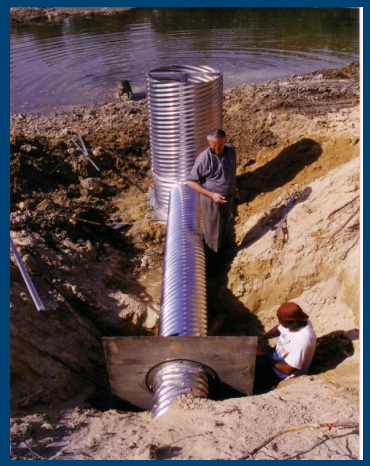
# Hydrologic Management of Dismal Swamp Peatlands

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Brian van Eerden

The Nature Conservancy – VA Chapter

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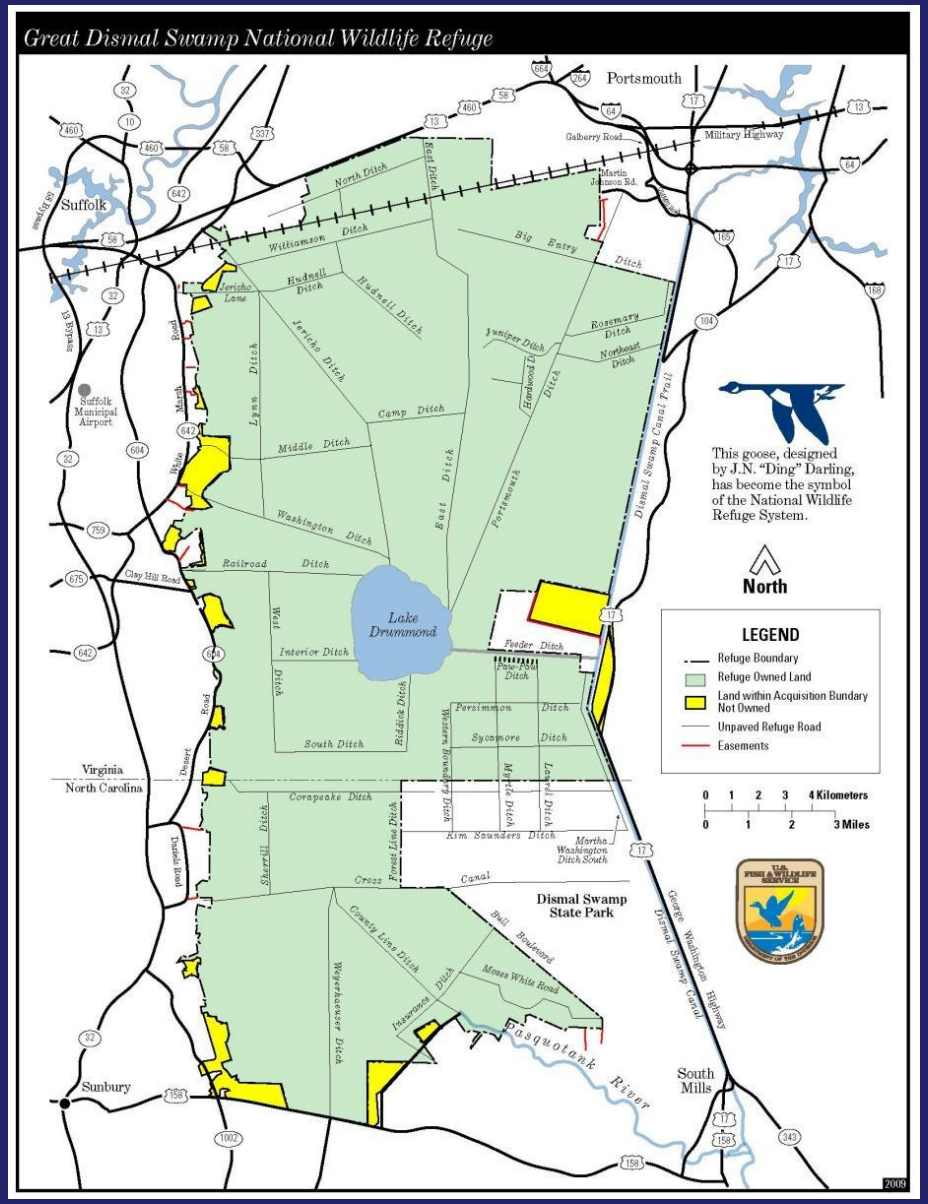
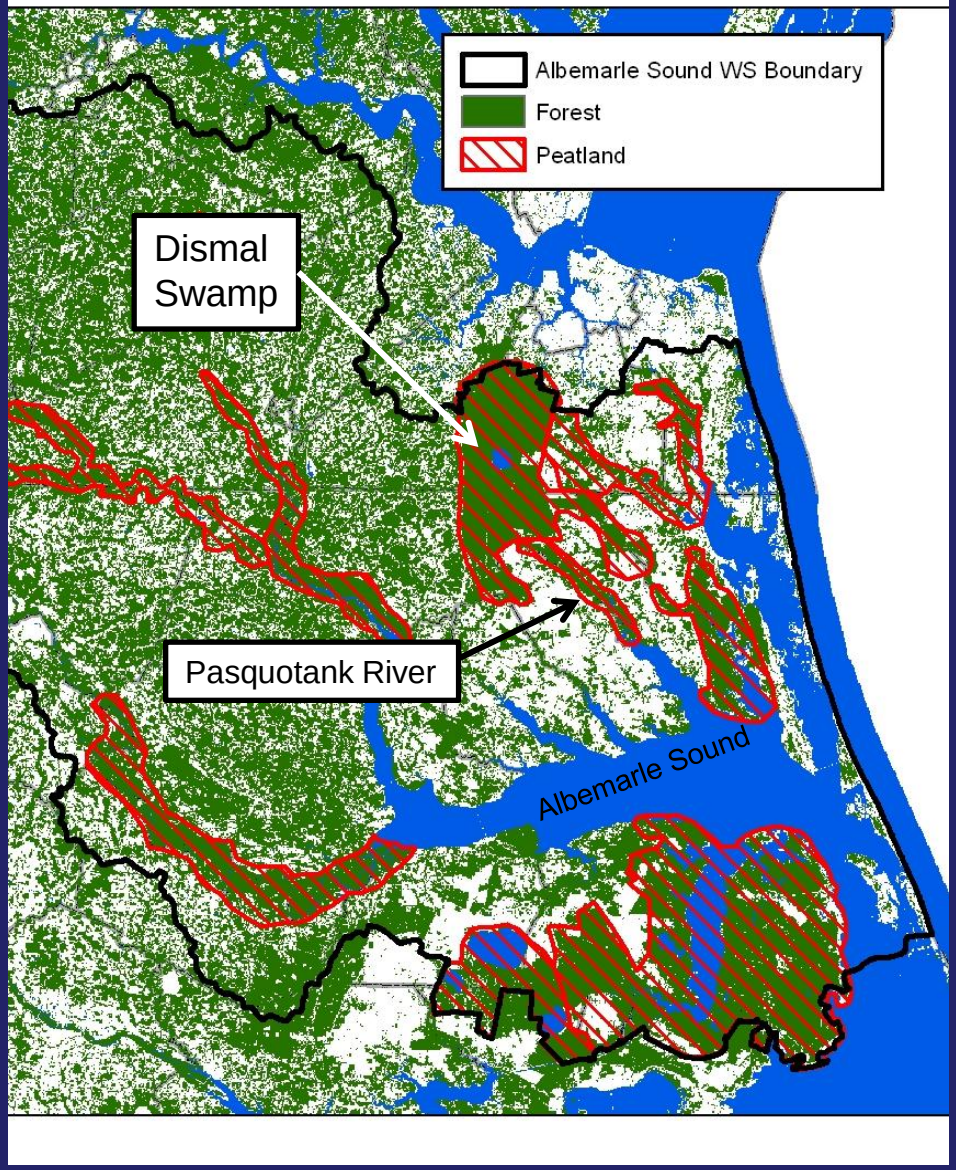
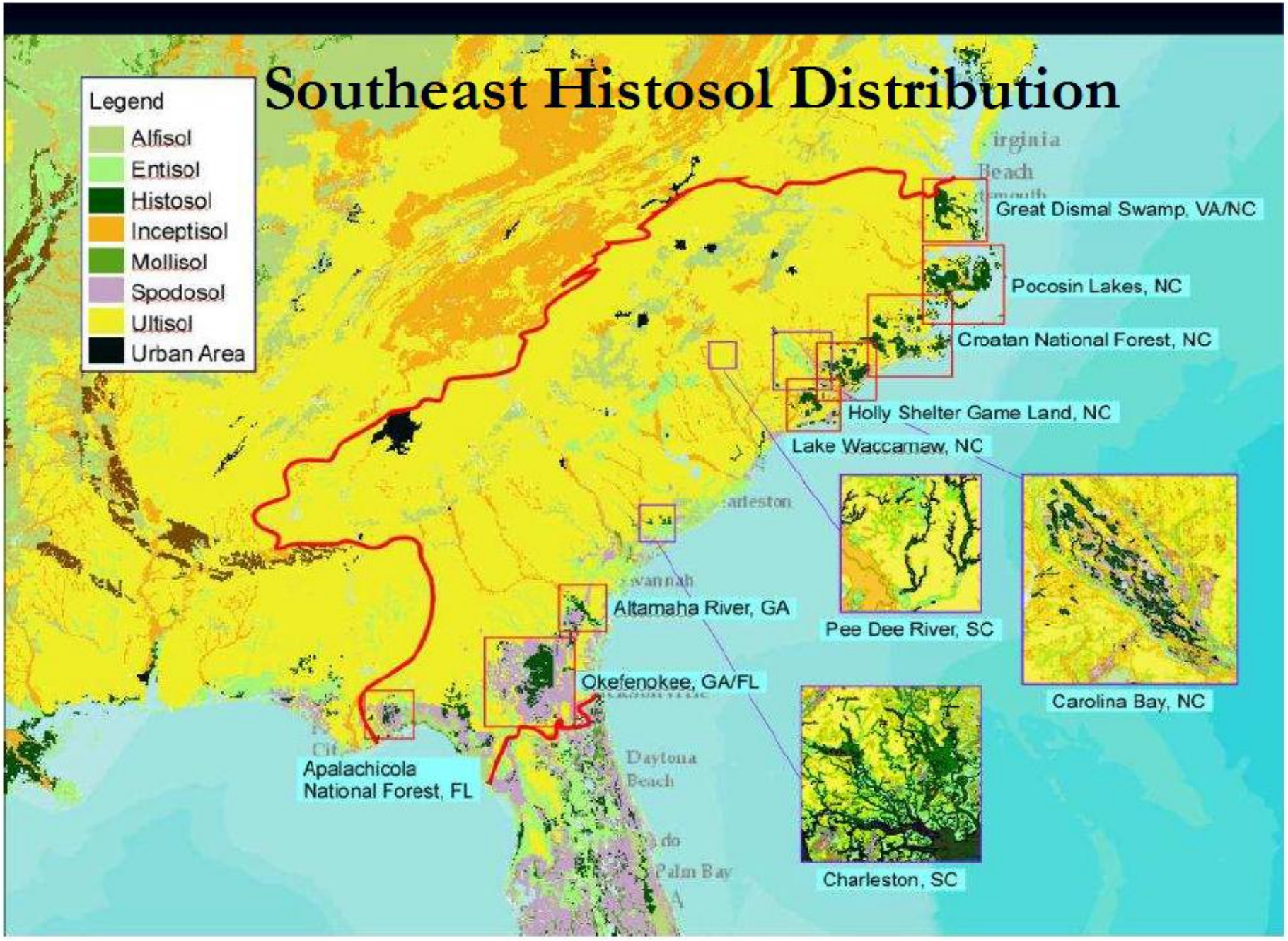
# Outline

- Dismal Swamp Overview
- The Need for Hydrologic Management
- Projects


Great Dismal Swamp National Wildlife Refuge
Portsmouth
Suffolk
Military Highway
Galberry Road
Martin Johnson Rd.
North Ditch
West Ditch
Williamson Ditch
Big Entry Ditch
Hudnell Ditch
Jericho Lane
Jericho Ditch
Juniper Ditch
Rosemary Ditch
Northeast Ditch
Hardwood Ditch
Dismal Swamp Canal Trail
Suffolk Municipal Airport
Lynn Ditch
Camp Ditch
Middle Ditch
East Ditch
Portsmouth
Washington Ditch
Railroad Ditch
Clay Hill Road
Lake Drummond
Interior Ditch
West Ditch
Feeder Ditch
Pine Hill Ditch
Persimmon Ditch
Sycamore Ditch
South Ditch
Riddick Ditch
Virginia
North Carolina
Corapeake Ditch
Sherrill Ditch
Forest Line Ditch
Jericho Canal
Lateral Ditch
Rim Saunders Ditch
Martha Washington Ditch South
Cross Canal
Dismal Swamp State Park
County Line Ditch
Bell Boulevard
Moses White Road
Washington Ditch
Interstate Ditch
Pasquotank River
Sunbury
South Mills
George Washington Highway
Dismal Swamp Canal
This goose, designed by J.N. "Ding" Darling, has become the symbol of the National Wildlife Refuge System.
North
LEGEND
Refuge Boundary
Refuge Owned Land
Land within Acquisition Bundary Not Owned
Unpaved Refuge Road
Easements
0 1 2 3 4 Kilometers
0 1 2 3 Miles
2009


Albemarle Sound WS Boundary
Forest
Peatland
Dismal Swamp
Pasquotank River
Albemarle Sound


Southeast Histosol Distribution
Legend
Alfisol
Entisol
Histosol
Inceptisol
Mollisol
Spodosol
Ultisol
Urban Area
Great Dismal Swamp, VA/NC
Pocosin Lakes, NC
Croatan National Forest, NC
Holly Shelter Game Land, NC
Lake Waccamaw, NC
Altamaha River, GA
Pee Dee River, SC
Carolina Bay, NC
Okefenokee, GA/FL
Apalachicola
National Forest, FL
Charleston, SC

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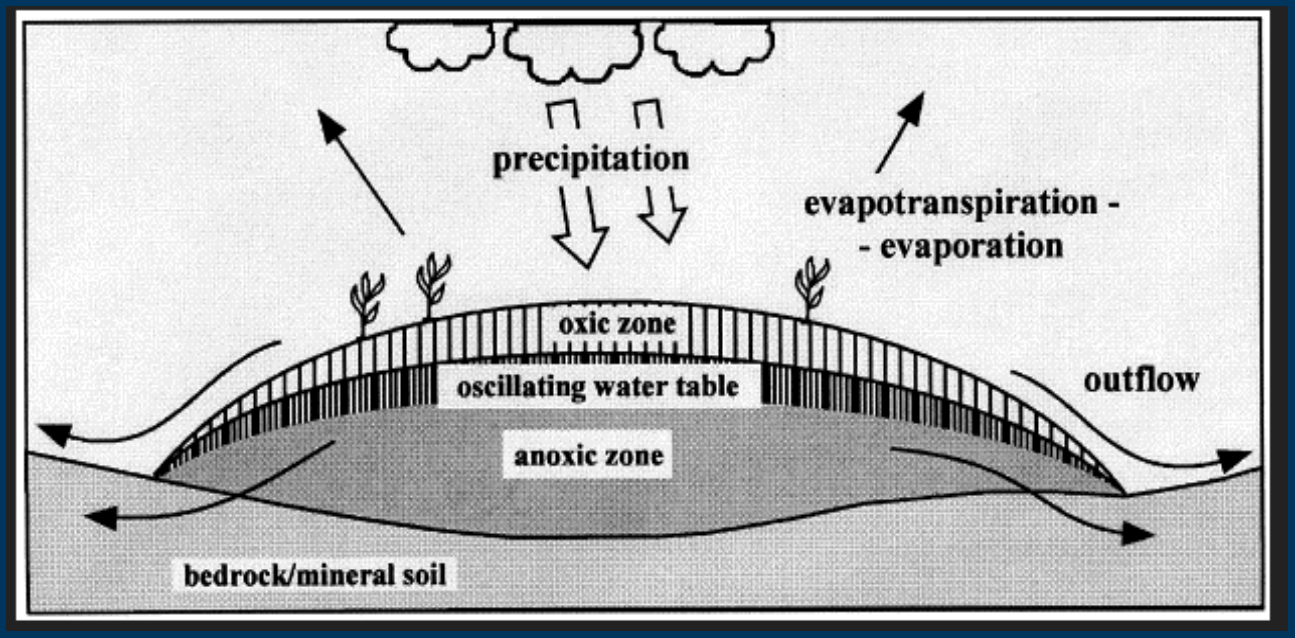
# Soils and Hydrology

Peat soil profile




rain-fed wetlands

***Peatlands cover only 3% of the land surface of the earth, contain twice as much carbon as all the world's forest biomass.***

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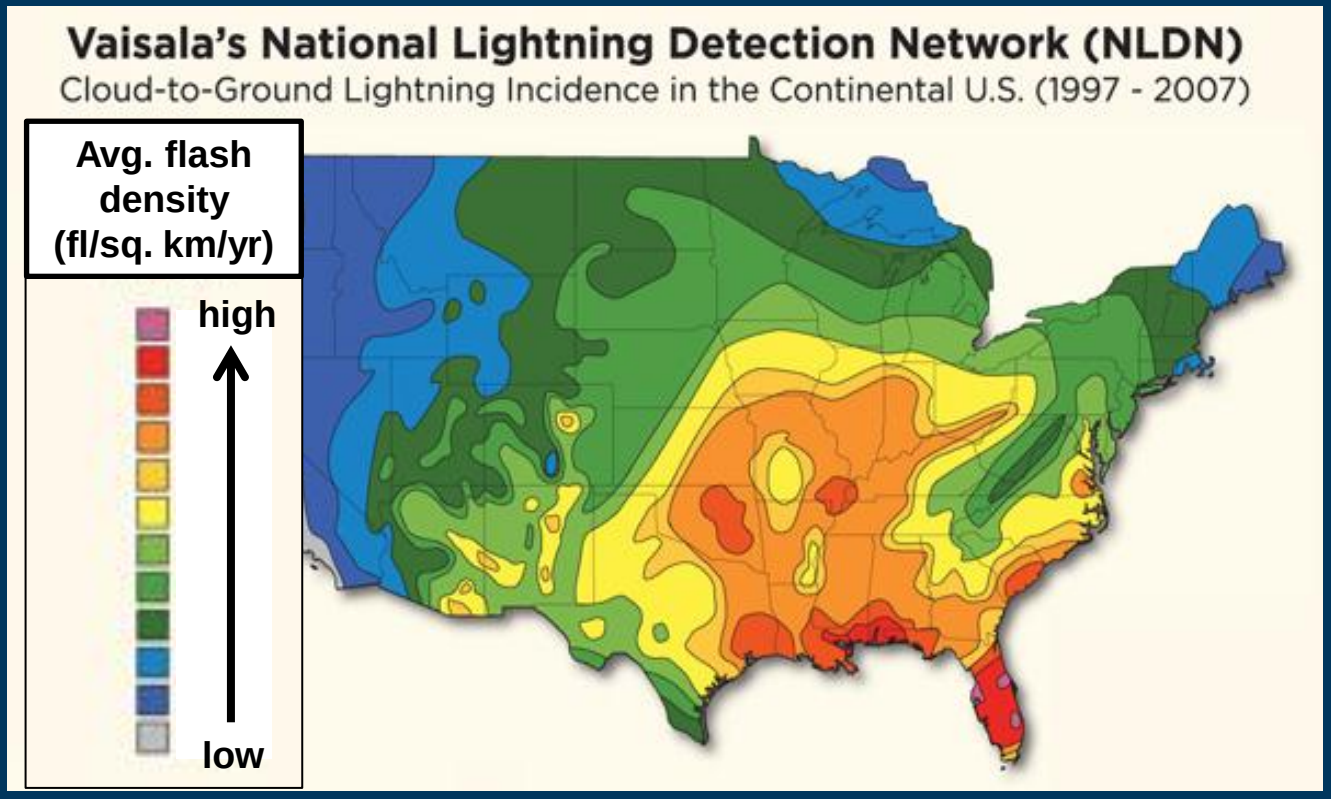
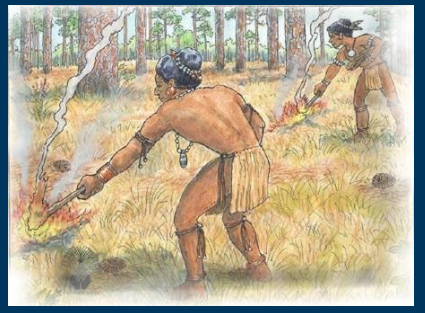
# The Natural Role of Fire



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# Historically Dominant Species

Atlantic white cedar

Bald cypress

canebreak

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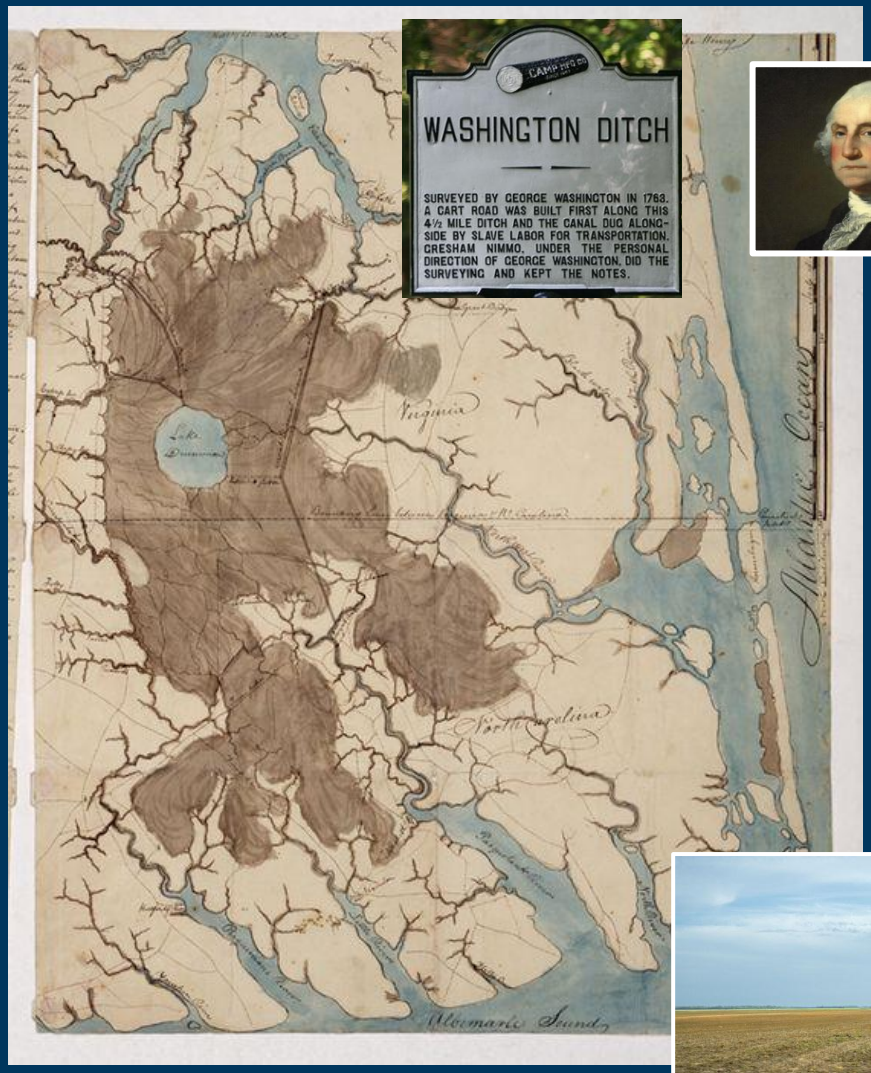
# Conversion and Hydrologic Alteration




1890


ca. 1973

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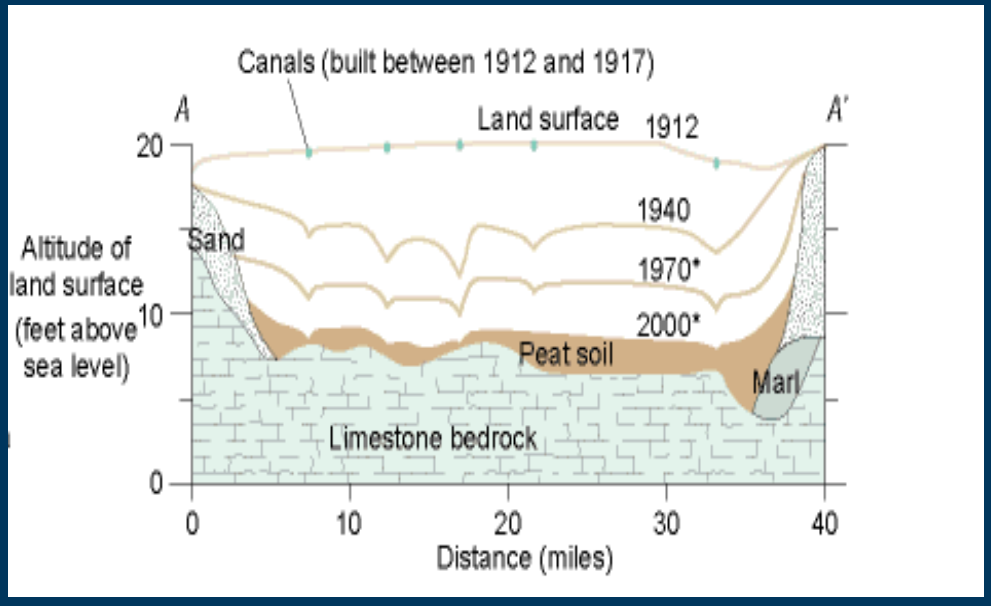
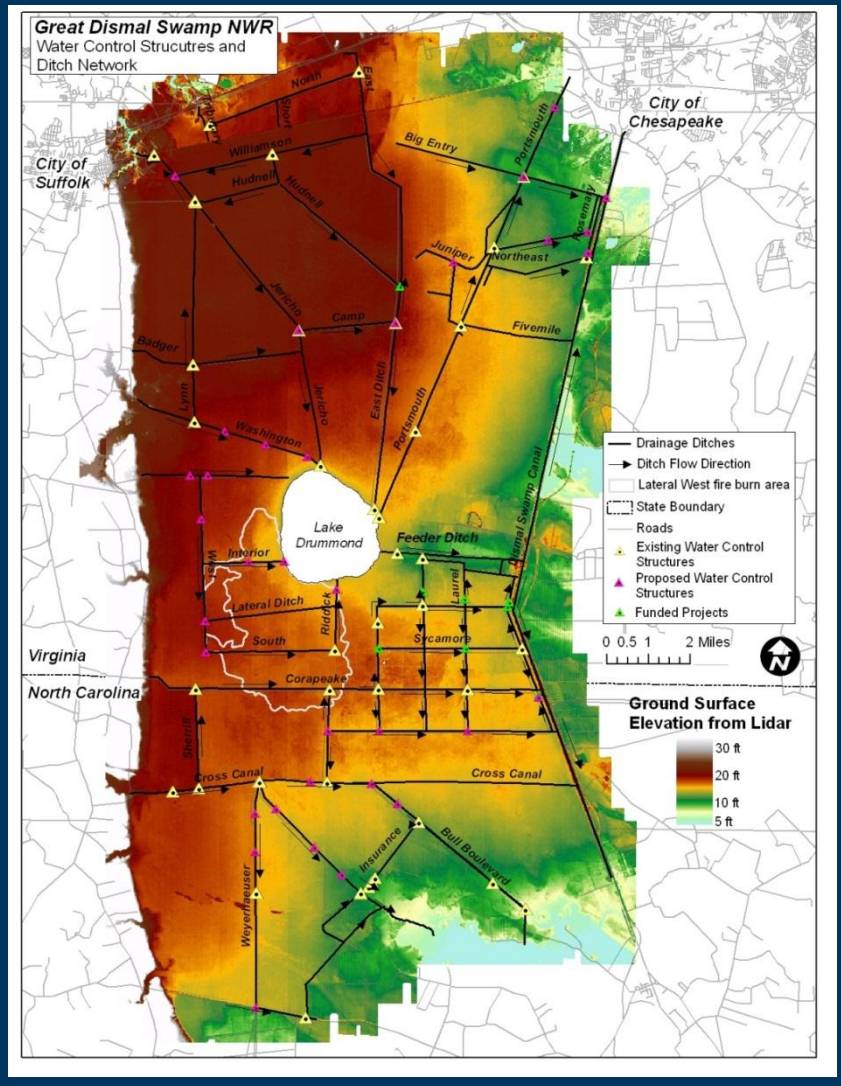
# Peat Subsidence




Everglades



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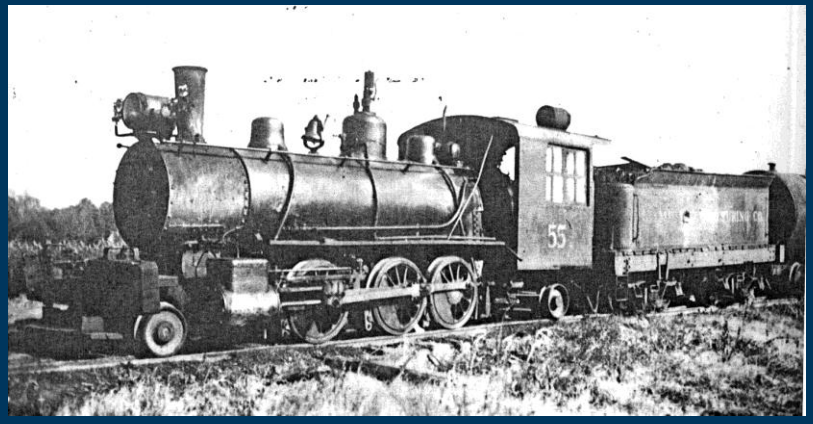
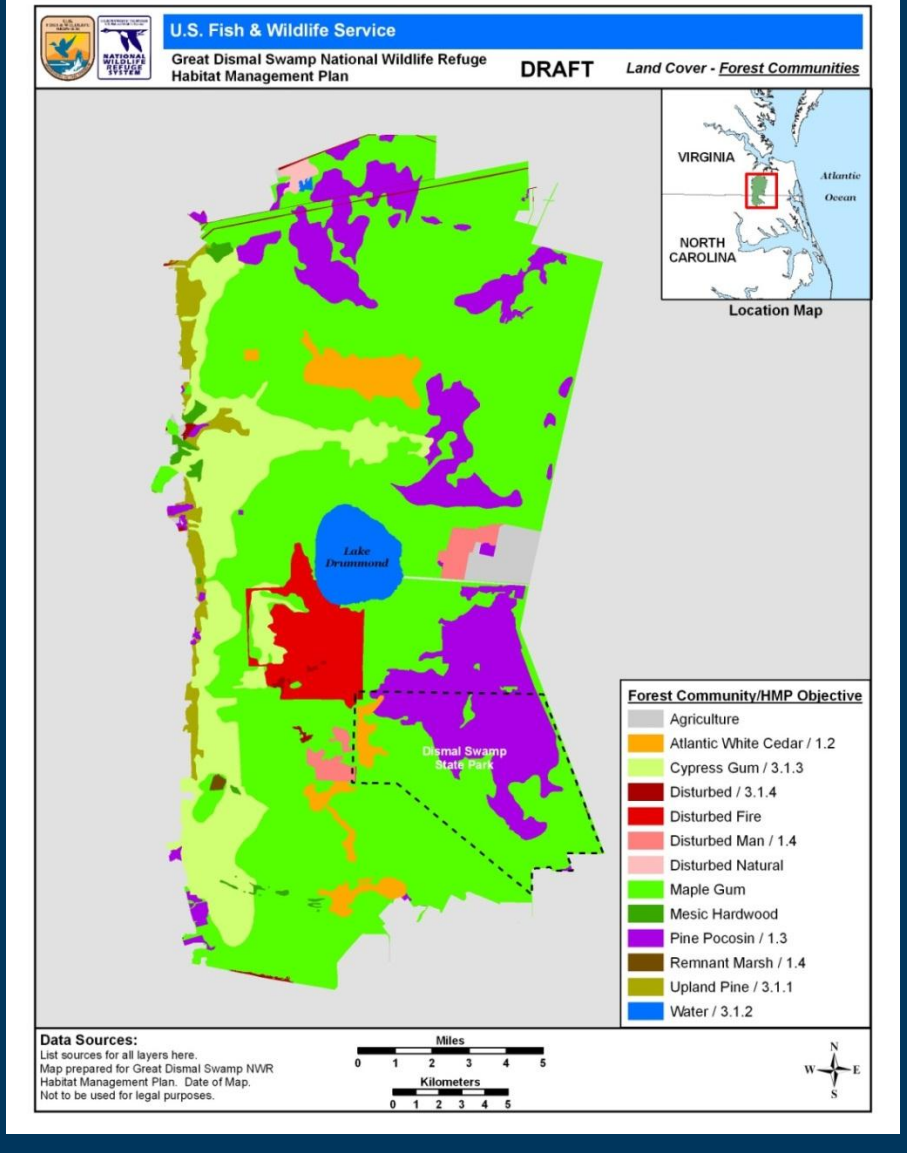
# Logging and Forest Change





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# Ecological Management (1974 - )

U.S. FISH & WILDLIFE SERVICE
DEPARTMENT OF THE INTERIOR

U.S. DEPARTMENT OF THE INTERIOR
U.S. Fish and Wildlife Service
NATIONAL WILDLIFE REFUGE SYSTEM

*"Acquired and managed for the principal purpose of protecting a unique and outstanding ecosystem and its incumbent diversity of plant and animal life.."*

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# Wildfires – Not a Question of If, but When

South One Wildfire - 2008

Lateral West Wildfire 2011

Hurricane Isabel - 2003

**2004 - 2011**

- 11 wildfires
- 15 starts in 1 month in 2007
- 2 largest and most expensive wildfires in Refuge and VA history

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# Impacts of Peatland Wildfires

Ecological impacts – habitat


Human impacts – smoke

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## The science of wildfire smoke: What does it do to your lungs?

Posted to: Environment | Health | News  Login or register to post comments


By Elizabeth Simpson
The Virginian-Pilot
© August 13, 2011

You're breathing it in, that acrid air, day after day, outside and even inside your house.

The smoke from the Great Dismal Swamp National Wildlife Refuge fire is not bringing you to your knees, but it's starting to feel ubiquitous.

Where does it go? What does it do?

Dr. Jeffrey Schnader can tell you. He's a pulmonologist and a professor at Eastern Virginia Medical School who has studied the lungs

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# Increasing Frequency of Peatland Wildfires

Alb-Pam Refuges; 2008-2011

- Four fires, 94,000 acres
- 20 million metric tons of carbon
- $58 million
- 562 days from ignition to out

Other Major  Peatland Fires

- 1997 – Indonesia
- 2004 - Alaska
- 2010 – Russia


2010 peat fires in Russia

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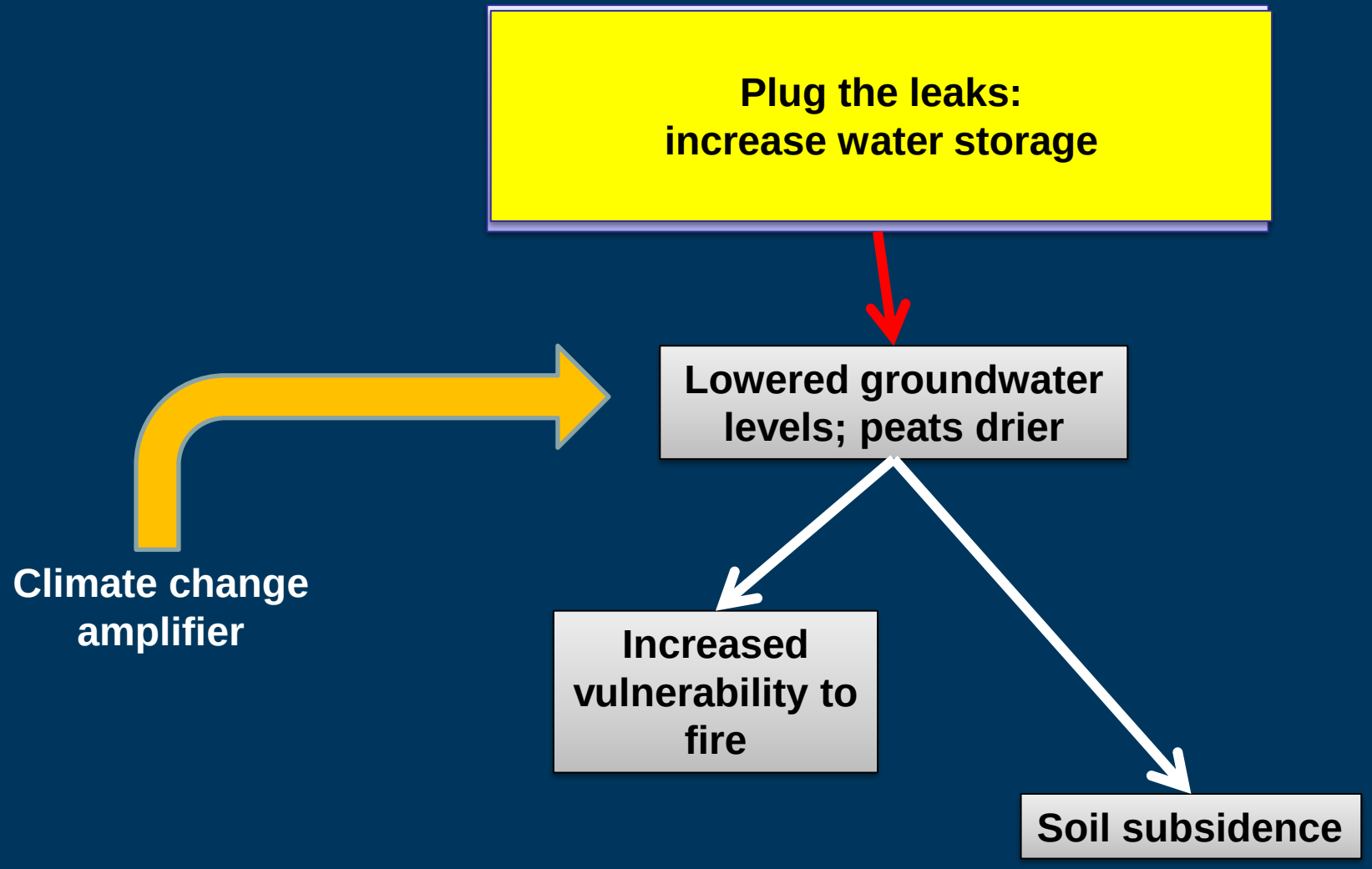
# Altered Hydrology: the Common Denominator



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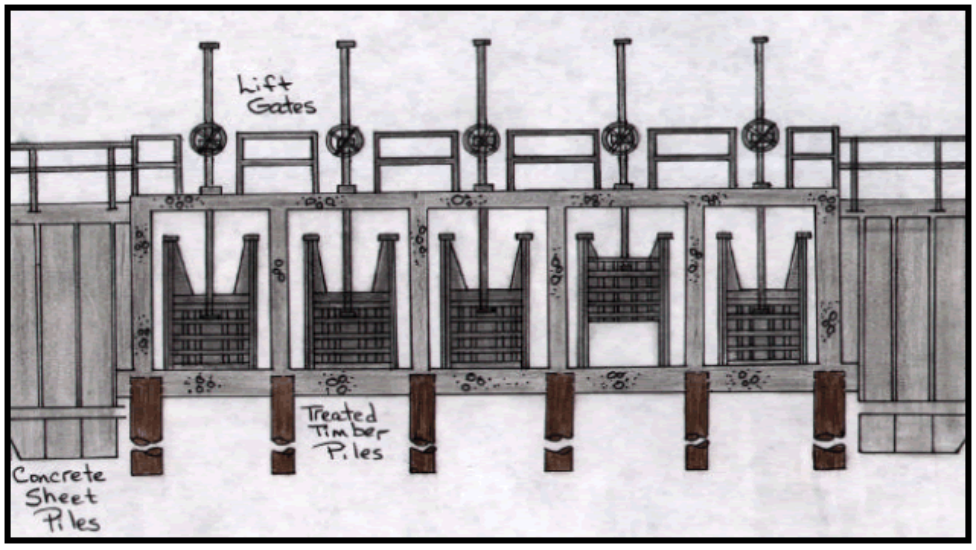
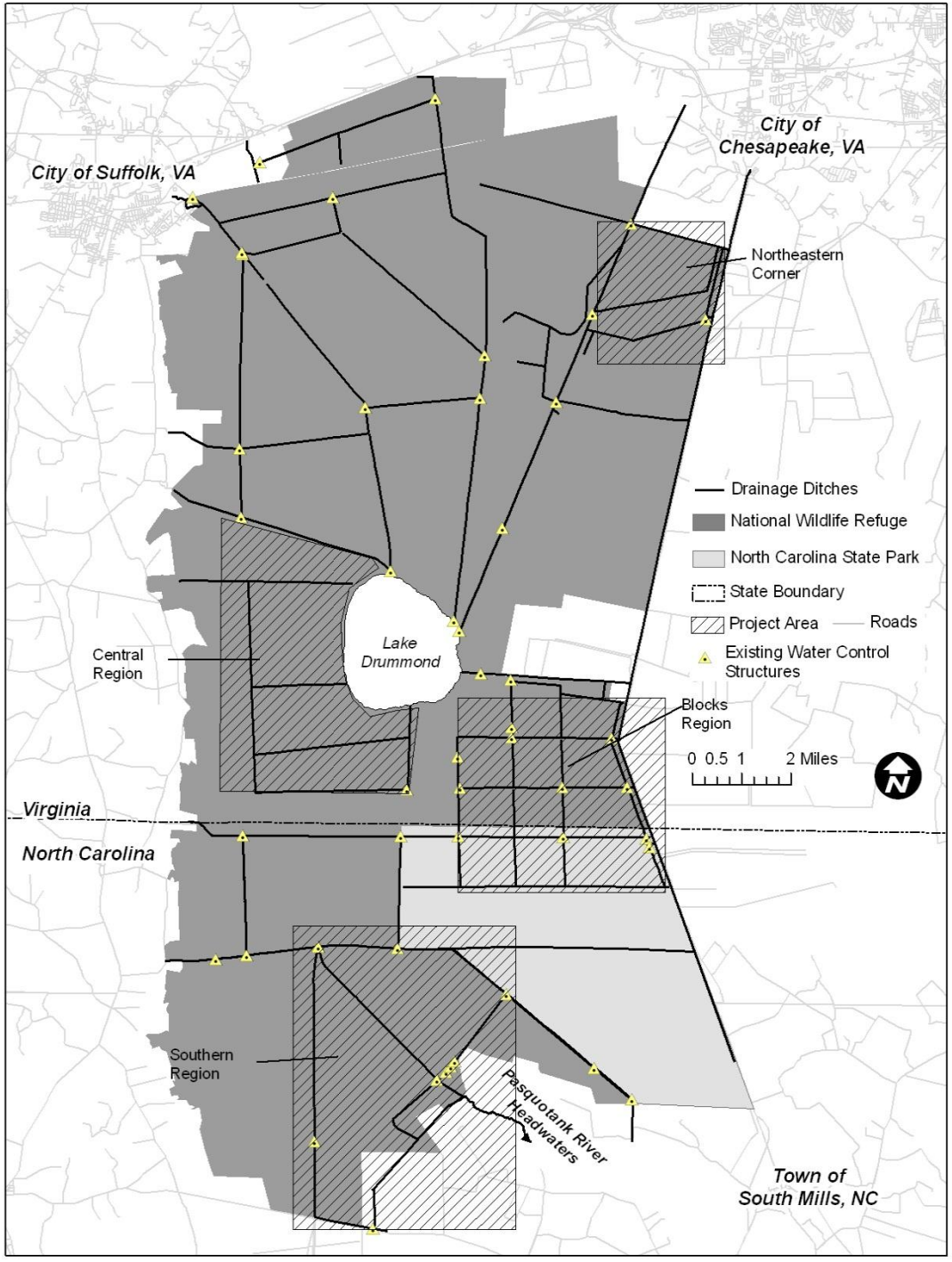
# Restoring Peatland Hydrology to Minimize the Threat of Catastrophic Wildfires

water control structure




Water Control Structure
adapted from USACE - Galveston District

Figure 54




# Projects

<u>The "Blocks"</u>

- 5 WCS installations
- 4,000 acres
- **APNEP $30K grant; $80K match**
- USFWS NAWCA grant; $1M

<u>Pasquotank Headwaters</u>

- 12 WCS
- 8,000 acres
- USFWS/TNC Co-op ($100K)

<u>Northeastern Corner</u>

<u>Central Region (Wildfire Scars)</u>

<u>Carbon Sequestration Feasibilty Study</u>

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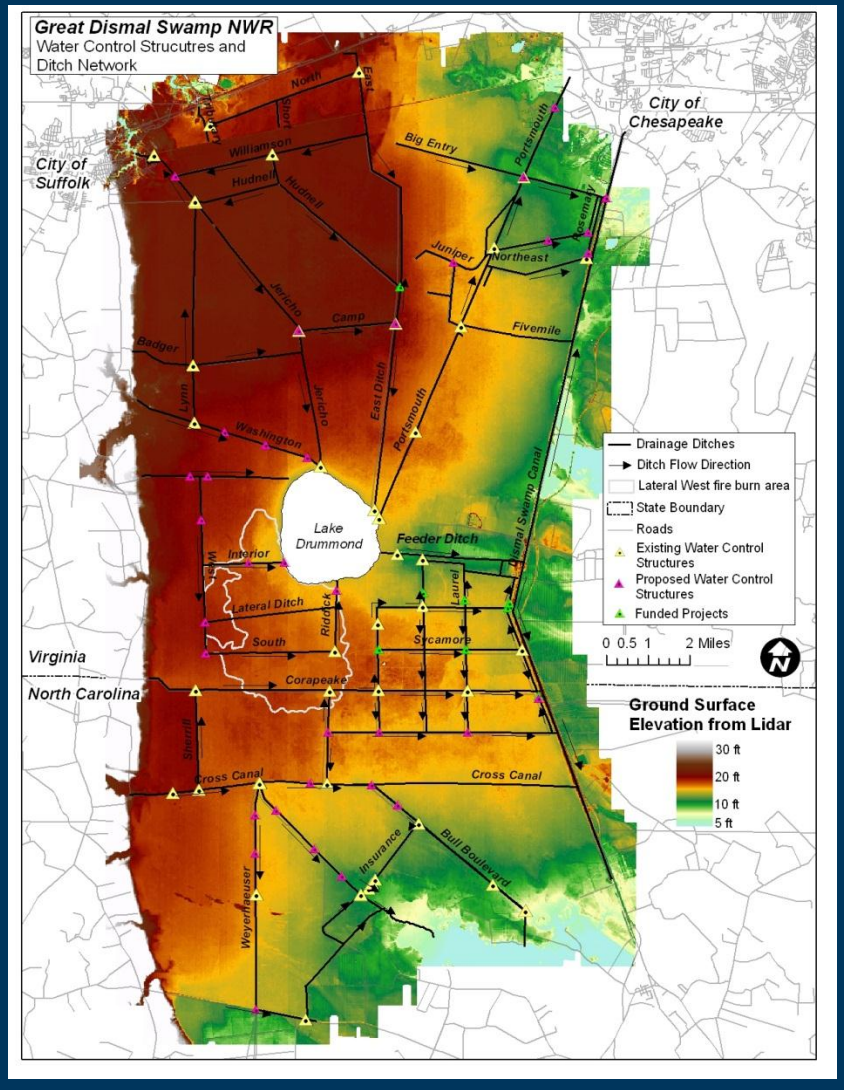
# Comprehensive Hydrologic Management: Challenges




## System-Scale Modeling

- Flow patterns of 150-mile drainage ditch network;
- Water budget
- Soils mapping - fibric vs. sapric peat
- Vegetation controls on peat chemistry
- Interaction of climate change, hydrology and vegetation

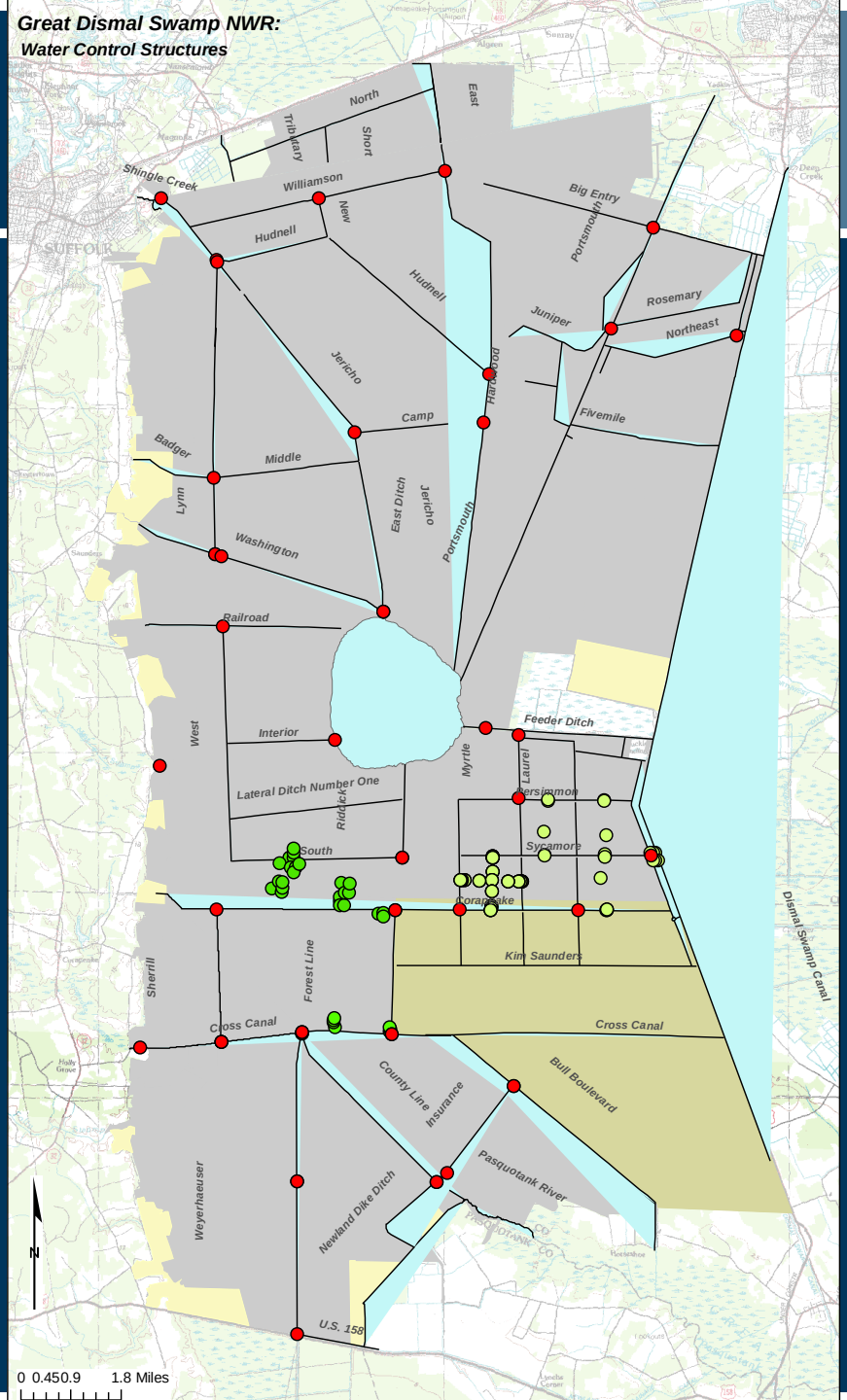
# Comprehensive Hydrologic Management : Challenges

**Managing for Multiple Targets**

- Fire prevention
- Peat and carbon conservation;
- Hydrologic requirements of priority habitat (Atlantic White Cedar Forest)

**Costs**

- Comprehensive planning
- Implementation
- Monitoring for adaptive management




# Monitoring for Adaptive Management

- 49 surface water sites
- 106 groundwater monitoring wells

Surface Water Monitoring
USGS wells
CNU Wells
Ditches

**Refuge Boundary**

Acquired
Inholding
State Park

# Increasing the Resiliency of Forested Wetlands on FWS Refuges: Peatlands of The Albemarle Sound Region

**Overview** The U.S. Fish & Wildlife Service's (FWS) 425,000 acres of National Wildlife Refuge (NWR) land in the Albemarle Sound watershed of northeastern North Carolina and southeastern Virginia represent one of the largest ownerships of peat-based forested wetlands in the eastern U.S. FWS is collaborating with an array of stakeholders to increase the resiliency of 100,000 acres of peatlands through restoring the hydrology of these carbon-rich wetlands.


Photo Credit: USFWS

## Profile of Albemarle Sound's Peatland Refuges

Expansive forested wetlands are one of the distinguishing features of the Albemarle Sound's coastal region. Peats up to 14 feet deep– comprised of partially decomposed plant material– underlie the majority of these wetlands. The largest areas are located on FWS land:


- Alligator River NWR (154,000 acres)
- Pocosin Lakes NWR (110,000 acres)
- Great Dismal Swamp NWR (112,000-acre)

These lands provide critical habitat for migratory birds and waterfowl, Black Bear populations, and two federally endangered species: Red Wolf and Red-cockaded Woodpecker. Refuge forests protect water quality in headwaters and tributaries of the Albemarle Sound, supporting healthy, productive fish nursery areas.

*While covering only 3% of the world's land area, peatlands contain the equivalent to twice the carbon stock of all forest biomass worldwide.*

Peatland forests are gaining global recognition for their tremendous carbon sequestration potential. With over 100,000 acres of restorable peatlands in the Albemarle Sound region, refuges can substantially contribute to international targets for carbon sequestration through rewetting efforts, which will also restore significant wildlife habitats.

# Summary

**Desire Outcome:**

**Application of ecosystem-based hydrologic management in the Dismal Swamp that results in:**

- ***reduced risk of wildfire providing air quality benefits for people;***
- ***increased protection of carbon stocks;***
- ***recovery of priority habitats***