

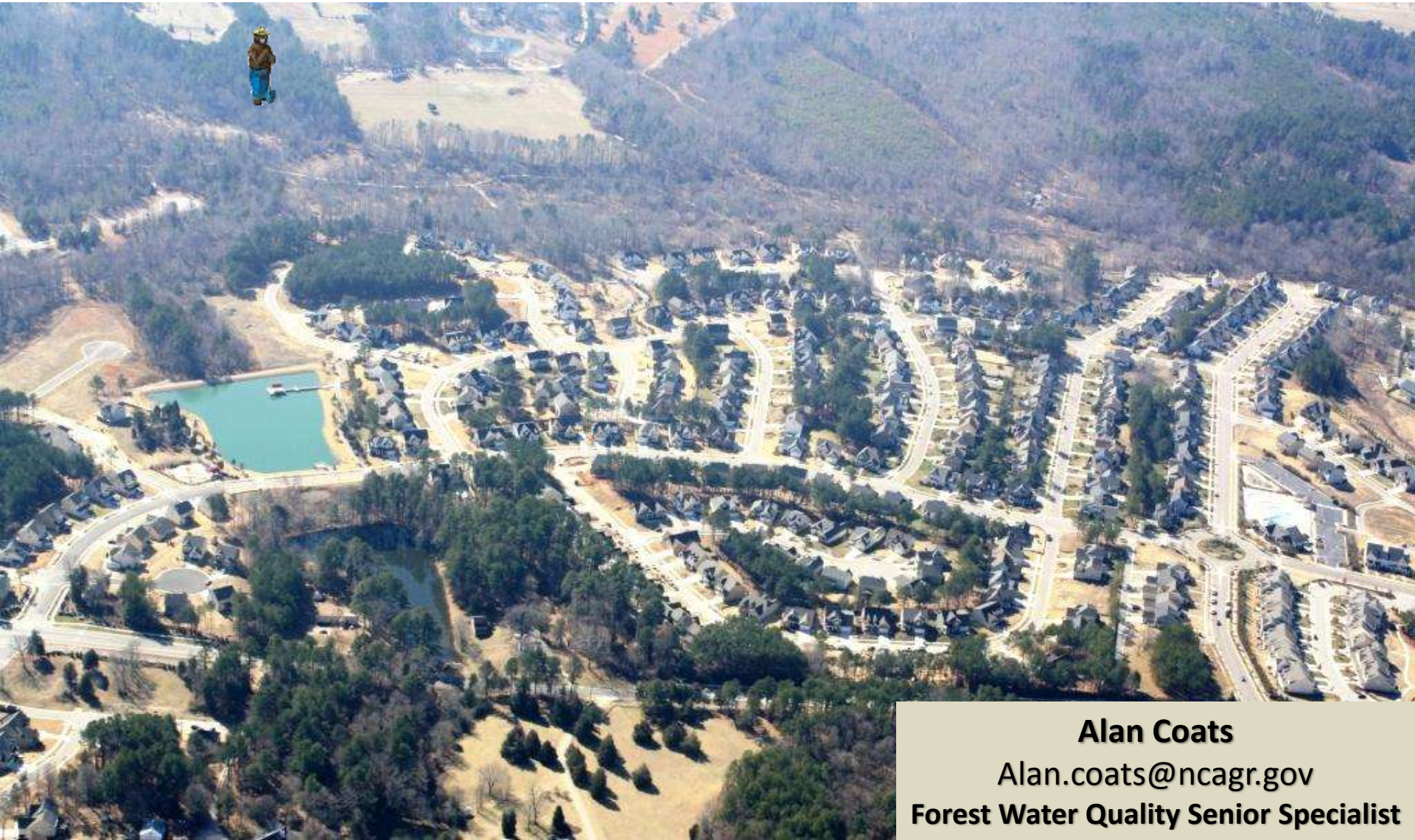


How Does Water Fit In the Forestry Landscape of North Carolina?



N.C. Dept. of Agriculture & Consumer Services

North Carolina Forest Service



Alan Coats

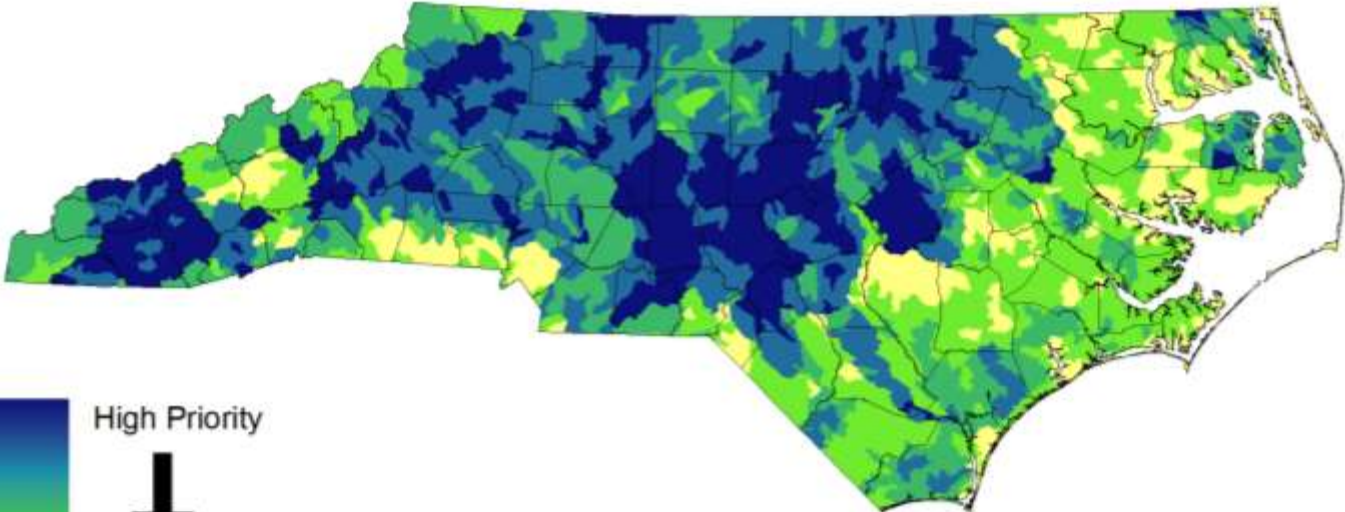
Alan.coats@ncagr.gov

Forest Water Quality Senior Specialist

“So What” for a Community, Town, County?

- **In NC (& the South) water comes from forests.**
 - North Carolina: ~18MM acres. ~65% privately owned.
- **What is the relationship between forests & water?**
 - Forests are the sponge... filter... holding tank... regulator valve
 - Can we assume that more forests = more, better water?
- **Managing the forest is compatible with protecting WQ**
 - Forests do not need to be preserves or ‘hands off’.
- **Measures are in place to protect WQ during forestry operations (logging, debris removal, road building, etc)**

Priority Forests for Surface Water Quality and Supply



Hardwoods

- Elm/Ash/Cottonwood
- Maple/Beech/White Birch
- Oak/Gum/Cypress
- Oak/Hickory/Chestnut
- Oak/Pine Group

Millions of Gallons per Day per Square Mile

- < 5 %
- 5 - 25 %
- 25 - 50 %
- 50 - 75 %
- > 75 %



Forecast Increases in Water Demand 2005-2030

Forests, Watersheds & Water Supply

Understanding relationships between:

- forests and water quality
- forests and water supply availability
- forests and water supply treatment costs
- forests and urban stormwater management

- effects of freshwater/seawater flux on forests
 - sea level rise, saltwater intrusion, tree species adaptability

- effects of forest systems change on water systems
 - loss of hemlocks in mountains; effects of invasive plants

“So What” for a Community, Town, County?

If you maintain 1 acre of forest in your watershed, you will prevent _____ tons of sediment from washing into the water supply reservoir.

If you pay a forest owner \$____ per acre to keep their land in forest, you'll save \$____ (x) times in treatment costs.

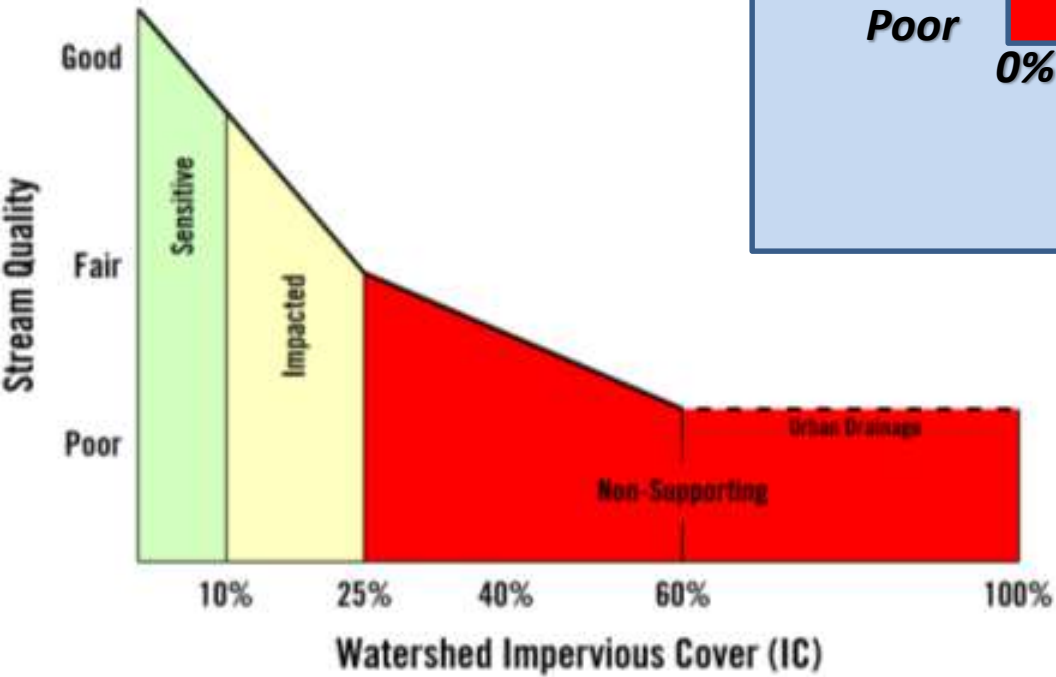
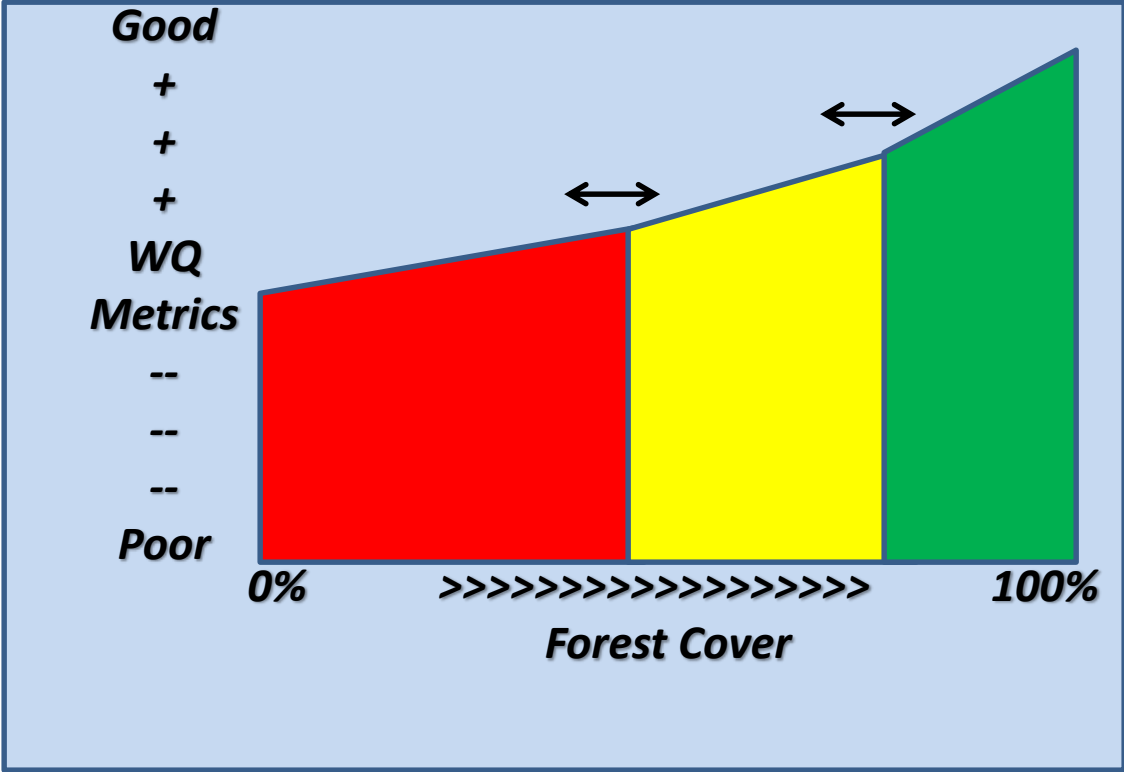
If you retain at least _____% of forest in your watershed, you can expect a _____% reduction in stormwater runoff. Where in the watershed is a forest best suited to control or manage stormwater runoff?

How much water do different species of trees utilize in evapotranspiration? Should this guide decisions about water-supply watershed management?

How much are trees & forests worth, to provide clean & reliable water?

Forests, Watersheds & Water Supply

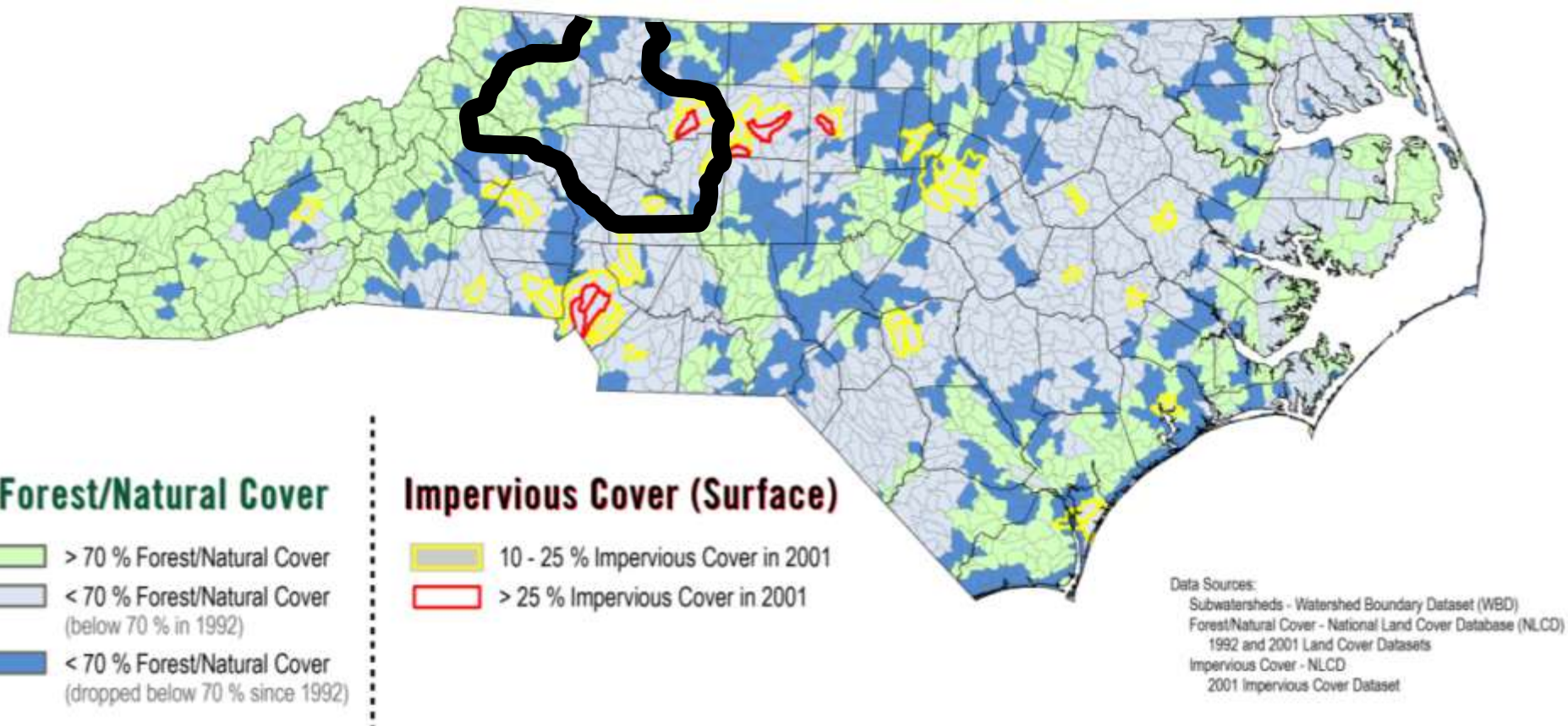
Theoretical Forest Cover Model



Center for Watershed Protection,
Impervious Cover Model

Forests, Watersheds & Water Supply

Land Use / Land Cover Assessment in High Rock Lake Watershed



Forests, Watersheds & Water Supply

High Rock Lake Watershed Study:

- **Examined Water Quality**
 - Compared aquatic insect data with LU/LC
- **Examined Water Supply**
 - Obtained data from system operators
 - Looked at water quality samples pre-treatment
 - Requested estimated treatment costs
- **Examined Stream Buffers**
 - Effect of different widths & LU/LC
 - Identify parcels where work may help

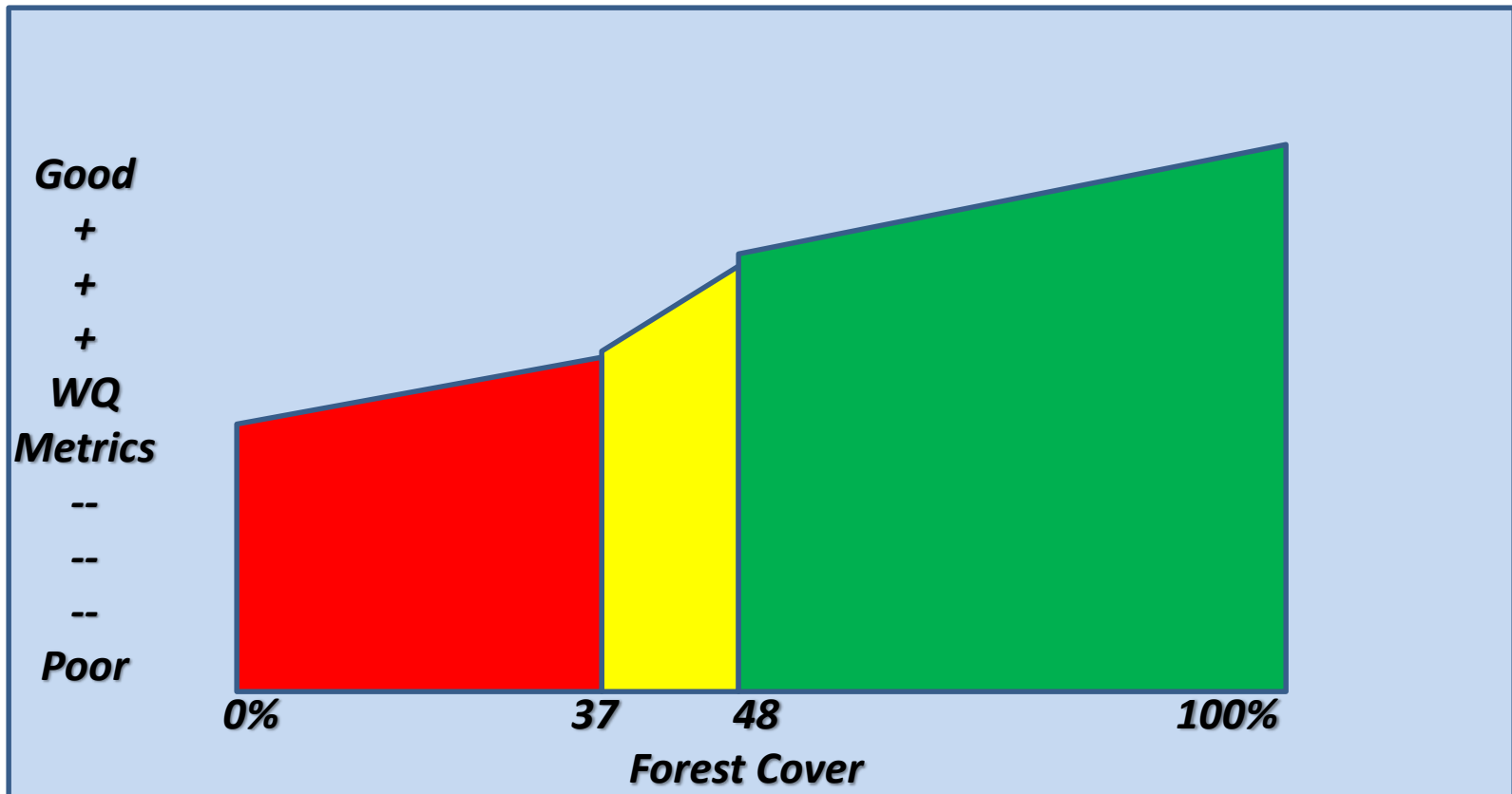
Forests, Watersheds & Water Supply

High Rock Lake Watershed Study

Question 1: Forests & Water Quality:

Findings: More Forest =>>= better water quality.

- “Forest Cover Model”: <37%.... 37% to 48%..... >48%



Forests, Watersheds & Water Supply

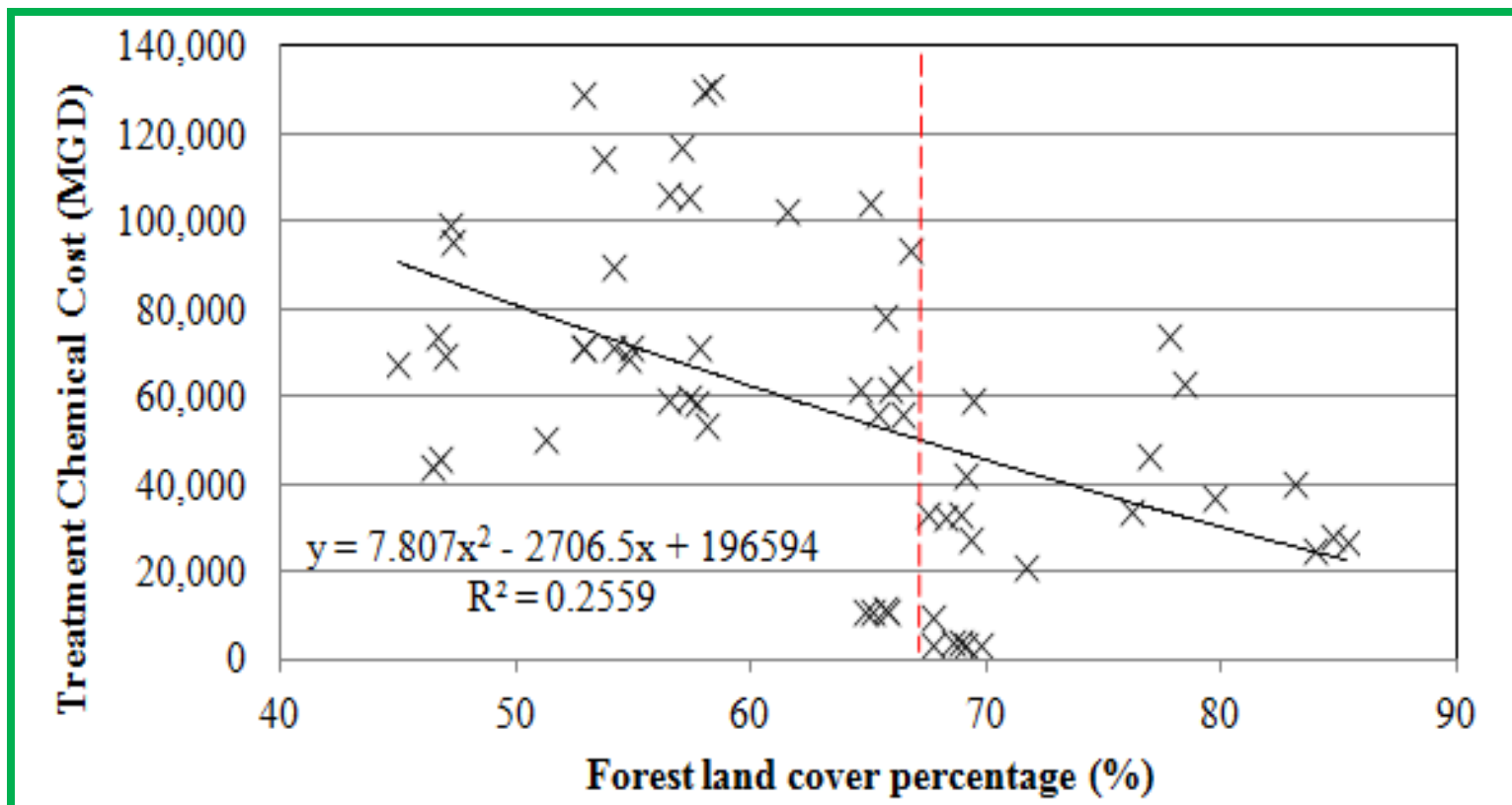
High Rock Lake Watershed Study

Question 2: Forests & Water Supply:

Findings: More Forest >>>> trend towards reduced treatment costs.

- When forest cover is ~70% or more... You should expect lower treatment costs.

(Chart excerpted from statistical analysis and project report conducted by CAGIS at UNC-C)



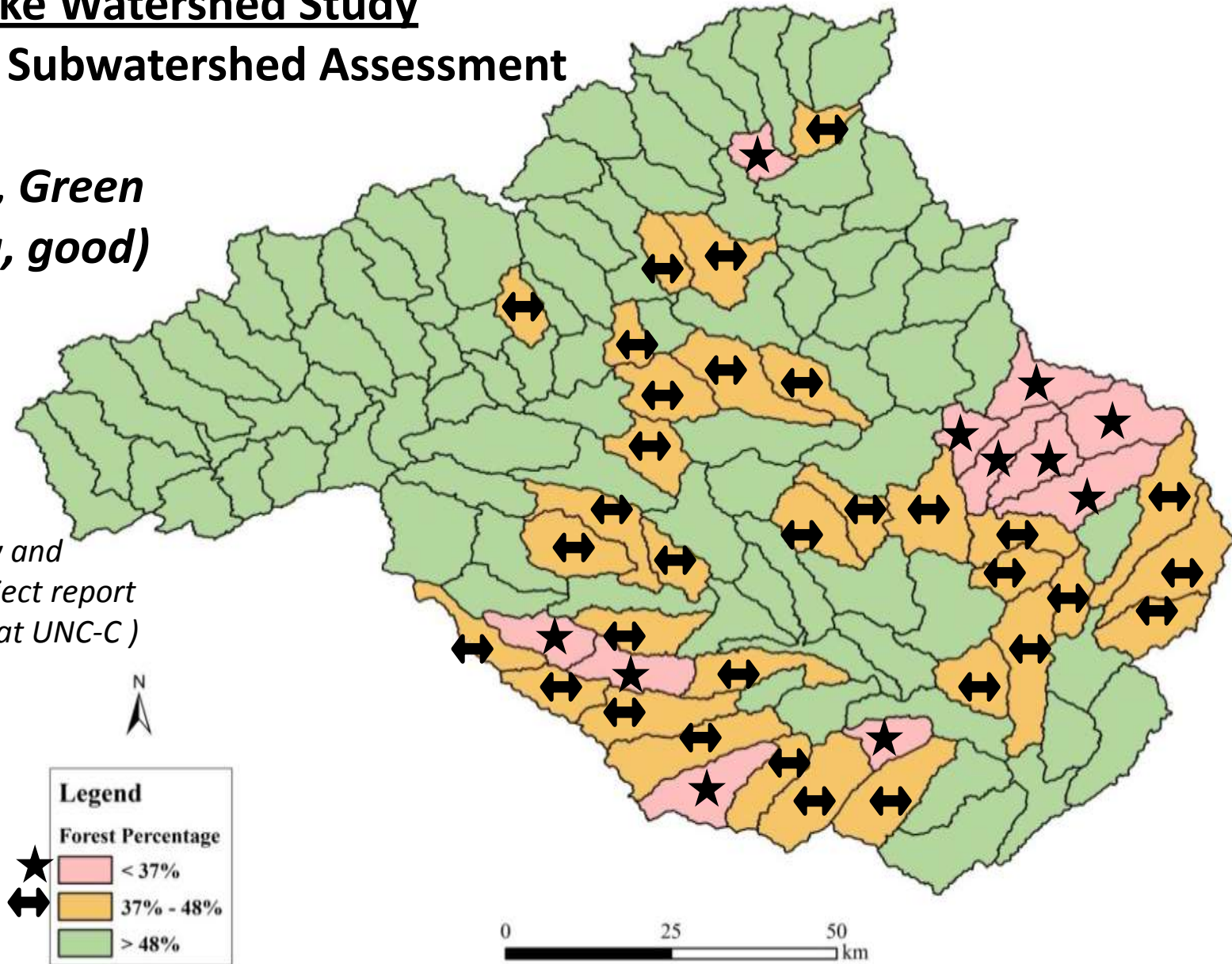
“So What” for a Community, Town, County?

High Rock Lake Watershed Study

Forest Cover Subwatershed Assessment

Red, Orange, Green
(bad, tipping, good)

*(Map generated by and
excerpted from project report
prepared by CAGIS at UNC-C)*



Forests, Watersheds & Water Supply

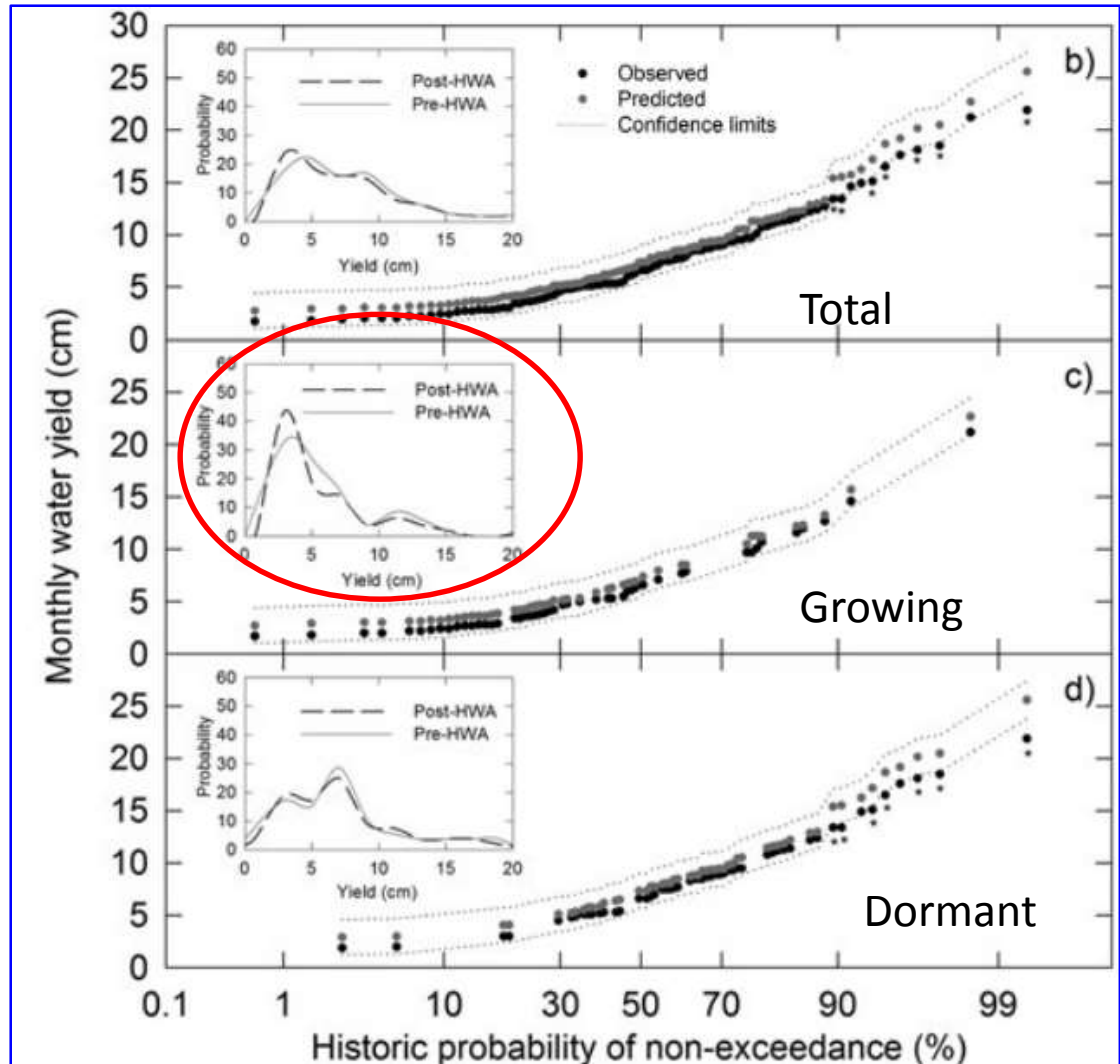
Changing hydrology after loss of eastern hemlock (Brantley et al. 2014)

- Observed water yield at Coweeta after hemlock wooly adelgid infestation in 2003
- Permanent reductions in water yield
 - Hemlock replaced with higher-transpiring species
- Possible temporary increase in stormflow
 - Reduced interception

Invasive species

Forest component removal

Change in water resource



Forests, Watersheds & Water Supply

So... more forests = better water quality & supply.

Q- What should be done with the forests?

A- Forest management is compatible with water protection

Water Systems

Parts:

Motors, Valves, Screens, Pipe

Sub-assemblies or Components:

Pump Station, Lift Station, Junction Box,
Tanks/Vessels,

Systems or Processes:

Reservoir Intake, Pumping, Lifting,
Flocculation, Filtration, Treatment,
Storage, Delivery, Transport, Metering

Forest Systems

Parts:

Soil, Terrain, Aspect, Veg., Shrubs, Trees

Sub-assemblies or Components:

- Compartment, Management Unit, Stand
- Tree Canopy Structure:
dominant, co-dominant, suppressed

System (examples):

Even Aged Pine/Conifer.
Two-Aged Upland (Xeric) Mixed Oak/Pine.
Bottomland Riparian Forest.
Even Aged Moist (Mesic) Hardwood Cove.

SYSTEMS MANAGEMENT

Interconnected, complex systems cannot function without maintenance, monitoring, capital investment, replacement of parts / components.

Forests, Watersheds & Water Supply



“Asset Management”

Water Systems

The systems and supporting infrastructure need routine monitoring, maintenance & upkeep to make sure they are performing to specifications, and *not approaching a point of failure.*

Forest Systems

The forest needs routine monitoring, maintenance & upkeep through periodic treatments (like harvesting or vegetation control) to assure sustained healthy conditions which can *prevent the forest from approaching a point of failure.*

“So What” for a Community, Town, County?

Recognize the benefits of forest management:

- If you own land in your watershed....**
 - Set the standard, get a plan, manage accordingly**
- If you don't own the land in your watershed....**
 - Support the ability of forest owners to sustain their land as forests**
 - economic development of markets, zoning, tax/use policies, financial incentives (or at least avoid 'disincentives'), payment-for-watershed-services...**

Forestry Operations & Water Quality

- ✓ Water comes from the forests...
- ✓ More forests >>> clean, low-cost water...
- ✓ Managing forests is “okay”...

Next Step: undertake forestry operations in a way that protects water quality



Forestry Operations & Water Quality

Q) Are logging jobs regulated in NC to protect water quality? A) Yes.

- ***North Carolina Forest Practices Guidelines Related to Water Quality (“FPGs”): 02 NCAC 60C .0100-.0209.***
- **General Statutes prohibit stream/ditch blockages.**
- **Riparian buffers in special-designated watersheds.**
- **Federal ‘guidance’ when working in wetlands.**

Best Management Practices = BMPs = Key to Success

Forestry Operations & Water Quality

NC Forest Service Role

- site compliance inspections & follow-up
- BMP technical assistance (explain the “how to”)
- training for loggers, buyers, owners, managers
- interagency cooperation
- evaluate/monitor/study BMPs



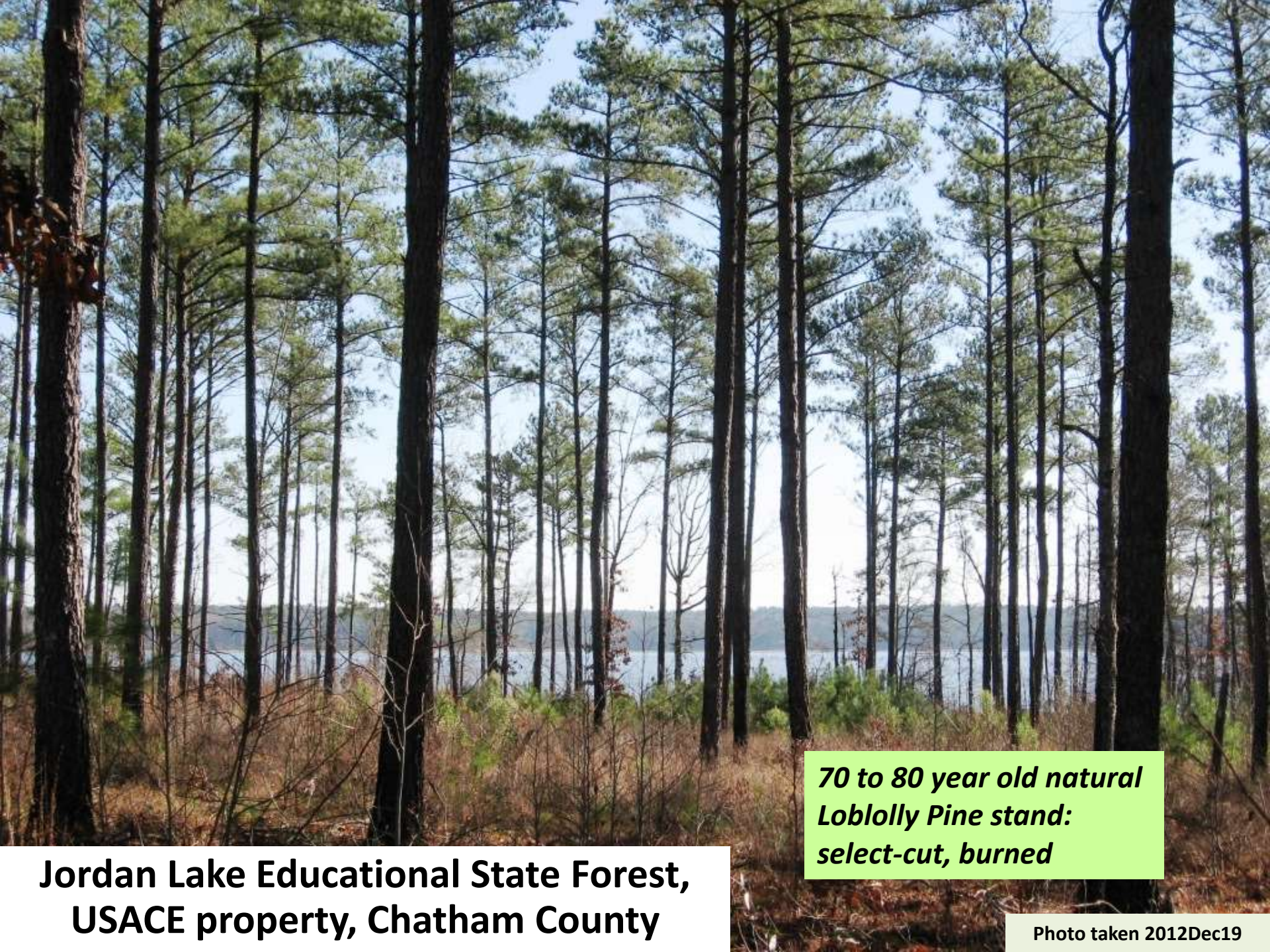
“So What” for a Community, Town, County?

How Are We Doing:

- **10-year FPG Compliance ~95% to 98%**
- **BMP Report Card: 85% statewide average**

A Supporting Role:



- **Know your County Forest Ranger**
- **Cross-Training & Cooperation w/ local staff:**
 - **urban forestry, E&SC, planning, engineering, stormwater...**
- **Forest owner referrals.... Cost-share BMPs??**



**Jordan Lake Educational State Forest,
USACE property, Chatham County**

*70 to 80 year old natural
Loblolly Pine stand:
select-cut, burned*

Photo taken 2012Dec19

 Stands to thin
 Stands to harvest

Jordan Lake Educational State Forest, USACE property, Chatham County. Before Harvest Treatments

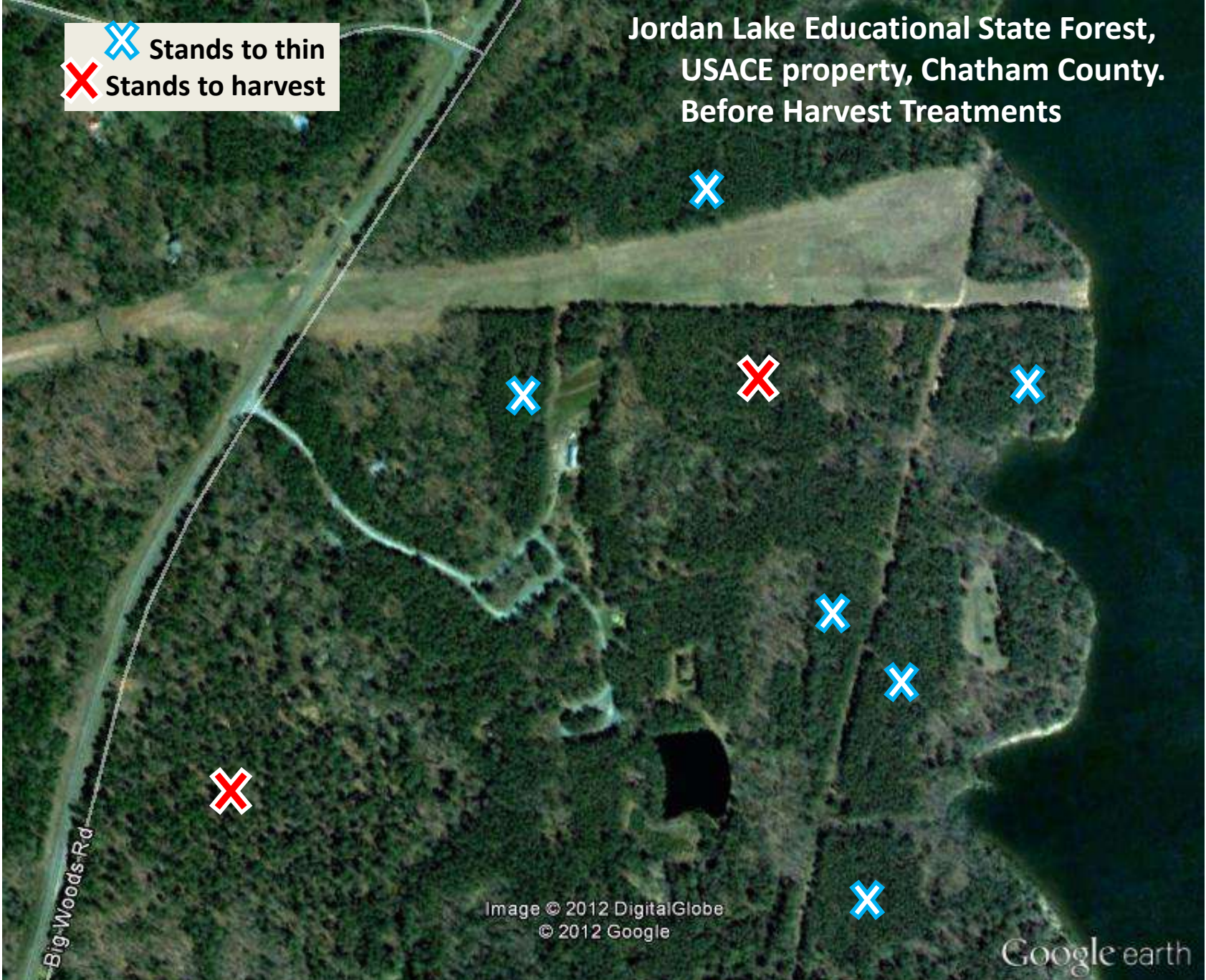


Image © 2012 DigitalGlobe
© 2012 Google

Google earth

Imagery Date: 5/4/2004

lat 35.775744° lon -79.041341° elev 257 ft

Eye alt 3547 ft

T Thinned stands

Jordan Lake Educational State Forest, USACE property, Chatham County. After Harvest Treatments

Clearcut Harvest
(longleaf pine
restoration)

Clearcut
Harvest

Big Woods Rd

© 2012 Google

Google earth

Imagery Date: 7/5/2010

lat 35.775744° lon -79.041341° elev 257 ft

Eye alt 3547 ft

Forestry Operations & Water Quality

Forest Certification Role

“The reality is that worldwide environmental concern is resulting in a demand from governments, businesses, and consumers for verifiable, credible information on the environmental impacts of products and services.”

*Excerpted from Report Entitled “Environmental Product Declarations: What? Why? How?”
October 30, 2012. By Wayne Trusty. Published by Dovetail Partners Inc. www.dovetailinc.org*



- Independent, 3rd-party audited
- Demonstrates environmental sustainability
- Members agree to many principles:
 - Follow BMPs to protect WQ, above & beyond min. rules
 - Use loggers / suppliers who are trained in BMPs

Stream, Riparian & Urban Forest Restoration

Water comes from the forest...

More forests >>>> clean, lower-cost water...

Managing forests is “okay”...

Comply with WQ rules, use BMPs...

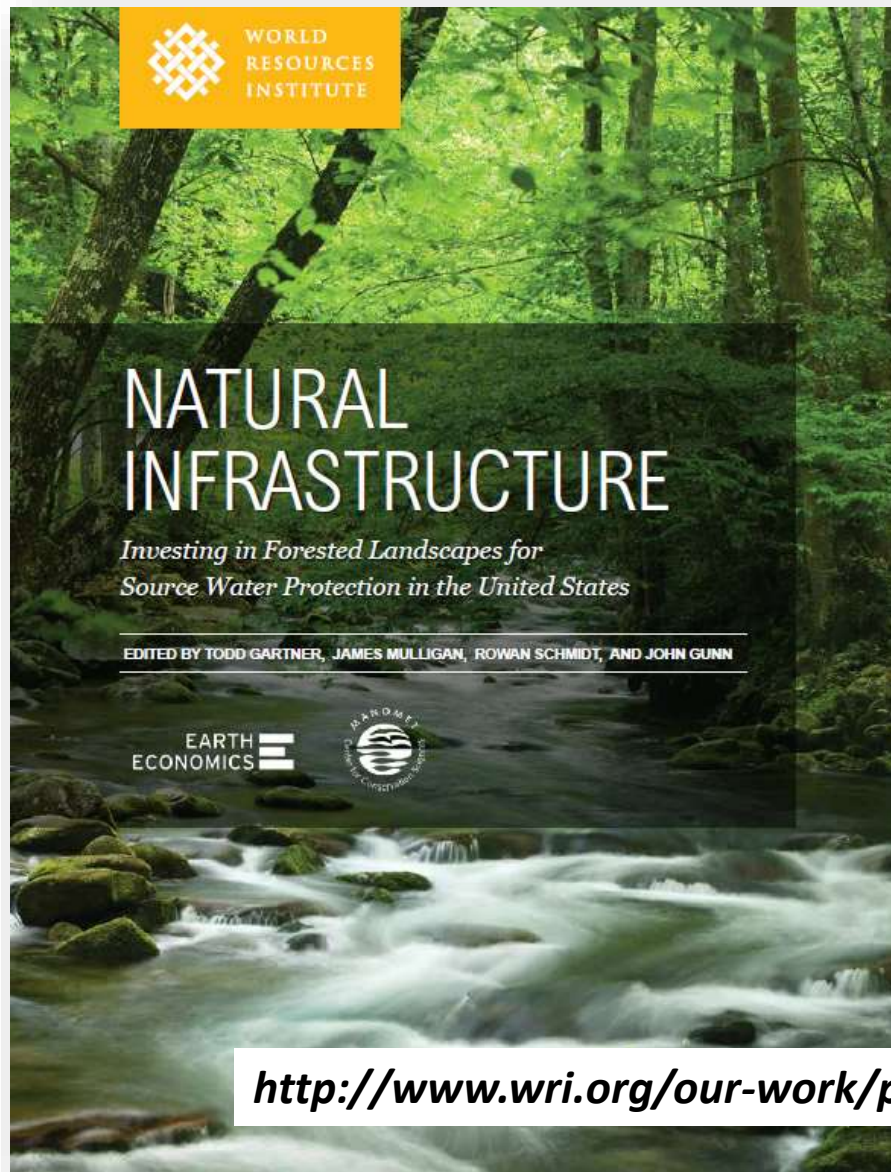
How does forestry relate to:

- **stream restoration...?**
- **stormwater management...?**
- **watershed management...?**
- **urban land use practices...?**

**Where To
Find Advice**

>>>>>

Stream, Riparian & Urban Forest Restoration



***Natural Infrastructure:
Investing in Forested
Landscapes for Source
Water Protection in the US***

<http://www.wri.org/our-work/project/natural-infrastructure-water>

Stream, Riparian & Urban Forest Restoration

www.forestsforwatersheds.org

Center for
Watershed
Protection

Urban Watershed Forestry Manual

CENTER FOR
WATERSHED
PROTECTION



NA



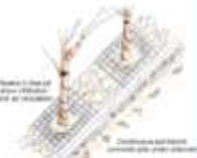
February
2005

Urban Watershed Forestry Manual

Part 2: Conserving and Planting Trees at Development Sites



 
United States Department of Agriculture
Forest Service
Northeastern Area
State and Private Forestry
NA-17-01-06
May 2006



Center for
Watershed
Protection

URBAN WATERSHED FORESTRY MANUAL Part 3: Urban Tree Planting Guide



CENTER FOR
WATERSHED
PROTECTION



NA

March 2006

Stream, Riparian & Urban Forest Restoration

Low Impact Development (LID)
www.ncsu.edu/lid



LOW IMPACT DEVELOPMENT
A GUIDEBOOK FOR NORTH CAROLINA
North Carolina State University • June 2009 • Published by North Carolina Cooperative Extension



Green Infrastructure Center
www.gicinc.org



November 2013

**EVALUATING AND CONSERVING
GREEN INFRASTRUCTURE
ACROSS THE LANDSCAPE:**
A Practitioner's Guide

By Karen Firehock

North Carolina



Stream, Riparian & Urban Forest Restoration

Self-Directed Assessments

Johnston County Natural Resource Initiative

Green Infrastructure Assessment Report



*An assessment of Johnston County's
network of natural areas, working
lands, and open spaces.*

February 2012

April 2010

Urban Ecosystem Analysis Mecklenburg County and the City of Charlotte, North Carolina

Calculating the Value of Nature

Report Contents

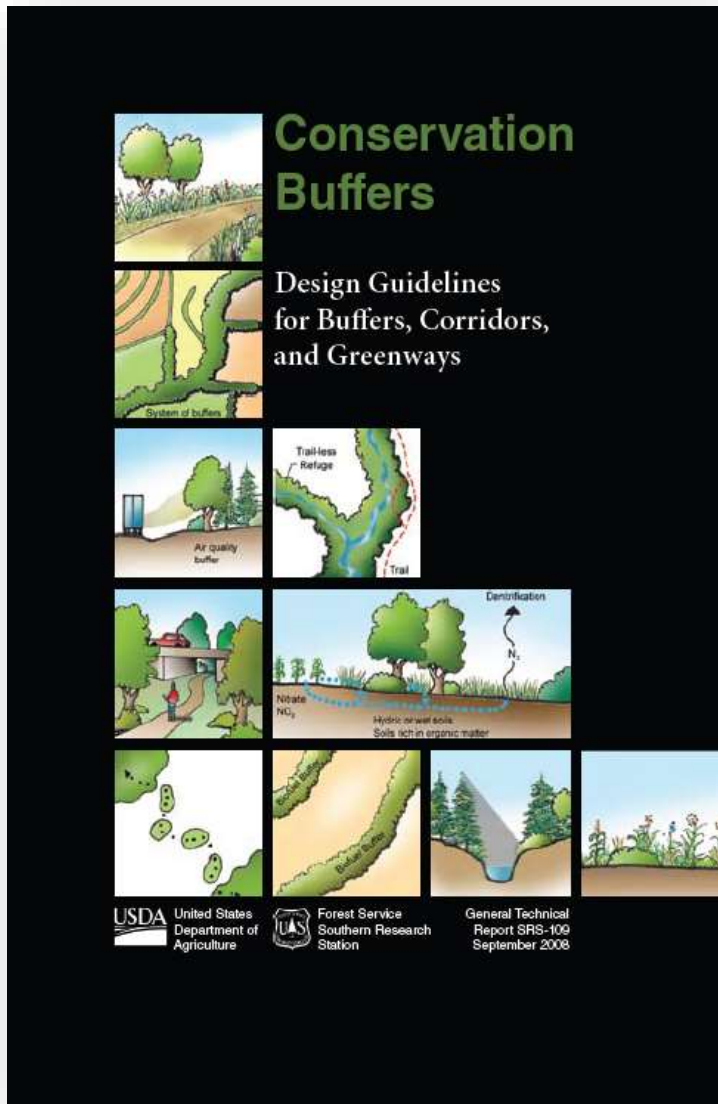
- 2** Introduction and Project Overview
- 2-3** Major Findings Summary
- 4-5** Land Cover Change Trends: Landsat 1985-2008
- 5-10** High Resolution Analysis 2008 and Ecosystem Benefits
- 10-13** Protecting Watershed Scale Tree Canopy for Water Quality
- 14** Implementation Recommendations
- 15-16** About the Urban Ecosystem Analysis



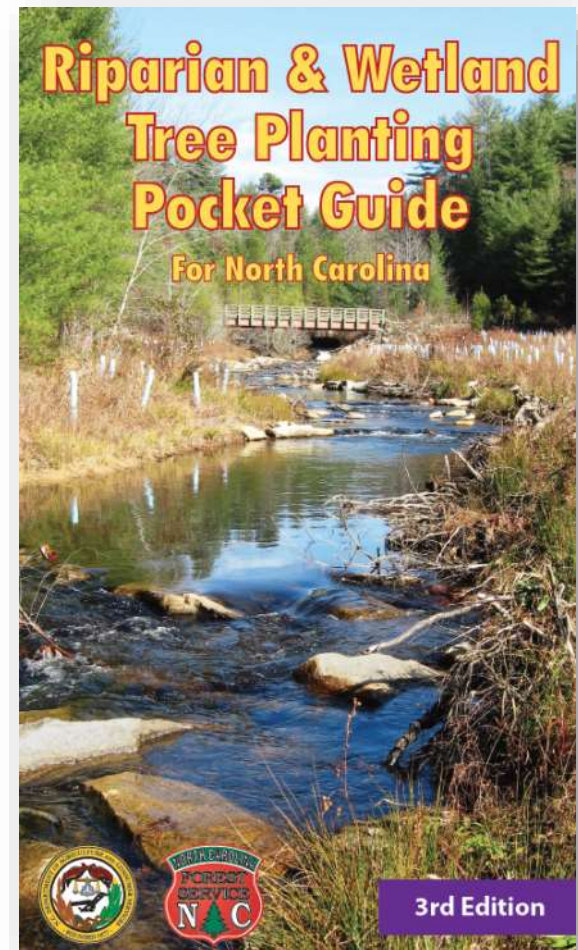
**AMERICAN
FORESTS**
americanforests.org

Stream, Riparian & Urban Forest Restoration

Stream & Conservation Buffers




U.S. Forest Service



North Carolina Forest Service

Stream, Riparian & Urban Forest Restoration



Stream Restoration
A Natural Channel Design Handbook
Prepared by the North Carolina Stream Restoration Institute
and North Carolina Sea Grant

NC STATE UNIVERSITY

A Guide for the Installation,
Establishment, and Maintenance of
Riparian Vegetation on Restoration
Projects in North Carolina



NC State University
2017 State University
**COOPERATIVE
EXTENSION**
Empowering People • Providing Solutions

NCSU Stream Restoration Program and Cooperative Extension Service

“So What” for a Community, Town, County?



That clearcut may look ugly; but is it a long term, lasting, pervasive risk to water quality?

“So What” for a Community, Town, County?

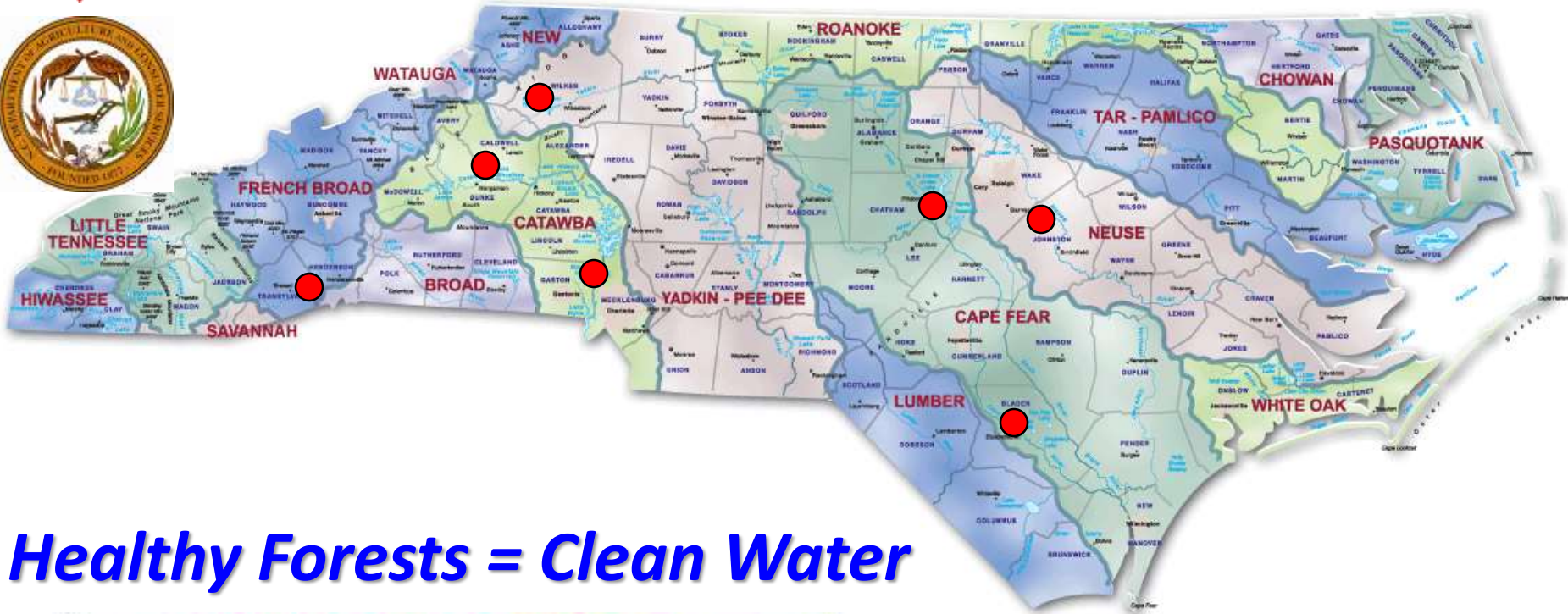
Will this forest still be a forest in 10y... 20y....50y?

And how can forests & urban tree cover help with water quality?





State Forest Locations



Healthy Forests = Clean Water



- www.ncesf.org
- www.ncforestservice.gov
- www.forestsforwatersheds.org
- www.forestationplans.org

North Carolina Forest Service Seedlings
Plant Trees for Tomorrow!
1-888-NC TREES