defined in Article XIII. Recreational Facilities and Open Space in the Town of Carrboro's Land Development Ordinance. "Primary conservation areas" are defined as areas containing slopes greater than 25%, hardwood areas identified on the "Carrboro Natural Constraints Map", wetlands, floodplains, stream buffers, lakes and ponds, and some road buffers. Secondary conservation areas are defined as slopes between 15 and 25%, wooded areas, other than hardwood areas, identified on the "Carrboro Natural Constraints Map", vistas along entrance ways to the town, rock formations, and historical, archaeological, or

unique areas. Development is restricted within these areas and limited to roadway crossings, utility crossings, and passive recreational purposes.

Stormwater Management Requirements:

Stormwater Management: NC Division of Water Quality Standards

The DWQ Stormwater Management Program protects waters by restricting impervious surface development, maintaining vegetative buffers, and prescribing vegetative conveyances to transport runoff. DWQ has assigned the section of Bolin Creek located a stream index number of 16-41-1-15-1-(0.5) and a stream classification of Class C and Nutrient Sensitive Waters (NSW). DWO has assigned the Crow Branch a stream index number of 16-41-1-15-2-2 and a stream classification of Class B and NSW. Class C waters are protected for secondary recreation, fishing, wildlife, fish and aquatic life propagation and survival, agriculture and other uses. There are no restrictions on watershed development or types of discharges. Class B Waters are used for primary recreation and other uses and there are no restrictions on watershed development or types of discharges. In general, management strategies are site-specific for NSW waters and require control of pollutants for water quality benefits. Water quality certification from DWQ to disturb these streams, and associated tributaries, is required. A typical requirement of the water quality certification is the review and approval from DWQ for a stormwater management system designed to achieve 85% total suspended solids (TSS) removal. Additionally, DWQ mandates the use of one of the three following methods for achieving this requirement: 1) Wet Detention Ponds followed by a forested filter strip, 2) Extended Detention Stormwater Wetlands, or 3) Bioretention Areas. Special permission from the DWQ will be required to use below ground stormwater management facilities to meet the requirements of a water quality certification.

Stormwater Management: Town of Chapel Hill Standards

The Town of Chapel Hill enforces strict stormwater management requirements for new developments. The following are the performance standards for site stormwater management plans. as is stated within the Land Use Management Ordinance, Section 5.4.6:

Stormwater treatment must be designed to achieve an average annual TSS removal efficiency of 85%. This removal standard applies to the volume of runoff that is generated by the first inch of rainfall.

- The stormwater runoff <u>volume</u> leaving the site in the post-development condition cannot exceed the volume leaving the site in the predevelopment condition for the two-year, 24-hour storm event. The reduction in volume may be attained by hydrologic abstraction, recycling and/or re-use, or any other acceptable scientific method.
- The stormwater runoff <u>rate</u> leaving the site in the post-development condition cannot exceed the rate leaving the site in the pre-development condition for the one-, two-, and 25-year, 24-hour storm events.
- Land disturbance within the stream channel of any <u>ephemeral</u> stream shall be minimized and prohibited unless explicitly authorized by issuance of a Zoning Compliance Permit after demonstration of the necessity for the disturbance. Ephemeral streams are designated as such by Town staff upon site inspection. The true definition of an ephemeral stream is a channel that carries flow only in direct response to a rainfall event and in all cases is elevated above the groundwater table in the area.

This subject property is not located within a water-supply watershed protected area, and it is not currently located within a designated river basin requiring specific State mandated nutrient and/or runoff rate controls. However, it is expected that on or about the summer of 2007, regulations will be enacted on a State level that will require this development to comply with nutrient and peak flowrate reduction and control strategies. It is not yet known when these regulations may apply at a local level. These requirements are part of draft regulations intended to protect the water quality of Jordan Lake. Per the current draft regulations being considered, the following would apply to development on the subject property:

- Riparian buffers of fifty feet from the top of bank of all intermittent and perennial streams as denoted on the most recent versions of the 1:24000 USGS topographic map or the Orange County Soil Survey Maps, unless the State Division of Water Quality concurs that the features shown on the maps do not exist in the field.
- Nutrient controls for stormwater runoff leaving the site limiting both nitrogen and phosphorus export.
- One year storm peak runoff <u>rate</u> controls (overlapping with the Town's runoff rate control requirements).

Stormwater Management: Town of Carrboro Standards

The Town of Carrboro also has stormwater management requirements for new developments. The following are the performance standards for stormwater management plans, as is stated within the Land Use Management Ordinance, Section 15-263.

- 1) All developments shall be constructed and maintained so that they do not cause stormwater-related damage to upstream or downstream properties as provided in the remaining provisions of this section. Compliance with this standard shall be determined in reference to storm events up to the 100-year storm for upstream properties and up to the twenty-five year storm for downstream properties. Effects on downstream drainage facilities within street rights-of-way shall also be evaluated for storm events up to the twenty-five year storm.
- 2) Developers shall design and construct all storm water drainage facilities in accordance with the guidelines set forth in the Town of Carrboro Storm Drainage Design Manual. However, the permit issuing authority may establish different requirements if it concludes, based upon the development proposal, recommendations of the Public Works Director, or the Town Engineer, that such deviations from the guidelines are necessary to satisfy the standards set forth in this section, or that the standards can still be met with such deviations and the deviations are otherwise warranted.

Cultural and Historic Resources:

The John R. McAdams Company reviewed maps and records located at the North Carolina State Preservation and Historic Office (SHPO) on August 3, 2006 for documented occurrences of cultural and historic resources sites on the subject property and within the vicinity. The locations of cultural and historic resources sites were noted and files were reviewed for each of the noted sites. Table 2, below, provides a summary of the NCSHPO review. The attached Wetlands and Streams Exhibit depicts the approximate location of cultural and historic resources sites located on the subject property boundary. The attached USGS with SHPO Exhibit depicts the approximate location of cultural and historic resources sites that lie outside the subject property boundary.

Table 2. SHPO Records Review

Item Number	SHPO Records Review Record	Comment	
1	31OR42	Un-assessed; Middle & Late Archaic; projectile point, debitage	
2	31OR272	Not Eligible; recorded during widening survey; historic period (former house site)	
3	31OR19	Not eligible; site destroyed by construction of church ball field revisited in 1992 in connection with road widening; Middle Archaic, Middle Woodland	
4	A	Archaeology reviewed areas; however, there was not a significant finding	
5	ER-87-8426	Not found to be significant	
6	ER-85-7596	Not found to be significant	
7	31-OR-272(SL)(DOE)	State List & State Register, Determined Eligible; Weaver House; 116 Walters Road	
8	31-OR-562(SL)	State List & State Register; Hudson- Merritt-McDade House; 133 W. Franklin Street	
9	31-OR-1260(LD)	Local Landmark; Franklin Rosemary Historic District, Icl.; E Franklin Street, Pritchard Avenue, McDade and Lindsay Streets	
10	31-OR-1449(SL)	State List & State Register; Old Tavern Building; 419 block Hillsborough Street	
11 11(a)	31-OR-327(NR)	National Register; Chapel Hill Town Hall; NW corner Franklin and Rosemary Streets; 11(a) is the former Town Hall location	
12	31-OR-506(SL)	State List & State Register; Lustron House; 109 Stephens Street; noted site	
13	31-OR-445	Thomas Hogan Farm; E si Old NC 86, 0.2 mi S of jct w/ SR 1777	
14	31-OR-446	Brodie Lloyd Farm; E si NC 86, 0.3 mi S of jet w/ SR 1777; noted site	

15	31-OR-448	Hogan Dairy, Clay Hogan, Dairy Farm Road; N si SR 1777, 0.4 mi E of jct w/ Old NC 86; noted site
16	В	Church # 605 Church Street; noted site
17	С	Hargraves Center; noted site
18	D	House 405 Lindsay Drive; noted site
19	E	House 7 Mt. Bolus Road; noted site
20	F	House 5 Mt. Bolus Road; noted site
21	G	Johnson Williams house; noted site
22	H	Maddry house; moved 4/97; noted site
23	I	Hogan house; noted site
24	J	House (Airport Road); demolished; noted site
25	31-OR-449	Hogan – William D. Hogan House; N si SR 1777, 1 mi W of jct w/ SR 1729; noted site
26	31-OR-450	Hogan - Hogan House; S si SR 177, 0.9 mi W of jct w/ SR 1729; noted site
27	K	Old Hogan Mill near here; noted site
28	L	2 old chimneys; noted site
29	M	1 story front gable; noted site
30	N	1 story side gable; noted site
31	0	1 story side gable; noted site

Threatened and Endangered Species:

NHP Review

The John R. McAdams Company reviewed databases, maps, and records located at the North Carolina Natural Heritage Program (NHP) office on August 3, 2006 for documented occurrences of uncommon species and unique habitats on the subject property and within the vicinity. The locations of uncommon species and unique habitats were noted and files were reviewed for each. Table 3, below, provides a summary of the NHP review. The

attached Wetlands and Streams Exhibit depicts the approximate location of uncommon species and unique habitats located on the subject property boundary. The attached USGS Natural Heritage Program Database Review Exhibit with SHPO Exhibit depicts the approximate location of uncommon species and unique habitats that lie outside the subject property boundary.

Table 3. NHP Records Review

Item Record Number		Comment	
1	7	Bolin Creek; significant Natural Heritage Area	
2	9	Hemidactylium scutatum; Rare Animal	
3	20	University Lake marsh; Natural Community	
4	4	On map; No data; Not in data base	
5	32	On map; No data; Not in data base	
6	23	University Lake Aquatic Habitat; Natural Community	
7	27	Pycanthemum torrei; Rare Animal	

Threatened and Endangered Species Field Inspections

Information concerning the occurrence of federally protected species within Orange County was obtained from the USFWS list of protected and candidate species (April, 2006 listings). A series of on-site inspections were initiated from August 8th through August 22nd, 2006 to determine the presence of threatened and endangered species on the subject property. The principal Federally listed species surveyed for include the following: bald eagle (Haliaeetus leucocephalus – Threatened [proposed delisting]), red-cockaded woodpecker (Picoides borealis – Endangered), Michaux's sumac (Rhus michauxii – Endangered), and smooth coneflower (Echinacea laevigata – Endangered). The USFWS also lists the dwarf wedgemussel (Alasmidonta heterodon – Endangered) as occurring within Orange County; however, this species was not surveyed for. In addition, surveys were not conducted for Federal Species of Concern (FSC). Based on the field surveys, no individual species were observed; however, potential habitat for the bald eagle, red-cockaded woodpecker, Michaux's sumac, and smooth coneflower was observed on the subject property.

The John R. McAdams Company appreciates the opportunity to provide our services for the referenced project. If you should have any questions, please do not hesitate to contact us at (919)361-5000. Sincerely,

THE JOHN R. McADAMS COMPANY, INC.

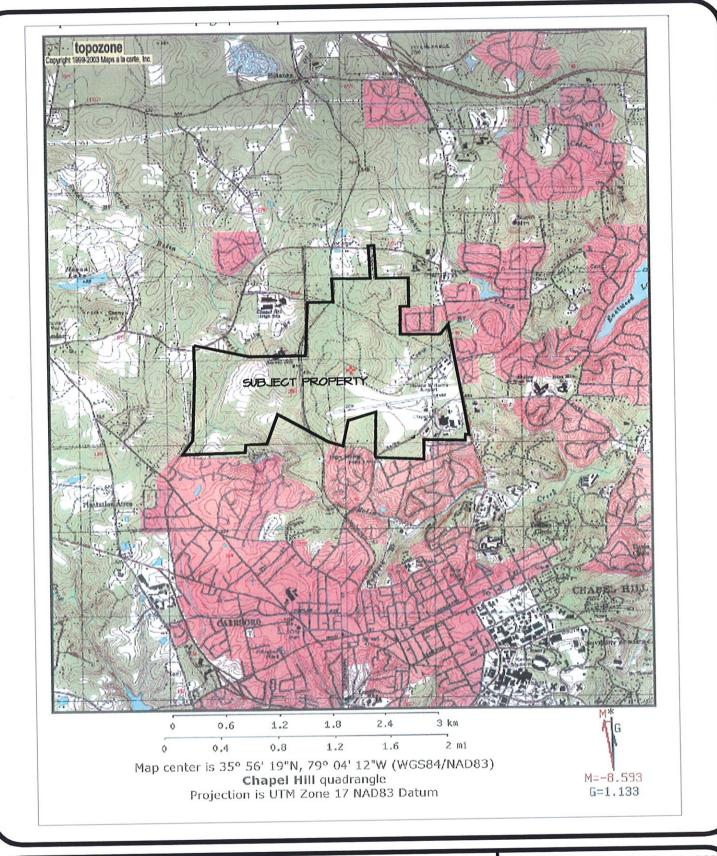
George Buchholz, REM, PWS Environmental/Wetland Scientist

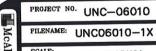
Stormwater and Environmental Department

Geage Buchnotzant

Kevin Yates

Senior Environmental/Wetland Scientist Stormwater and Environmental Department





AS SHOWN 11-22-06

CAROLINA NORTH

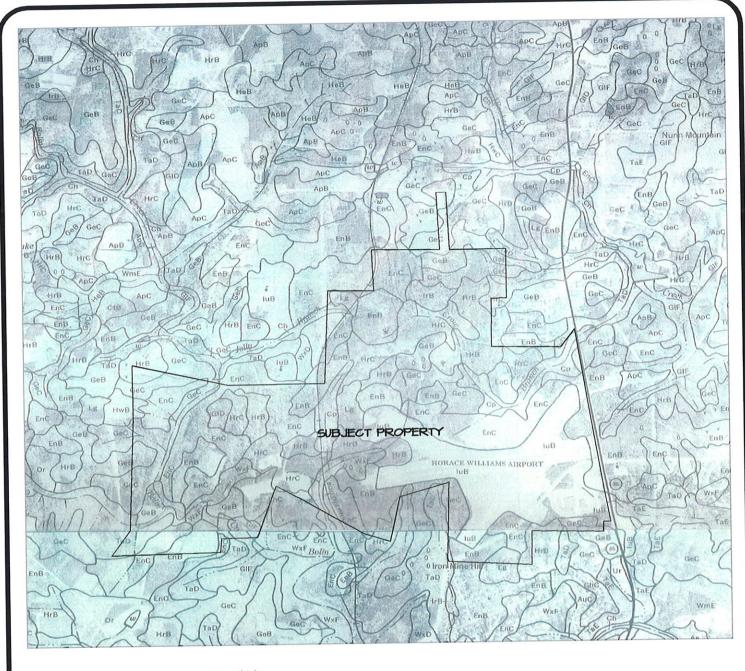
CHAPEL HILL QUAD CHAPEL HILL, NORTH CAROLINA



THE JOHN R. McADAMS COMPANY, INC.

ENGINEERS/PLANNERS/SURVEYORS

RESEARCH TRIANGLE PARK, NC P.O. BOX 14005 ZIP 27709-4005 (919) 361-5000



Cp - CONGAREE FINE SANDY LOAM

EnB - ENON LOAM, 2 TO 6% SLOPES

Enc - ENON LOAM, 6 TO 12% SLOPES

GeB - GEORGEVILLE SILT LOAM, 2 TO 6% SLOPES

GEC - GEORGEVILLE SILT LOAM, 6 TO 10% SLOPES

GID - GOLDSTON SLATY SILT LOAM, 6 TO 15% SLOPES

GIF - GOLDSTON SLATY SILT LOAM, 15 TO 45% SLOPES

HrB - HERDON SILT LOAM, 2 TO 6% SLOPES

Hrc - HERDON SILT LOAM, 6 TO 10% SLOPES IrB - IREDELL GRAVELLY LOAM, 1 TO 4% SLOPES

IVB - IREDELL-URBAN LAND COMPLEX, I TO 8% SLOPES

Lg - LIGNUM SILT LOAM, O TO 3% SLOPES

WXF - WILKES GRAVELLY LOAM, 15 TO 45% SLOPES

PROJECT NO. UNC-06010 FILENAME: UNC06010-1X 1" = 2,000'11-22-06

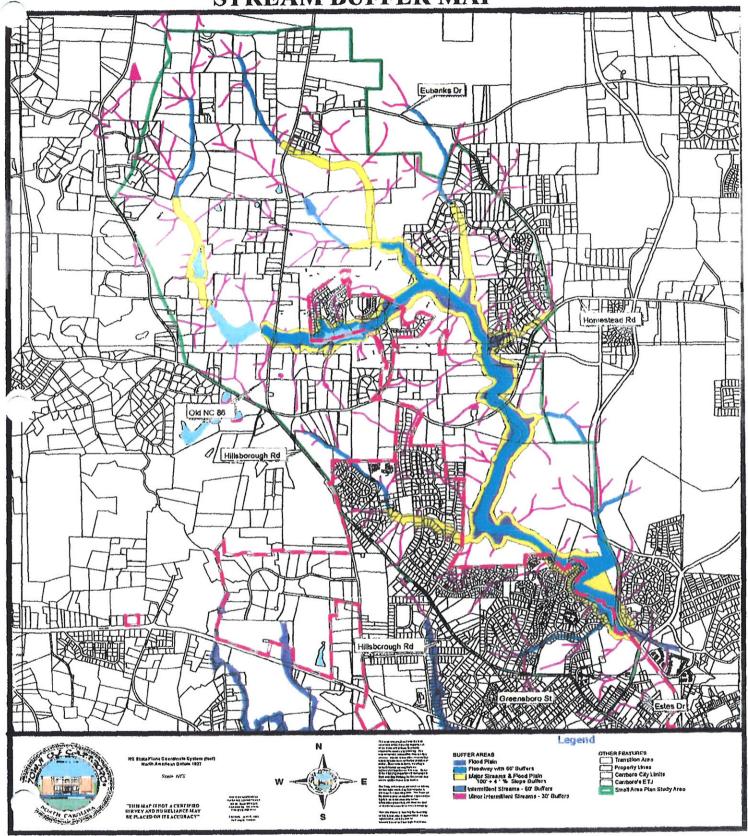
ORANGE COUNTY SOIL SURVEY CHAPEL HILL, NORTH CAROLINA

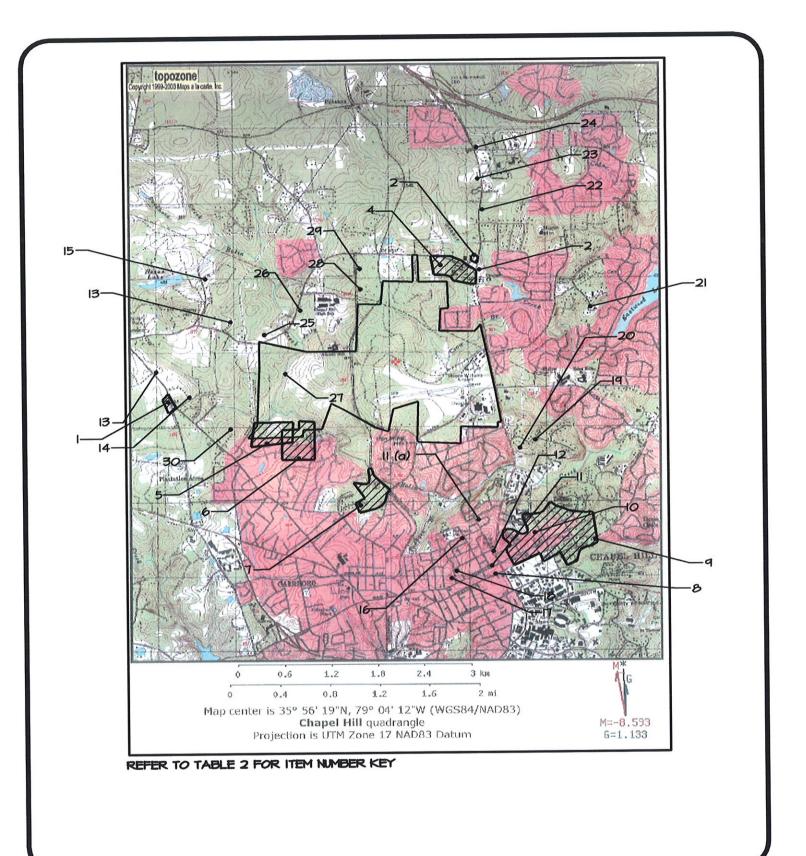
THE JOHN R. McADAMS COMPANY, INC.

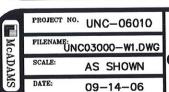
ENGINEERS/PLANNERS/SURVEYORS

RESEARCH TRIANGLE PARK, NC P.O. ROX 14005 ZIP 27709-4005 P.O. BOX 14005 (919) 361-5000

NORTHERN TRANSITION AREA STREAM BUFFER MAP





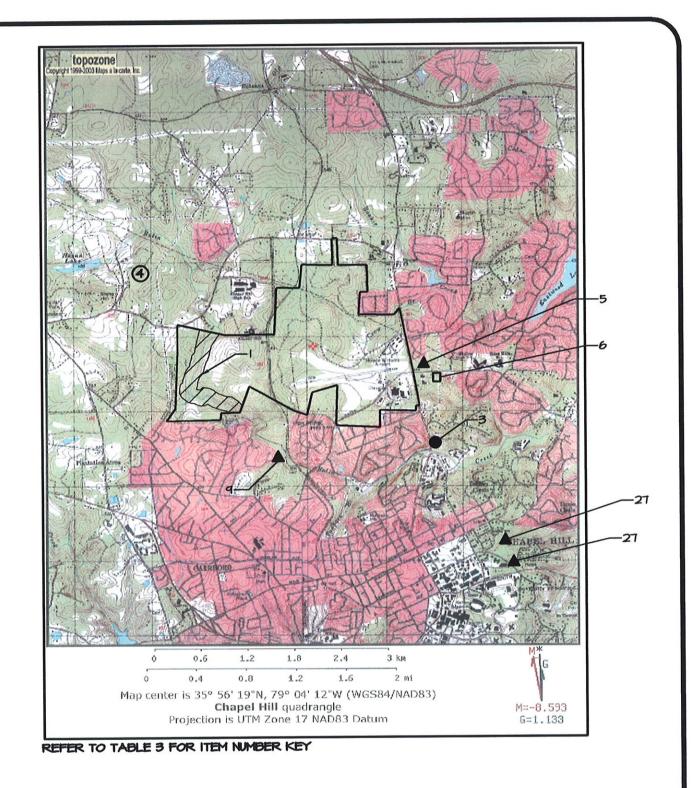


CAROLINA NORTH CHAPEL HILL, NORTH CAROLINA

SHPO LISTINGS - SUBJECT PROPERTY AND VICINITY



ENGINEERS/PLANNERS/SURVEYORS RESEARCH TRIANGLE PARK, NC P.O. BOX 14005 ZIP 27709-4005 (919) 361-5000



PROJECT NO. UNC-06010

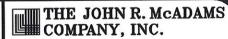
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SCALE: AS SHOWN

DATE: 09-14-06

CAROLINA NORTH CHAPEL HILL, NORTH CAROLINA

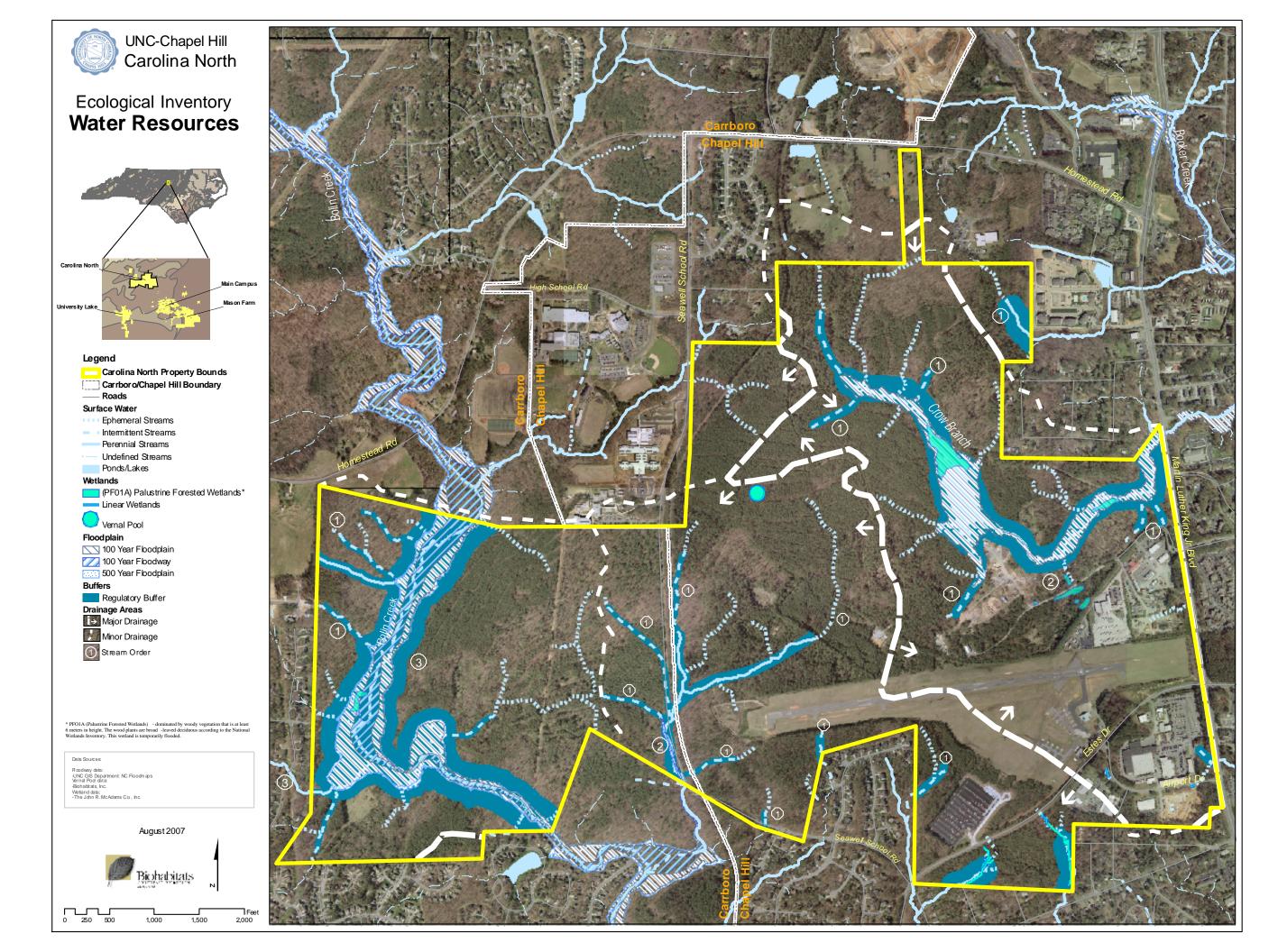
NHP LISTINGS - SUBJECT PROPERTY AND VICINITY

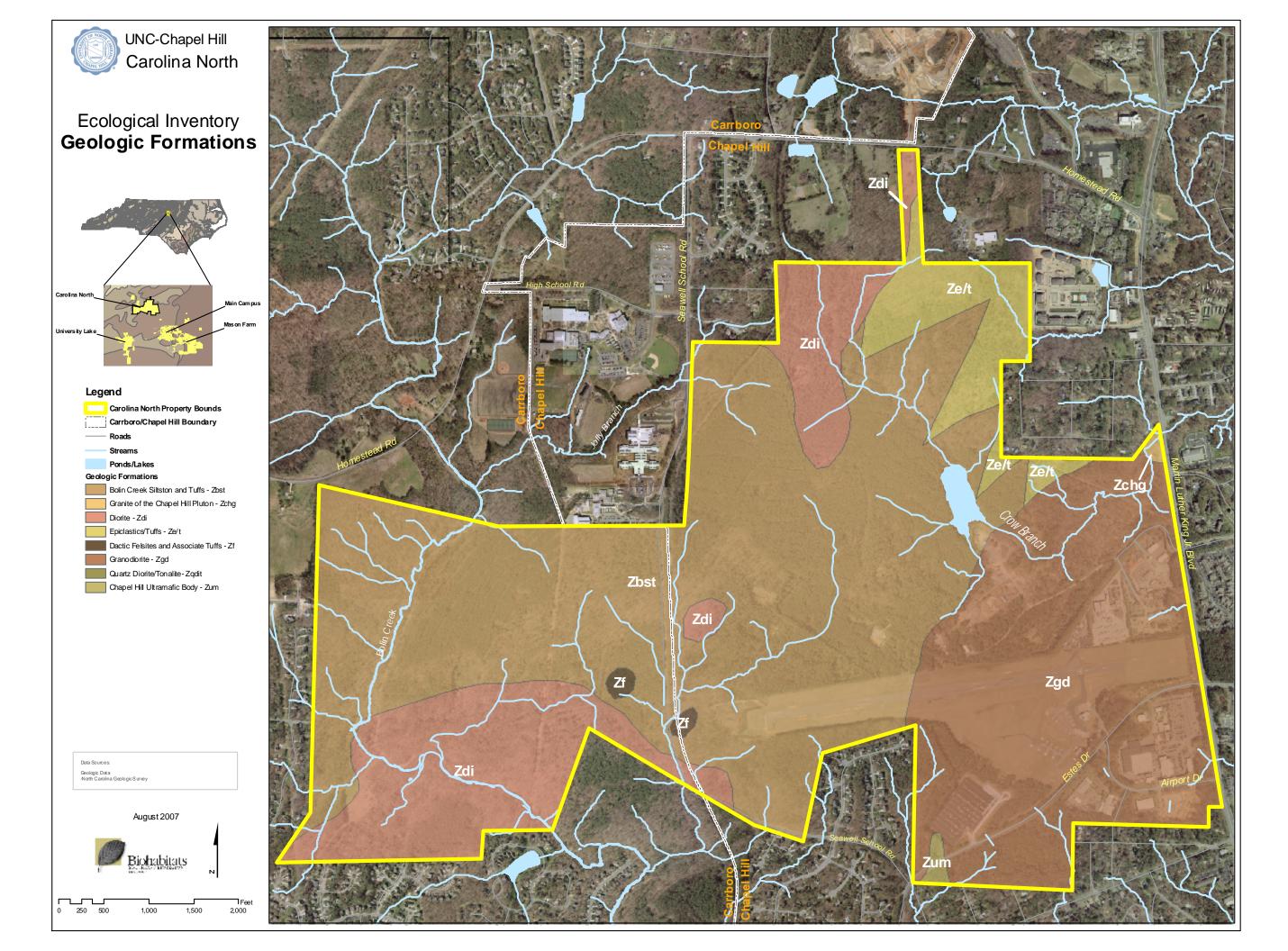


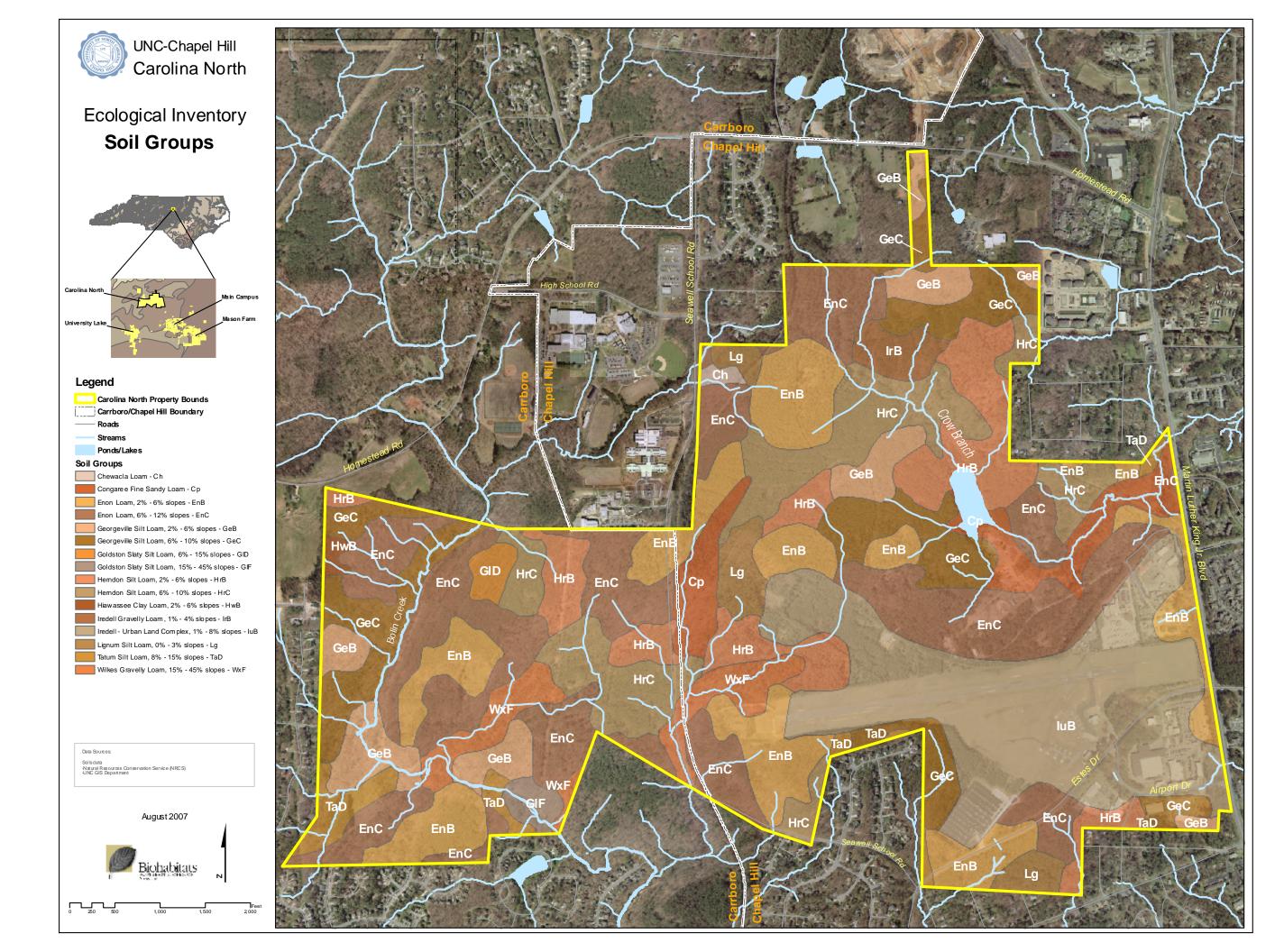
ENGINERRS/PLANNERS/SURVEYORS RESEARCH TRIANGLE PARK, NC P.O. BOX 14005 ZIP 27709-4005 (919) 361-5000

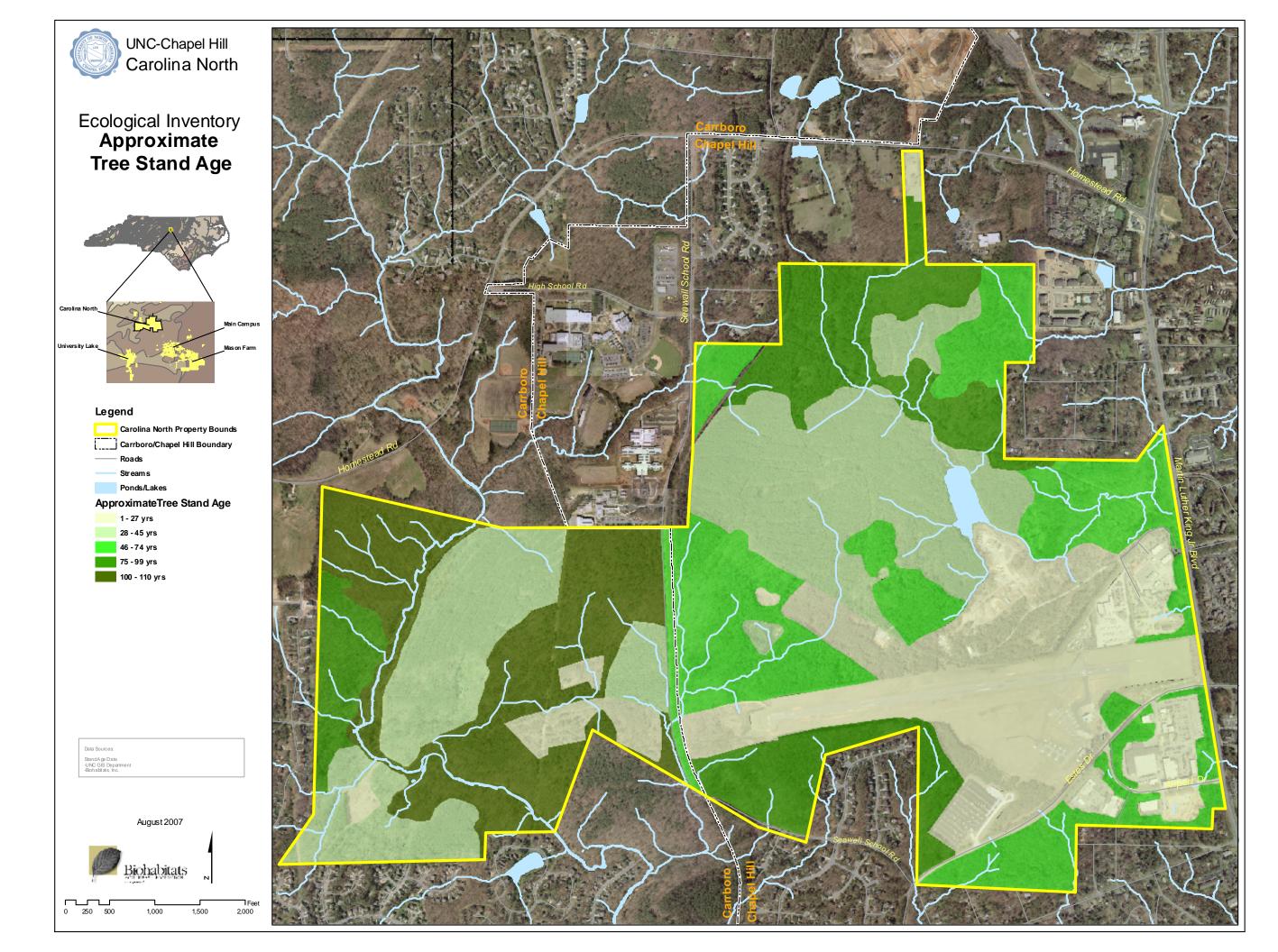
APPENDIX 3

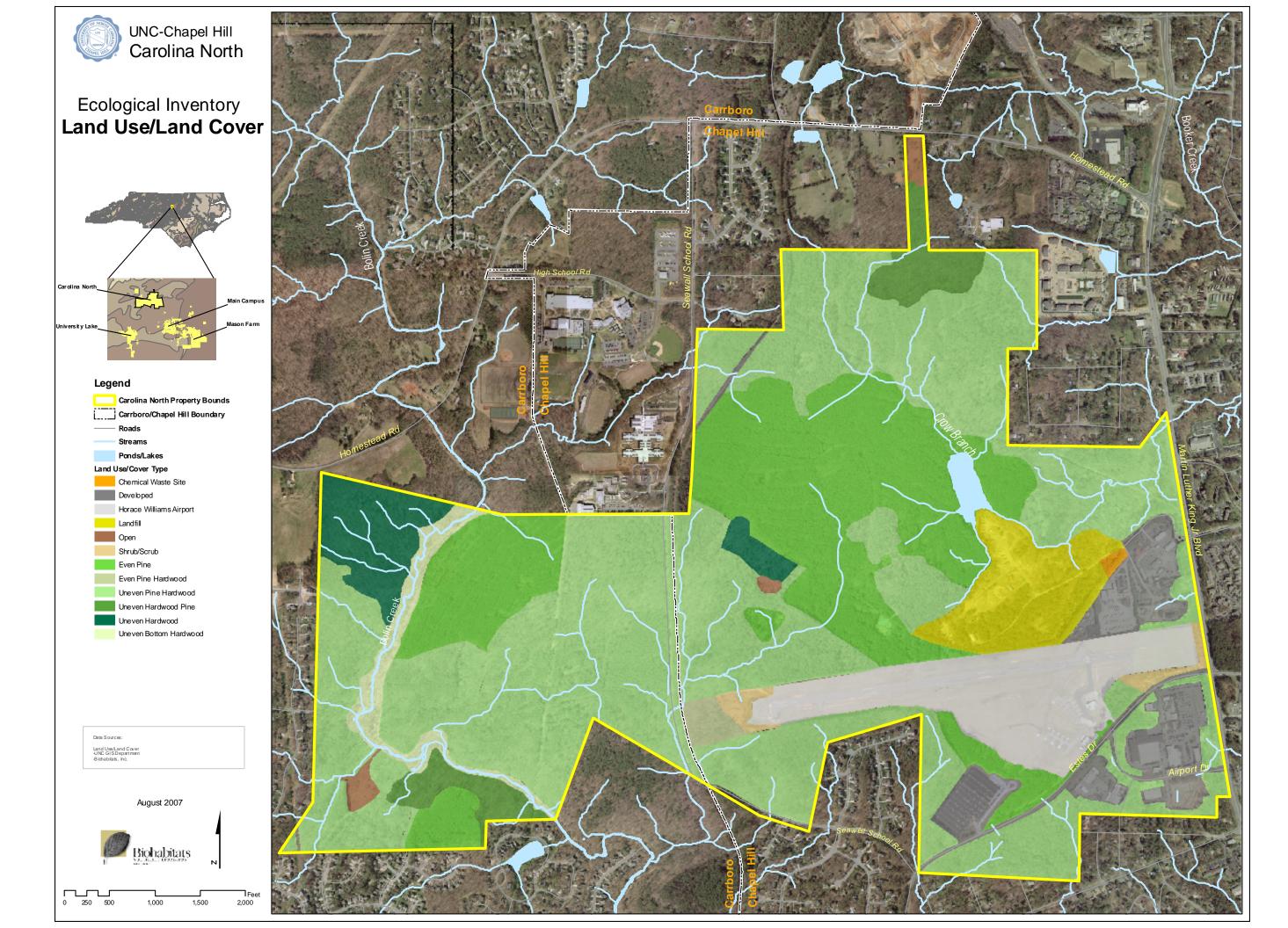
Inventory Maps





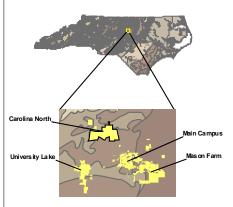








Ecological Inventory **Morphology**

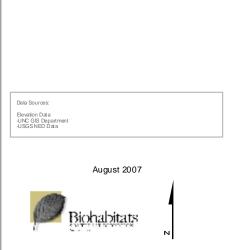


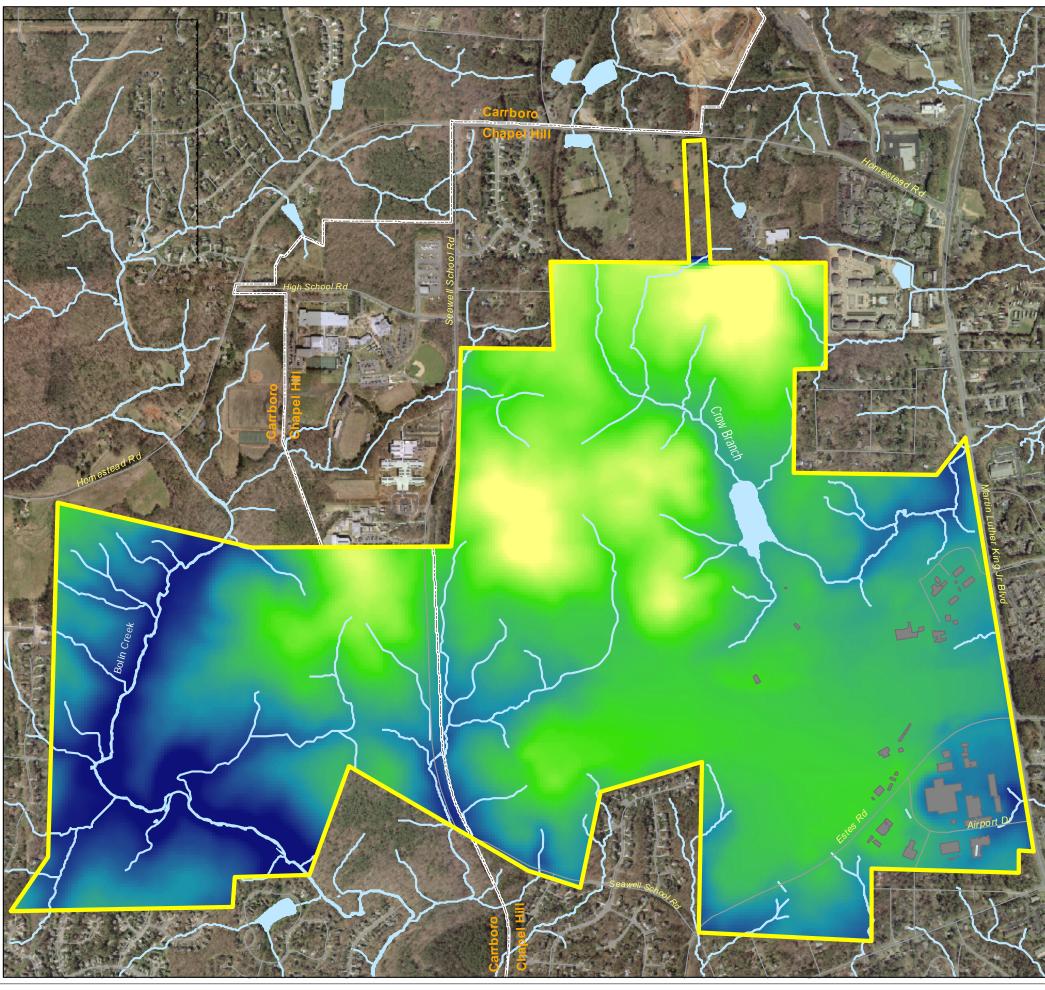
Legend

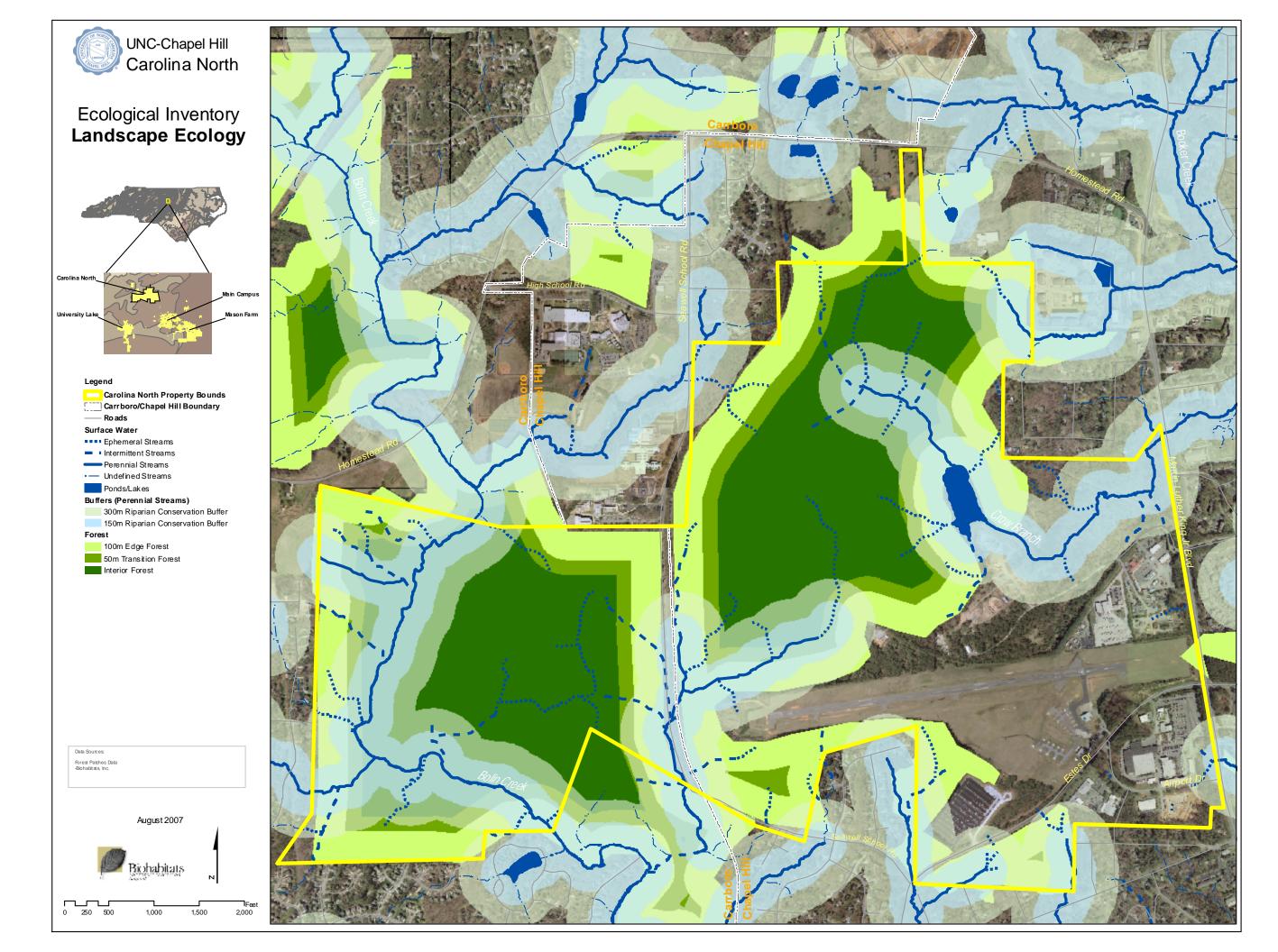
Carolina North Property Bounds Carrboro/Chapel Hill Boundary

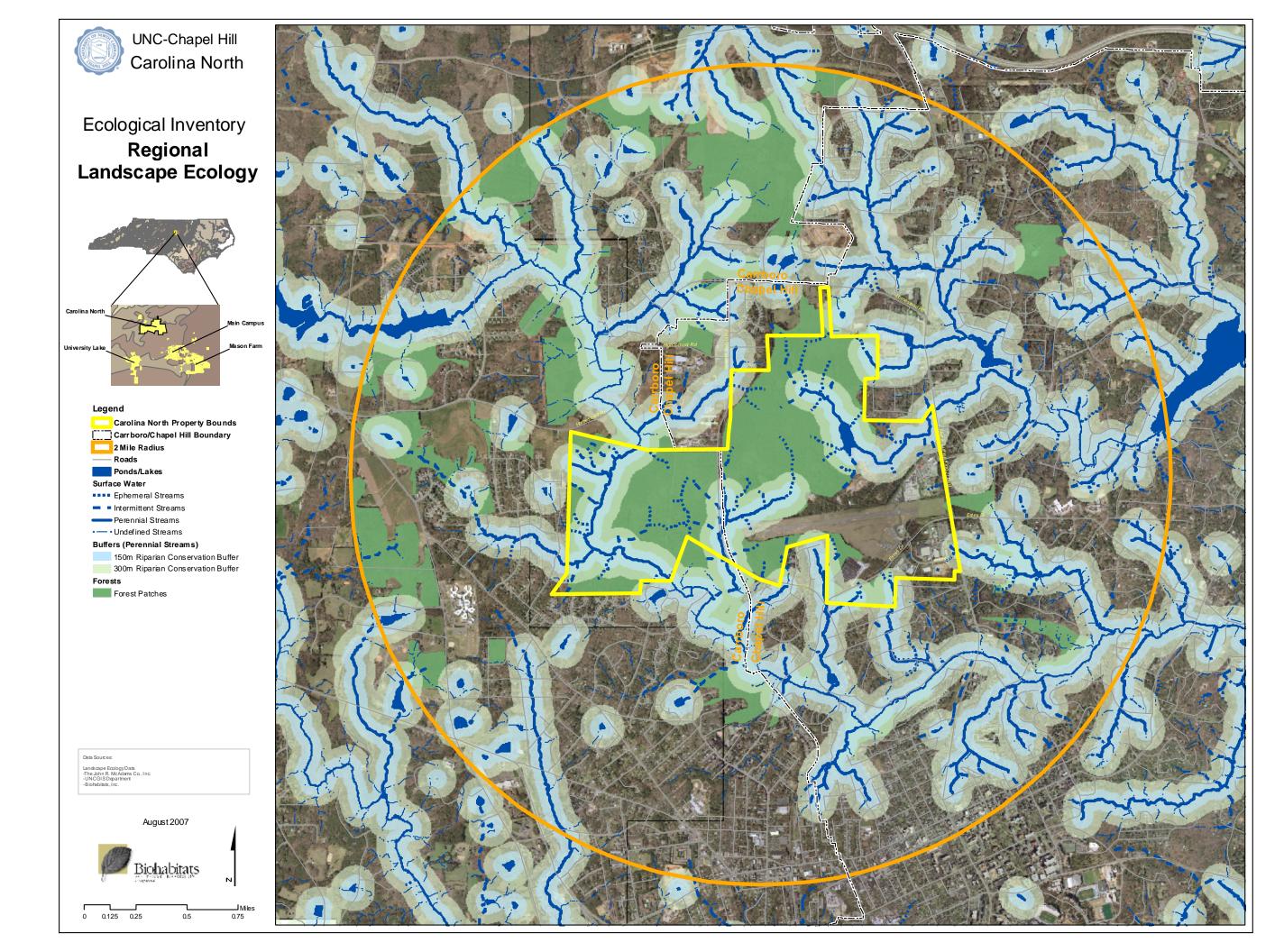
Building Footprints Topographic Elevation (ft above mean sea level)

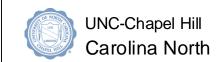
High: 574





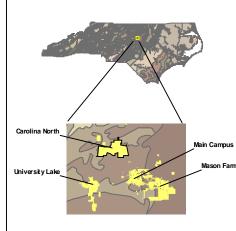






Ecological Inventory

State and Local Government **Natural Area Designations**



Carolina North Property Bounds

Roads
Streams

Ponds/Lakes

Conservation Areas

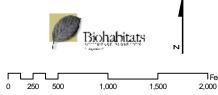
Locally Significant Natural Heritage Area

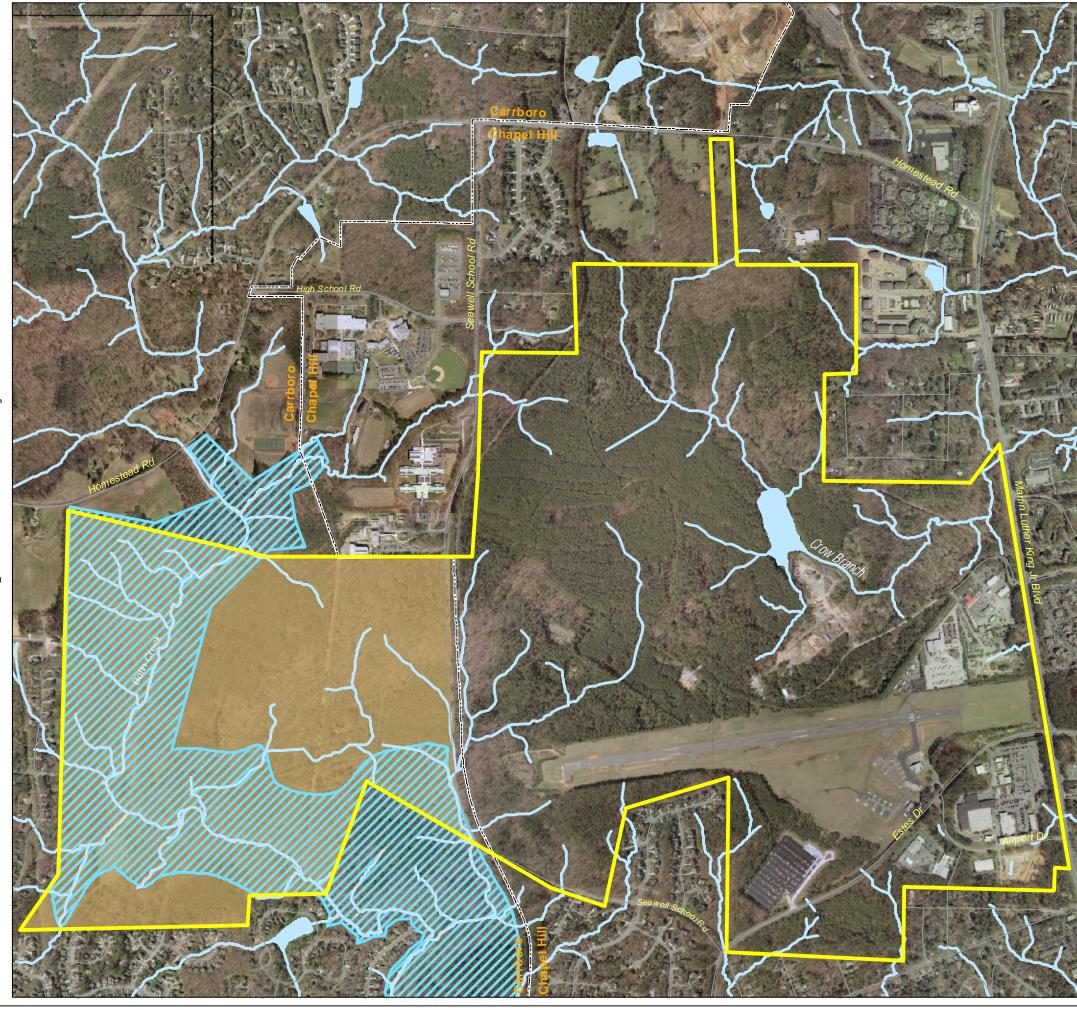
Friends of Bolin Creek Proposed Preserve Revised

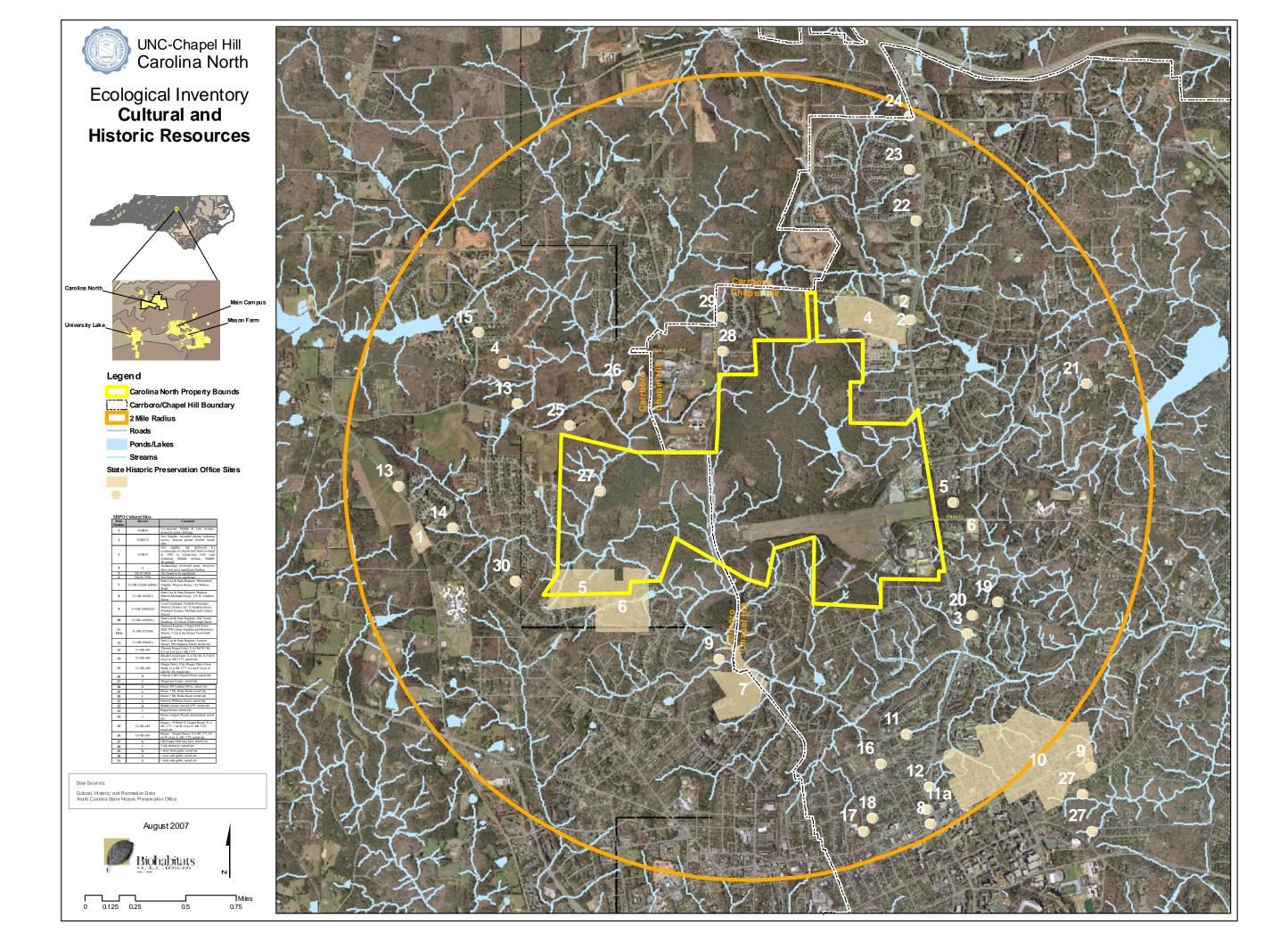
Common Name	Scientific Name	Federal Status	State Status
Red-cockaded	Picoides borealis	Endangered	Endangered
Woodpecker		_	_
Dwarf Wedgemussel	Alasmidonta heterodon	Endangered	Endangered
Michaux's Sumac	Rhus michuaxii	Endangered	Endangered
Smooth Coneflower	Echinacaa laaviaata	Endangered	Endangered

Common Name	Scientific Name	State Status
Bald Eagle-T	Haliaeetus leucocephalus	Threatened
American Eel-FSC	Anguilla rostrata	None
Roanoke Bass-FSC	Ambloplites cavifrons	Significantly Rare
Atlantic Pigtoe-FSC	Fusconaia masoni	Endangered
Brook Floater-FSC	Alasmidonta varicose	Endangered
Green Floater-FSC	Lasmigona subviridis	Endangered
Savannah Lilliput-FSC	Toxolasma pullus	Endangered
Yellow Lampmussel-FSC	Lampsilis cariosa	Endangered
Creamy Tick-trefoil-FSC	Desmodium ochroleucum	Significantly Rare
Sweet Pinesap-FSC	Monotropsis odorata	Significantly Rare



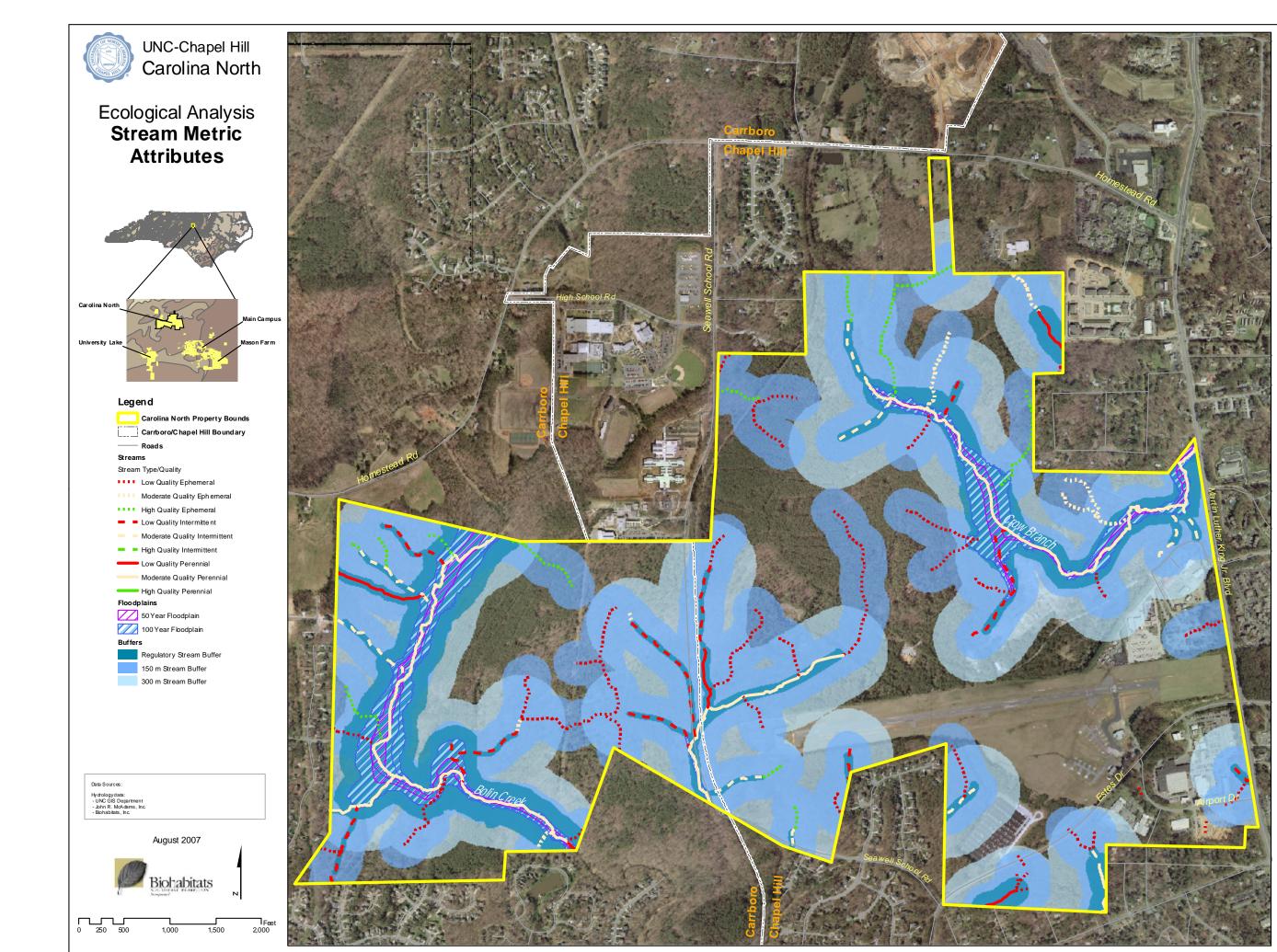


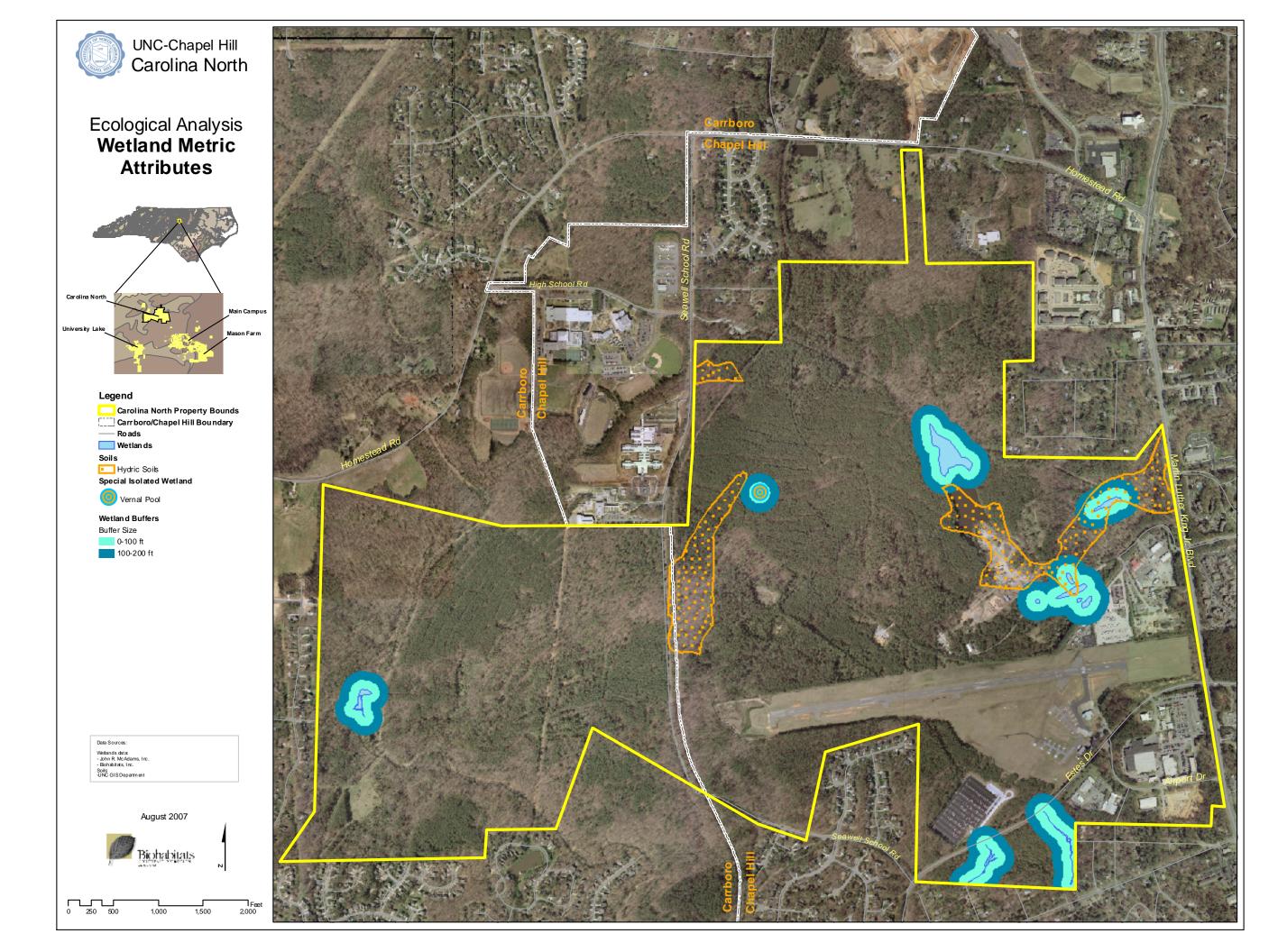




APPENDIX 4

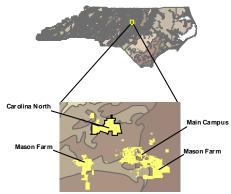
Metric Attributes Maps







Ecological Analysis Groundwater Metric **Attributes**





Carolina North Property Bounds

Carrboro/C hapel Hill B oundary

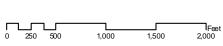
Soil Permeability

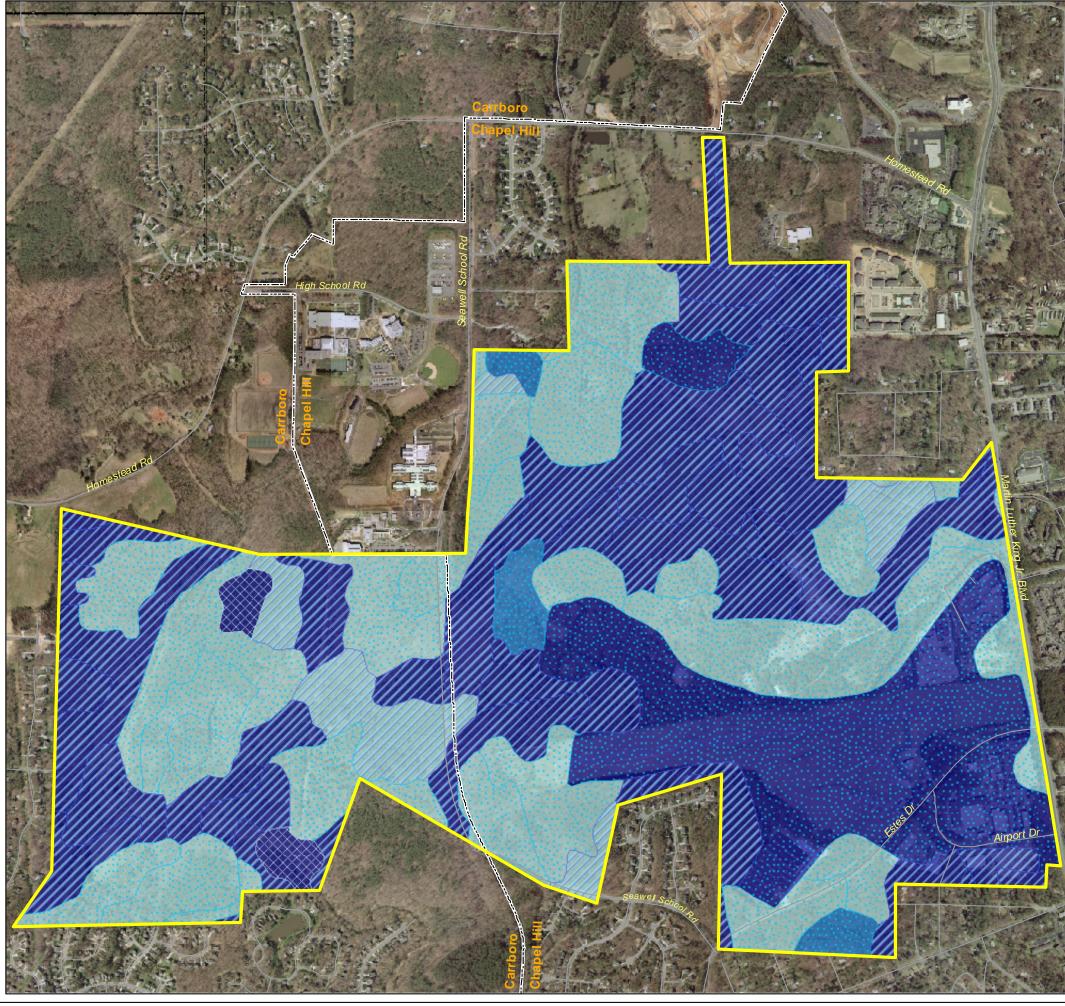
1.6 - 3.0 ft 3.1 - 6.1 ft

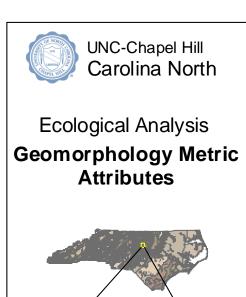
Groundwater data:
-Detived from Natural Resources Conservation Service
(NRCS) and UNC GIS Departmentsoils data.

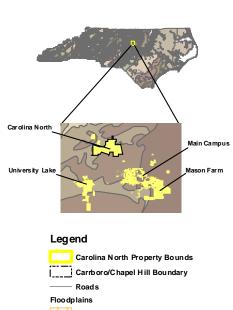
August 2007

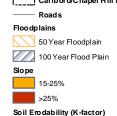


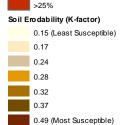






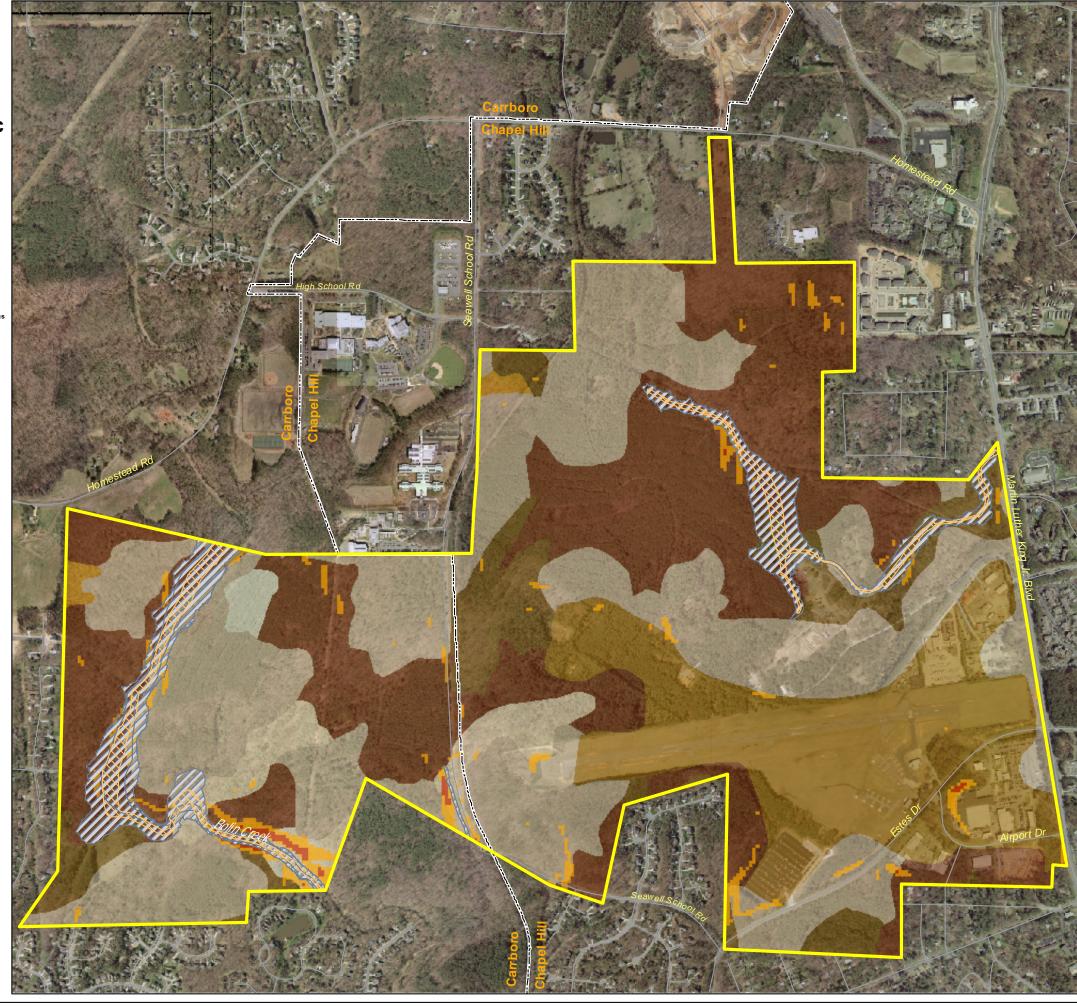


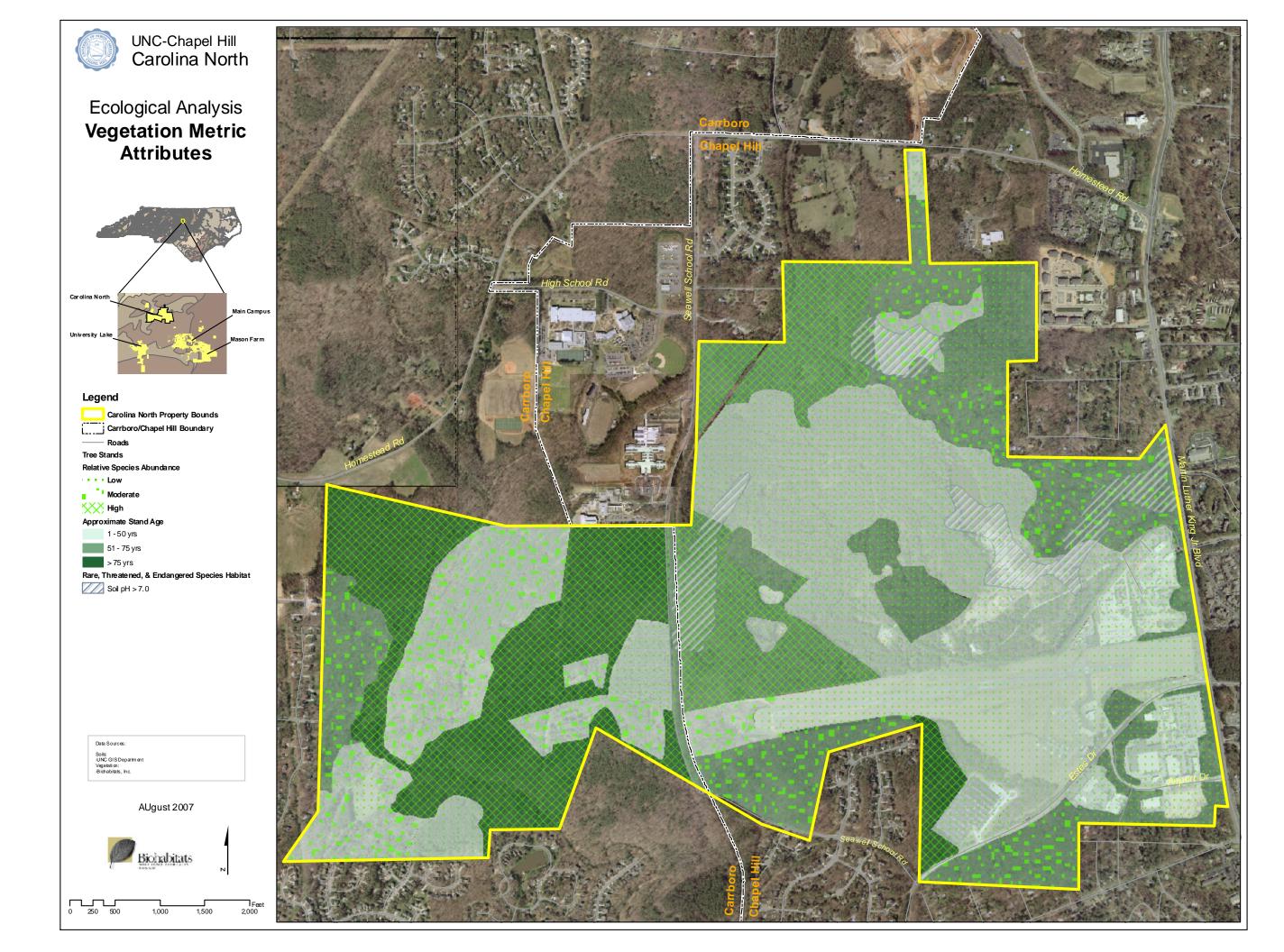


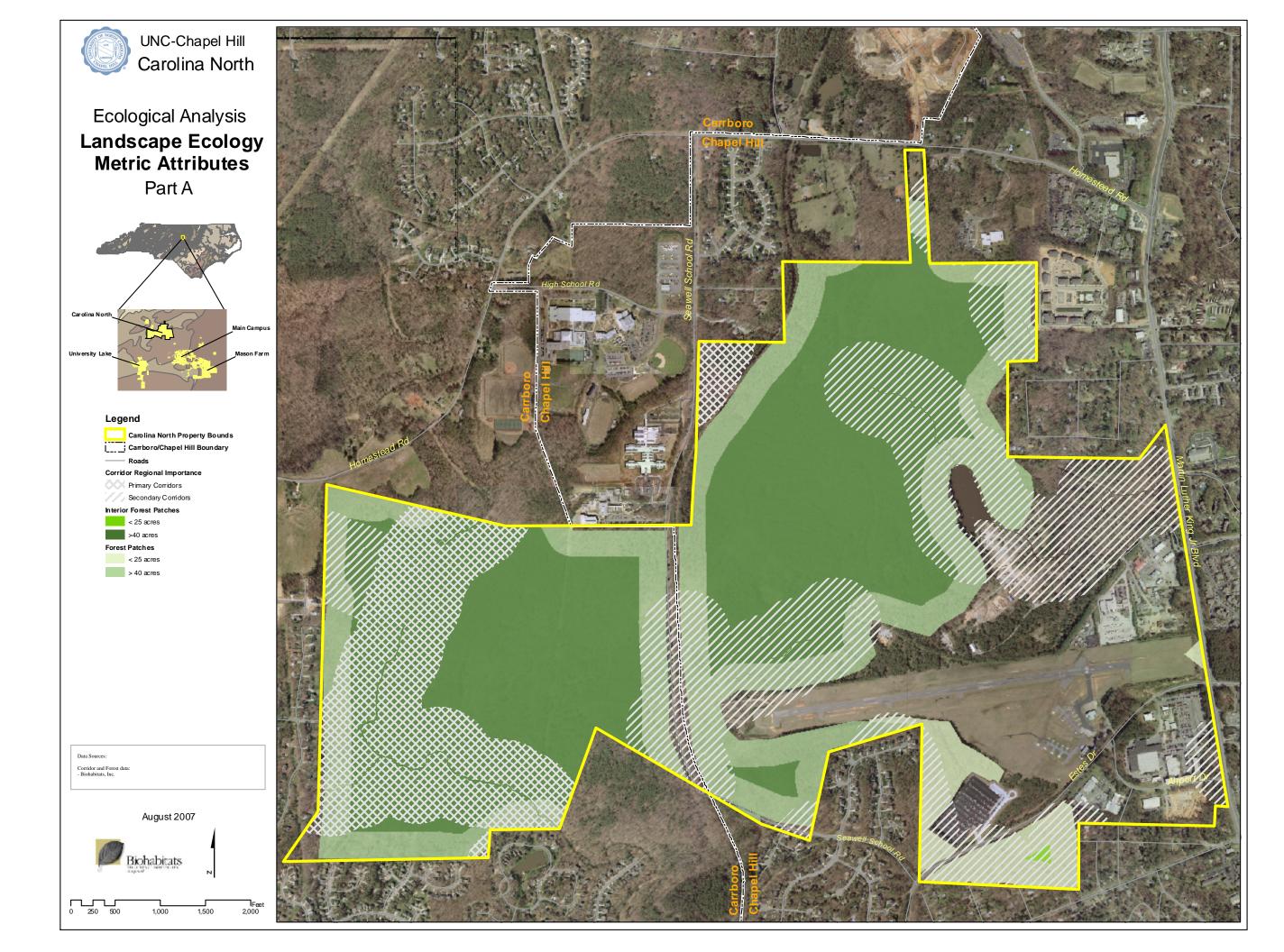


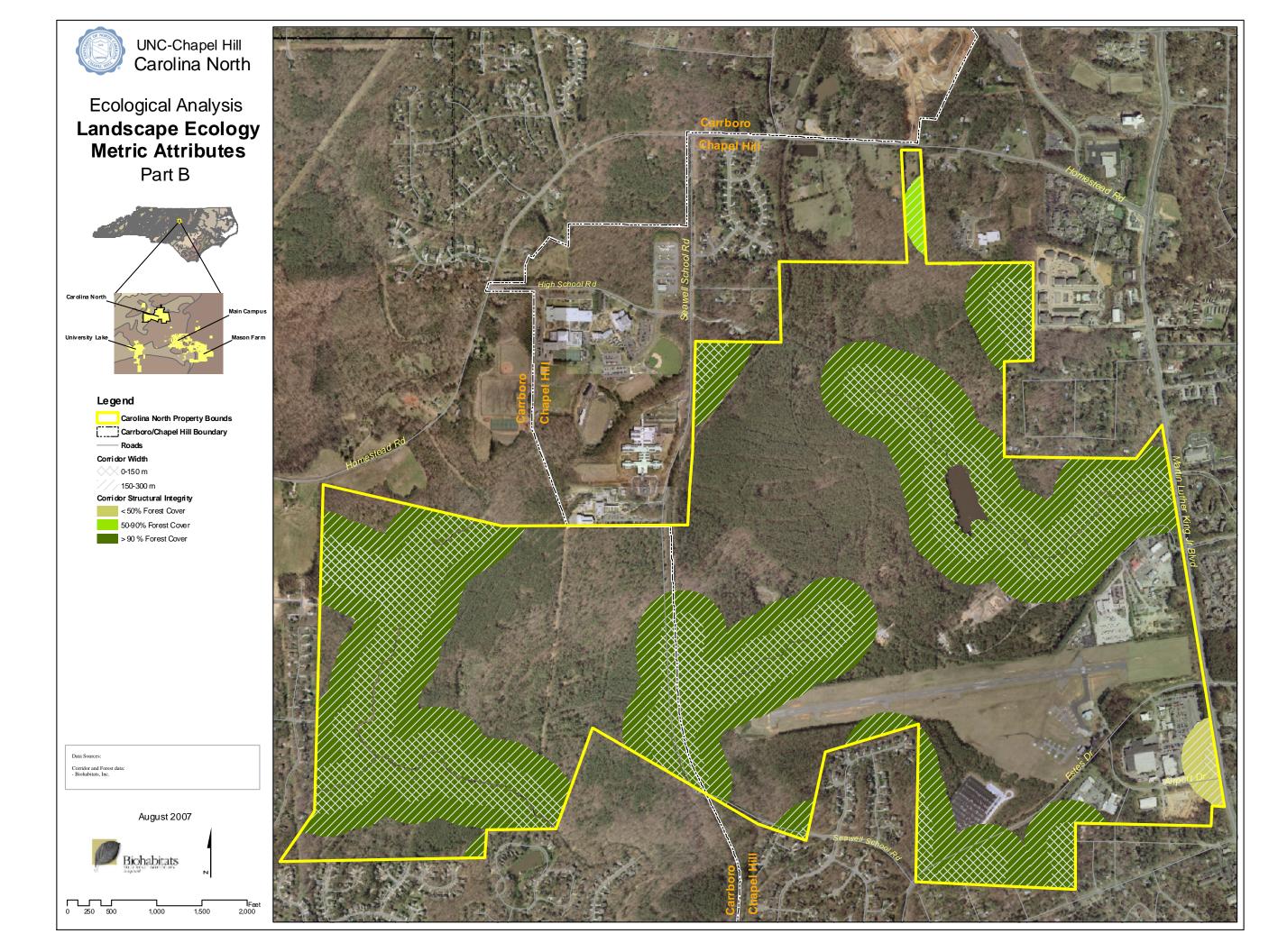


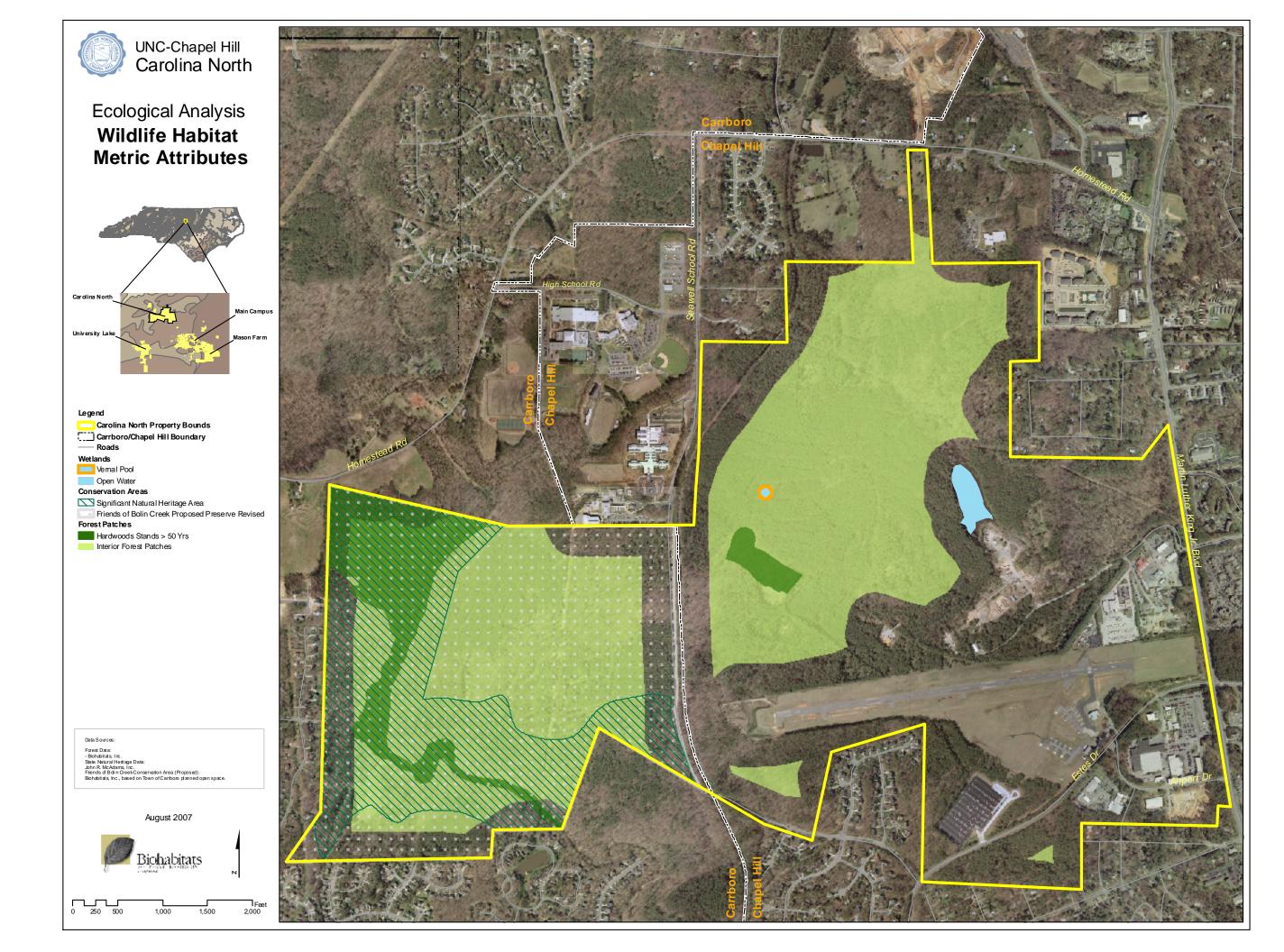


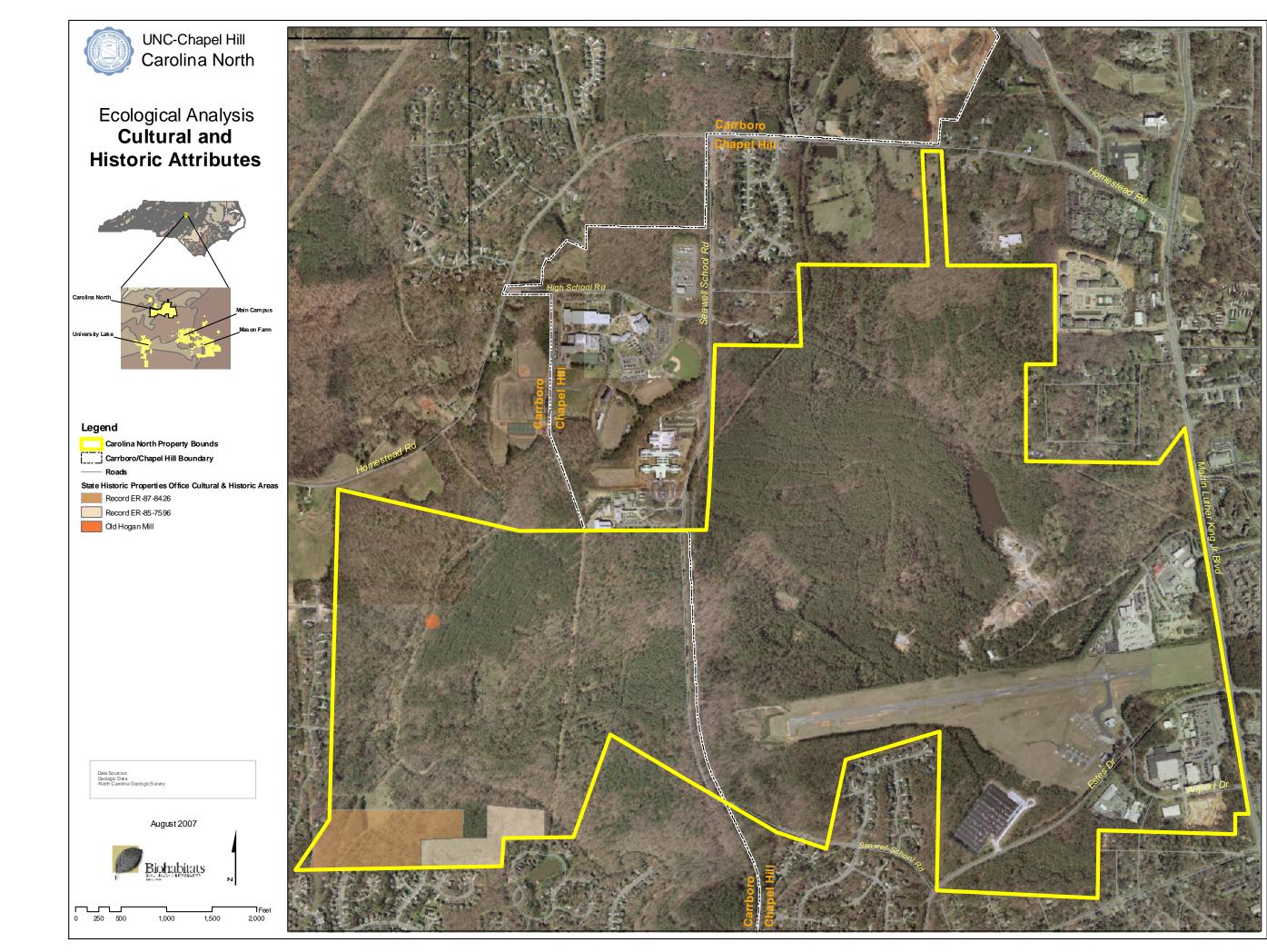












APPENDIX 5

Table with Metrics and Classifications



University of North Carolina at Chapel Hill

Carolina North Ecological Assessment - METRICS

Site Element	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	Land Suitability Index*
	Class. 0-No Impact Class. 1- Marginal Impact	Classification 2	Classification 3	Classification +1	
Streams					
Hydrologic Regime ¹					
Ephemeral	1				1
Intermittent		2		1	3
Perennial			3	1	4
Buffers ²					_
Regulatory Buffer		2		1	3
150 m Conservation Buffer 300 m Conservation Buffer	1		3		3 1
Floodplains ³	ı				1
Regulatory 100 yr floodplain		2		1	3
Morphological 50 yr floodplain		-	3	•	3
Aquatic Habitat ⁴			, and the second		
Aquatic Habitat-High Quality			3	1	4
Aquatic Habitat-Mod Quality		2		1	3
Aquatic Habitat-Low Quality	1			1	2
Wetlands ⁵					
Hydric Soils					
Hydric Soils			3	1	4
Non-hydric soils	0				0
Wetland Size					
Area < 0.1 ac		2			2
Area 0.133 ac		2		1	3
Area > 0.33 ac			3	1	4
Special Isolated Wetland Type					
Vernal Pool			3	1	4
Springs and Seeps Wetland Buffer ⁶			3	1	4
0-100' Conservation Bufer			3		3
100'-200' Conservation Buffer		2	3		2
Groundwater ⁷		-			_
Recharge Zones					
High Soil Permeability/Recharge Zone		2			2
Mod. Soil Permeability/Recharge Zone	1				1
Low Soil Permeabity/Recharge Zone	0				0
Depth to Groundwater					
Depth to Groundwater <1.5'			3		3
Depth to Groundwater 1.5'-4'		2			2
Depth to Groundwater >4'	0				0
Geomorphology					
Erodability ⁷					
Erodability K Factor <0.35		2	-		2
Erodability K Factor >0.35			3		3
Slope Slope 0.45%	A				4
Slopes 0-15% Slopes 15-25%	1	2			1
Slopes 15-25% Slopes >25%		2	3	1	2 4
Floodplain			3	1	4
Morphological 50 yr floodplain			3	1	4
Vegetation				·	
Rare Species					
RTE Species Location			3	1	4
RTE Potential Habitat		2			2
Tree Age					
Tree Age Class 0-50 yrs	1				1
Tree Age Class 51-75 yrs		2			2
Tree Age Class >75 yrs			3		3



University of North Carolina at Chapel Hill

Carolina North Ecological Assessment - METRICS

Site Element	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	Land Suitability Index*
	Class. 0-No Impact Class. 1- Marginal Impact	Classification 2	Classification 3	Classification +1	
Vegetation (continued)					
Tree Species Abundance ⁸					
Relative Species Abundance - High			3		3
Relative Species Abundance - Mod.		2			2
Relative Specie Abundance - Low	1				1
Landscape Ecology					
Corridor Regional Importance ⁹					
Primary Corridors			3		3
Secondary Corridors		2			2
Isolated Corridors	1				1
Corridor Width					
Site Corridors 0-150 meters			3		3
Site Corridors 151-300 meters		2			2
Corridor Structural Integrity					
Solid->90% forest cover			3		3
Porous-50-90% forest cover		2			2
Stepping Stone-<50% forest cover	1				1
Total Patch Size ¹⁰					
Forested Habitat Patch > 40 ac			3		3
Forested Habitat Patch 25-39 ac		2			2
Forested Habitat Patch <25 ac	1				1
Interior Patch Size ¹⁰					
Forested Habitat Patch > 40 ac			3		3
Forested Habitat Patch 25-39 ac		2			2
Forested Habitat Patch 0-24 ac	1				1
Wildlife Habitat					
Endangered Species Habitat ¹¹					
Identified Critical Habitat			3	1	4
Rare,Threat. or Spec. Species Hab.					
Hardwoods > 50 yrs old		2			2
Hardwoods < 50 yrs old	1				1
Migratory Bird Habitat		2			2
Vernal Pool			3	1	4
Identified Natural Areas			-		
Nat. Her. Prog. or Other Designation		2			2
Cultural & Historic					
Cultural Areas					
Viewsheds - regional		2			2
Viewsheds - site		2			2
Historic Sites					
Nationally Registered Sites			3	1	4
Identified Cult and Hist. Occurences		2			2
*Land Suitability Index-Value used to cat	egorizo respectivo attributo in				

^{*}Land Suitability Index-Value used to categorize respective attribute in GIS

¹ The stream regime designations were determined in the field by John R. McAdams Co. and NCDWQ, historically.

² The regulatory stream buffer lines are computed based on John R. McAdams Co. field calls on intermittent and perennial stream start points, and Chapel Hill and Carrboro regulations. The conservation buffer widths determined through synthesis of peer-reviewed literature.

³ The 100 year floodplain was taken from NC Floodmaps data and the 50 year floodplain was estimated using GIS.

⁴Aquatic habitat quality was determined by a qualitative field assessment of stream channel morpology and habitat quality, which was then converted to a numerical score. Ranges for High, Moderate and Low were developed based on the characteristics of the site and data set.

⁵Wetland area ranges based on State and Federal regulations.

⁶Buffer width determined through synthesis of peer-reviewed literature.
⁷Orange County Soil Survey, Natural Resource Conservation Service, USDA.

⁸Relative species abundance determined from field assessment and qualitative ranges developed from the data.

⁹Landscape ecology corridor widths determined through synthesis of peer-reviewed literature.

 $^{^{\}rm 10}\mbox{Patch}$ size ranges determined through synthesis of peer-reviewed literature.

¹¹Critical habitat protection based on USFWS designation and consultation.



University of North Carolina at Chapel Hill Carolina North Ecological Assessment - METRICS

Site Element	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	Land Suitability Index*
	Class. 0-No Impact Class. 1- Marginal Impact	Classification 2	Classification 3	Classification +1	
Streams					
Hydrologic Regime ¹					
Ephemeral	1				1
Intermittent		2		1	3
Perennial			3	1	4
Buffers ²					
Regulatory Buffer		2		1	3
150 m Conservation Buffer			3		3
300 m Conservation Buffer	1				1
Floodplains ³					
Regulatory 100 yr floodplain		2		1	3
Morphological 50 yr floodplain			3		3
Aquatic Habitat ⁴					
Aquatic Habitat-High Quality			3	1	4
Aquatic Habitat-Mod Quality		2		1	3
Aquatic Habitat-Low Quality	1			1	2
Wetlands ⁵					
Hydric Soils					
Hydric Soils			3	1	4
Non-hydric soils	0		Ü	•	0
Wetland Size	· · · · · · · · · · · · · · · · · · ·				
Area < 0.1 ac		2			2
Area 0.133 ac		2		1	3
Area > 0.33 ac		2	3	1	4
Special Isolated Wetland Type			3		4
Vernal Pool			3	1	4
			3	1	
Springs and Seeps Wetland Buffer ⁶			3	1	4
					•
0-100' Conservation Bufer			3		3
100'-200' Conservation Buffer		2			2
Groundwater ⁷					
Recharge Zones					
High Soil Permeability/Recharge Zone		2			2
Mod. Soil Permeability/Recharge Zone	1				1
Low Soil Permeabity/Recharge Zone	0				0
Depth to Groundwater					
Depth to Groundwater <1.5'			3		3
Depth to Groundwater 1.5'-4'		2			2
Depth to Groundwater >4'	0				0
Geomorphology					
Erodability ⁷					
Erodability K Factor < 0.35		2			2
Erodability K Factor >0.35			3		3
Slope					
Slopes 0-15%	1				1
Slopes 15-25%		2			2
Slopes >25%			3	1	4
Floodplain					
Morphological 50 yr floodplain			3	1	4
Vegetation					
Rare Species					
RTE Species Location			3	1	4
RTE Potential Habitat		2			2
Tree Age					
Tree Age Class 0-50 yrs	1				1
Tree Age Class 51-75 yrs		2			2
Tree Age Class >75 yrs			3		3



University of North Carolina at Chapel Hill

Carolina North Ecological Assessment - METRICS

Site Element	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	Land Suitability Index*
	Class. 0-No Impact Class. 1- Marginal Impact	Classification 2	Classification 3	Classification +1	
Vegetation (continued)					
Tree Species Abundance ⁸					
Relative Species Abundance - High			3		3
Relative Species Abundance - Mod.		2			2
Relative Specie Abundance - Low	1				1
Landscape Ecology					
Corridor Regional Importance ⁹					
Primary Corridors			3		3
Secondary Corridors		2			2
Isolated Corridors	1				1
Corridor Width					
Site Corridors 0-150 meters			3		3
Site Corridors 151-300 meters		2			2
Corridor Structural Integrity					
Solid->90% forest cover			3		3
Porous-50-90% forest cover		2			2
Stepping Stone-<50% forest cover	1				1
Total Patch Size ¹⁰					
Forested Habitat Patch > 40 ac			3		3
Forested Habitat Patch 25-39 ac		2			2
Forested Habitat Patch <25 ac	1				1
Interior Patch Size ¹⁰					
Forested Habitat Patch > 40 ac			3		3
Forested Habitat Patch 25-39 ac		2			2
Forested Habitat Patch 0-24 ac	1				1
Wildlife Habitat					
Endangered Species Habitat ¹¹					
Identified Critical Habitat			3	1	4
Rare, Threat. or Spec. Species Hab.					
Hardwoods > 50 yrs old		2			2
Hardwoods < 50 yrs old	1				1
Migratory Bird Habitat		2			2
Vernal Pool			3	1	4
Identified Natural Areas					
Nat. Her. Prog. or Other Designation		2			2
Cultural & Historic					
Cultural Areas					
Viewsheds - regional		2			2
Viewsheds - site		2			2
Historic Sites					
Nationally Registered Sites			3	1	4
Identified Cult and Hist. Occurences		2			2
*Land Suitability Index-Value used to ca	tegorize respective attribute in	GIS			

^{*}Land Suitability Index-Value used to categorize respective attribute in GIS

¹ The stream regime designations were determined in the field by John R. McAdams Co. and NCDWQ, historically.

² The regulatory stream buffer lines are computed based on John R. McAdams Co. field calls on intermittent and perennial stream start points, and Chapel Hill and Carrboro regulations. The conservation buffer widths determined through synthesis of peer-reviewed literature.

³ The 100 year floodplain was taken from NC Floodmaps data and the 50 year floodplain was estimated using GIS.

⁴Aquatic habitat quality was determined by a qualitative field assessment of stream channel morpology and habitat quality, which was then converted to a numerical score. Ranges for High, Moderate and Low were developed based on the characteristics of the site and data set.

⁵Wetland area ranges based on State and Federal regulations.

 $^{^6\}mbox{Buffer}$ width determined through synthesis of peer-reviewed literature.

 $^{^{7}\}textsc{Orange}$ County Soil Survey, Natural Resource Conservation Service, USDA.

⁸Relative species abundance determined from field assessment and qualitative ranges developed from the data.

⁹Landscape ecology corridor widths determined through synthesis of peer-reviewed literature.

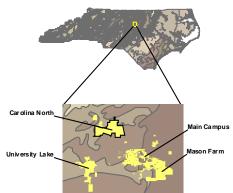
¹⁰Patch size ranges determined through synthesis of peer-reviewed literature.

¹¹Critical habitat protection based on USFWS designation and consultation.

APPENDIX 6 Metric Suitability Analysis Maps



Ecological Analysis **Stream Metric**Suitability Analysis

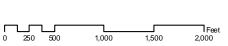


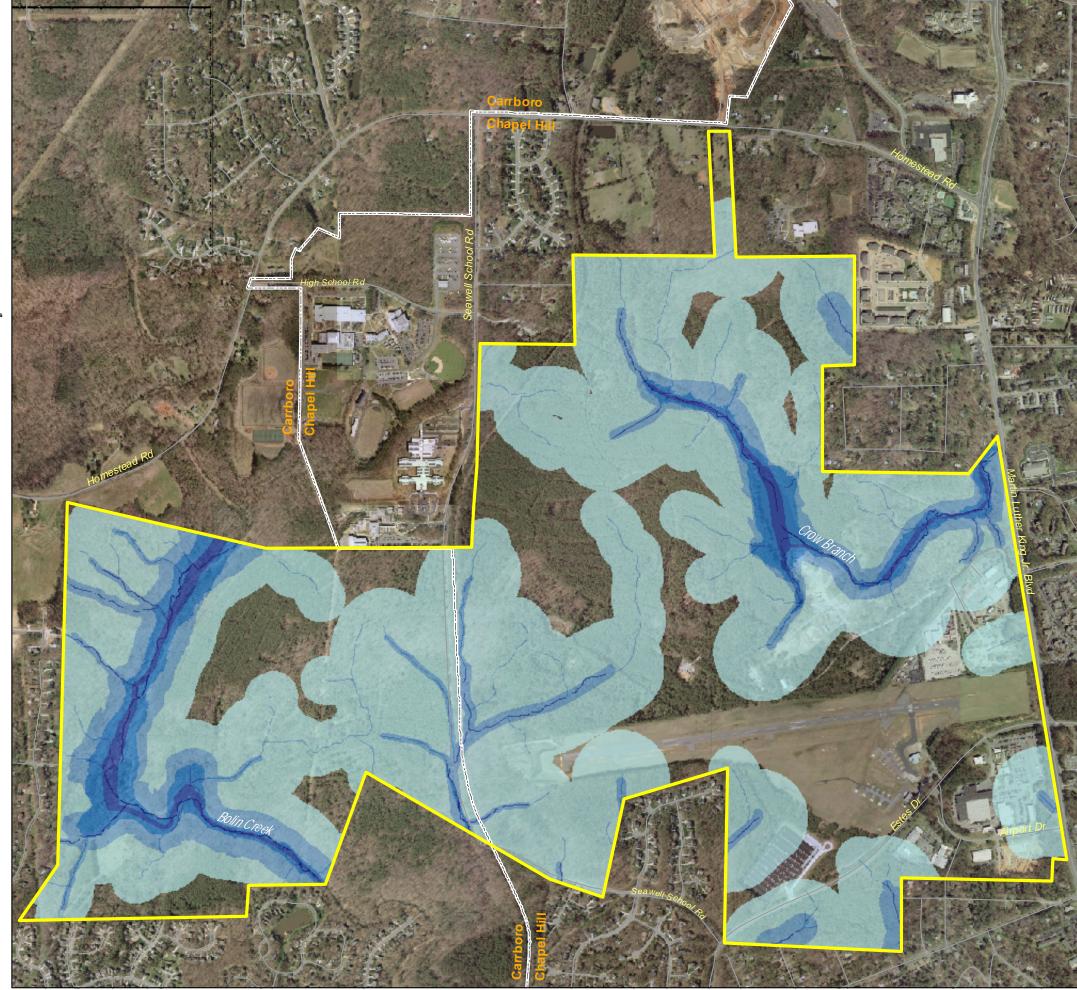
Legend Carolina North Property Bounds Carrboro/C hapel Hill Boundary Roads Stream Metric Sensitivity to Disturbance Low

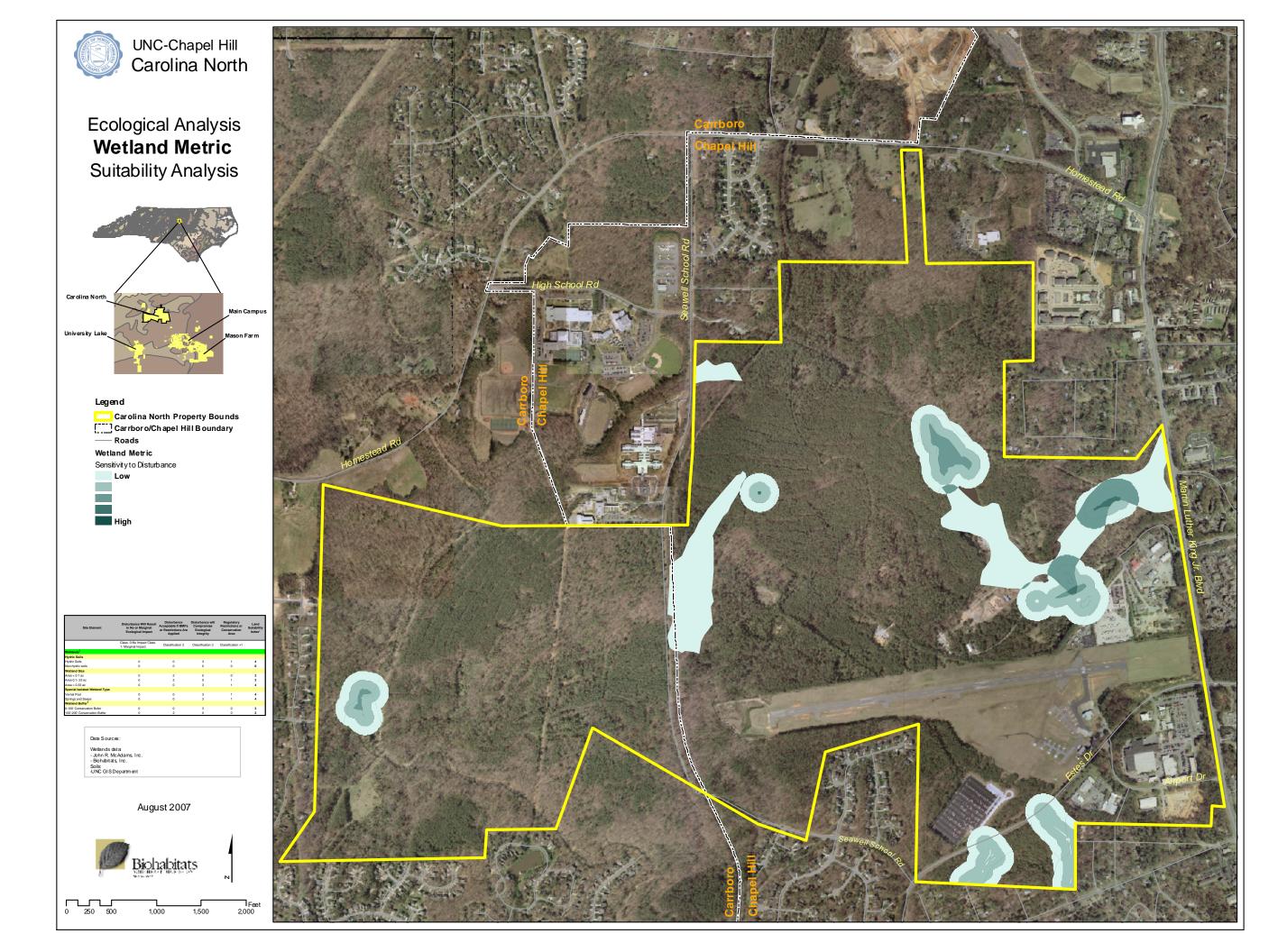
Site Element	Disturbance Will Result in No or Marginal Ecological Impact	Disturbance Acceptable If BMPs or Restrictions Are Applied	Disturbance will Compromise Ecological Integrity	Regulatory Restrictions or Conservation Area	Land Suitability Index*
	Class. 0-No Impact Class. 1- Marginal Impact	Classification 2	Classification 3	Classification +1	
Streams					
Hydrologic Regime ¹					
Ephemeral	1	0	0	0	1
Intermittent	0	2	0	1	3
Perennial	0	0	3	1	4
Buffers ²					
Regulatory Buffer	0	2	0	1	3
150 m Conservation Buffer	0	0	3	0	3
300 m Conservation Buffer	1	0	0	0	1
Floodplains ³					
Regulatory 100 yr floodplain	0	2	0	1	3
Morphological 50 yr floodplain	0	0	3		3
Aquatic Habitat ⁴					
Aquatic Habitat-High Quality	0	0	3	1	4
Aquatic Habitat-Mod Quality	0	2	0	1	3
Aquatic Habitat-Low Quality	1	0	0	1	2

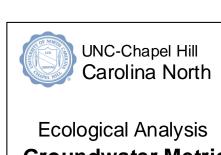
Data Sources:
Hydrologydata:
- UNC GIS Department
- John R. Mod Arms, Inc.
- Biohabitas, Inc.



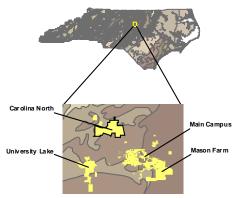








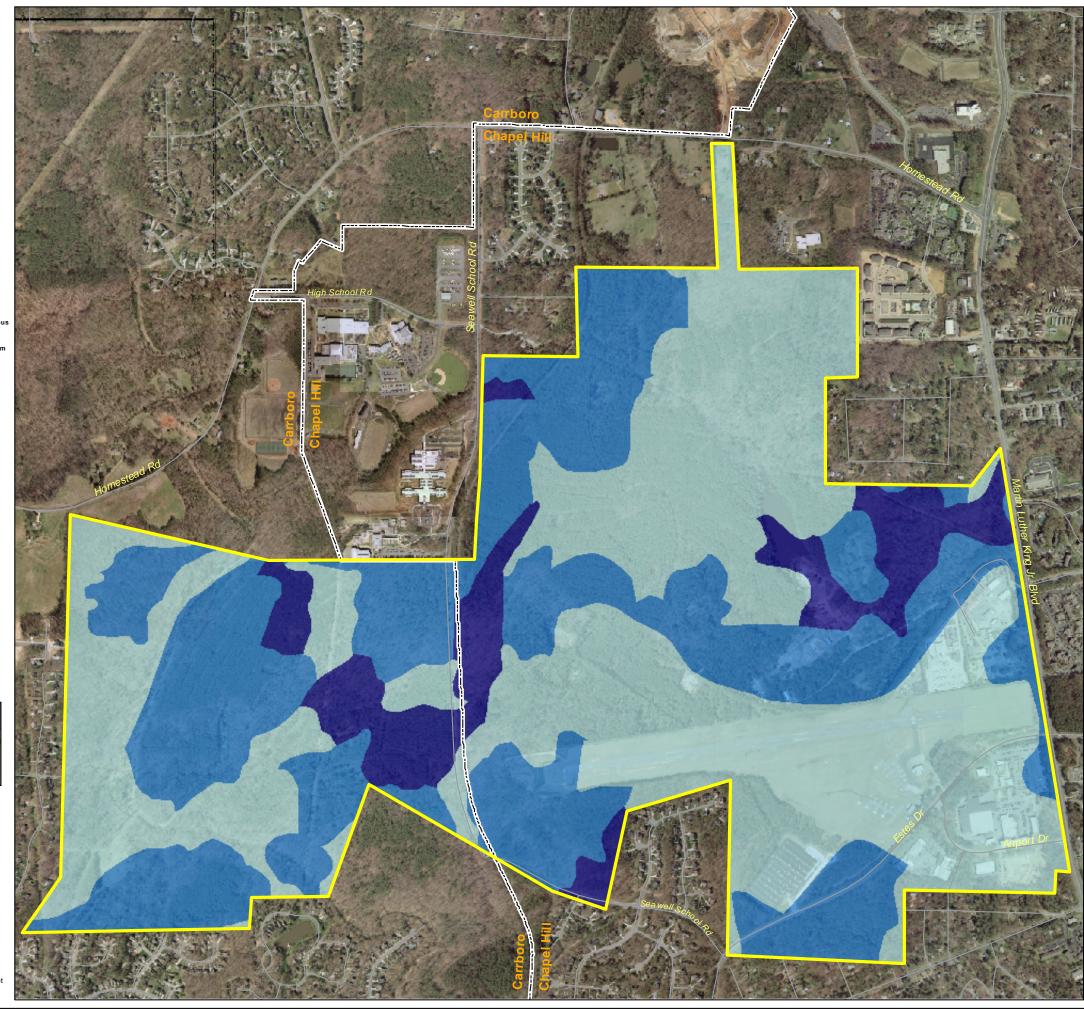
Ecological Analysis **Groundwater Metric**Suitability Analysis

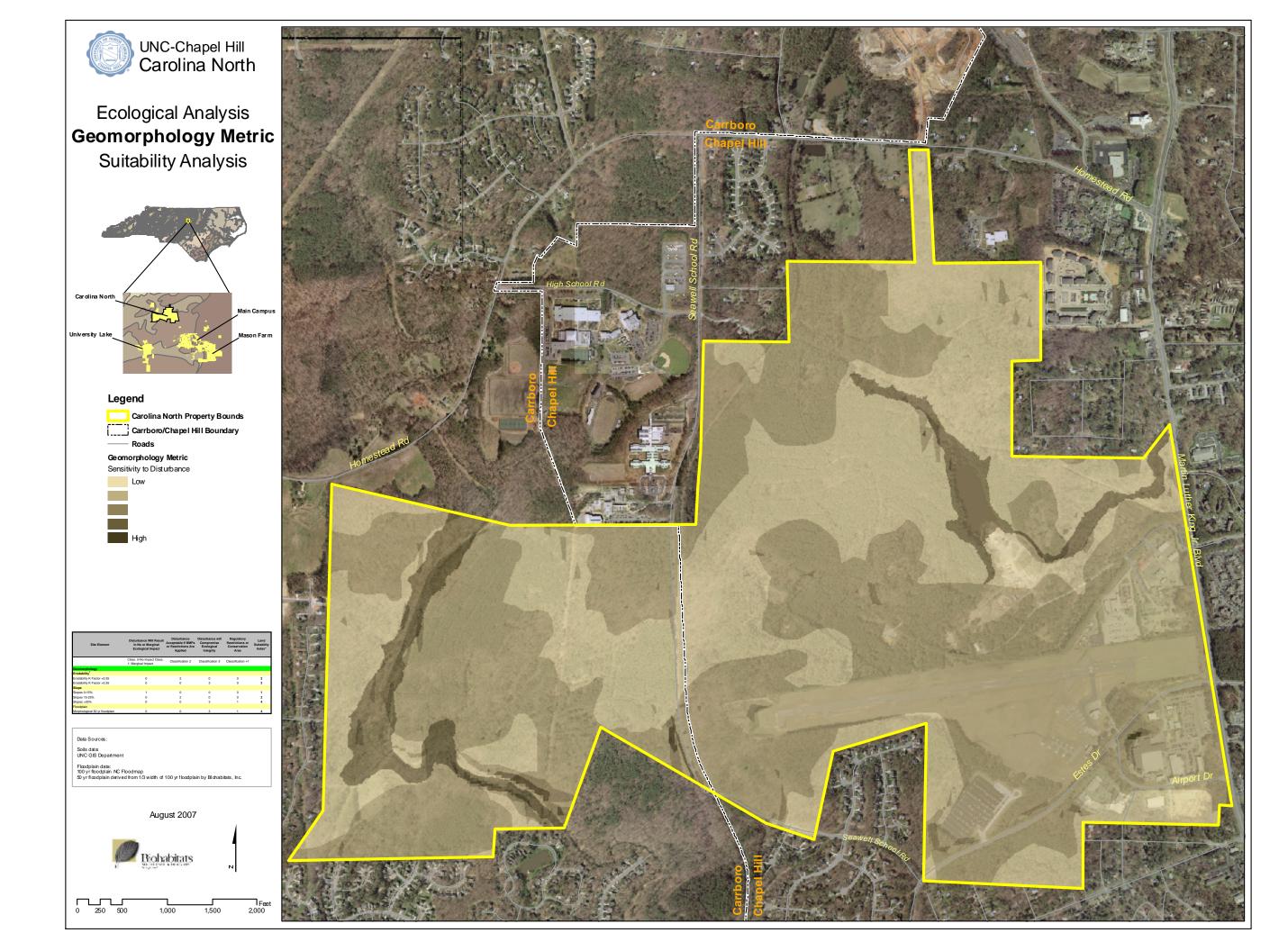


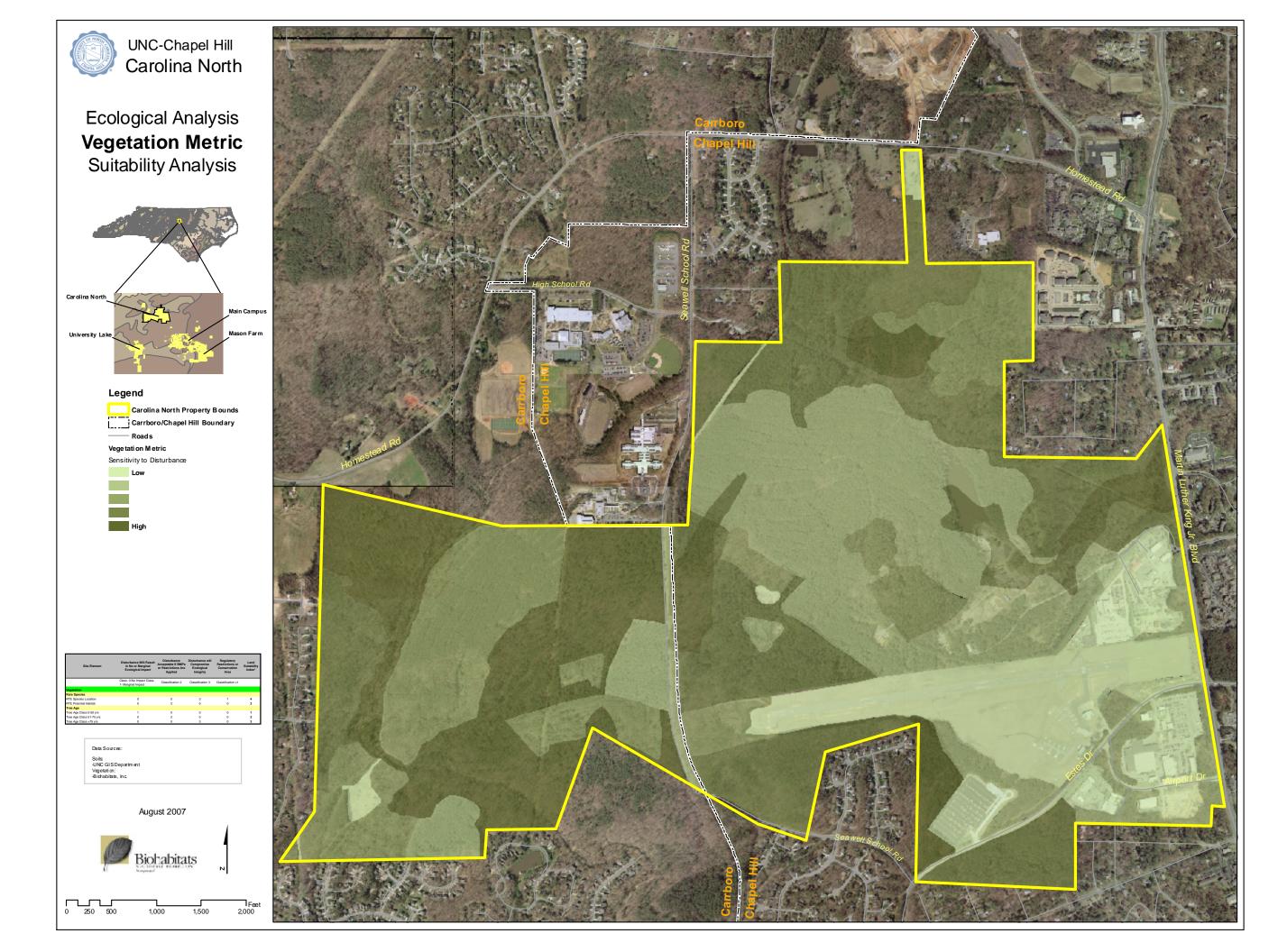
Legend Carolina North Property Bounds Carrboro/Chapel Hill Boundary Roads Groundwater Metric Sensitivity to Disturbance

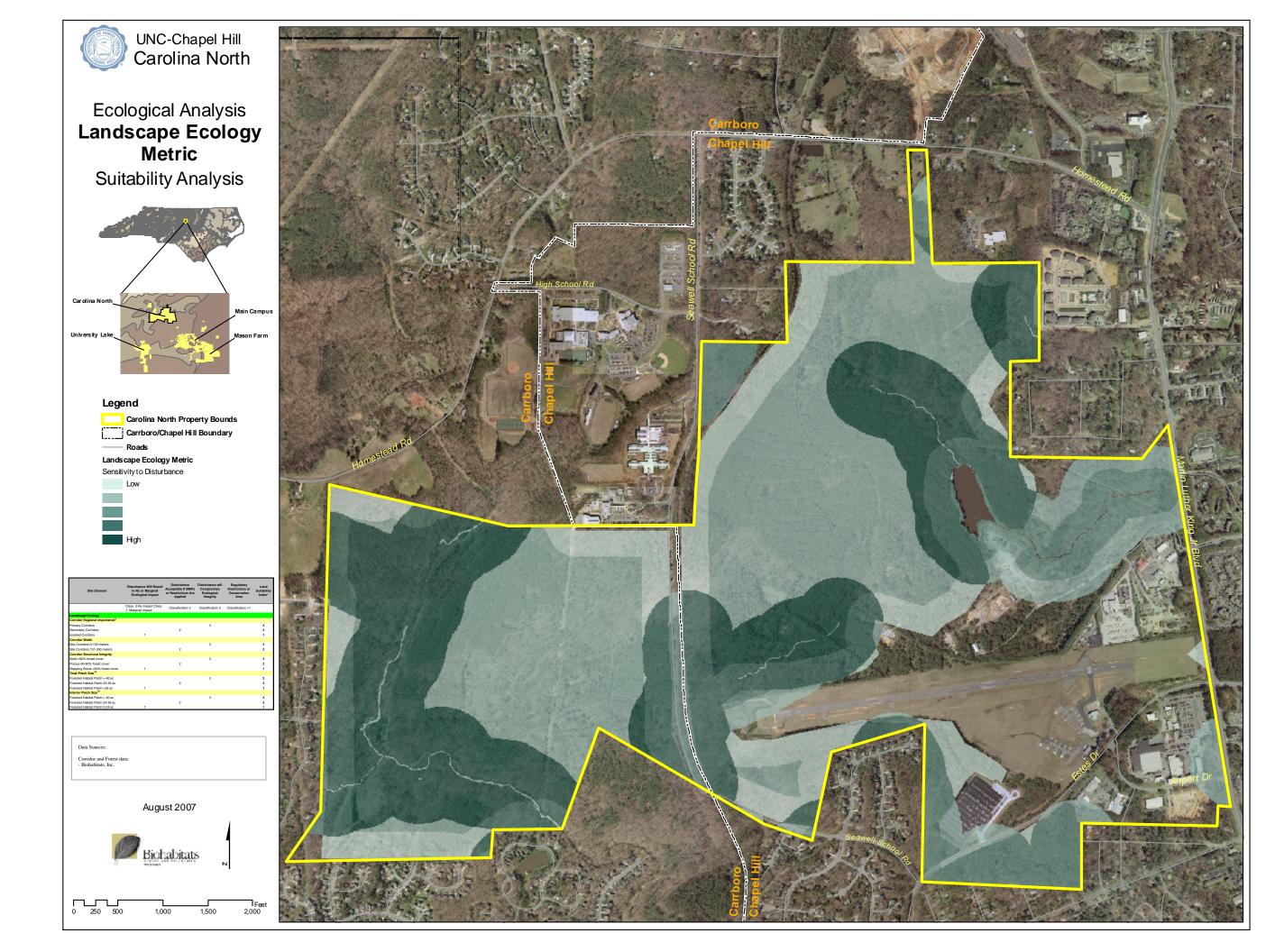
High

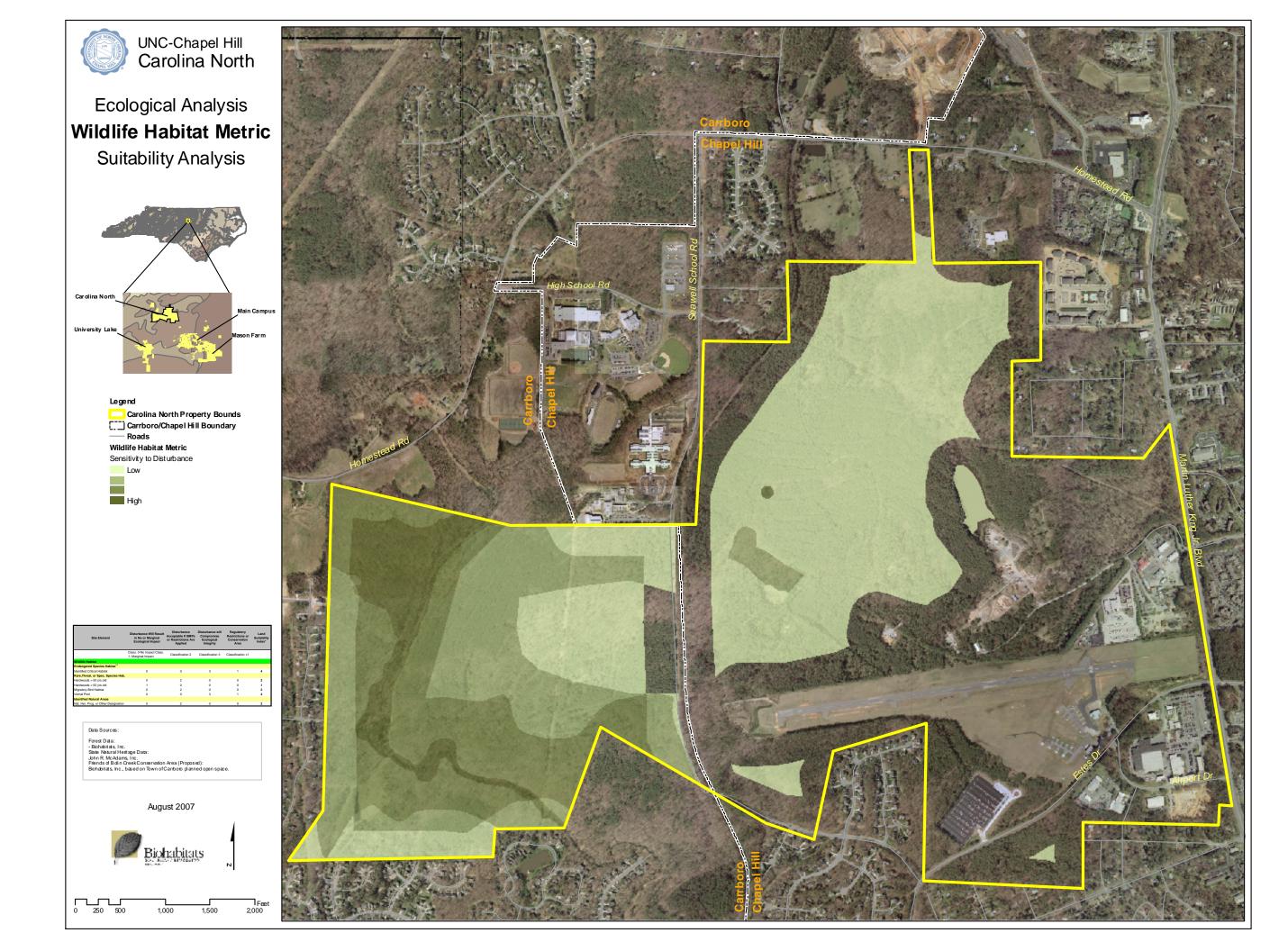
Site Element	Disturbance Will Result in No or Marginal Ecological Impact	Disturbance Acceptable If BMPs or Restrictions Are Applied	Disturbance will Compromise Ecological Integrity	Regulatory Restrictions or Conservation Area	La Suita Ind
	Class. 0-No Impact Class. 1- Marginal Impact	Classification 2	Classification 3	Classification +1	
Groundwater ²					
Recharge Zones					
High Soil Permeability/Recharge Zone	0	2	0	0	
Mod. Soil Permeability/Recharge Zone	1 0	0	0	0	
Low Soil Permeabity/Recharge Zone	0	0	0	0	
Depth to Groundwater Depth to Groundwater < 1.5'	0	0	3	0	
Depth to Groundwater 1.5'-4'	0	2	0	0	
Depth to Groundwater >4'	0	ō	0	0	
- derived from Nat (NRCS) and UNC			ervice		_
	GIS Department	sollsdata.			
	GIS Department				
	Augi	sollsdata.		2	

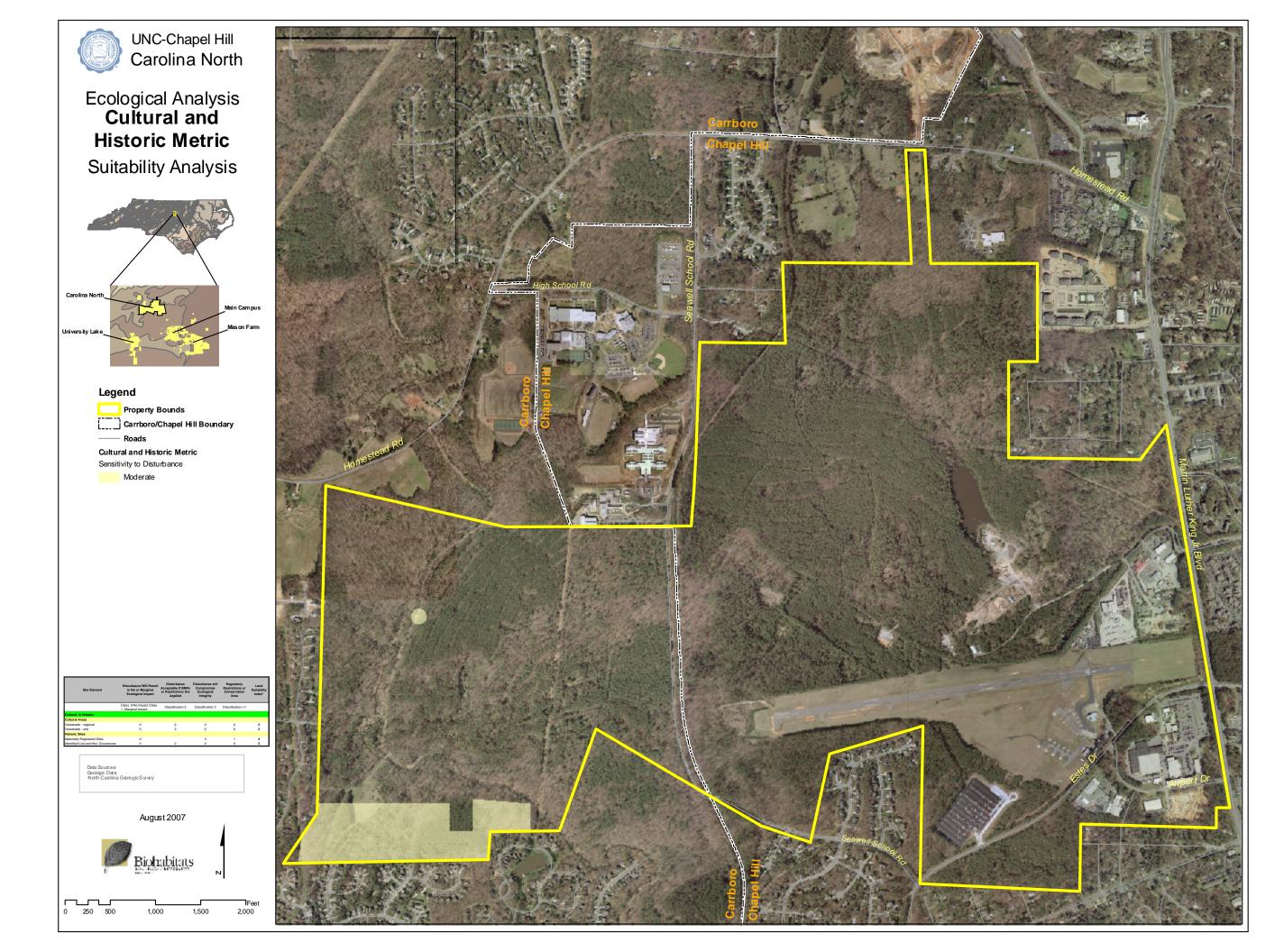






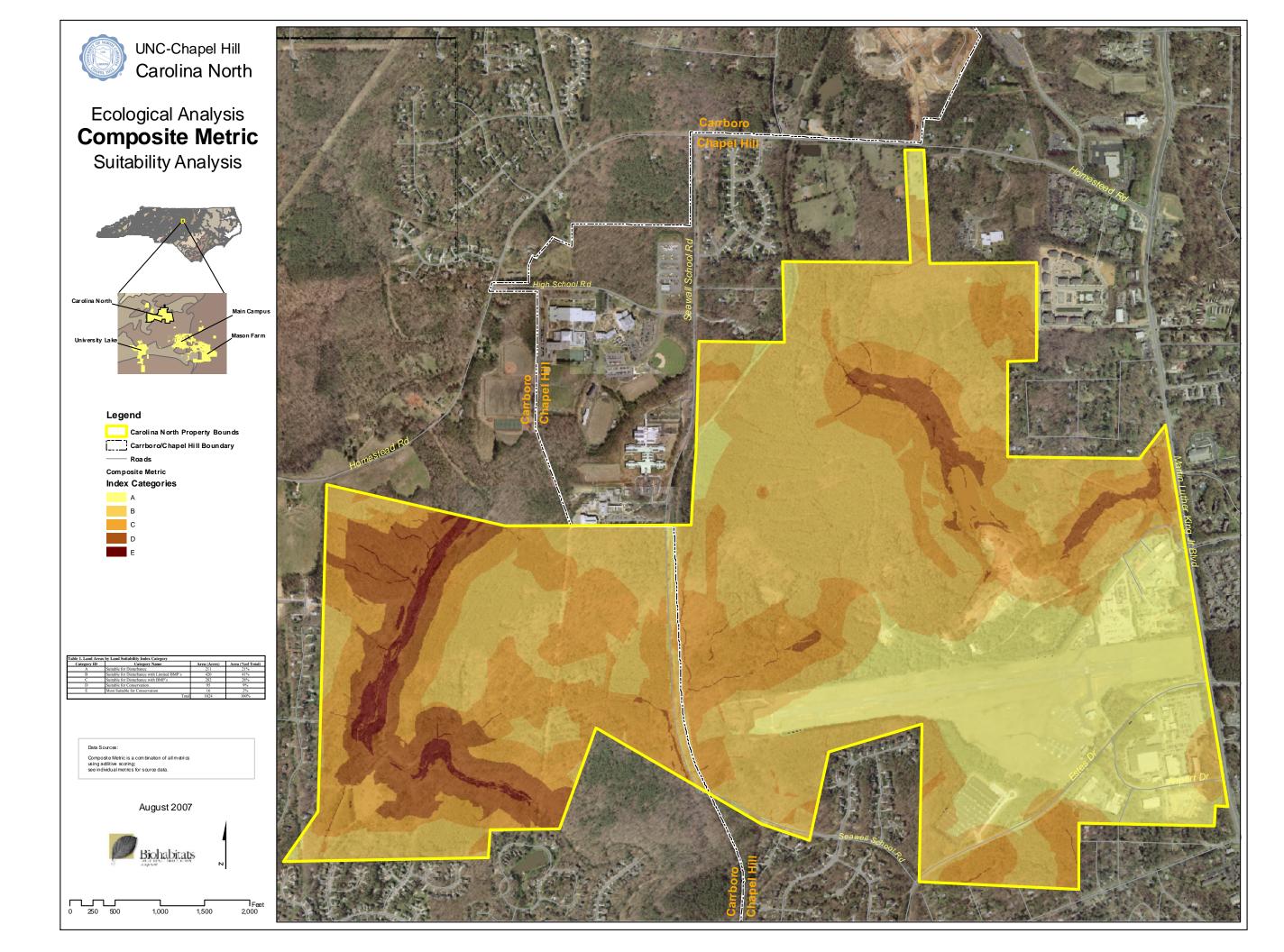


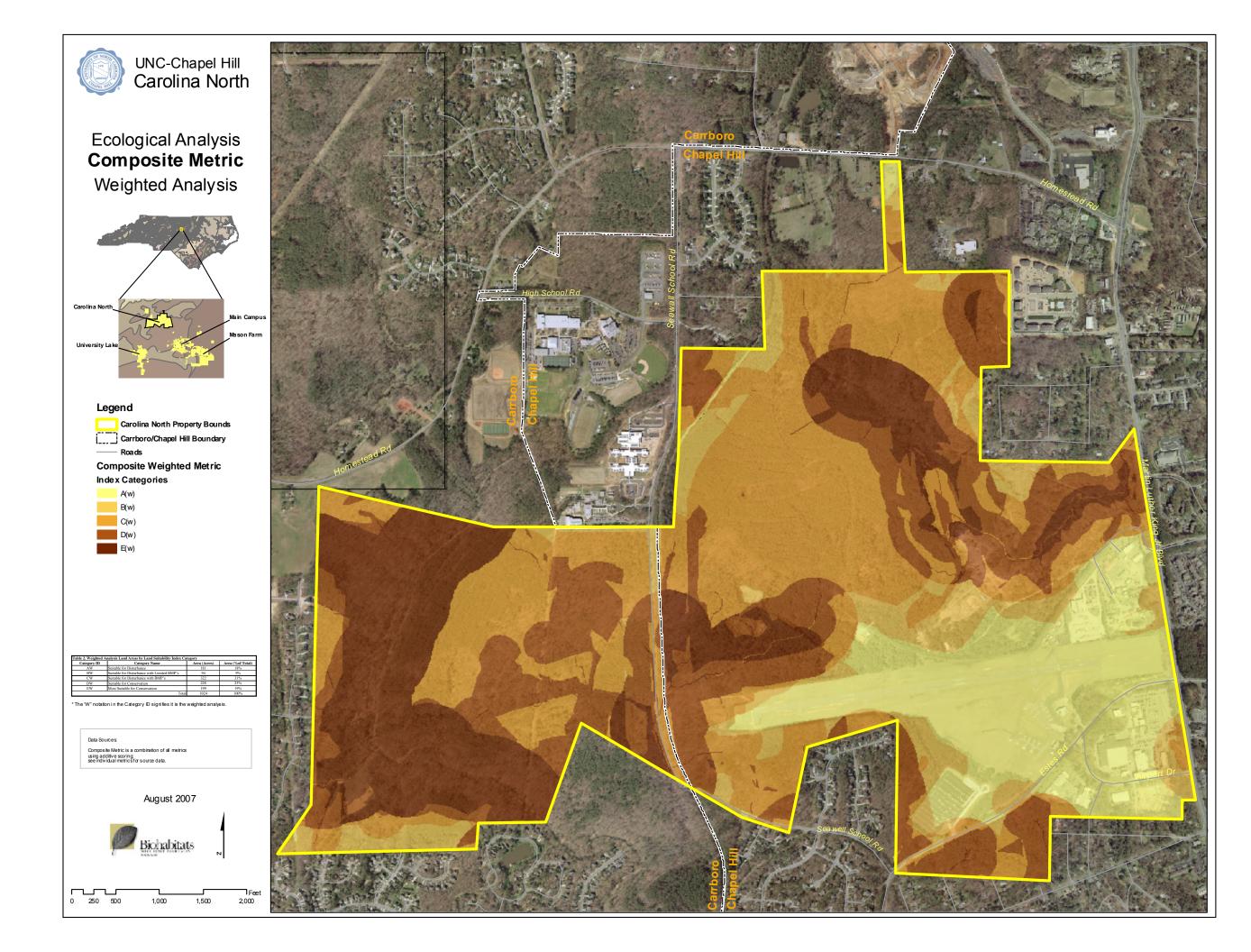


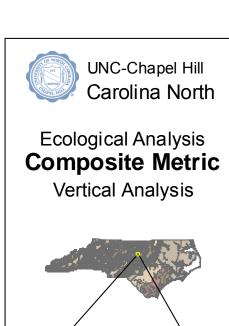


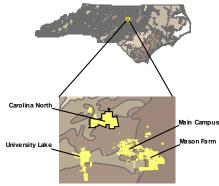
APPENDIX 7

Composite Map, Weighted Analysis Map, Vertical Analysis Map, Designated Conservation Areas and Regulatory Restriction Areas Map









Legend

Carolina North Property Bounds Carrboro/Chapel Hill Boundary

Composite Vertical Metric Index Categories

A(v)

B(v)

Table 3. Vertical Analysis Land Areas by Land Suitability Index Category				
Category ID	Category Name	Area (Acres)	Area (%of Total)	
	Disturbance will compromise ecological integrity-			
AV	LOW	489	57%	
	Disturbance will compromise ecological integrity-			
BV	MEDIUM	338	39%	
	Disturbance will compromise ecological integrity-			
CV	HIGH	29	3%	
	Total	856	100%	

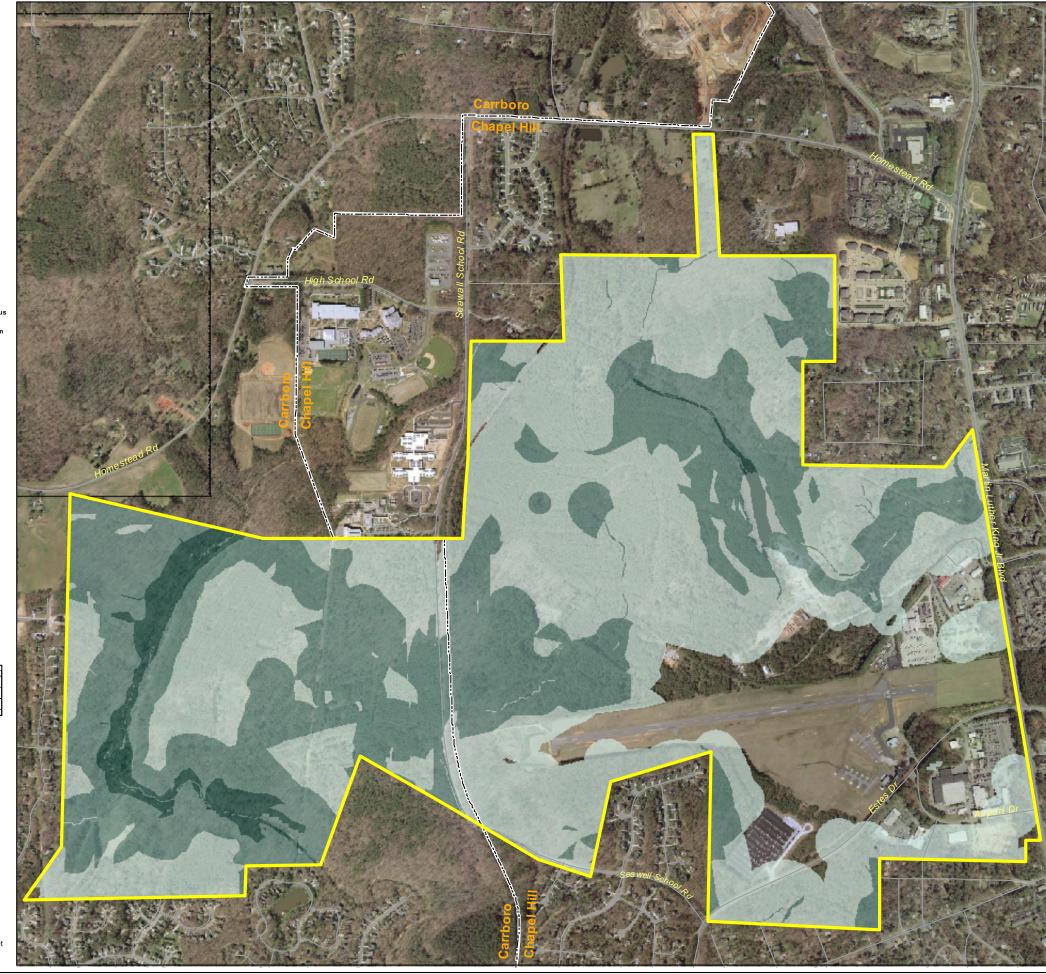
*The "V" notation in the Categoryl D signifies it is the vertical analysis.
In add tion, approximately 165 acres of the site had no Classification 3 designation. These areas have no shading associated with them.

Composite Metric is a combination of all metrics using an additive scoring; see individual metrics for source data.

August 2007



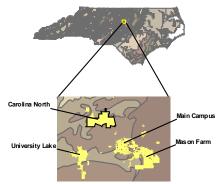
0	250	500	1,000	1,500	2,00





Ecological Analysis

Regulatory Restriction/ Conservation Areas



Legend

Property Bounds

Carrboro/Chapel Hill Boundary

---- Roa

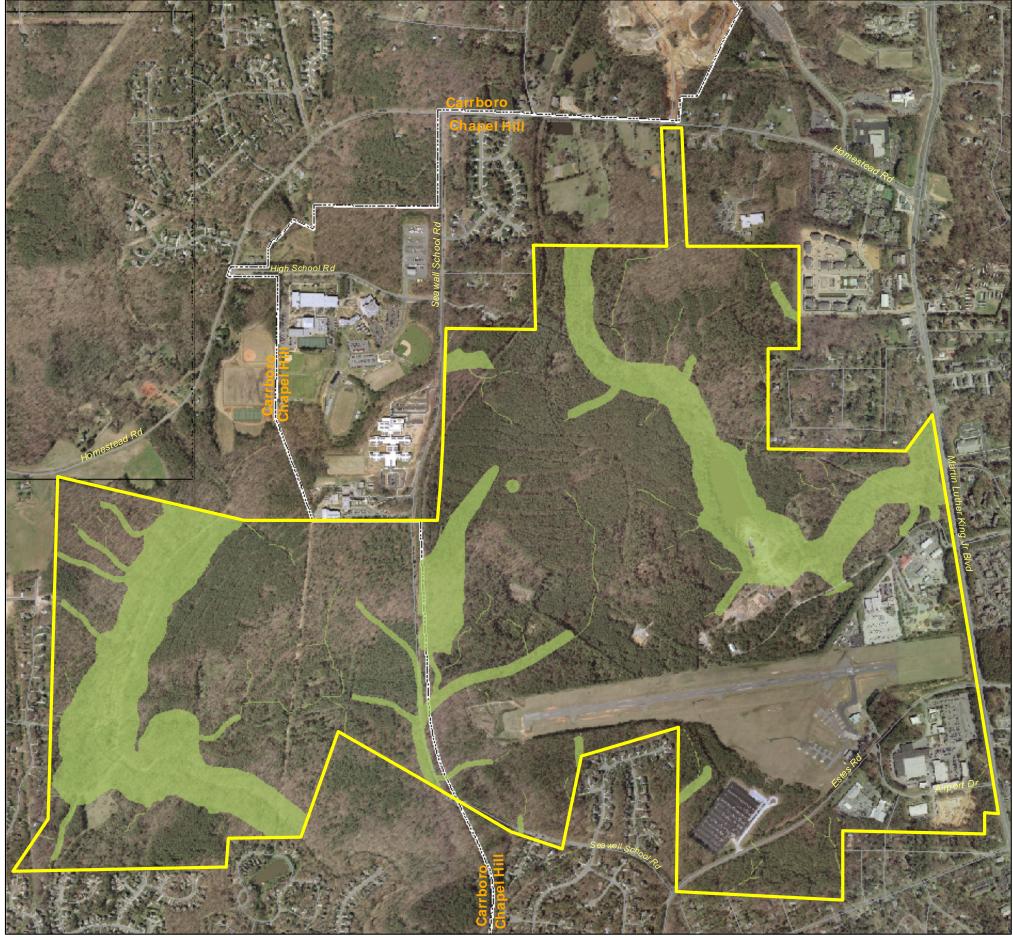
Regulatory Restriction/Conservation Areas

Data Sources:

Data selects a composite of invertory data which includes, filoophairs, wallands, went pools, seep slopes, and hydric soils.

August 2007

Feet 0 250 500 1,000 1,500 2,000



APPENDIX 8
Public and Peer Review Meeting Information

This Appendix contains attendee lists, attendee comments and some display maps from the following meetings:

BIOHABITATS PUBLIC LISTENING SESSION WITH COMMUNITY LEADERS, VAN HECKE WETTACH LAW SCHOOL, ROOM 5046, NOVEMBER 6, 2006 5:30-7:00 PM

PARTICIPANTS

Neal Flanagan	Friends of Bolin Creek
Julie McClintock	Friends of Bolin Creek
Johnny Randall	NC Botanical Garden
David Cooley	Friends of Bolin Creek
Terri Buckner	Community Member
Tony Waldrop	UNC, Research and Economic Development
Loren Hintz	Chapel Hill High School
Ted Brown	Biohabitats
Kevin Nunnery	Biohabitats
Keith Bowers	Biohabitats
Kirk Pelland	UNC, Grounds Services
Tom Bythell	UNC, Grounds Services
Sharon Myers	UNC-EHS
Neil Caudle	UNC, Research and Economic Development
Mary Jane Felgenhauer	UNC, Facilities Planning
Bob Berkebile	BNIM
4 3377	
Anna Wu	UNC, Facilities Planning
Anna Wu Jill Coleman	UNC, Facilities Planning UNC, Facilities Planning
	e
Jill Coleman	UNC, Facilities Planning
Jill Coleman Stewart Bryan	UNC, Facilities Planning Triangle Off-Road Cyclists (TORC)
Jill Coleman Stewart Bryan Bill Camp	UNC, Facilities Planning Triangle Off-Road Cyclists (TORC) Triangle Off-Road Cyclists (TORC)
Jill Coleman Stewart Bryan Bill Camp Carolyn Buckner	UNC, Facilities Planning Triangle Off-Road Cyclists (TORC) Triangle Off-Road Cyclists (TORC) Friends of Bolin Creek
Jill Coleman Stewart Bryan Bill Camp Carolyn Buckner Randee Haven-O'Donnell	UNC, Facilities Planning Triangle Off-Road Cyclists (TORC) Triangle Off-Road Cyclists (TORC) Friends of Bolin Creek Carrboro Board of Alderman
Jill Coleman Stewart Bryan Bill Camp Carolyn Buckner Randee Haven-O'Donnell Haven Wiley	UNC, Facilities Planning Triangle Off-Road Cyclists (TORC) Triangle Off-Road Cyclists (TORC) Friends of Bolin Creek Carrboro Board of Alderman UNC-Biology
Jill Coleman Stewart Bryan Bill Camp Carolyn Buckner Randee Haven-O'Donnell Haven Wiley Peter White	UNC, Facilities Planning Triangle Off-Road Cyclists (TORC) Triangle Off-Road Cyclists (TORC) Friends of Bolin Creek Carrboro Board of Alderman UNC-Biology UNC-Biology/NC Botanical Garden
Jill Coleman Stewart Bryan Bill Camp Carolyn Buckner Randee Haven-O'Donnell Haven Wiley Peter White Luanne Greene	UNC, Facilities Planning Triangle Off-Road Cyclists (TORC) Triangle Off-Road Cyclists (TORC) Friends of Bolin Creek Carrboro Board of Alderman UNC-Biology UNC-Biology/NC Botanical Garden ASG
Jill Coleman Stewart Bryan Bill Camp Carolyn Buckner Randee Haven-O'Donnell Haven Wiley Peter White Luanne Greene Jonathan Howes	UNC, Facilities Planning Triangle Off-Road Cyclists (TORC) Triangle Off-Road Cyclists (TORC) Friends of Bolin Creek Carrboro Board of Alderman UNC-Biology UNC-Biology/NC Botanical Garden ASG UNC, University Relations UNC, Facilities Planning and

DOES THE GROUP KNOW OF ANY STUDIES THAT HAVE BEEN DONE ON THE SITE?

- -Morgan and Little Creek Plan by the State of NC
- -Chapel Hill Bird Club bird counts
- -Chapel Hill High School bird counts
- -Smith Middle School water monitoring (data may not be usable)
- -Streamwatch on Bolin Creek
- -Fish studies done by UNC students downstream of site
- -Creeping Cedar study
- -County assessment of forests across the entire county includes site (publication-Landscape for Wildlife in Orange County)
- -Salamander study by graduate student
- -Local governments and Haw River Assembly water quality data-Wendy Smith, of Town of Chapel Hill, may have some of the data

- -Carrboro macro-invertebrate data
- -Information on Friends of Bolin Creek website-pictures of flora and also pictures of Crow Branch
- -There is some history of the site on the Friends of Bolin Creek website also. There is an
- old mill site on the property, originally owned by Buck Taylor, a notable early Chapel Hill citizen. Comment that this site has been abused/disturbed by the public.

ARE THERE ANY NOTABLE AREAS OR FEATURES OF THE SITE THE GROUP WOULD LIKE TO POINT OUT?

- -Winter sparrows and woodpeckers are often sighted on property.
- -Over the past 10 years invasive plant species presence has increased notably.
- -The pond enhances site beauty and should be preserved.
- -There is a hardwood stand to the north of the pond that is very nice.
- -There is a very old hardwood stand in the northwest corner of the
- -There are large, mature yellow poplars to the west of the runway.
- -There are large mounds of earth to the north of the runway, of uniform size and spacing, that are visible from an interior road.
- -There are approximately 20 miles of mountain bike trails on the site that are also used by hikers and people walking their dogs.
- -An area to the north and east of the runway is not well drained and the bike trail builders avoided it.
- -The open area on the west side of the site was a community garden site approximately 10 years ago.
- -Crow Branch and its tributaries are a very ecologically important part of the site.
- -Suggestion that the rail line be a focus area for transit, rather than using interior site routes;
- -Bedrock prevents vertical erosion of the channel of Bolin Creek, which is increasing lateral erosion of the stream banks.
- -Vernal pools exist to the north of the west end of the runway.
- -Quite a few Indian artifacts have been found in the former community garden area.
- -Areas that were part of the former Navy runways have pioneer species vegetation that
- are different from the adjacent areas.
- -There are piles of organic matter north of the west end of the runway that are in and around an open area. They were placed there by the University for recycling, before the drum grinder was purchased and placed in the current lay down area.
- -The water quality in Crow Branch downstream of the pond appears to be poor, and it may be that the leachate from the old landfill is negatively affecting it.
- -The water quality in the pond is good.
- -The Carolina North tract is a very important community amenity for outdoor activities.
- -There is no data on usage, but the numbers of users is thought to be high.

- -There are not many recreational trails in the greater site area.
- -Some of the trails on the site are very old.
- -Some of the mountain bike trails on the site are well-built and some are not.
- -The mountain bike community would like to volunteer to work with the University on the trails.
- -The southeastern portion of the tract is not as recreationally attractive as other areas of the site.
- -Individual commented that they view open fields/athletic fields as greenspace.
- -The site is a very good running site, it has a rural flavor that is valuable.
- -The site needs some active management now, to maintain it and prevent degradation.
- -The deer population may become a problem as habitat surrounding the site shrinks.
- There is an opportunity to build bike trails through the site along Bolin
 Creek that would avoid car traffic and possibly connect to Barclay Road.
- -High school students occasionally use trails across site to get to school.
- -There are possibilities to link community greenways across the site, on the Craig and Adams tracts, and from Twin Creeks to the site.
- -Local residents see the site as a destination for open space.
- -Carolina North will provide an impetus for an off-road link between old and new campuses.

WHAT ARE SOME CHANGES THAT THE GROUP WOULD LIKE TO SEE?

- -Invasive plant species removal;
- -Improved water quality;
- -Trail design and management;

- -Landfill and chemical site remediation;
- -Recreational spaces-fields;
- -More archaeological assessment of the site;
- -Use of proper construction specifications for mountain bike trails, which are available through local bike clubs;
- -Repair the channels of tributaries of Crow Branch that flow across gas line right of way;
- -Stream bank restoration/stabilization where there is high trail use;
- -Successfully prohibit four-wheelers from the site;
- -The Little River County Park could be used as a model for good bike trail design;
- -Leave standing dead trees for bird habitat;
- -Deer population management;
- -Wildlife inventory;
- -Maintain wildlife corridor to north of Homestead Road;
- -There are many different ecotypes onsite, it is complicated and needs further discussion to fully explore;

ARE THERE ANY DATA GAPS?

- -Viewscape locations on the site-the feeling of isolation is valued, especially along Bolin Creek;
- -Habitat Map;
- -User frequency data;
- -GPS mapping of bike trails;
- -How much ecological work does the site do for society? How much natural capital exists onsite?
- -The fewer rules, the better;
- -Conservation areas need to be at least 40 acres for viable wildlife habitat presentation; Forested areas, especially mature hardwoods, are very ecologically valuable.

BELOW IS AN IMAGE OF THE MAP ON WHICH SOME OF THE MEETING ATTENDEES PLACED COMMENTS ABOUT THE SITE.

Map numbers as presented below correspond to the areas/features identified by attendees:

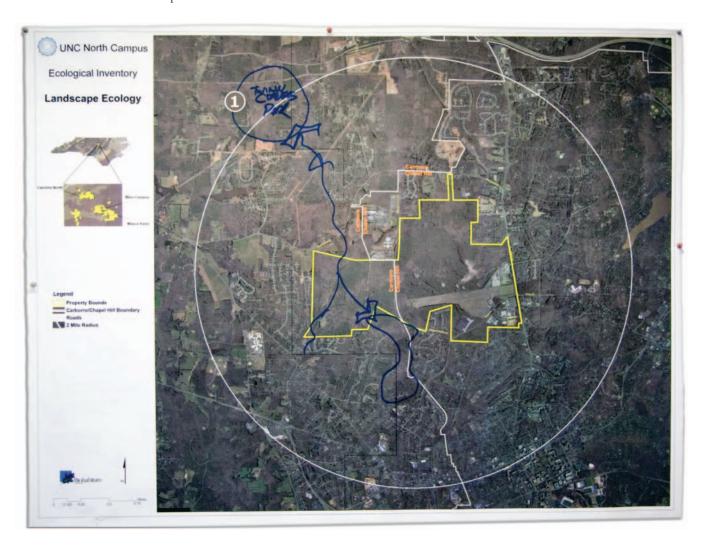


- 1. +20 miles trail
- 2. very important for recreation hiking, learning
- 3. site feels like home in rural N.C.
- 4. more trails not done in resp. manner
- 5. bike trail
- 6. native american artifacts
- 7. Community gardens used up to 10 years ago
- 8. amazing forest
- 9. bedrock lateral erosion
- 10. cascades ridge (left) and enchanted forest (right)
- 11. mill site
- 12. 120' tulip poplars amazing site
- 13. recreation

- 14. rail line
- 15. wet
- 16. vernal pools
- 17. large trees special place
- 18. [variation of ??]
- 19. organic waste (1 yr)
- 20. 3-4 mounds disturbed
- 21. wet
- 22. (swimming) pond
- 23. crow branch leachate
- 24. landfill area
- 25. runway alignments
- 26. bike connector

THE LANDSCAPE ECOLOGY MAP DISPLAYED IN THE MEETING IS PRESENTED BELOW.

The comments listed on this map were:



1. Twin Creeks Park

TUESDAY, NOVEMBER 28TH 4:00-6:00PM ECOLOGICAL ASSESSMENT FACULTY METHODOLOGICAL REVIEW AND INTERNAL REVIEW OF ANALYSIS

Participants

Robert Peete	UNC, Ecology
Johnny Randall	UNC, NC Botanical Garden
Jonathan Howes	UNC, University Relations
Terri Buckner	Community member
Sharon Myers	UNC, Environmental Health and Safety
Jack Evans	UNC, Carolina North, Leadership Advisory Committee
Mary Jane Felgenhauer	UNC, Facilities Planning
Cindy Shea	UNC, Sustainability Office
Tony Waldrop	UNC, Research and Economic Development
Pat Crawford	UNC, Office of General Counsel
Neil Caudle	UNC, Research and Economic Development
Anna Wu	UNC, Facilities Planning
John D'Epagnier	RK&K
Ted Brown	Biohabitats
Keith Bowers	Biohabitats
Kevin Nunnery	Biohabitats
Luanne Greene	Ayers/Saint/Gross
Karla Aghajanian	Ayers/Saint/Gross
Brad Nies	BNIM
Mohit Mehta	BNIM

- Biohabitats gave an overview of the methodology for the Ecological Assessment and went through the inventory maps, attribute maps, and suitability analysis for an internal UNC group and professors and local scientists.
- The methodology for weighing/valuing the various attributes was discussed.

THURSDAY, DECEMBER 13^{TH} 3:00-5:00PM PUBLIC REVIEW OF ECOLOGICAL ASSESSMENT INVENTORY AND ANALYSIS (SESSION 1)

Participants

Sue Burke	Chapel Hill Stormwater
Michael Collins	Neighborhoods for Responsible Growth
Alan Snavely	Neighborhoods for Responsible Growth
Ken Broun	UNC, School of Law, Leadership Advisory Committee
Dave Godschalk	UNC, Department of City and Regional Planning
Jamie Schulman	Reporter
Tim Toben	Greenbridge
Henry McKoy	TCON
Katherine O'Brien	UNC, Engineering and Information Services
Bernedette Pelissier	Sierra Club
Roy Cox	UNC, Public Safety
Pat Evans	Friends of Downtown

Roger Perry	UNC Board of Trustees, Leadership Advisory Committee
Sally Vilas	UNC Board of Visitors
Gordon Sutherland	Chapel Hill Planning Department
Kendal Brown	Carrboro Planning Department
Tom Tucker	Greenbridge
Jamie Dervin	Chamber of Commerce
Diane Gillis	UNC, Facilities Planning
George Alexiou	MAB
Curtis Brooks	Chapel Hill Public Works
Bruce Runberg	UNC, Facilities Planning
Bob Winston	UNC Board of Trustees, Leadership Advisory Committee
Tavey Capps	Duke University, Sustainability
Jennie Orcutt	UNC Student
David Yeargan	UNC, Carolina Adventures
Jessica Long	UNC Student
Allan Rosen	Village Project
Nancy Kiplinger	UNC, School of Government
MJ Felgenhauer	UNC, Facilities Planning
Carolyn Elfland	UNC, Campus Services
Pat Crawford	UNC, University Counsel
John Masson	UNC, Facilities Planning
Tom Bythell	UNC, Grounds Services
Sharon Myers	UNC, Environmental Health and Safety
Michael Pierce	UNC, Facilities Planning
Jim Ward	Chapel Hill Town Council, NC Botanical Garden
Masaya Konishi	UNC, Facilities Planning
Thomas Lehman	UNC, Math Department
Kirk Ross	Community member
Diana Steele	Community member, Mason Farm Road
Jannice Ashley	UNC, Property Office
Delores Bailey	Empowerment
Anna Wu	UNC, Facilities Planning
Meg Holton	UNC, Energy Services
Karla Aghajanian	Ayers Saint Gross

- Look at different analyses to see if there are major deviations.
- CRed application to site \rightarrow Forest ability to sequester carbon
- Show acres per category for scales
- How do attributes change based on different development scenarios.
- Natural Heritage Program (NHP) sites getting value of "2" seems lows
- Value of impaired streams seems discounted
- How does site serve UNC's education and research mission
- Need to track changes to sight and establish a baseline
- · Look at recreational trail impacts
- Water quality data source from watershed study
- Some data more political than ecological (ex. Carrboro school site reserve)
- What is happening with old landfill → seems to have potential
- Chemical dump is less likely due to clean up needs
- Are there more biological/ ecological indicators that will be looked at
- For each indicator → consider regional/ causal factors and impacts

THURSDAY, DECEMBER 13[™] 6:00-8:00PM PUBLIC REVIEW OF ECOLOGICAL ASSESSMENT INVENTORY AND ANALYSIS (SESSION 2)

Participants

Lucille Fidler	Community Member/Village West
Diane Vander Brock	Com munity Member
Tiffany Clarke	UNC, Research and Economic Development
Marc deBree	Community Member
Chris Carter	Solar Village Institute
Deborah Amaral	NC Ecosystem Enhancement Program
Jack Chestnut	Carol Woods Retirement
Kirk Pelland	UNC, Grounds Services
Scott Kosmecki	UNC Student
Mary Rabinowitz	First School/Friends of Bolin Creek/ Carrboro Planning Board
Carolyn Buckner	Friends of Bolin Creek/Carrboro
Sam Odom	UNC, Frank Porter Graham Child Development Institute
Bob Berkebile	BNIM
MJ Felgenhauer	UNC, Facilities Planning
Karla Aghajanian	Ayers Saint Gross
Luanne Greene	Ayers Saint Gross
Ellen Miller	Stonebridge Associates
John d'Epagnier	RKK
Kathy Buck	The Village Project
Danyele McPherson	Triangle Off-Road Cyclists (TORC)/ Carrboro Resident

Andrew Farris	Triangle Off-Road Cyclists (TORC)/ Carrboro Resident
Sharon Myers	UNC, Environmental Health and Safety
Linda Convissor	UNC, University Relations
Anna Wu	UNC, Facilities Planning
Jonathan Howes	UNC, University Relations
Brad Nies	BNIM
Ed Harrison	Chapel Hill Town Council
Paul Harrison	
Julie McClintock	Leadership Advisory Committee, Friends of Bolin Creek
Loren Hintz	Community Member
Rob Crook	Community Member, Spring Valley Neighborhood
Will Raymond	Community Member
Steward Bryan	Triangle Off-Road Cyclists (TORC)
Jack Evans	UNC, Carolina North, Leadership Advisory Committee

- How have we qualified impacts to streams downstream from any potential development onsite, i.e., edge effect? What about upstream to downstream effects of development → traffic impacts on water quality on Bolin Creek?
- Should metrics or a metric be based on an indicator or threatened or rare species?
- Contiguous habitat areas should receive more weight
- Water quality on Crow Branch decreases Bolin Creek Increases

 → document