

## ***Bottomland & Swamp Forest Silviculture Symposium, Field Tour: Nov. 2, 2017***

### **Common Characteristics of Bottomland Swamp Forests in the South Atlantic Coastal Plain**

#### **Hydrology Effects**

- Species Composition
  - Persistent inundation will favor water-tolerant plants (not always forest tree spp).
  - Flooding often reduces tree species diversity.... favors larger trees instead of seedlings or saplings.... may result in an abbreviated successional cycle.
- The highest Net Primary Productivity is usually not on the wettest nor driest sites:
  - Pulsing flood wetlands +> flowing water sloughs +> backwater +> stagnant water
- Organic Matter
  - Pulsing flood wetlands favor more rapid decomposition rates of organic matter
  - Persistent inundation or stagnant water favors accumulation of organic matter
- Nutrient Cycling
  - Pulsing flood wetlands favor more oxidation reactions, denitrification.
  - Persistent inundation or stagnant water favors reduction reactions, organic nitrogen 'sink'.

#### **Differences in Swamp Systems**

##### Wet Flats

- Topographically similar to peat swamps and pocosins, but better drained
- Mineral soil basis: Drier sites have pine... Wetter sites have hardwoods

##### "Red River Bottom" swamps

- Higher gradient due to starting at higher elevations (foothills / piedmont)
- Transport more sediments, more frequently
- Contain a wide range of soils, hydro-periods, and vegetation
- More pronounced topography = easier to see when you are 'in the floodplain / bottomlands'

##### "Black River Bottom" swamps

- Slower moving water, higher tannin content.
- Sediment accumulates in riverbeds, or gets over-washed out of banks during floods.
- More flood- / water-tolerant tree species.
- More organic matter than red river bottoms.
- Flatter terrain makes it harder to identify floodplains on-the-ground.

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### **Select References**

*Guide to the Natural Communities of North Carolina: Fourth Approximation.* 2012. Michael P. Schafale. North Carolina Natural Heritage Program. (online only from [www.ncnhp.org](http://www.ncnhp.org)).

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*Riparian & Wetland Tree Planting Pocket Guide for North Carolina: 3<sup>rd</sup> Edition.* 2014. North Carolina Forest Service. Pub. No. FM-WQ-01-14. <http://ncforestservice.gov/publications/WQ0114.pdf>

## **Bottomland & Swamp Forest Silviculture Symposium, Field Tour: Nov. 2, 2017**

### **All Groups, Stop #1: Cape Fear River Bottomland Swamp**

**Theme: Influence of Hydrology on Forest Regeneration**

#### Site Conditions & Location

- This tract was harvested 12/3/10 to 1/6/11.
- Site visited initially around summer 2012 (seedling regen was evident at that time).
- Soils: Chewacla/Chastain (Loamy alluvial parent material, Loam and silty clay loam surface horizons). Congaree on higher areas adjacent to the backwater swamp.
- Site heavily impacted over time by beaver damming (for many years), evident by signature / reflectivity of duckweed on aerial photography. Beaver trapping ongoing for several years.
- Lock #1 downstream (~4 mi.); Lock #2 upstream (~38 mi.); Jordan Lake impounds headwaters (~100mi.).
- Harvesting in this area has occurred since Colonial times to one degree or another.
- As late as the 1950's logs were rafted down-river to Wilmington (anecdotal)

#### What to Expect in a 'Typical Red-River' Swamp System:

- "Ridge and Slough" topography, with species change throughout (think about our drive into here).
  - Silvics of species is important.
  - Overstory
    - Cherrybark oak, willow oak, water oak, sugarberry, green ash, pumpkin ash, sycamore, river birch, American Elm, overcup oak, laurel oak, persimmon, eastern cottonwood, swamp cottonwood, bitternut hickory, shagbark hickory, water hickory, mockernut hickory, swamp chestnut oak, bald cypress, water tupelo, swamp tupelo, black tupelo, white oak, southern sugar maple, red maple, walnut, red mulberry, willow species,
  - Understory
    - Possumhaw, blackhaw viburnum, buttonbush, swamp dogwood, hawthorn spp., cane, greenbriar spp., climbing hydrangea, Matelea spp., cross vine, trumpet creeper, poison ivy, grape, American Hornbeam, hophornbeam, some of the above, false stinging nettle, a variety of other herbaceous spp., etc.
- Then you drop down into a cypress/tupelo "flat":
  - Seed distribution by water is important.
- Then you get into the deep swamp or backwater swamp on the river terrace (Tour Stop #1).

#### Regeneration

- Regen was surveyed August 2, 2016 via transects.
- Regen on the site was showing poor apical dominance due to saturation at time of survey.
- Herbivory was evident also.
- Regen Data:
  - 896 trees per acre (Bald Cypress, Water Tupelo, Swamp Tupelo, Willow)
  - 23% Cypress/Tupelo Coppice
  - 24% Cypress/Tupelo Seedlings
  - 50% Cypress/Tupelo Saplings
  - Remainder willow spp.
- Regeneration was impacted (flooded) during Hurricane Matthew
  - To what extent is not known, but regen still evident.

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Above Imagery Date: 1/03/2013. Note lack of inundation from beaver damming, north of the pinpoint label.  
Below Imagery Date: 10/29/2016. Note excessive water backing-up, drowning seedlings.



## **Bladen Lakes State Forest (BLSF)**

**Theme: Alternative Harvesting for Desired Future Conditions of Bottomland Forest Habitat**

### Site Conditions & Location

- Bladen Lakes State Forest is a demonstration forest, with research and hunting: ~40,000 acres
- Supported by receipts from sale of timber and pine straw.
- Focus on restoring and managing Longleaf Pine; and bottomland hardwood systems.

### Clearcut Timber Sale:

<u>Stand</u>	<u>Sale Species</u>	<u>Acres</u>	<u>Soil Series</u>
F113	Loblolly	3	Woodington loamy sand
F115	Slash/Loblolly	36.5	Wagram fine sand, Lakeland sand, Woodington loamy sand, Leon sand, Butters fine sand
F118	Loblolly	12	Lakeland sand, Altavista fine sandy loam
F150 a - d	Natural Mixed (patch harvests)	6.5	Congaree silt loam, Chewacla/Chastain soils (loamy alluvial parent material, Loam and silty clay loam surface horizons)

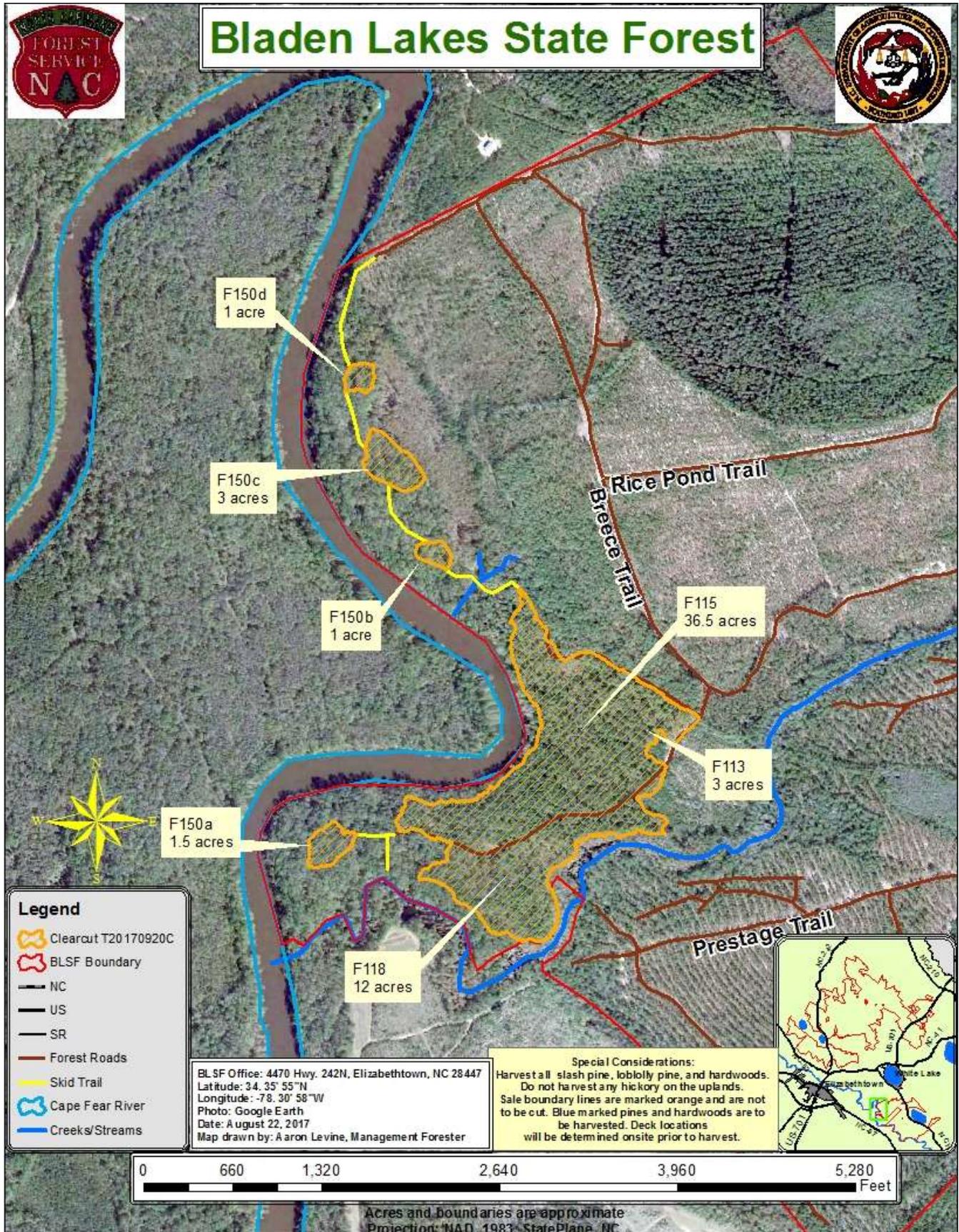
### Cooperative project to foster natural regeneration in bottomland systems:

- NC Forest Service, The Nature Conservancy, NCSU, UNC-Greensboro, NC Museum of Natural Sciences
- Funding: National Fish and Wildlife Foundation, USDA-Forest Service, Dept. of Defense, Intl. Paper Co.

Objectives: Management of mature hardwood floodplain forest to maximize preferred habitat for the following indicator and management interest species: northern long-eared bat, Rafinesque's big-eared bat, southeastern myotis, bald eagle, Swainson's warbler, hooded warbler, Kentucky warbler, Acadian flycatcher, American woodcock, marbled salamander, wild turkey, black bear, and white-tailed deer.

### Management recommendations for maximizing optimal habitat requirements for all target species:

- Patch clearcut harvests between 2 - 10 acres in addition to group selection removals. Harvest layout and size of patches and groups would depend on shade tolerance of tree species selected for regeneration.
- Patch clearcuts should not exceed 10% of a given stand, and all accompanying removals should not reduce canopy closure below 60% to 70%.
- Rotation age for patch clearcuts 100 to 150+ years. Harvesting intervals then occur every 10-15 years.
- Leave 300 to 600+ feet of forested riparian buffer. Within these forested buffers, group selection removals should be favored and size of patch clearcuts should be minimized to reduce negative impacts to water quality.
- Leave all hollow trees and snags in harvest areas, within limits of safety for loggers.
- Leave at least 2 dominant (emergent or "supercanopy") trees per acre.
- Protect isolated wetlands, steep slopes, and rock outcrops. Reducing tree canopy around rock outcrops can benefit basking reptiles, but avoid damaging the outcrop.
- Ideally, conduct timber harvesting from October 1 to December 1; and March 1 to April 1 to minimize negative impacts for target species.



## **Colly Swamp**

**Theme: Artificial Regeneration**

### Site Conditions & Location

- Tract harvested summer/fall 2013.
- A blackwater swamp system (Colly Creek is a tributary to the Black River)
- Soils: Primarily Dorovan Muck (muck down to 85"); some Croatan Muck, and Torhunta/Lynn Haven (very poorly drained) mineral soils along margin.

### What to Expect in a 'Typical Black-River/Black-Water' Swamp System

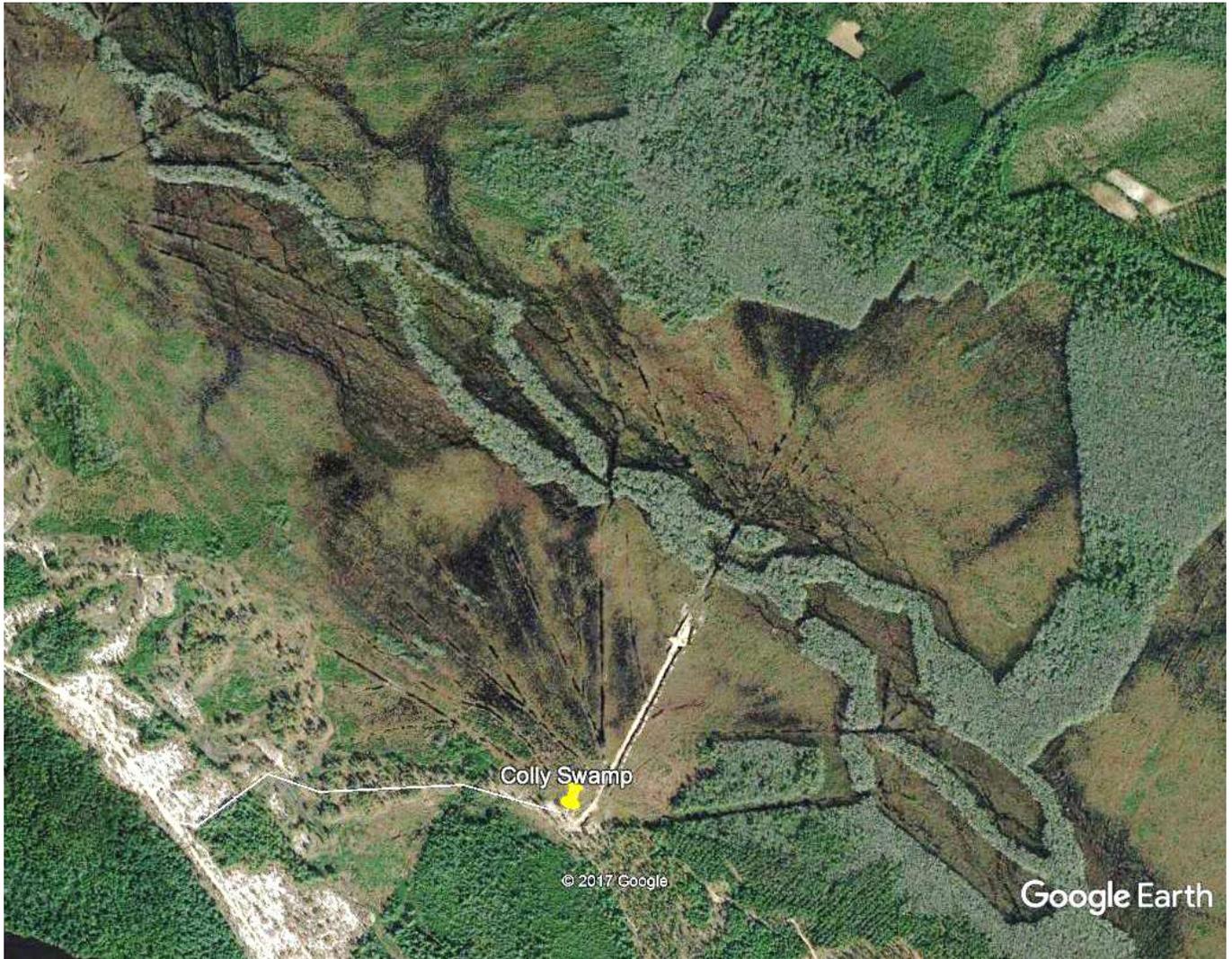
- Overstory
  - Bald cypress, pond cypress, swamp tupelo, some water tupelo, sweet bay, red maple, red bay, swamp cottonwood, loblolly pine on some areas, willow spp., juniper possible, laurel oak,
- Understory
  - Laurel greenbriar, titi, Carolina ash, wax myrtle, lyonia spp., highbush blueberry,

### Regeneration

- No site preparation.
- Regen was surveyed August 1, 2016 via transects.
- Found 944 trees per acre (swamp tupelo, bald cypress, sweet bay, red bay, and red maple)
  - 84% seedlings... 13% coppice... 3% saplings
- Cypress seedlings planted in 2013/14 planting season (15' x 15'...equals ~194 trees per acre).
- Our regen survey tallied approximately 144 trees per acre of bald cypress seedlings (74% survival).
- Also natural regen from seed distribution by animal/bird... and natural seed fall.
- Result is a naturally regenerated stand with cypress contributing a significant proportion.
- Overall composition of ~75% cypress/tupelo mix:
  - 58% swamp tupelo
  - 17% bald cypress (primarily consist of planted seedlings, based on observation)
- Planting conducted when possible.
- Could stick planting be an option?
- Abundance of sedges, bluestem, etc. does not seem to be affecting survival of tree seedlings.

### Road

- Constructed for silviculture: eliminated the need for a forest road stream crossing.
- Road stops short of the main run of Colly Swamp Creek.
- Road length / width / height / extent kept to minimum necessary.
- Road is severed -- allows cross-drainage of flood flows.
- Borrow ditches not tied-in to an outlet, only excavated along 1 side of roadway.
- Spoil material is piled within 20 feet of ditch (per state rule), not a continuous berm.



Imagery Date: 10/25/2016



## **Singletary Lake State Park**

**Theme: Carolina Bays**

Concentrated in the coastal plain of the southeastern U.S. are a series of elliptical or oval depressions most abundant across NC & SC; generally oriented on an axis northwest to southeast. These depressions are called Carolina Bays, named for the sweet bay, loblolly bay and red bay trees found growing around them.

Their origin remains unclear, with many theories. Current theory: when the region was covered by seawater, strong winds created water currents that carved the shallow depressions. Once the water receded, these depressions formed the bays.

Historically, nearly all bays contained open water. Today, most are filled with wet soils and are overgrown with woody and/or herbaceous vegetation. Only a few open-water bay lakes remain. Bay lakes are shallow, ranging from 8 to 12 feet depth. Water source is precipitation and runoff, not springs or streams. The underlying soils are clay or thick humic material that restricts downward water drainage.

Usually, vegetation is almost completely around margins of bay lakes. Peat is produced gradually from dead organic matter along the shoreline, and eventually trees take root. Typical bay vegetation includes red bay, loblolly bay, pond pine and Atlantic white cedar; shrubs include pepperbush, gallberry, leucothoe, huckleberry and sheepskill. When fully vegetated, Carolina Bays are extremely thick with vegetation and for all practical purposes are considered impenetrable by normal means; and are usually avoided by (most) people.

Some bays were cleared, ditched/drained and put into agriculture or silviculture production prior to wetland protection laws and rules. On the eastern/southeastern perimeter margin of most bays, there are dry sand ridges that often support Longleaf pine and its associated vegetation/habitat communities.

### **History of Singletary Lake State Park** *(excerpted from [www.ncparks.gov/singletary-lake-state-park](http://www.ncparks.gov/singletary-lake-state-park))*

Singletary Lake was named for Richard Singletary, who received a grant of land in Bladen County in 1729. Since colonial times, the region surrounding Singletary Lake was settled and used for subsistence farming along its river lowlands and creek bottoms. Longleaf pines - primarily used for turpentine, pitch and timber - were then prolific in the area. They were logged and used for the production of naval stores.

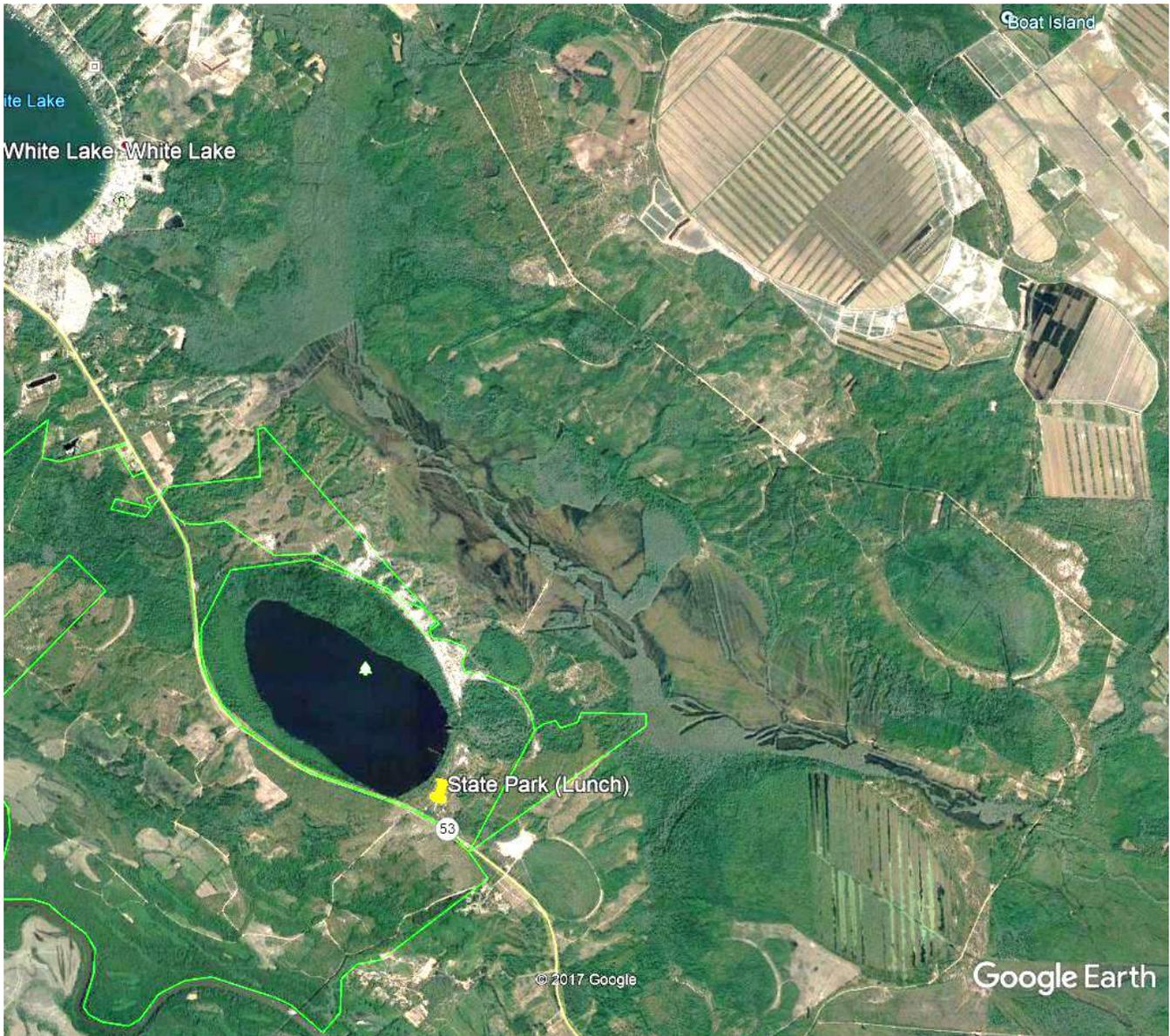
State government interest in the bay lakes emerged in the early 1800s when legislation blocked further private claims on land covered by lake waters. Later, the General Assembly declared that any lake of 500 acres or more in Bladen, Columbus or Cumberland counties shall remain the property of the state. By the early 1900s, due to the growth of the turpentine, lumber and cotton industries, the human population surrounding Singletary Lake increased beyond the soil's capacity to support it. With the decline of cotton farming and exhaustion of the tar, pitch, turpentine and timber industry, a large segment of the area's population lived on submarginal land.

In 1936, through a federally financed work program, the National Park Service bought portions of the land surrounding Singletary Lake for a recreational demonstration project. The land was managed by the Resettlement Administration until 1939, and during this period resettlement workers and local residents constructed Singletary Recreation Center, which included an office, maintenance building and recreation facilities. In addition, using local talents and materials, an infirmary building, ten cabins, a dining and recreation hall, and a workshop—a fully operational group camp—were also constructed.

The property was turned over to the state of North Carolina on July 1, 1939, for operation under a lease agreement. In October of 1954, Singletary Lake State Park officially became the property of the state. In addition to providing recreation, the park played other important roles in the area. During the 1945 flooding of the Cape Fear River, the state parks system cooperated with the Red Cross in disaster relief, and Singletary Lake was used as a refugee center. During WWII, the area was used by the Anti-Aircraft School from Camp Davis for special training programs.

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UNC-TV Science Learning Video on Carolina Bays: <http://science.unctv.org/content/carolina-bays>



Overview of area around the State Park. Note the multiple bays and their varying degrees of management regimes.