GREEN GROWTH GUIDELINES

A Framework for Sustainable Development for Coastal Georgia

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What is Green Infrastructure?

An interconnected network of undisturbed natural areas and open space that helps preserve the values and functions of our watersheds and provides a wide array of benefits to both people and wildlife

An ecological framework for environmental, social, and economic health... our natural life support system

(Benedict and McMahon 2006)

Green Infrastructure Tools: practices and strategies that incorporate fundamental GI principles to improve water quality, air quality and habitats, protect human health and restore naturally functioning ecosystems.

Green Infrastructure Stormwater

Better Site Planning	Better Site Design	Low Impact Development
• Preserve Primary Conservation Areas • Preserve Secondary Conservation Areas	• Reduce Clearing and Grading Limits • Reduce Roadway Lengths and Widths • Fewer or Alternative Cul-de-Sacs • Reduce Parking Lot Footprints • Landscaping Areas in Parking Lots • Reduce Sidewalk Lengths and Widths • Reduce Building Footprints • Reduce Setbacks and Frontages	• Soil Restoration • Site Reforestation • Conservation Areas • Vegetated Filter Strips • Grass Channels • Simple Disconnection • Rain Gardens • Stormwater Planters • Dry Wells • Rainwater Harvesting • Green Roofs • Permeable Pavement • Bioretention Areas • Infiltration Practices • Dry Swales

The recommended approach looks like this……

Better Site Planning

Better Site Design

Low Impact Development Practices

Stormwater Management Practices

Receiving Waters

rather than this.....

Development Project

Stormwater Management Practices

Receiving Waters

GI Goals

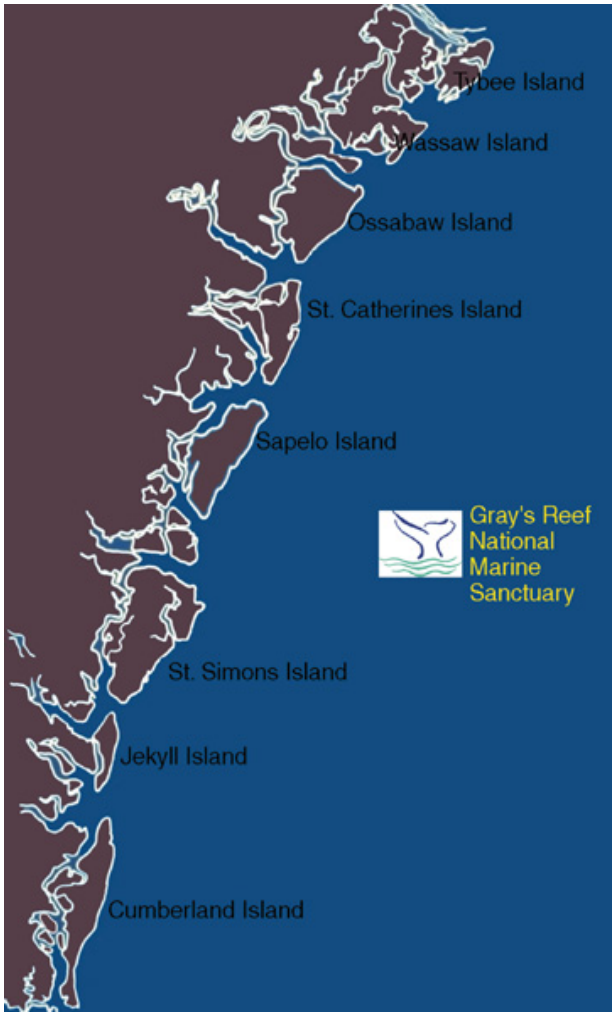
Protect the Environment & Human Health

- ✓ Reduce runoff rates, volumes and pollutant loads
- ✓ Protect of the integrity of streams, wetlands, riparian areas
- ✓ Preserve connectivity of areas that provide valuable habitat for aquatic and terrestrial organisms

Save Money and Time

- ✓ Reduce or eliminate need for larger, more expensive practices
- ✓ Reduce maintenance
- ✓ Reduce overall cost of development while maintaining or increasing overall value of project
- ✓ Streamline or eliminate expensive, time consuming federal permitting

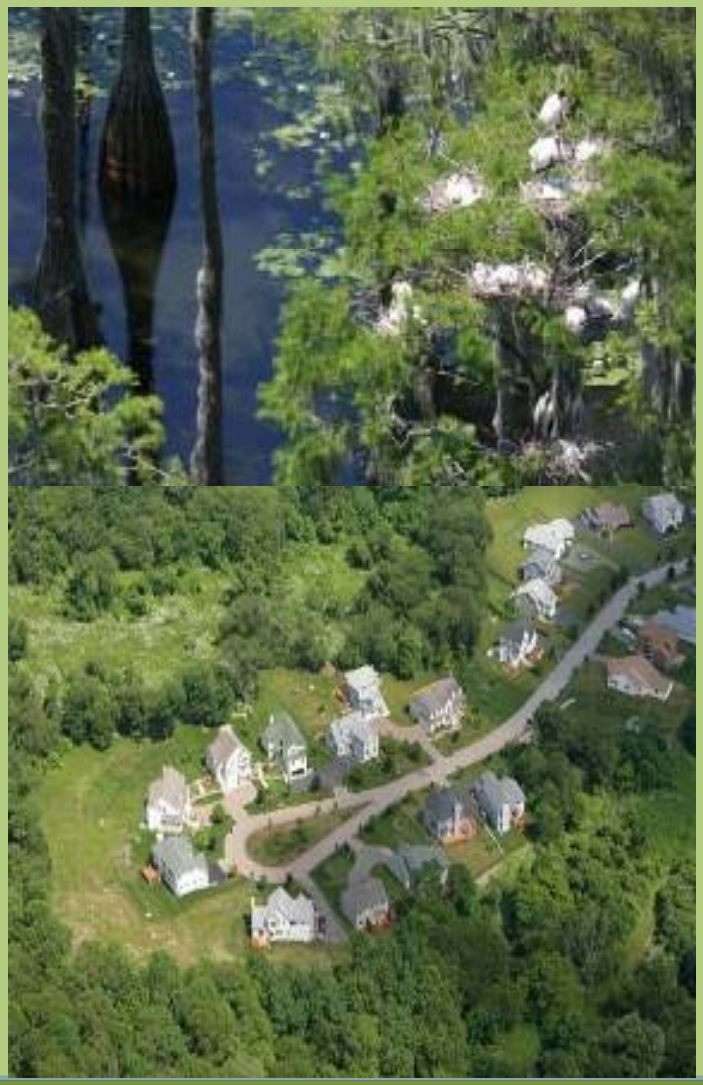
Healthy systems require a network of vital connections



Ecosystem Services

Using our **"Natural Capital"** (intact natural environment) and designing with the land to **provide important ecosystem services**:

- Flood Control
- Pollutant Removal
- Recreation
- Water and Air Quality Protection
- Energy Efficiency
- Carbon Sequestration
- Groundwater Recharge



Green Infrastructure Toolbox

- Green Growth Guidelines (G3)
- GA SW Mgmt Manual Coastal Stormwater Supplement (CSS)
- Coastscapes Communities Program
- Coastal Model Ordinances
- GA Statewide Water Plan
- Governor's Coastal Comprehensive Plan
- Georgia State Wildlife Action Plan and Coastal Biological Assessment

Green Growth Guidelines - G3

- Development tool geared for the coast
- Site-scale approach
- Intended for broad audience
- Environmental, economic, social benefits

Contents of G3

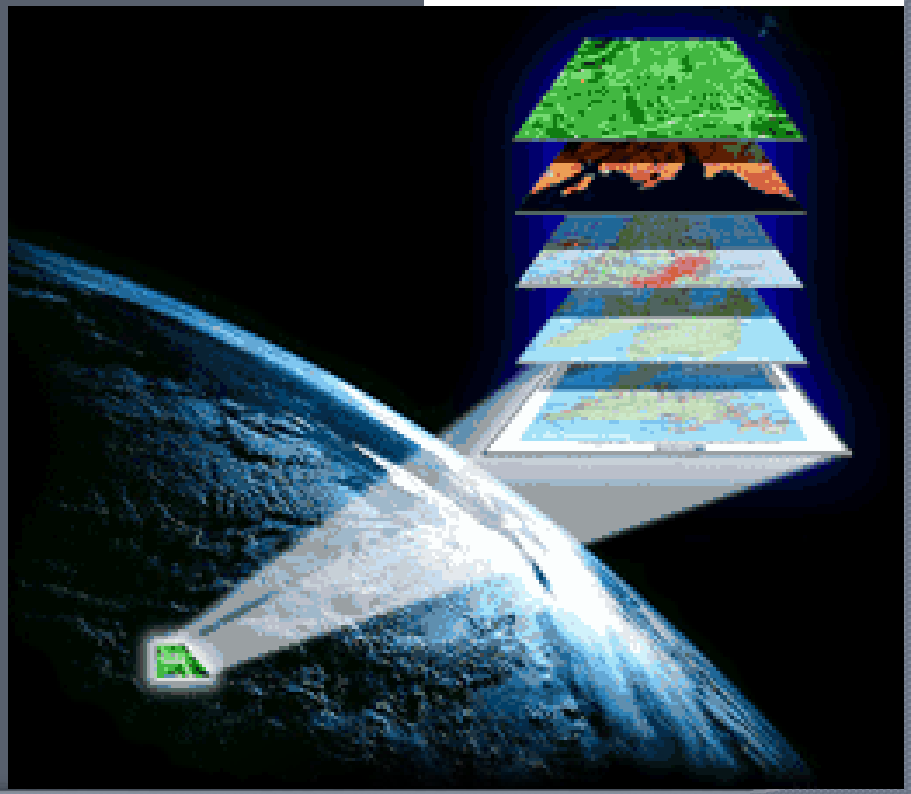
- Comprehensive Planning Methods
- Conservation Design Principles
- Low Impact Construction Practices

G3 Overview

- Site Fingerprinting Using GIS & GPS
- Designing with the Landform
- Low Impact Stormwater Management
- Streambank Stabilization
- Recreational Facilities (Marinas, Golf Courses)

CH. I Site Fingerprinting

- Utilize GIS/GPS Technology
- Identify Existing Conditions
- Consider Constraints & Opportunities
- Analyze Alternatives
- Predict Results



Mapping the Site

- Topography
- Hydrology
- Infrastructure
- Land use
- Zoning
- Significant landmarks
- Wetlands & waterways
- Groundwater recharge areas
- Floodplain
- Tree Cover
- Soils
- Wildlife Habitat
- Historic & Archeo Resources
- Setbacks & Buffers
- Essential Fish Habitat
- Shellfish Harvesting Areas

Topography

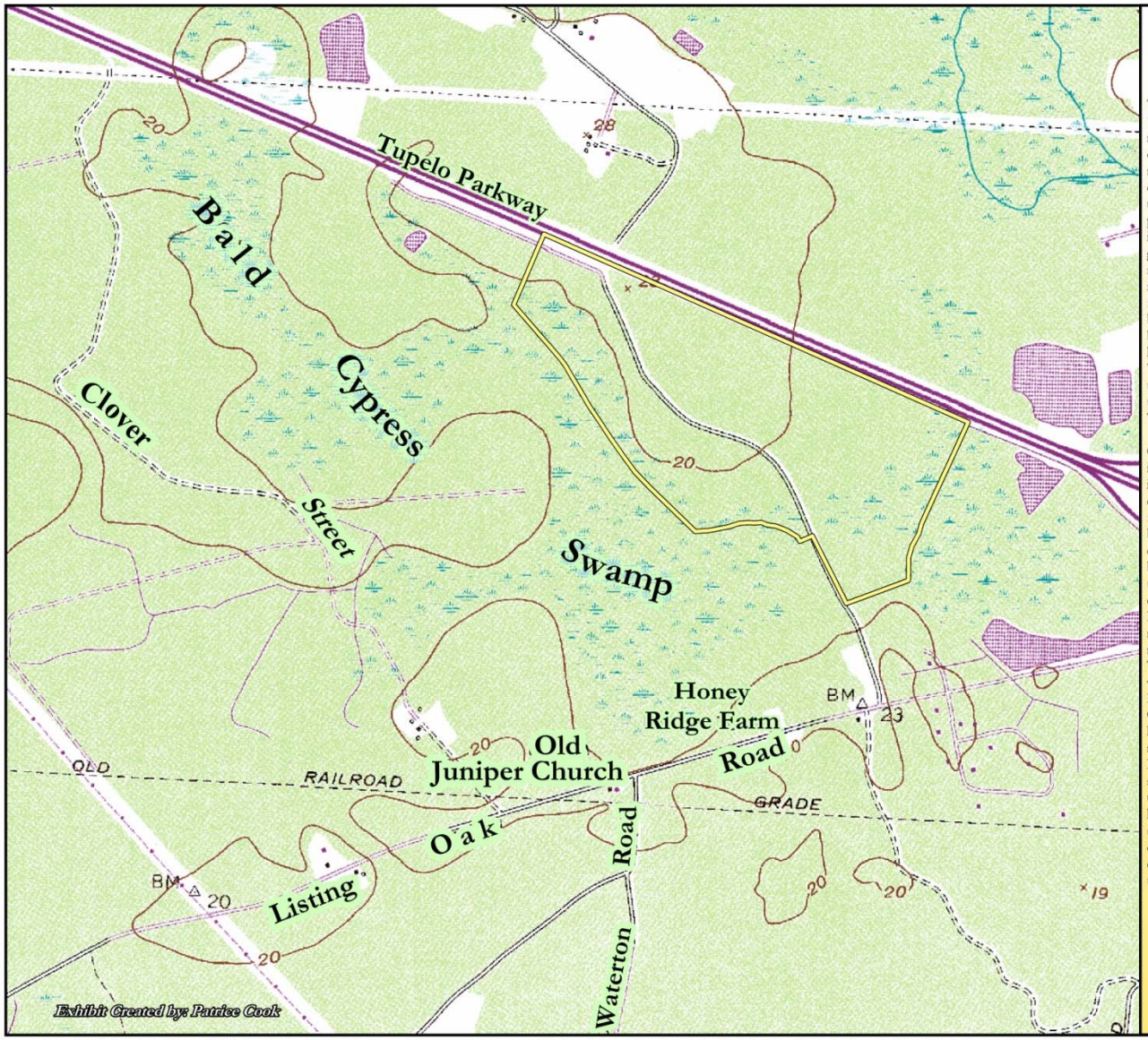


Exhibit 1:
Topographic &
Hydrologic Features

This exhibit displays a topographic map compiled in 1975 by the U.S. Geological Survey (USGS). This map shows the general topography and hydrology of the site and the surrounding area. Topographic maps illustrate a three-dimensional configuration of the Earth's surface (the actual ground elevation) using contour lines. Broadly spaced contours represent gentle slopes while close contour intervals indicate steep slopes. These maps show major geographic features including mountains, hills, rivers, valleys, and depressional wetlands. Also represented on the topographic are man-made features such as roads, churches, railroads, land boundaries, and buildings. Topographic maps are bounded by rectangular-shaped areas defined by latitudes and longitudes separated at 30', 15' or 7.5' intervals. These "quadrangles" are named by the most prominent geologic feature or the largest town. The 124-acre project site known as the Tupelo Tract is located on the Waterton Quadrangle.

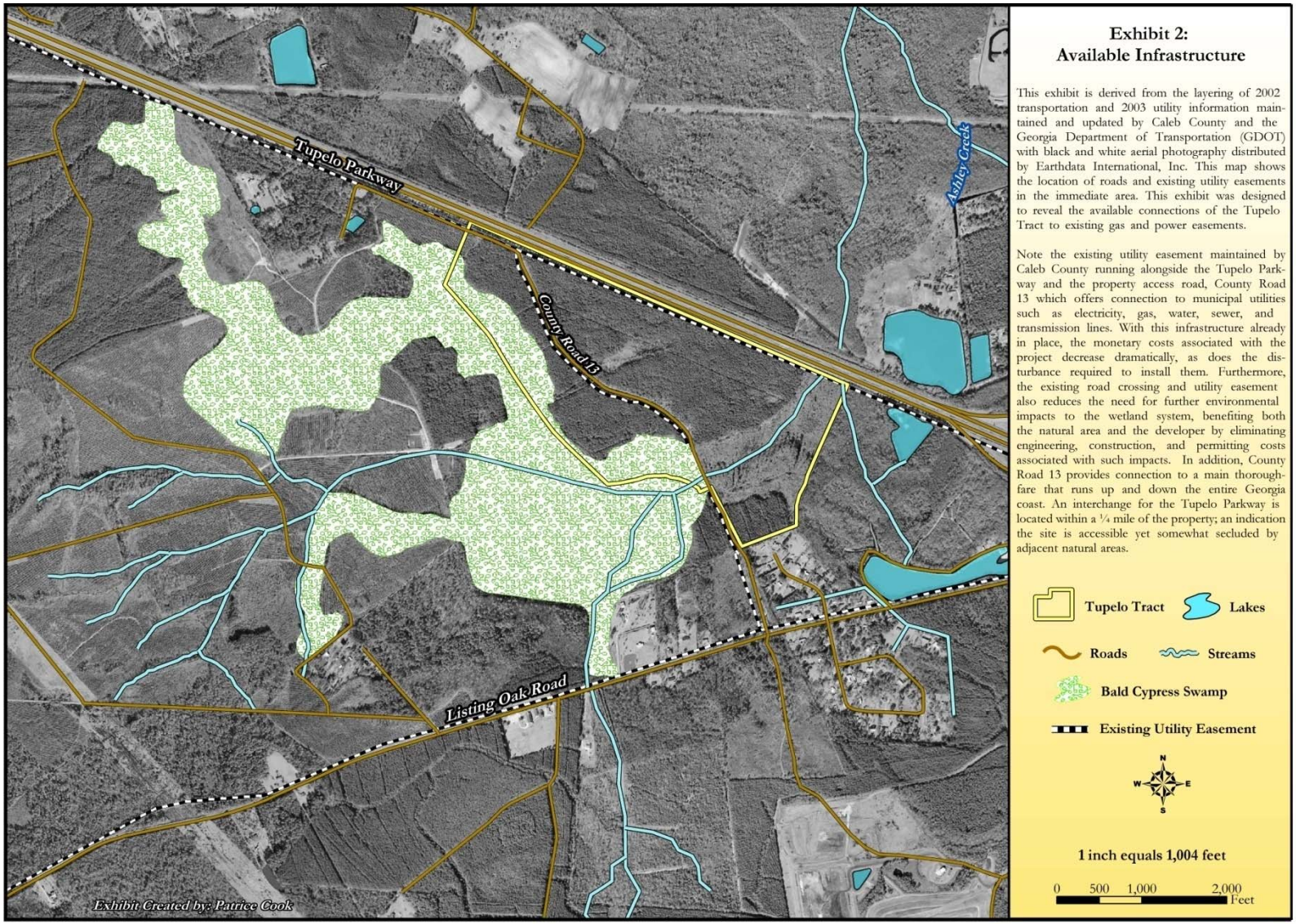
On this map, the low-lying Bald Cypress Swamp is graphically illustrated by its defining boundary identified by the twenty-foot contour line. Also depicted is the presence of an intermittent stream flowing through the tract. This stream flows beneath the Tupelo Parkway and eventually discharges into Bald Cypress Swamp. Several borrow pits and cleared areas located around the site are instantly recognizable, as well as a dated rail bed to the south of the subject parcel. Distances and the location of significant landmarks are also ascertained from the topographic map. Approximately 4,800 linear feet of the Tupelo Tract extends east-west along the Tupelo Parkway. Bisecting the southernmost ridge defining Bald Cypress Swamp is Listing Oak Road, where Old Juniper Church and Honey Ridge Farm are located. Further east on Listing Oak Road, approximately 300 feet from Benchmark 23, is County Road 13 which runs north from Tupelo Parkway, south to Listing Oak Road through the heart of the uplands portion of the tract. This access road location, the site's proximity to main thoroughfares (Tupelo Parkway and Listing Oak Road) and the concentration of uplands as a contiguous body on the northern portion of the property make this tract ideal for residential development.

Tupelo Tract: 124 Acres

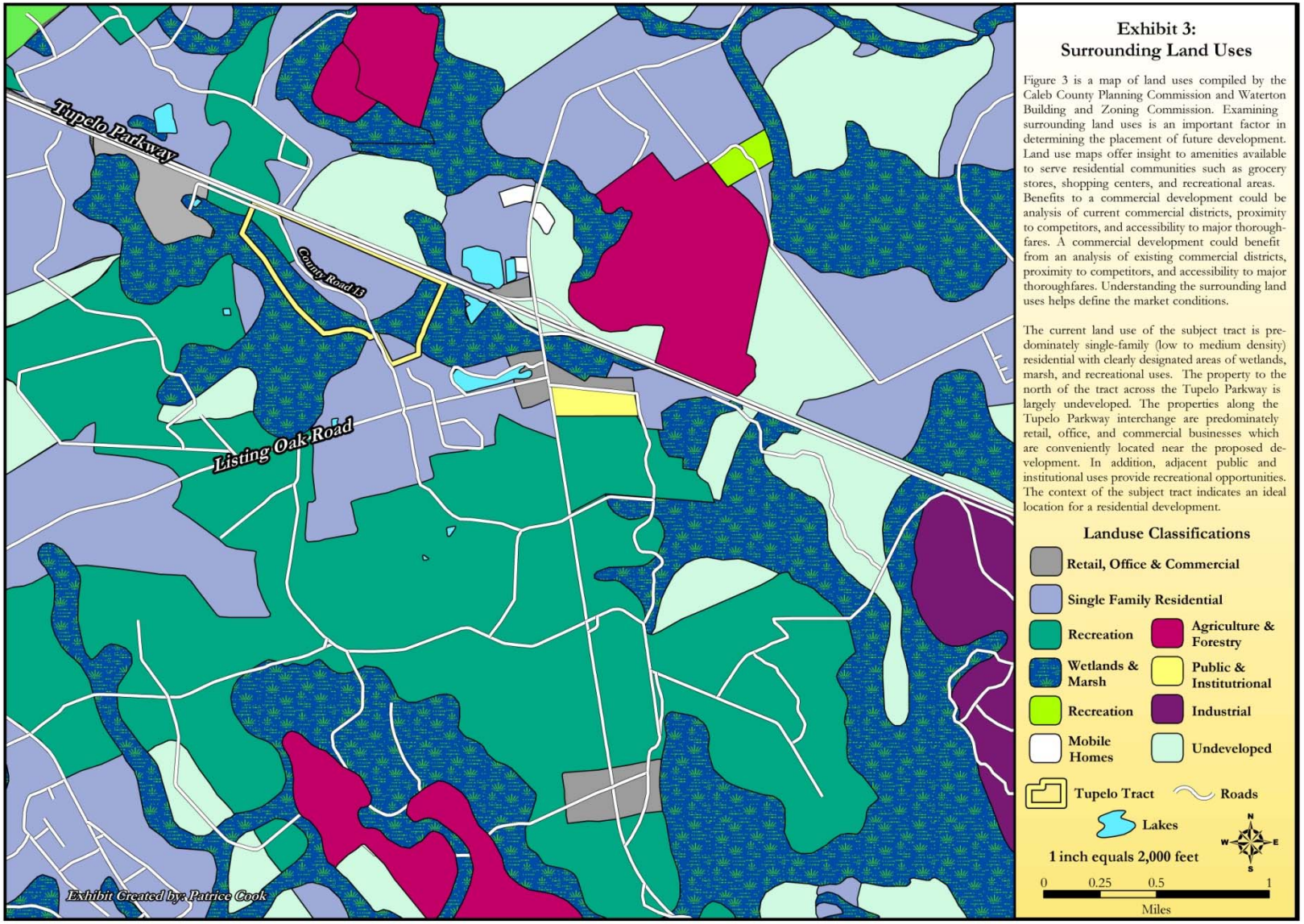
1 inch equals 1,000 feet

0 1,000 2,000 Feet

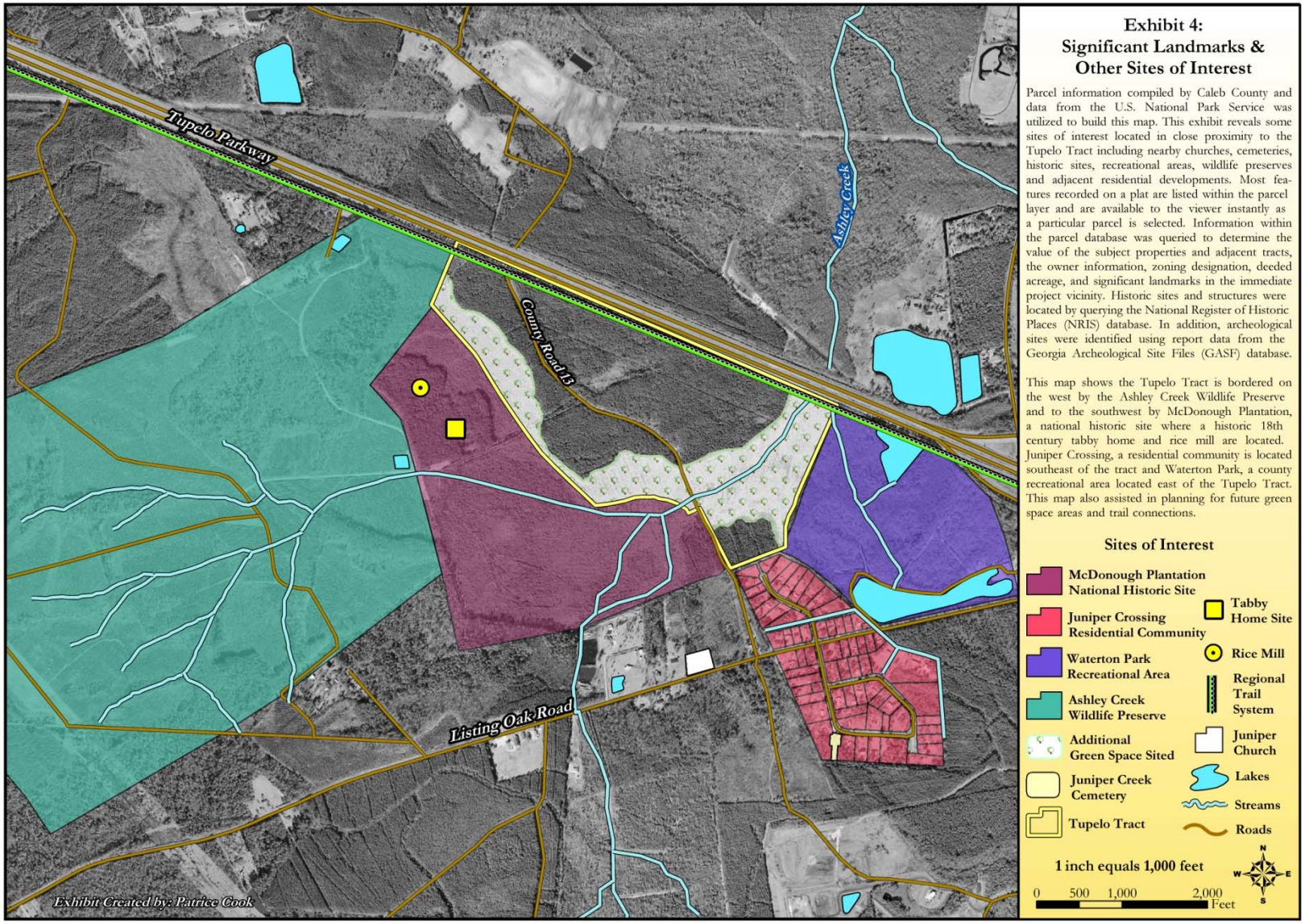
Infrastructure



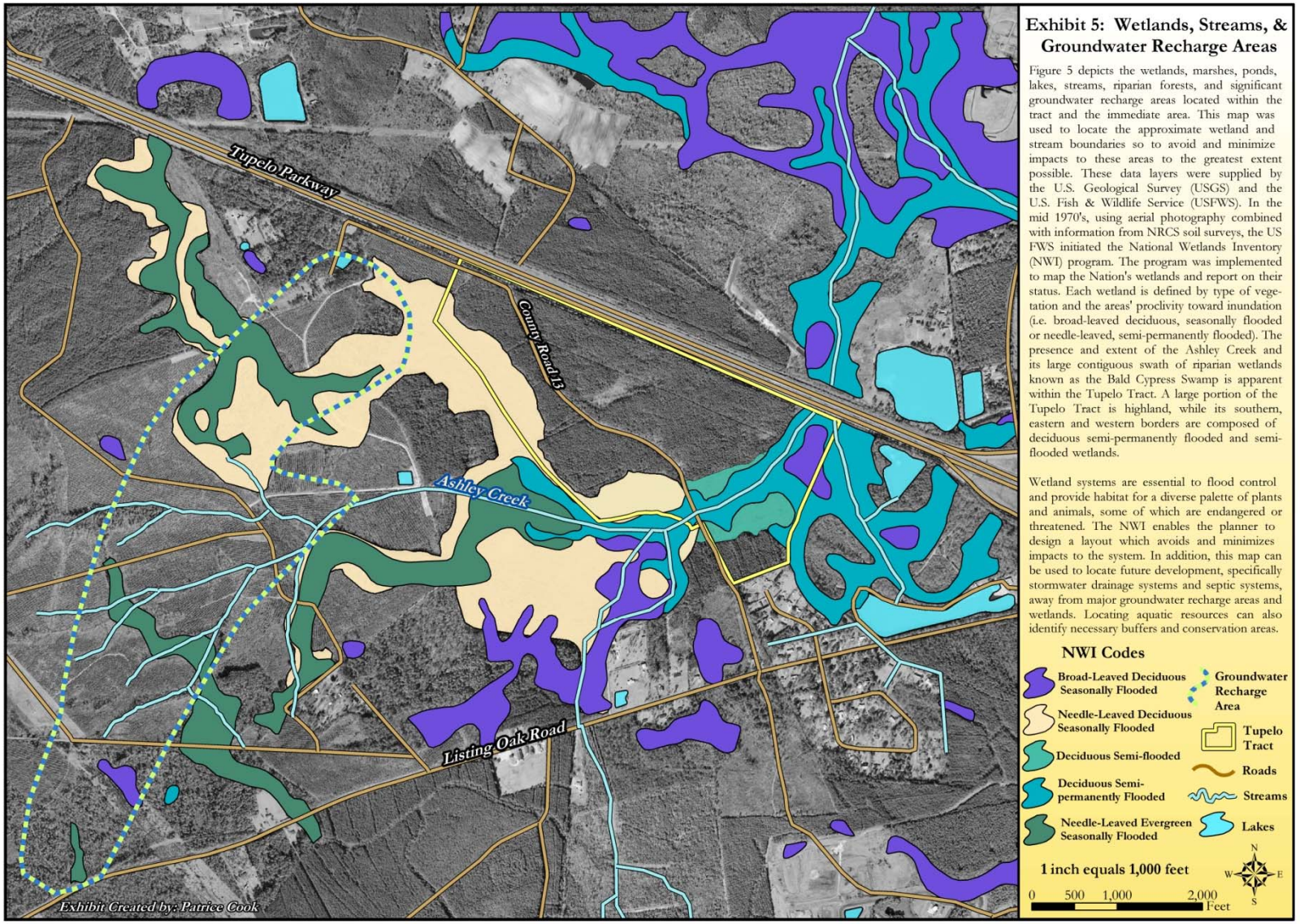
Surrounding Land Uses



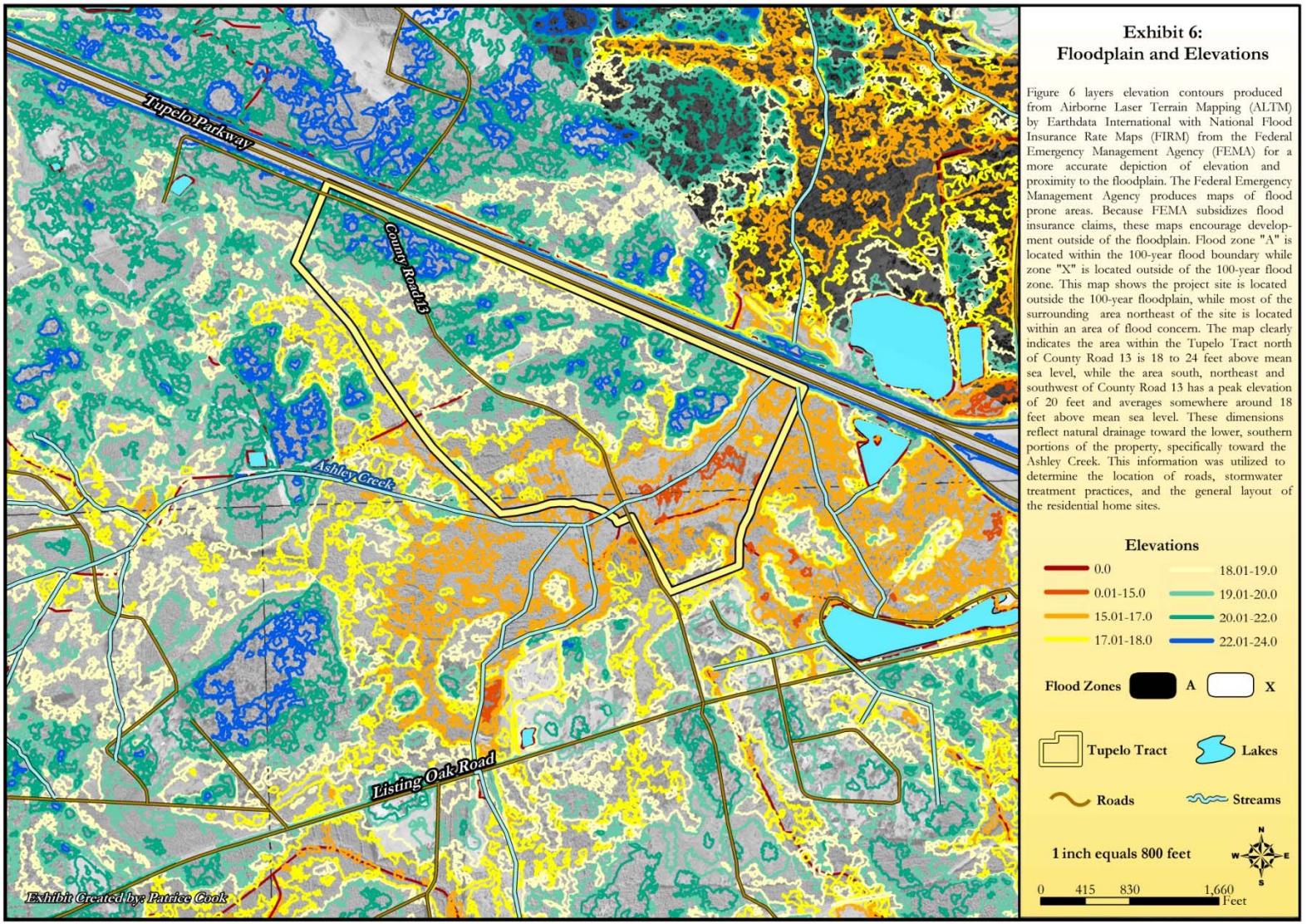
Sites of Interest



Wetlands


Tupelo Parkway
County Road 13
Ashley Creek
Listing Oak Road
Exhibit Created by: Patrice Cook
Exhibit 5: Wetlands, Streams, & Groundwater Recharge Areas
Figure 5 depicts the wetlands, marshes, ponds, lakes, streams, riparian forests, and significant groundwater recharge areas located within the tract and the immediate area. This map was used to locate the approximate wetland and stream boundaries so to avoid and minimize impacts to these areas to the greatest extent possible. These data layers were supplied by the U.S. Geological Survey (USGS) and the U.S. Fish & Wildlife Service (USFWS). In the mid 1970's, using aerial photography combined with information from NRCS soil surveys, the US FWS initiated the National Wetlands Inventory (NWI) program. The program was implemented to map the Nation's wetlands and report on their status. Each wetland is defined by type of vegetation and the areas' proclivity toward inundation (i.e. broad-leaved deciduous, seasonally flooded or needle-leaved, semi-permanently flooded). The presence and extent of the Ashley Creek and its large contiguous swath of riparian wetlands known as the Bald Cypress Swamp is apparent within the Tupelo Tract. A large portion of the Tupelo Tract is highland, while its southern, eastern and western borders are composed of deciduous semi-permanently flooded and semi-flooded wetlands.
Wetland systems are essential to flood control and provide habitat for a diverse palette of plants and animals, some of which are endangered or threatened. The NWI enables the planner to design a layout which avoids and minimizes impacts to the system. In addition, this map can be used to locate future development, specifically stormwater drainage systems and septic systems, away from major groundwater recharge areas and wetlands. Locating aquatic resources can also identify necessary buffers and conservation areas.
NWI Codes
Broad-Leaved Deciduous Seasonally Flooded
Needle-Leaved Deciduous Seasonally Flooded
Deciduous Semi-flooded
Deciduous Semi-permanently Flooded
Needle-Leaved Evergreen Seasonally Flooded
Groundwater Recharge Area
Tupelo Tract
Roads
Streams
Lakes
1 inch equals 1,000 feet
N
W
E
S
0
500
1,000
2,000
Feet

Floodplain and Elevations



Vegetation Type/Extent

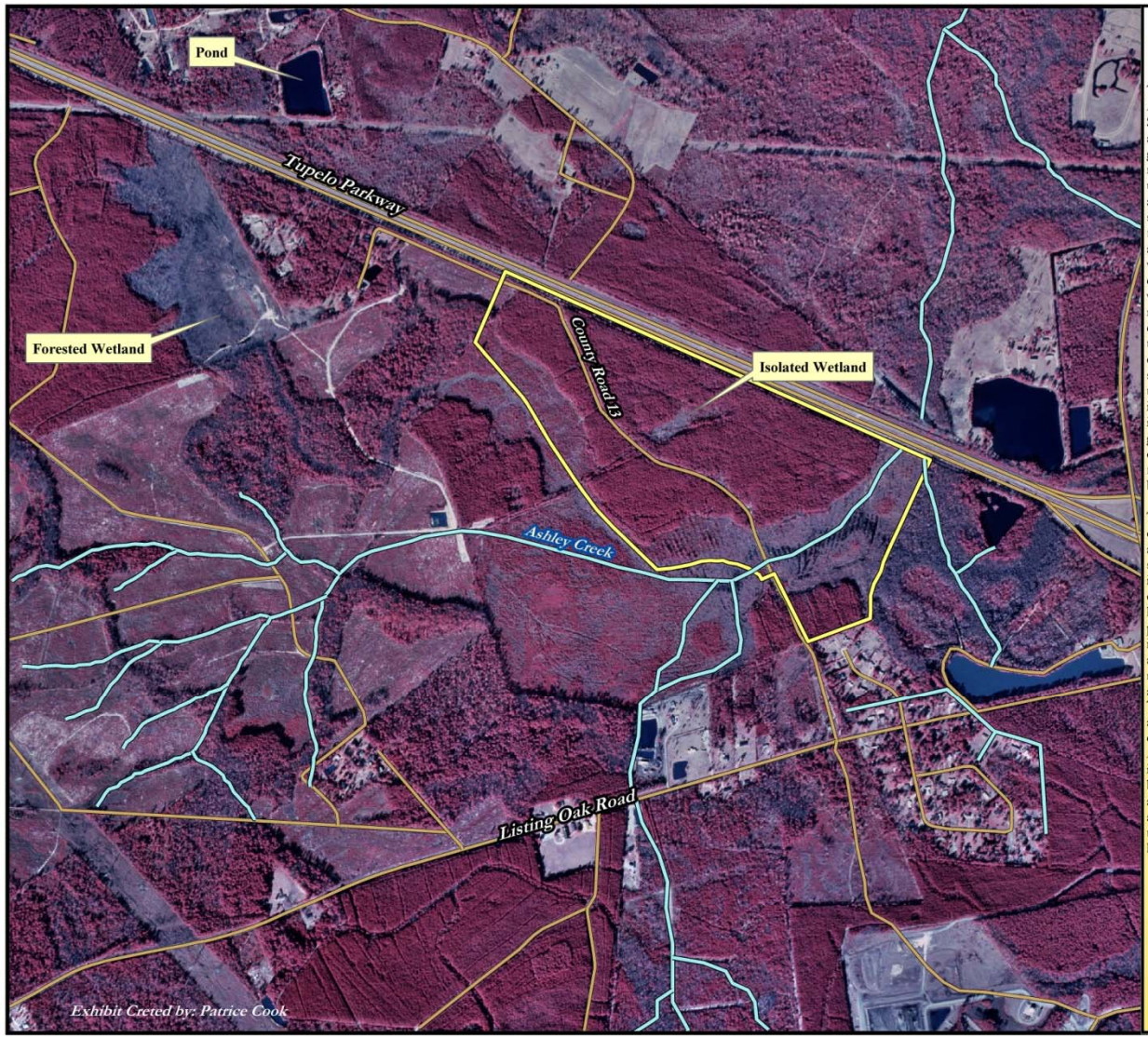


Exhibit 7: Vegetation Types & Extent of Coverage

The U.S. Geological Survey supplies Color Infrared Aerial Photography (CIR) of most of the United States. Each CIR is bound by the same coordinates as used to define the quadrangles of USGS topographic maps. This is the CIR of the Waterton Quadrangle taken in 1999. The aerial photograph was used to determine potentially wet areas within and adjacent to the site. This photography displays heat signatures emitted from the terrain as a range of colors from red to black. Wetlands, streams, marshes, lakes, and ponds display generally as black, indicating deep water; lighter shades of bluerepresent seasonally flooded forested wetlands; greenish blue indicates emergent wetlands and marshlands. Uplands typically show as a range of deep burgundy red to pink depending on the density of vegetation coverage. The denser the vegetation the more intense the red hue becomes. Acreage of tree cover can be quickly calculated when assessing site suitability. The type of indigenous trees and vegetation types within and around the subject tract can be identified and quantified on this coverage by recognizing its characteristic signature. The physical condition, growth pattern, and approximate age of the vegetation can also be inferred. Stressed vegetation, old growth forests, and past forestry and agricultural practices can be determined by viewing this type of imagery.

The uplands within the Tupelo Tract appear to be covered by mostly pine forest mixed with some tupelo and sweetgum. The viewer can infer from the light blue signature of this area and its proximity to the creek that it is most likely bottomland hardwood forest comprised of pines, maple, and cypress. The wetlands appear to have been timbered in the past and re-planted with pines evident by linear features (rows) and their associated bright red tones (upland species) intermingled among the deep blue hues indicative of wetlands. Also note a faint blue signature north of County Road 13 and centrally located within the uplands of the Tupelo Tract. This is a low-lying area (See Figure 6: Floodplain and Elevations), and is most likely an isolated wetland due to its proximity to the Bald Cypress Swamp and Ashley Creek. CIR photography makes these systems immediately apparent to the viewer and can be used by site designers to avoid and minimize impact to these areas during the planning phase of development. In addition, this imagery greatly aides in the planning of tree save areas timber harvest areas, buffers and hiking trails.

Tupelo Tract Roads

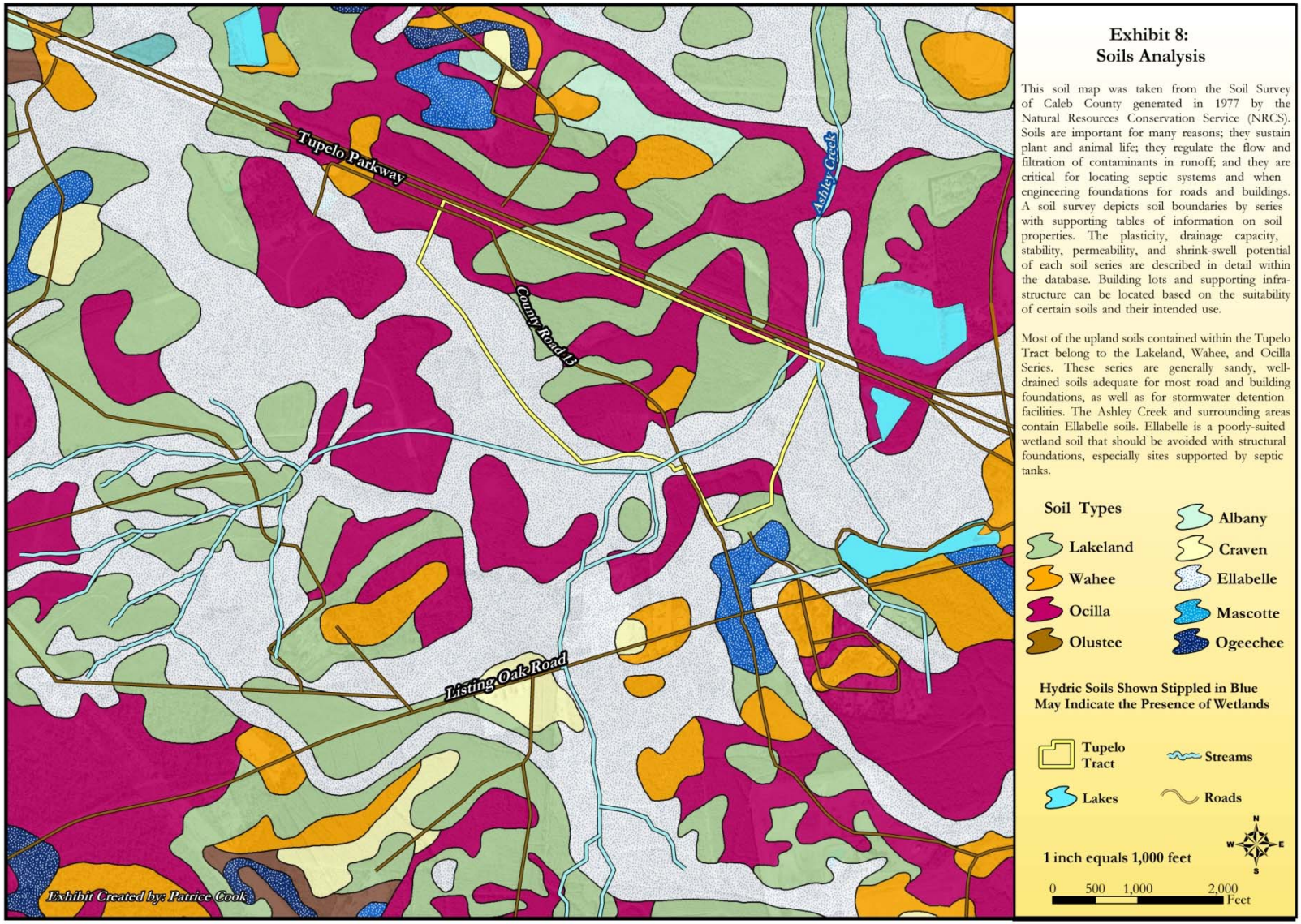
Streams

1 inch equals 1,000 feet

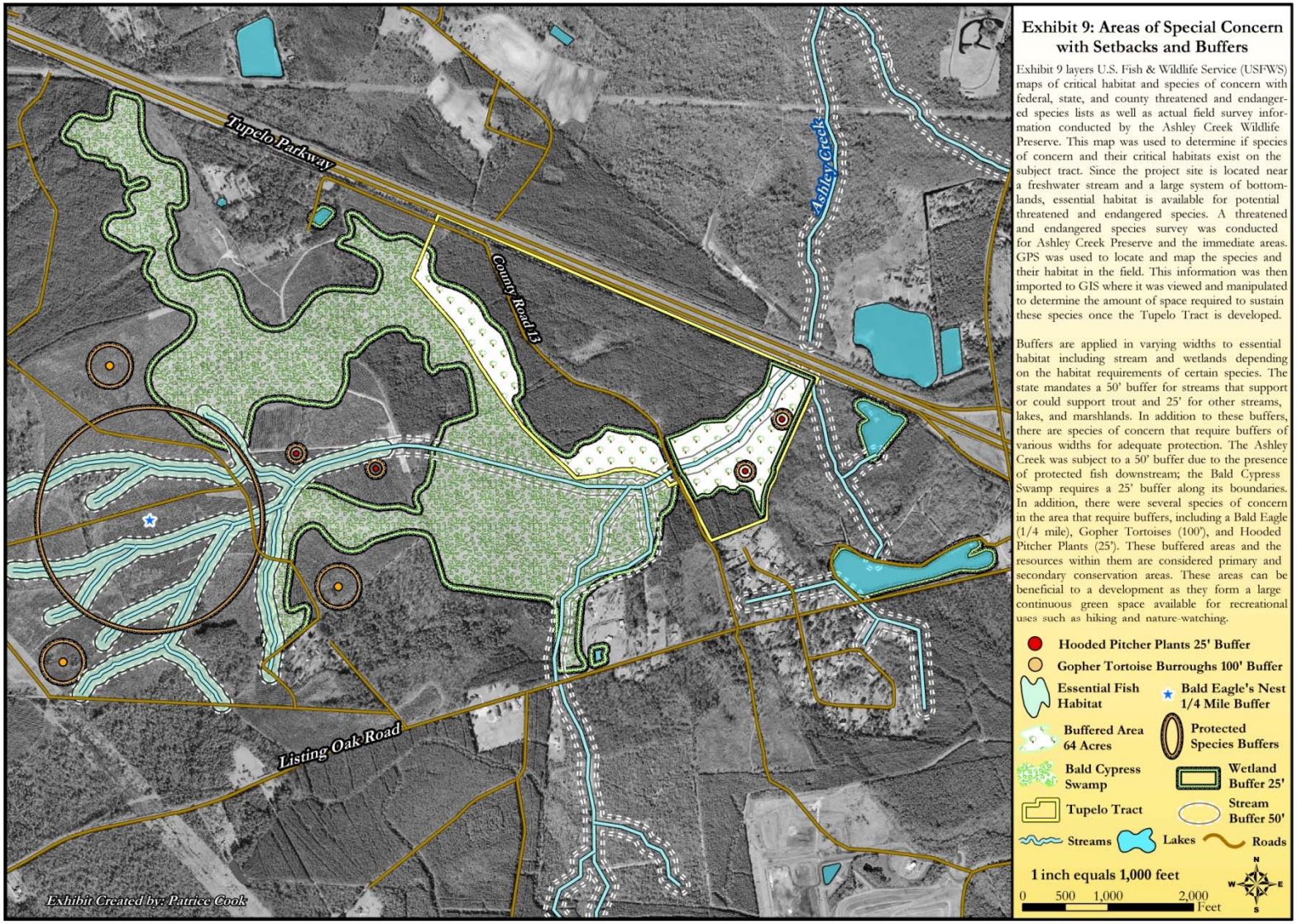
N W E S

0 500 1,000 2,000 Feet

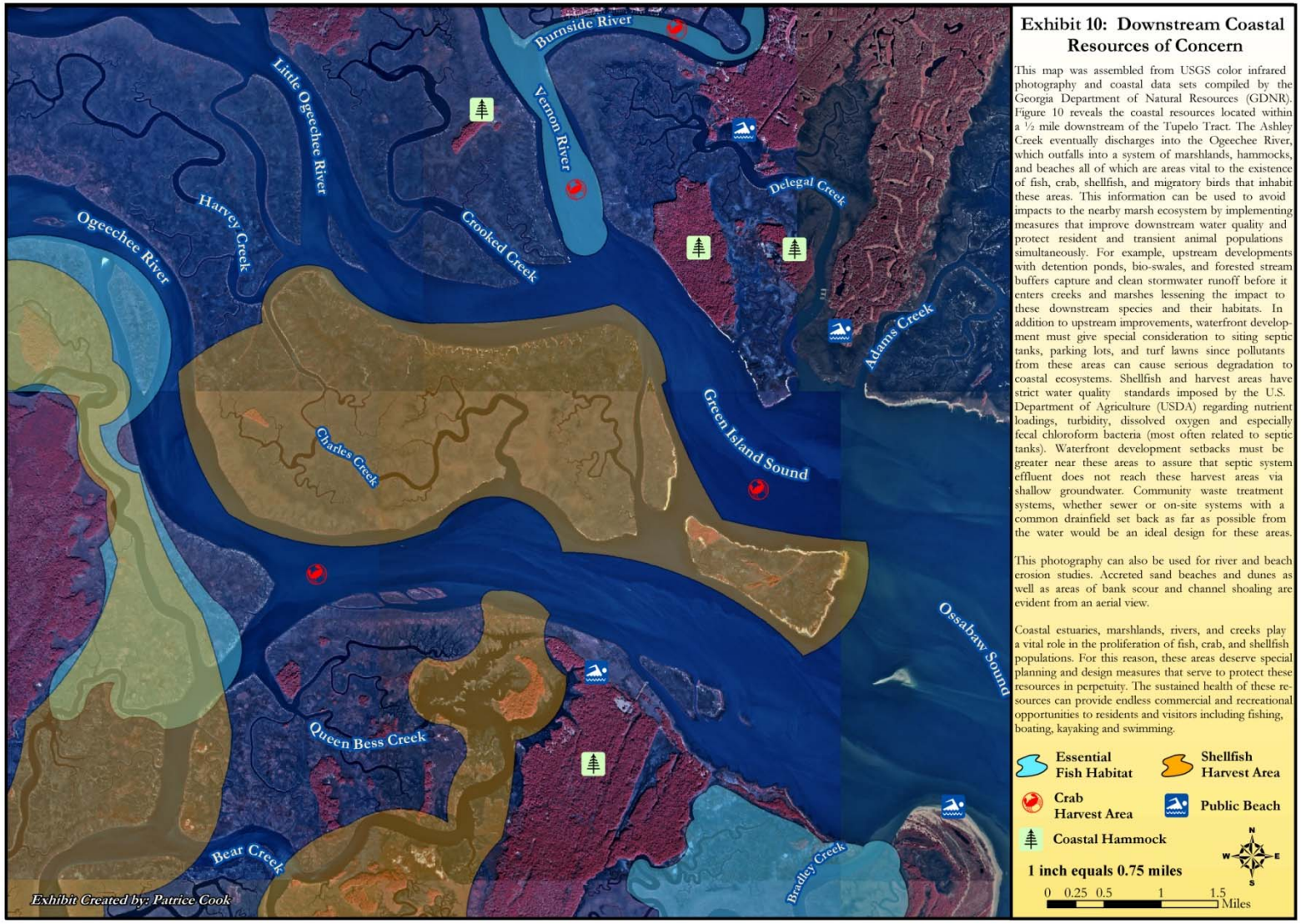
Soils


Tupelo Parkway
Ashley Creek
County Road 15
Listing Oak Road
Exhibit Created by: Patrice Cook
Exhibit 8:
Soils Analysis
This soil map was taken from the Soil Survey of Caleb County generated in 1977 by the Natural Resources Conservation Service (NRCS). Soils are important for many reasons; they sustain plant and animal life; they regulate the flow and filtration of contaminants in runoff; and they are critical for locating septic systems and when engineering foundations for roads and buildings. A soil survey depicts soil boundaries by series with supporting tables of information on soil properties. The plasticity, drainage capacity, stability, permeability, and shrink-swell potential of each soil series are described in detail within the database. Building lots and supporting infra-structure can be located based on the suitability of certain soils and their intended use.
Most of the upland soils contained within the Tupelo Tract belong to the Lakeland, Wahee, and Ocilla Series. These series are generally sandy, well-drained soils adequate for most road and building foundations, as well as for stormwater detention facilities. The Ashley Creek and surrounding areas contain Ellabelle soils. Ellabelle is a poorly-suited wetland soil that should be avoided with structural foundations, especially sites supported by septic tanks.
Soil Types
Lakeland
Wahee
Ocilla
Olustee
Albany
Craven
Ellabelle
Mascotte
Ogeechee
Hydric Soils Shown Stippled in Blue
May Indicate the Presence of Wetlands
Tupelo Tract
Streams
Lakes
Roads
N
W
E
S
1 inch equals 1,000 feet
0 500 1,000 2,000
Feet

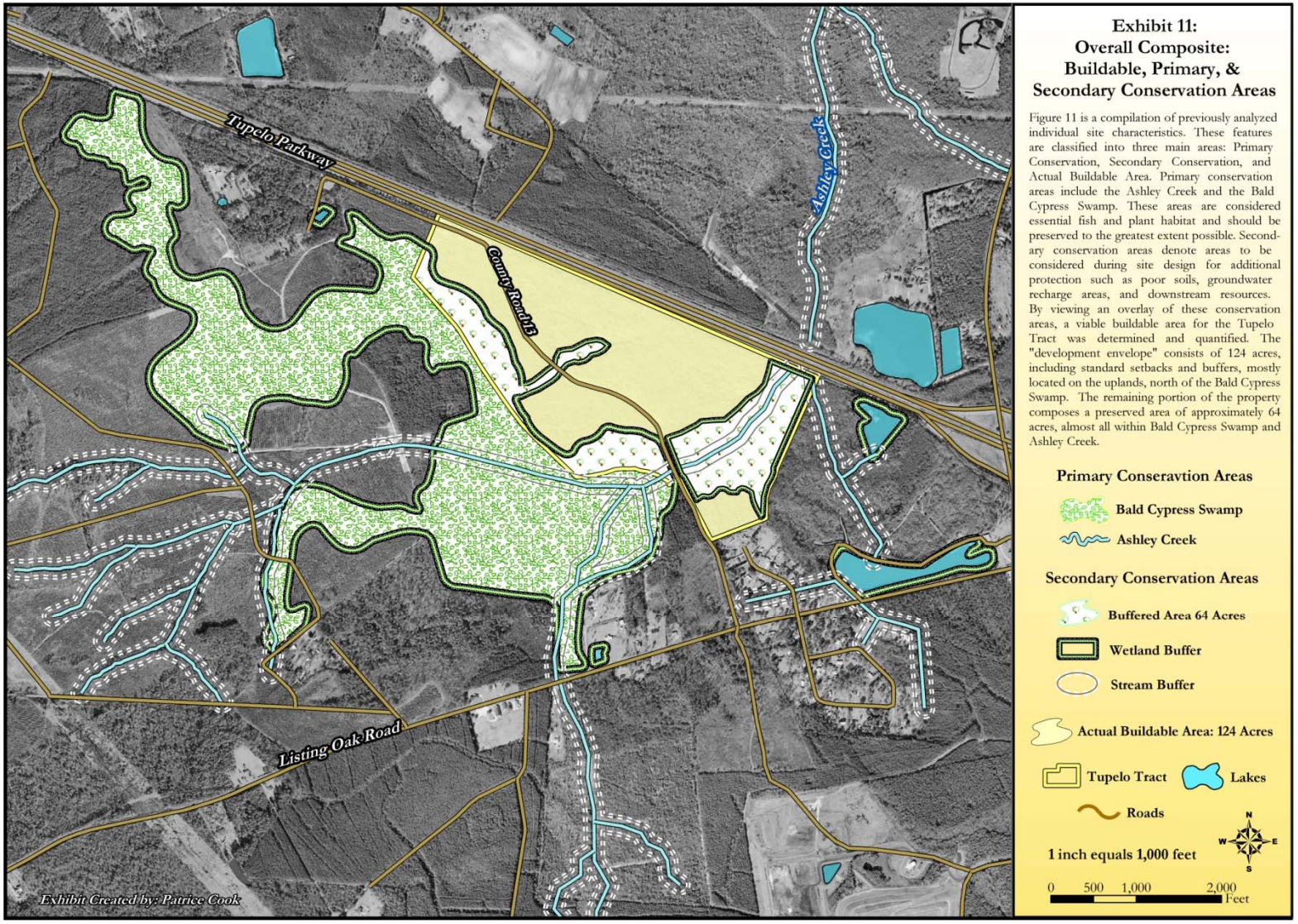
Setbacks and Buffers



Coastal Resources

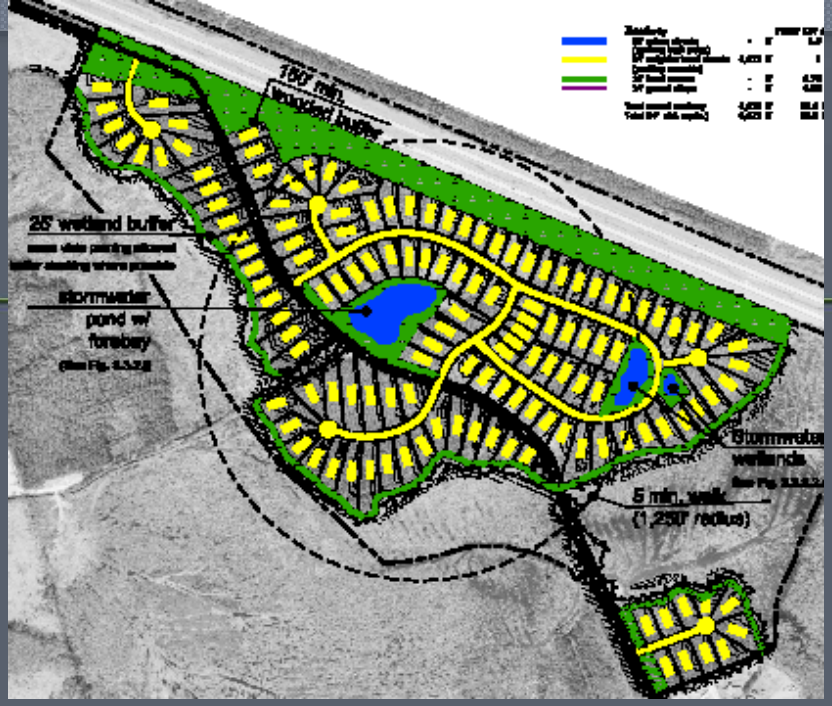


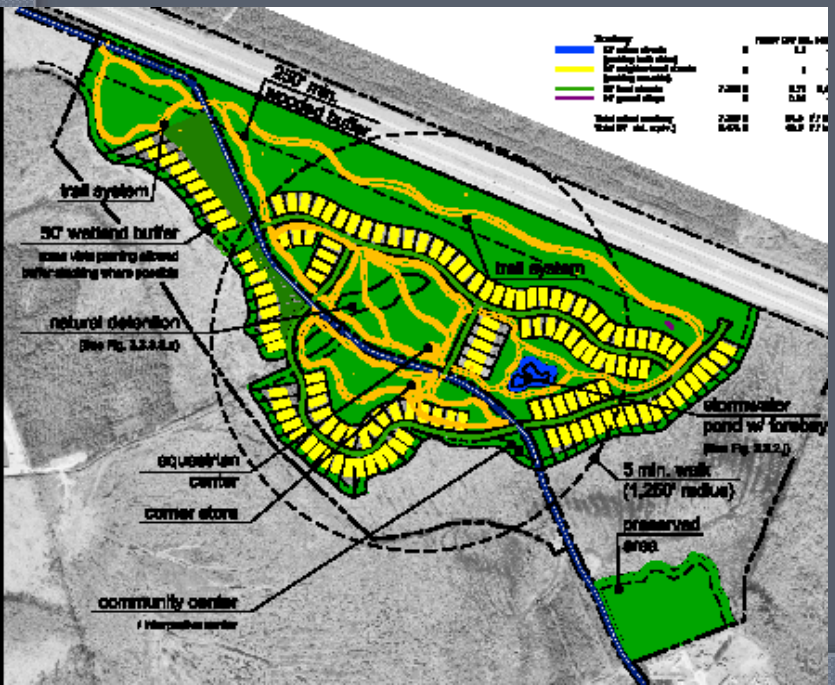
Buildable & Conservation Areas

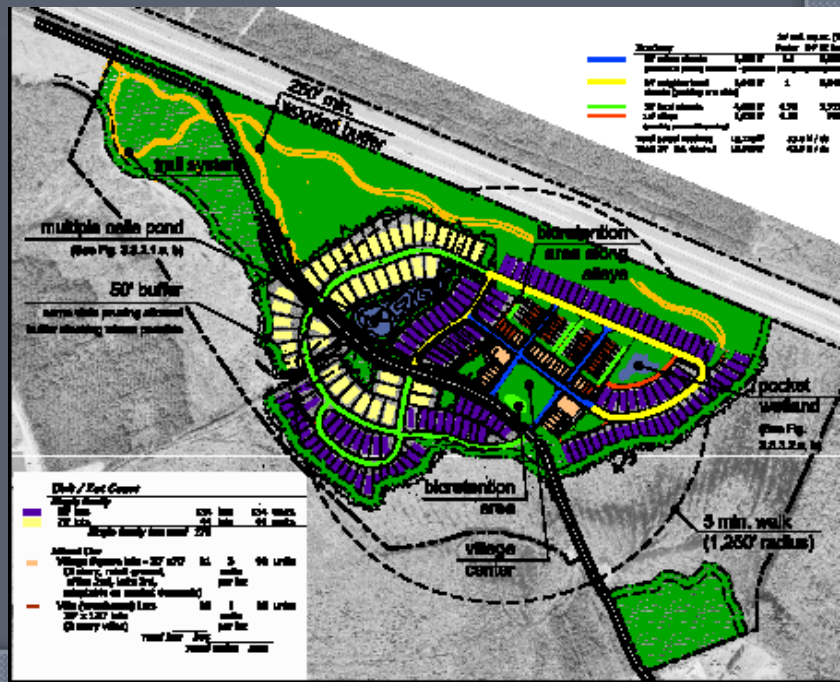


CH. II
Designing with the Landform

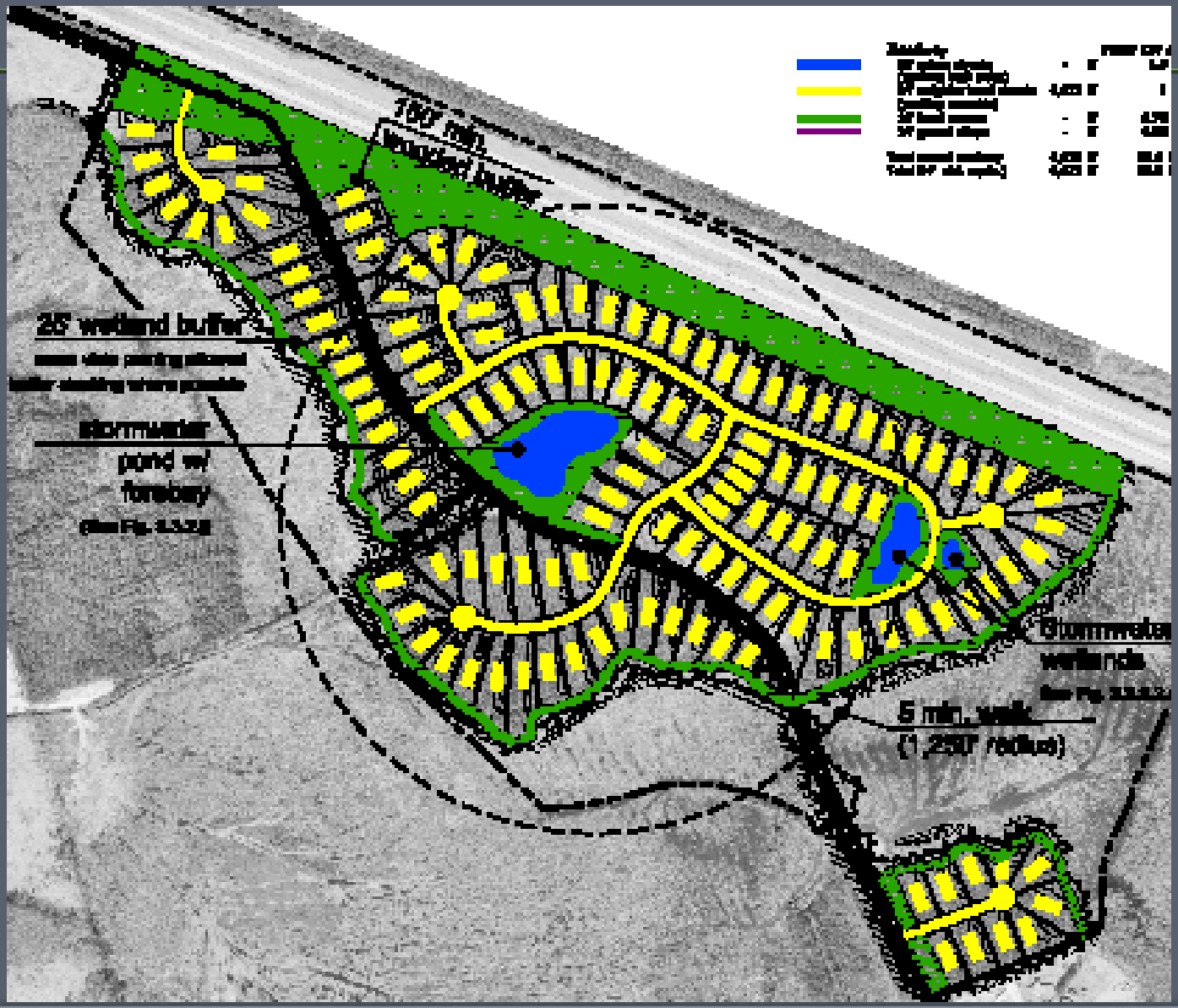
- Simple, intelligent design
- Design with nature
- Increased value, cost-savings


25' wetland buffer
stormwater pond w/ forebay
5 min. walk (1,250' radius)

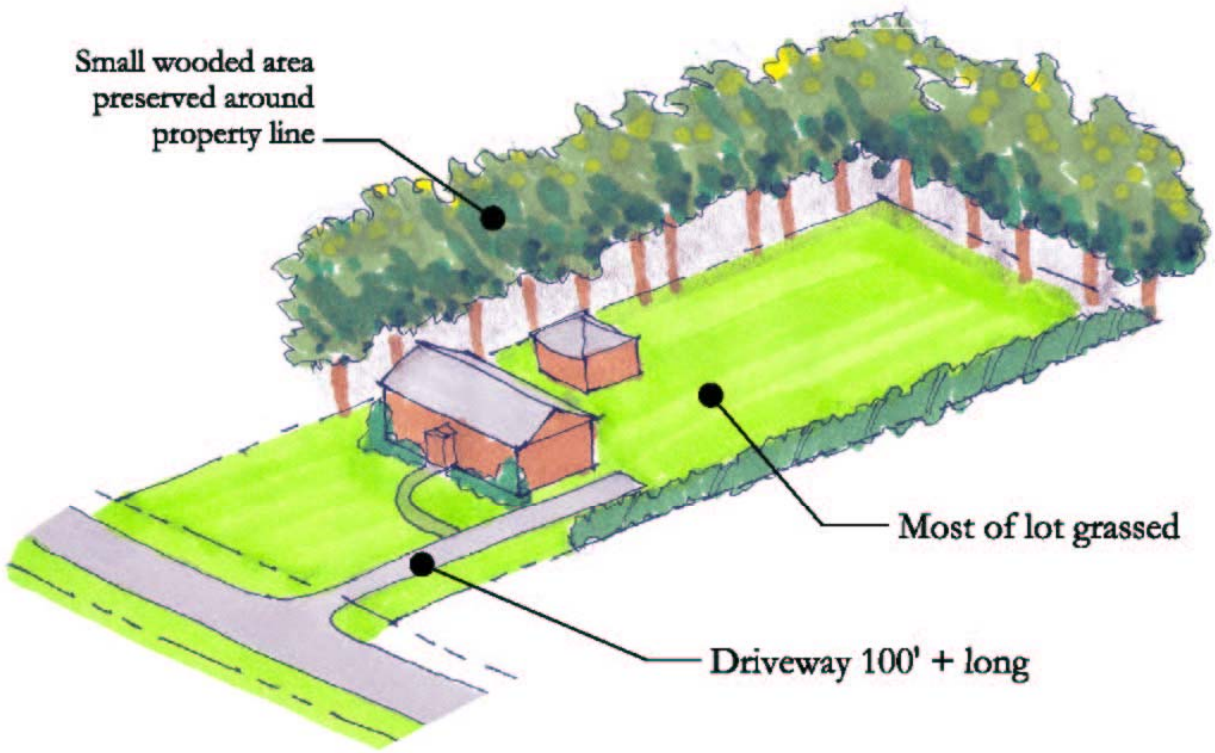

trail system
50' wetland buffer
natural detention
trail system
stormwater pond w/ forebay
5 min. walk (1,250' radius)
equestrian center
corner store
preserved area
community center


trail system
multiple cells pond
50' buffer
bioretention area along alleys
bioretention area
village center
5 min. walk (1,250' radius)

Conventional Site Plan



Conventional Lot

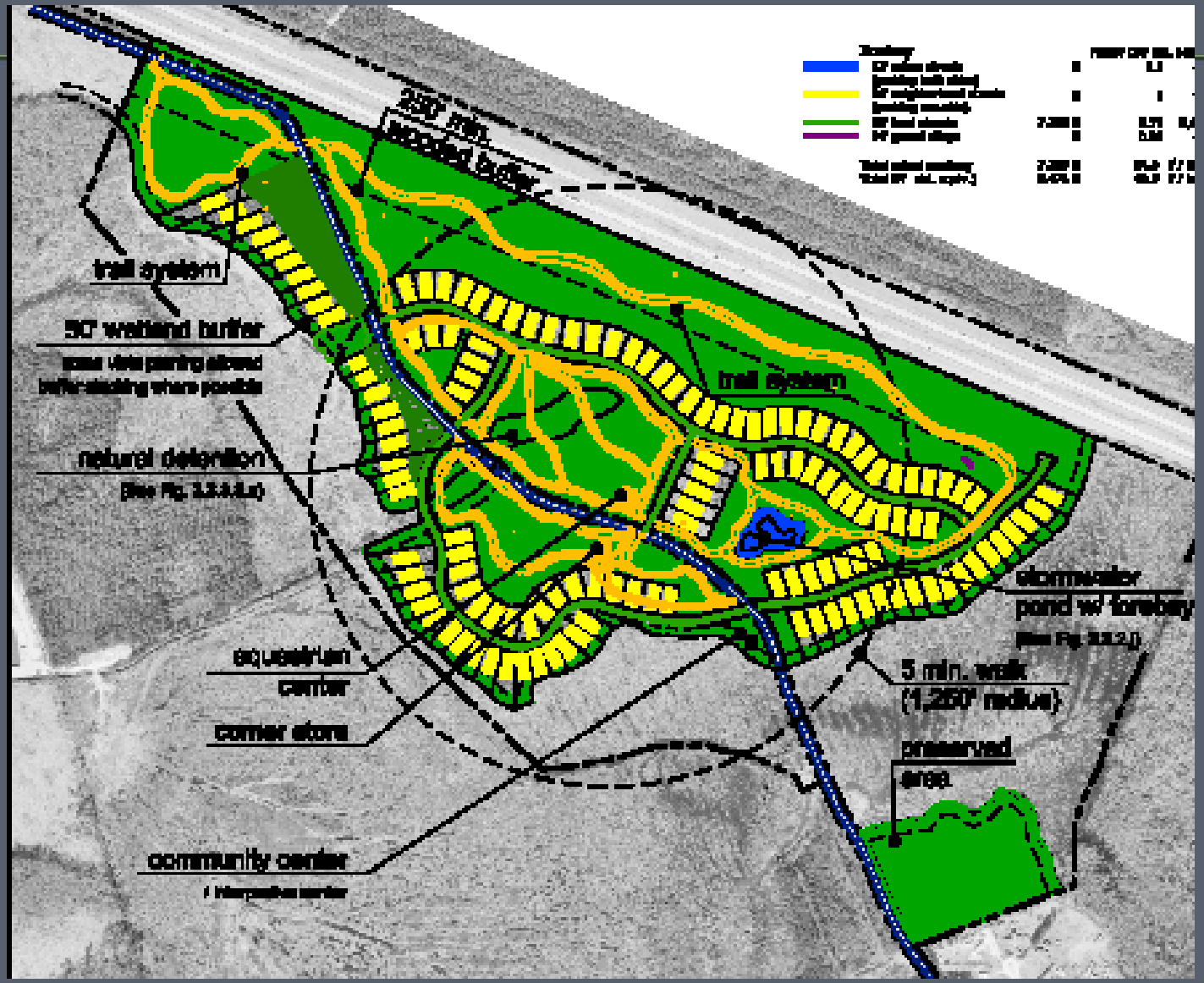


Typical Lot Development - Conventional

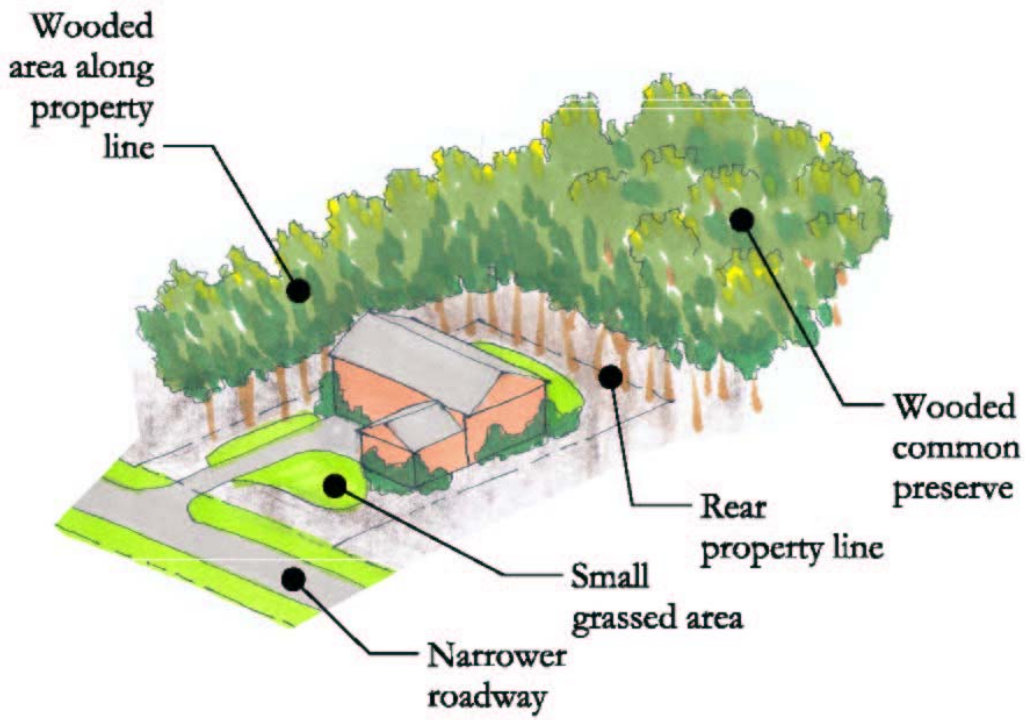
Figure 2.6.2.1.a - nts

Matthew R. Baker, ASLA

Community Preserve Site Plan



Community Preserve Lot

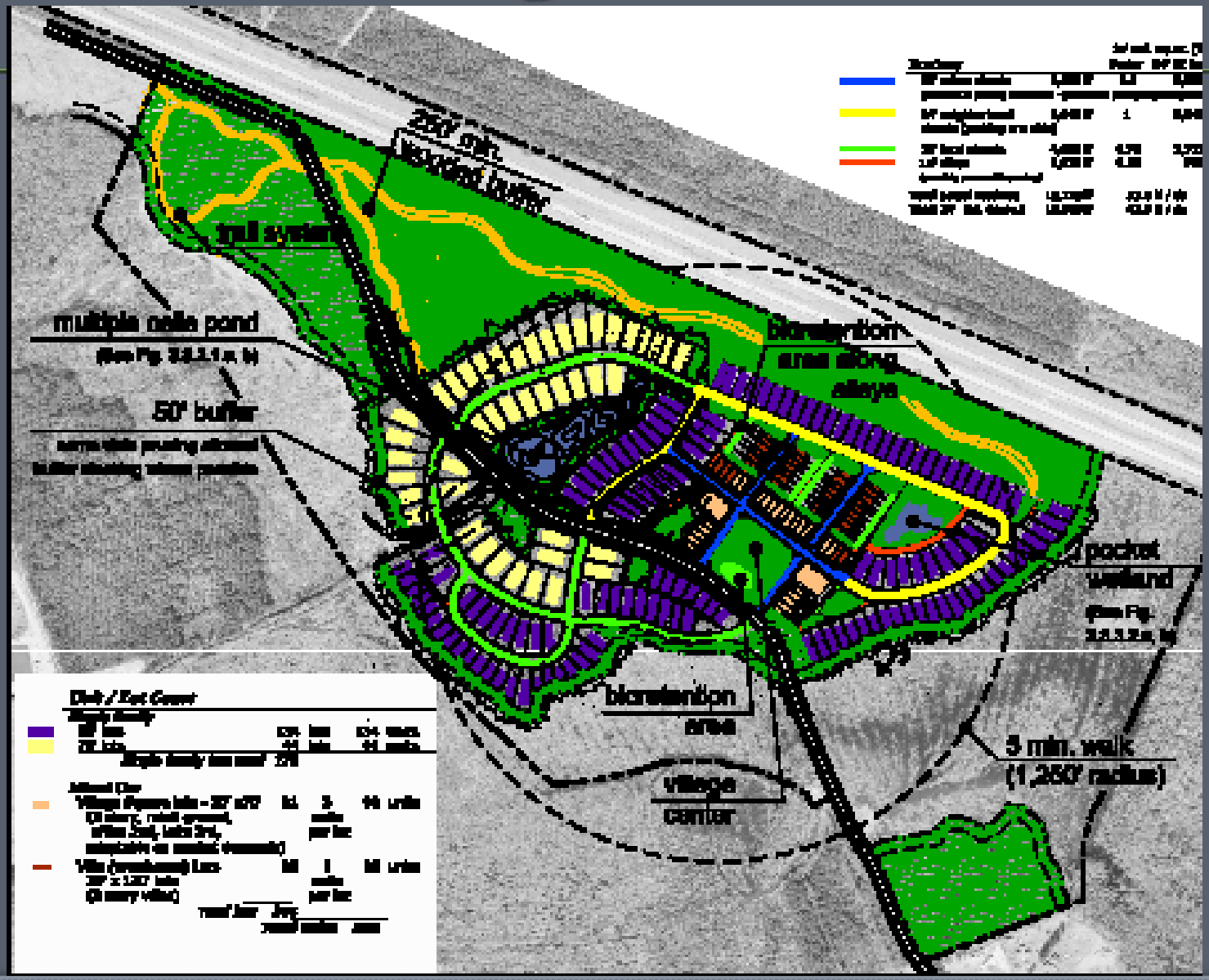


Typical Lot Development - Community Preserve

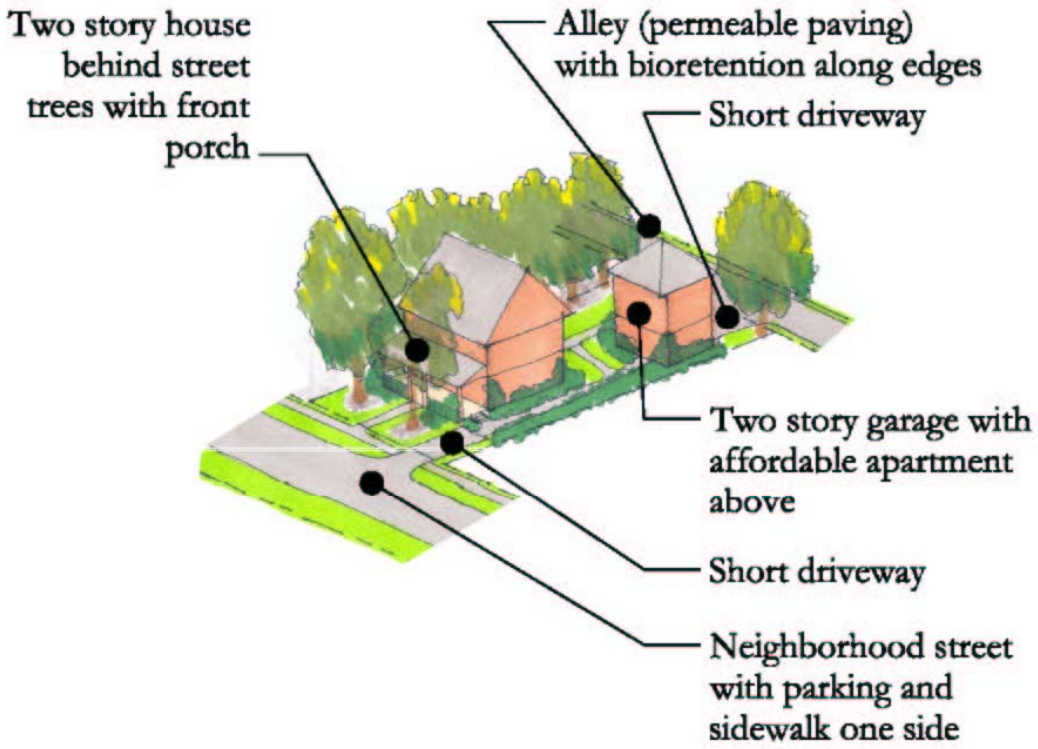
Figure 2.6.2.2.a - nts

Matthew R. Baker, ASLA

Village Site Plan



Village Lot



Typical Lot Development - Village

Figure 2.6.2.3.a - nts

Matthew R. Baker, ASLA

	Conventional	Community Preserve	Village
Total Site Area	188.6	188.6	188.6
Total Uplands	123.9	123.9	123.9
Disturbed Footprint	54%	26%	34%
Total Gray Space	12%	11%	17%
Upland Greenspace	18%	61%	48%
Greenspace (w/wetlands)	46%	74%	66%
Greenspace (w/on lot)	61%	79%	71%
Lot Yield (Net of Upland)	1.1 dua	1.1 dua	2.0 dua
Total Impervious (per lot)	4869 sf	4125 sf	3118 sf
Stormwater Runoff (per lot)	2.1 cfs	1.4 cfs	1.0 cfs
Total Cost (w/ impact fees)	$1.4 M	$1 M	$2.6 M
Total Cost (w/o fees)	$1 M	$680k	$1.8 M
Gross Profit Margin (w/fees)	36%	47%	51%
Gross Profit (w/o fees)	41%	52%	56%

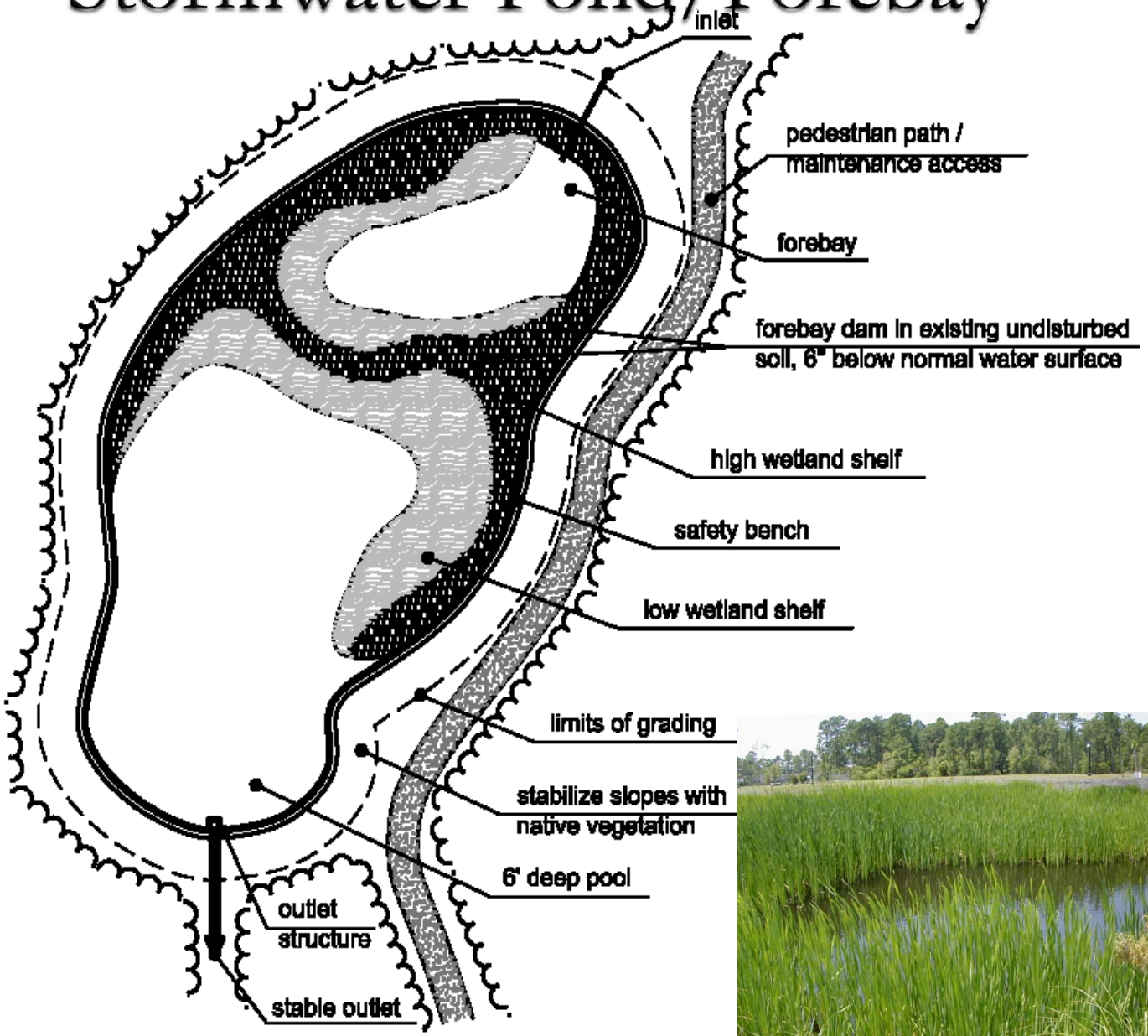
Water Quality

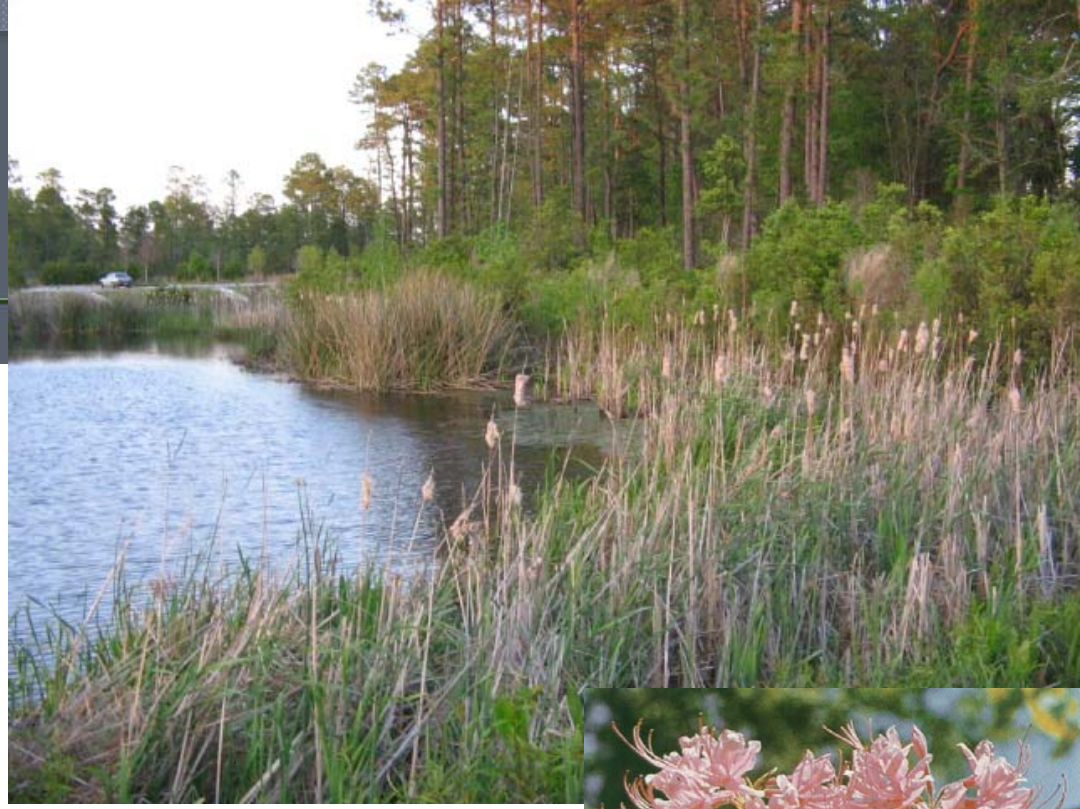
- Interaction Vegetation-Soils
- Infiltration-Filtration
- Microbial Activities
- Immobilizes-Removes Pollutants
- Erosion-Sedimentation

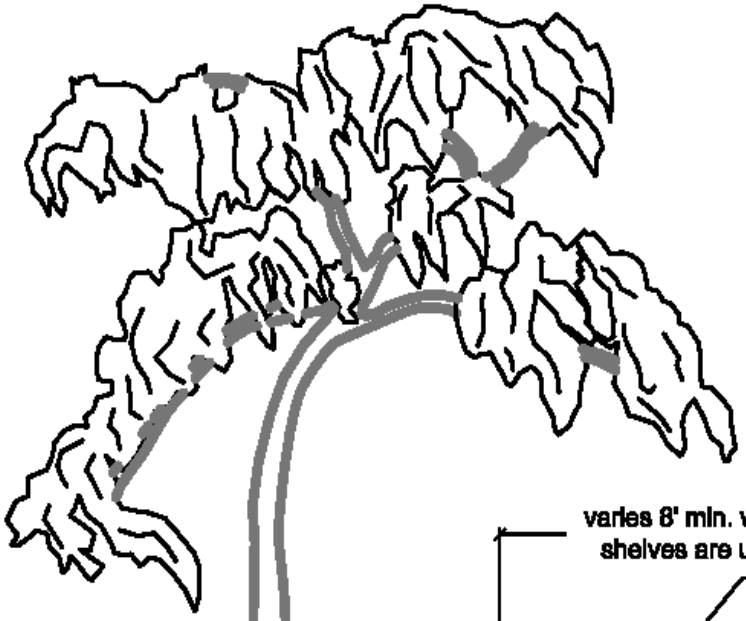
CH. III
Stormwater Management

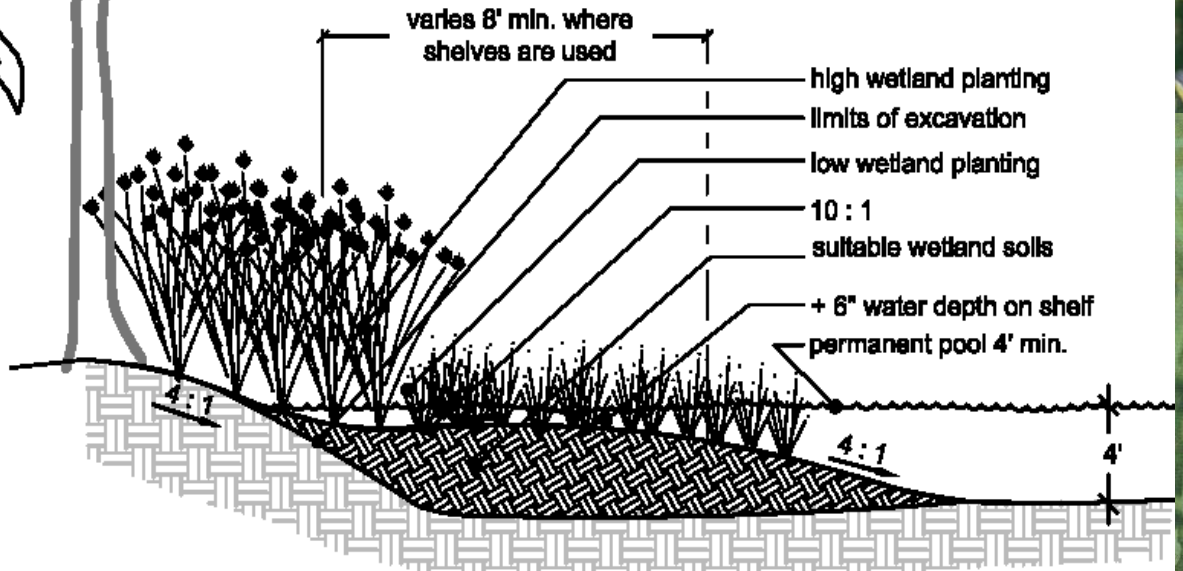
- Multi-purpose
- Flood Relief
- Control NPS
- Wildlife Habitat
- Enhanced Appearance

Stormwater Pond/Forebay

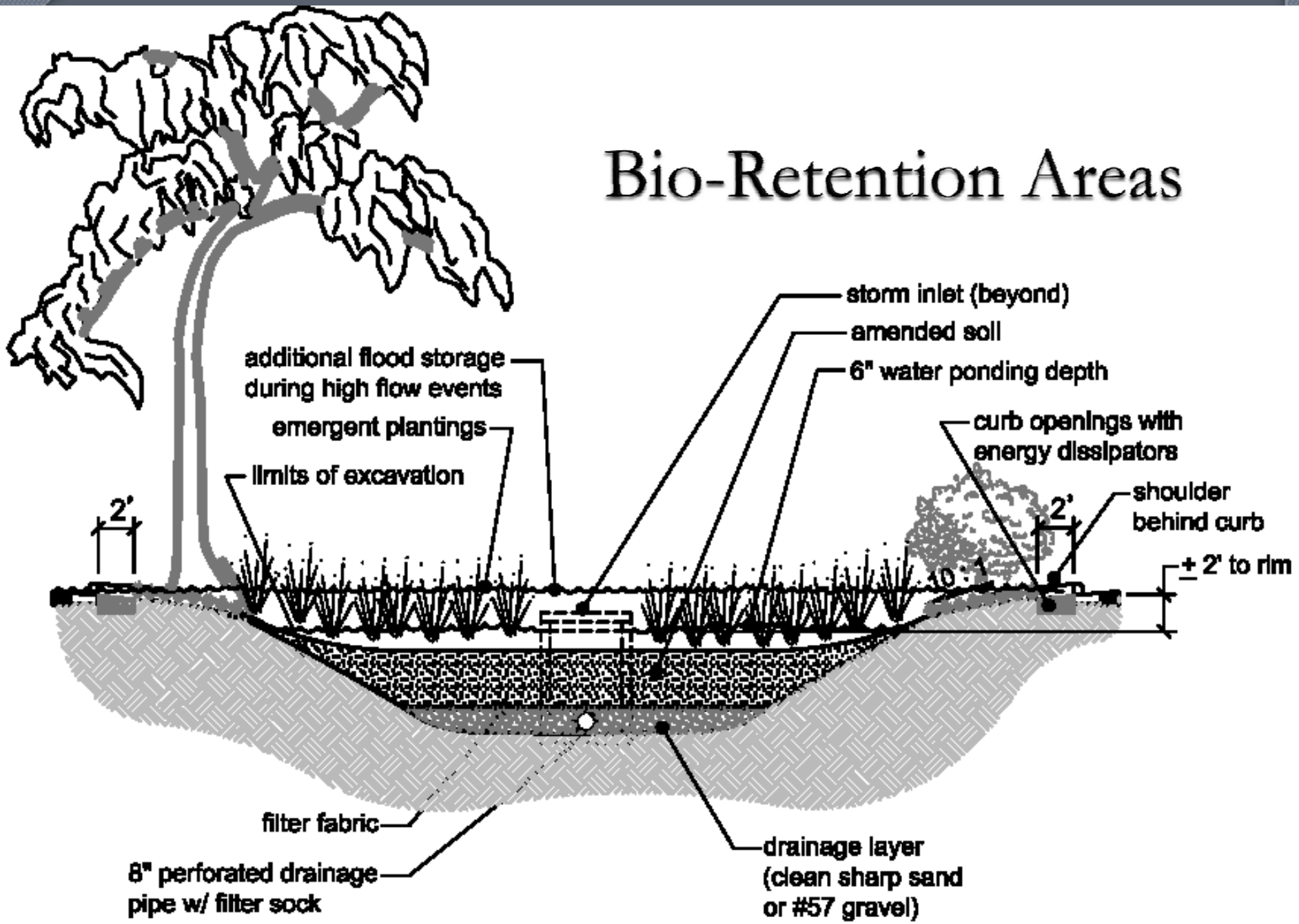




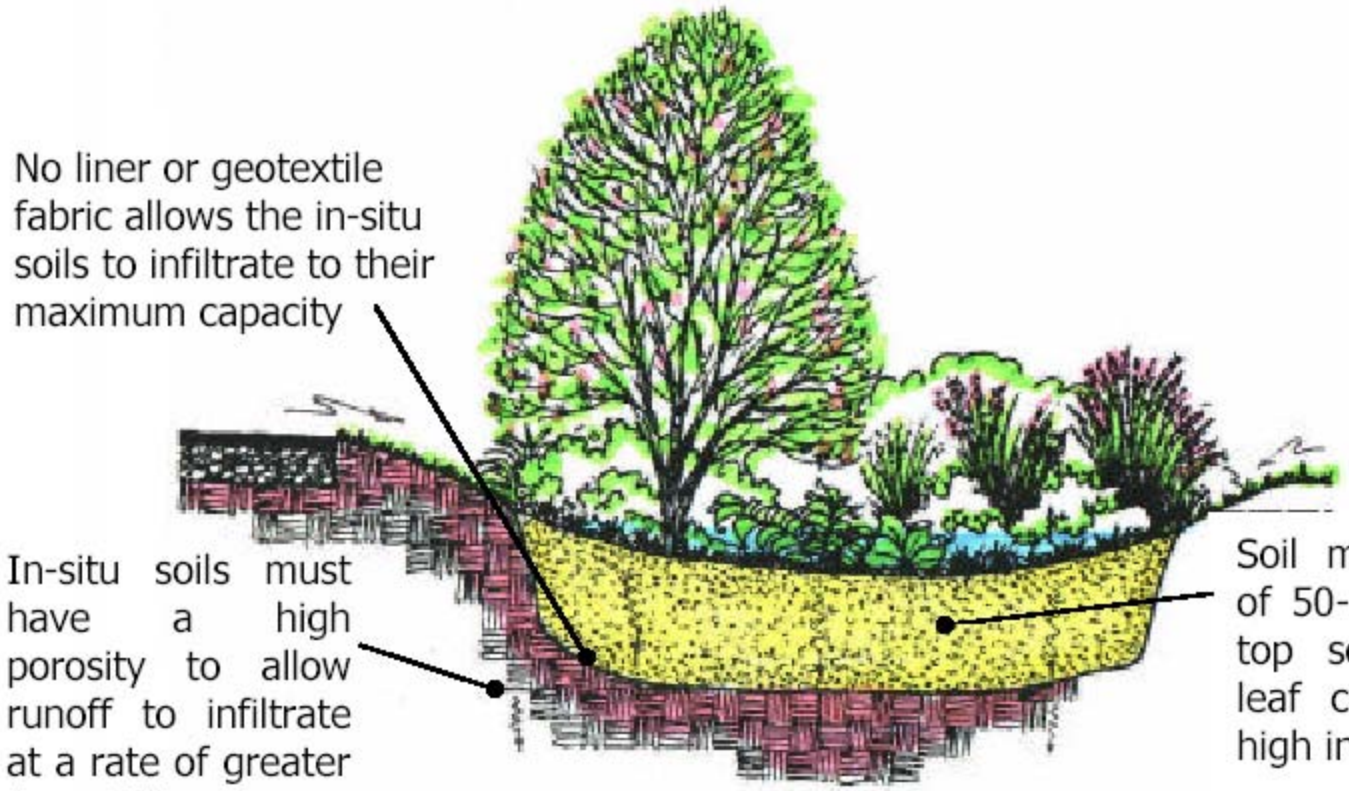



varies 8' min. where shelves are used
high wetland planting
limits of excavation
low wetland planting
10 : 1
suitable wetland soils
+ 6" water depth on shelf
permanent pool 4' min.
4 : 1
4 : 1
4'

Bio-Retention Areas



Rain Gardens



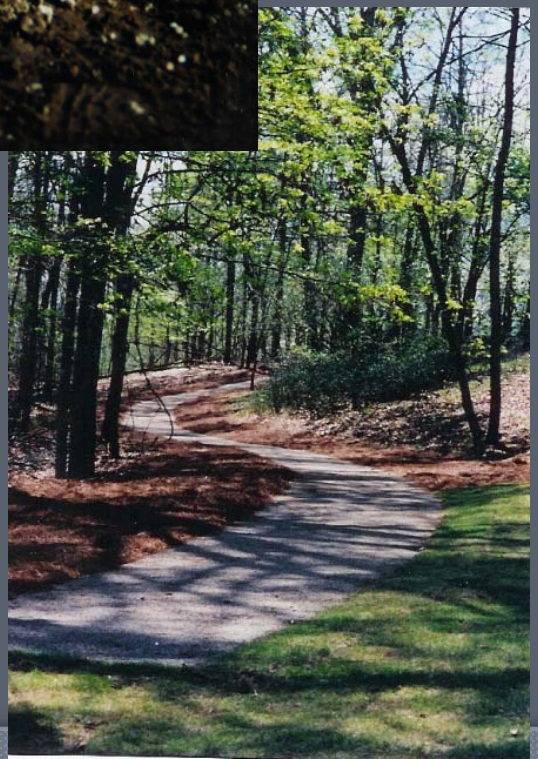
Residential Application

- Commercial
- Industrial
- Transportation

Green Roofs

- Versatile Application

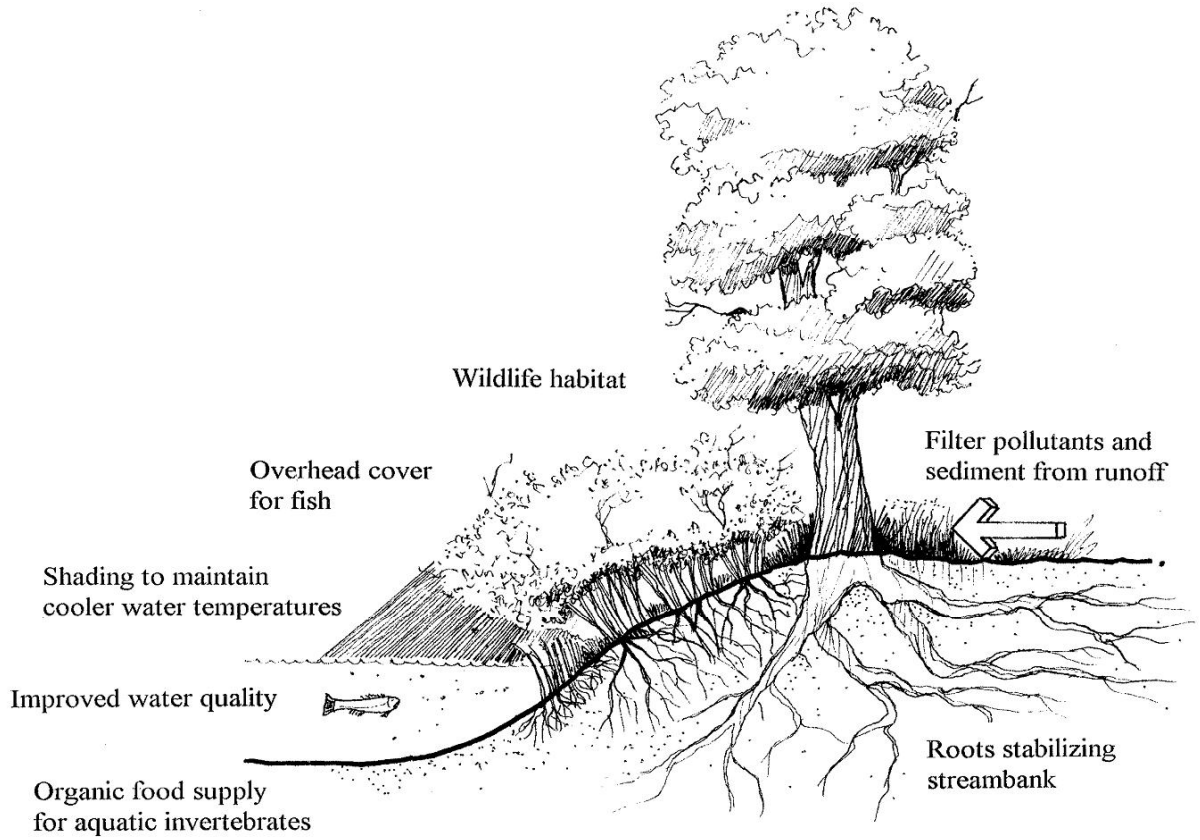
Permeable Paving



CH. IV
Streambank Stabilization

- Natural & Effective Solutions
- Native Trees & Plants
- Habitat

Mimic Natural System



Bio-Engineering

- Slope & Grade Banks

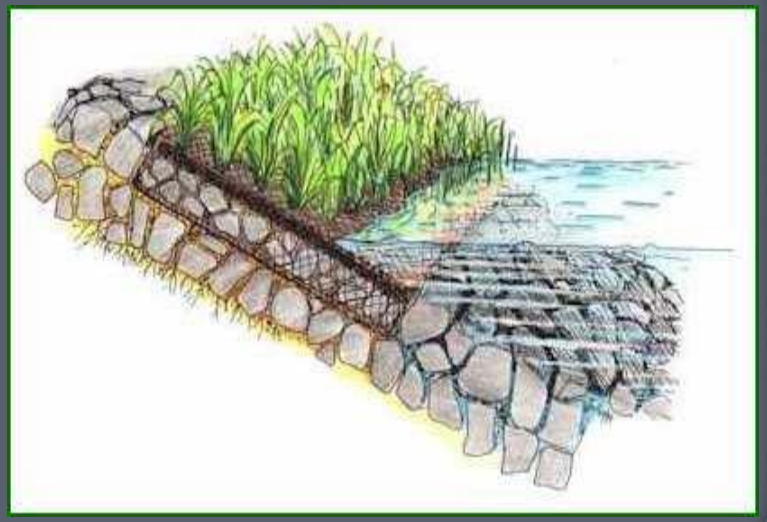
- Plant Native Vegetation

Temporary Solutions

Fiber Rolls, Geo-grids

Permanent Reinforcement

Gabions, Cribwalls, Revetments



G3 is available on the web

www.gadnr.org

Coastal Resources-Coastal Management Program

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