FOREST SERVICE SOUTHERN REGION
NATIONAL FOREST SYSTEM

ITS ALL ABOUT "GRITS"

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SOUTHERN FOREST TREE IMPROVEMENT CONF. JUNE 2017

“GRITS”

- ***Southern breakfast delicacy***
- ***Girls Raised In The South***
- ***GRIT = courage/strength/resolve to work in forest genetics***
- ***Genetic Resources In Transition***

Talking Points

National Forest System Genetic Resource Mgmt Program
Summary of program activities, updates, strategies, future plans

NFS Genetics Program Mission

Reforestation & restoration

Genetic conservation

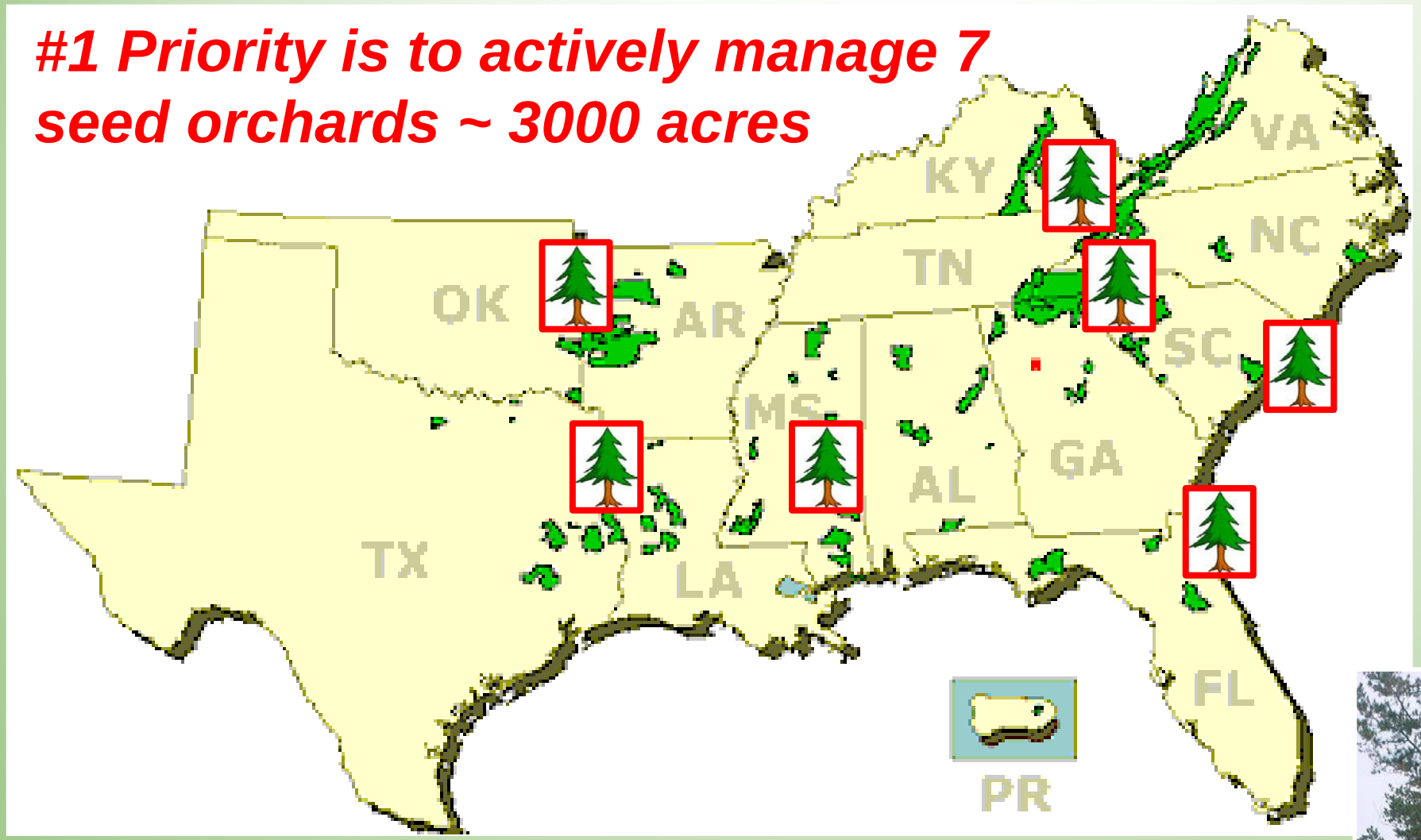
Partnerships

No tree Improvement or tree breeding in R8

National Genetics Strategic Plan *2017*

NFS plants < 5 million seedlings / year
Mostly longleaf & shortleaf pine seedlings, and oaks

#1 Priority is to actively manage 7 seed orchards ~ 3000 acres



<u>Seed orchard locations & species:</u> loblolly, longleaf (coastal & mountain), sand, slash, shortleaf, table mountain pine, Virginia, white pines, hardwood *species:* oaks, American chestnut, black cherry, butternut

•Seed bank to support reforestation/restoration:

- From the seed orchards - collect & maintain seed supply
- Seed forecasting and seed planning constantly
- Seed bank inventory 5-20 years of seed for 12 species

Ashe cone kiln, DeSoto NF, MS

Ashe seed bank, DeSoto NF, MS

Work horse species – Longleaf & Shortleaf pines

Shortleaf seed orchards

500	acres 1st Generation (FS)
27	acres 2nd Generation (FS)
0	acres 3rd Generation
?	acres Seed Production Area

Longleaf seed orchards

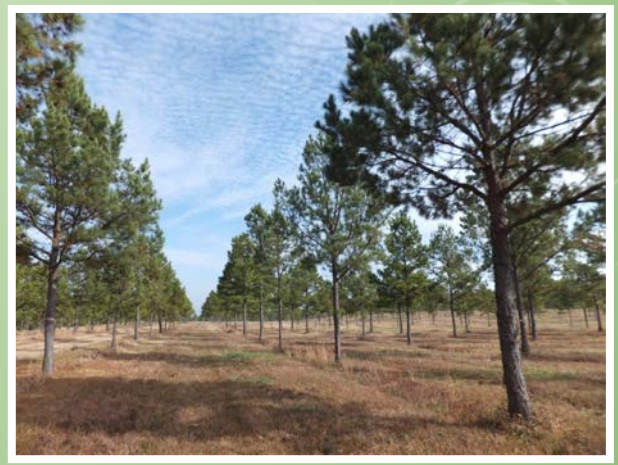
503	acres 1st Generation
37	acres 2nd Generation
2.5	acres 3rd Generation
272	acres Seed Production Area

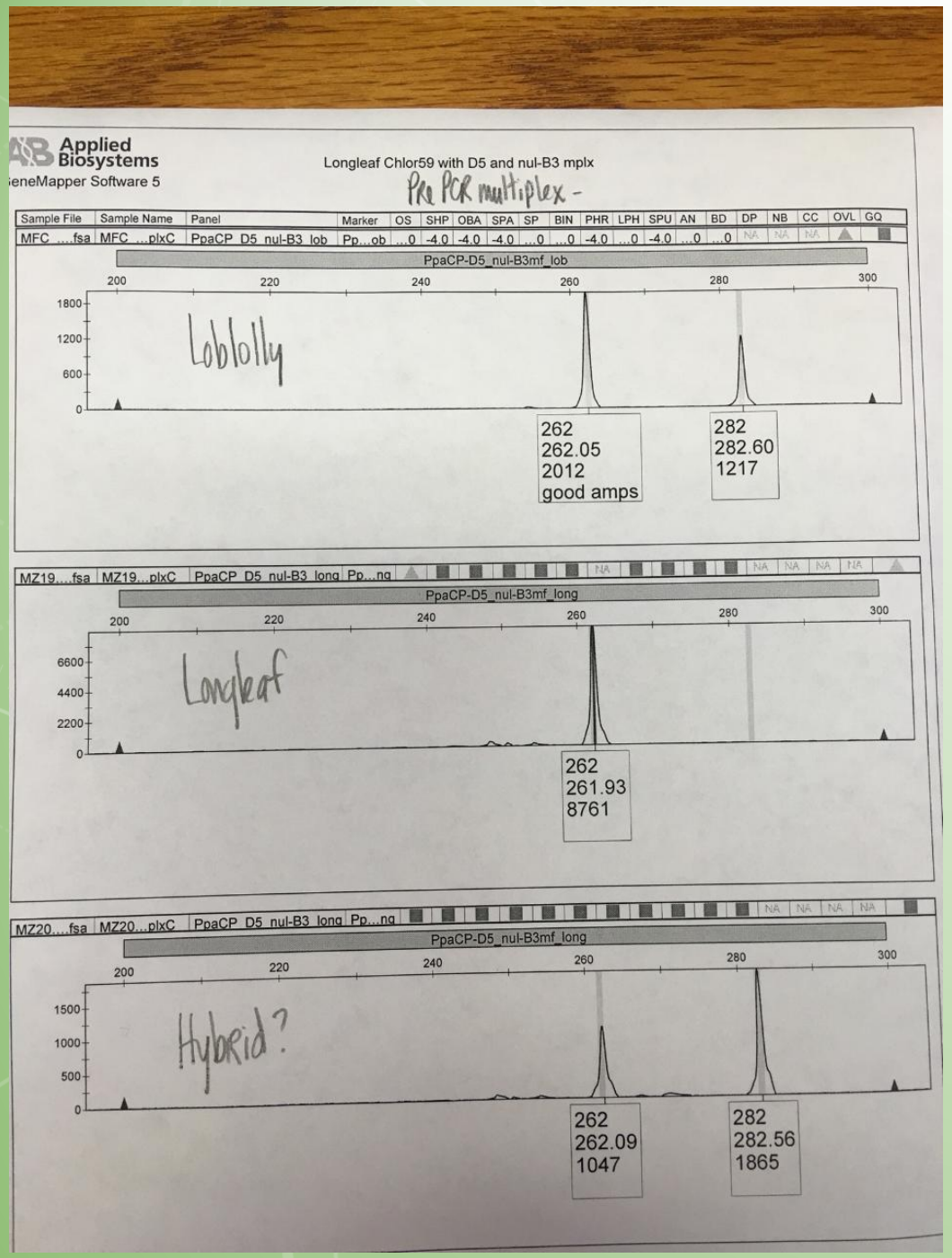
Longleaf pine

- ***97% of longleaf ecosystem has disappeared, Forest Service and 30+ partners committed to restoring this species***
- **Southwide survey of longleaf orchard resources -**
  - **Forest Service owns ~ 75% of all longleaf orchard resources across the south**
  - **JUST ABOUT THE ONLY GAME LEFT IN TOWN**
  - **Most other agencies have very few LL orchards**
  - **Looking for partners who want establish seed orchards**
- **FS NFS ~ 35 progeny tests are being maintained**
  - **Measurements completed**
  - **Progeny tests are valuable resources for seed, seed production areas, scion to establish 2nd gen. seed orchards, climate change studies**
- **Longleaf initiatives in play**

Shortleaf pine

- ***50% loss of the shortleaf ecosystem, Forest Service & 30+ partners committed to restoring this species***
- **Southwide survey of shortleaf seed orchard resources:**
  - **Forest Service owns 95 % of all shortleaf orchard resources across the south**
  - **JUST ABOUT THE ONLY GAME LEFT IN TOWN**
  - **Other agencies have very few SHL orchards**
- **NFS 155 progeny tests being maintained**
  - **prescriptions written, data not collected yet**
  - **Source of future seed, scion material**
- **Scarcity of seed for the Southern Appalachians sources**
  - **Establishing 2nd gen seed orchards, with NC Forest Service**
  - **Looking for more partners who want to establish seed orchards**
- **Shortleaf initiatives, http://www.shortleafpine.net**





Suspected increased hybridization:

- Longleaf X loblolly pines
- Shortleaf X loblolly pines

Actions taken:

- SSR markers developed (SIFG, OSU OK)
- DNA fingerprinting seed orchard trees & seed bank for species purity
- Seedling morphology studies on-going

National Forest Genetics Lab
Whitebark Pine
Linking Science to Management

Oak seed orchards:

Beech Creek, NC
Chilhowhee, TN
Sylamore, OZ

Increasing focus on OAK reforestation & restoration

- **Acorns cannot be stored long-term > therefore need living banks**
  - **establish more oak seed orchards, seed production areas**
  - **Using local source of acorns**
  - **Easily accessible & lower collection costs**

Partner assistance with oak work:

- ***Research alternative storage methods – project with Scott Merkle, UGA & R8 Forest Mgmt. Unit***

  Tissue culture techniques and cryopreservation of various species, e.g. oaks, Eastern & Carolina hemlocks, Atlantic white cedar, ash

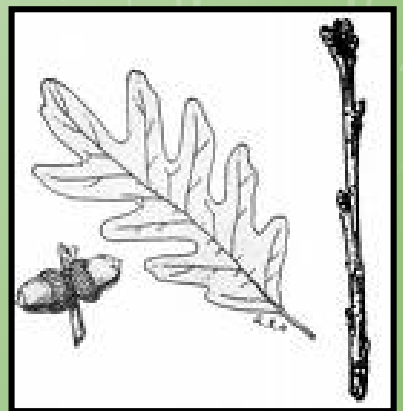
- ***Univ. TN Scott Schlarbaum & Cherokee NF***

  45-yr-old Watauga oak seed orchard management, oak seedling studies, acorn studies in cooperation with SRS Bent & Forest Health Protection

Oaks - 7 species listed as endangered:

- *Maple leaf oak (Ark)*
- *Arkansas oak (Ark, LA, MS, AL, GA, FL)*
- *Boynton oak(TX, AL)*
- *Georgia oak (AL, GA, SC)*
- *Florida oak (FL)*
- *Lacey oak (TX)*
- *Oglethorpe oak (LA, MS, GA, SC)*

- **Working with American Public Gardens Association and various Botanical Gardens (MOU) to collect & conserve**
- **SRS SIFG Dr. Craig Echt's conservation bank design (SFTIC 2011)**

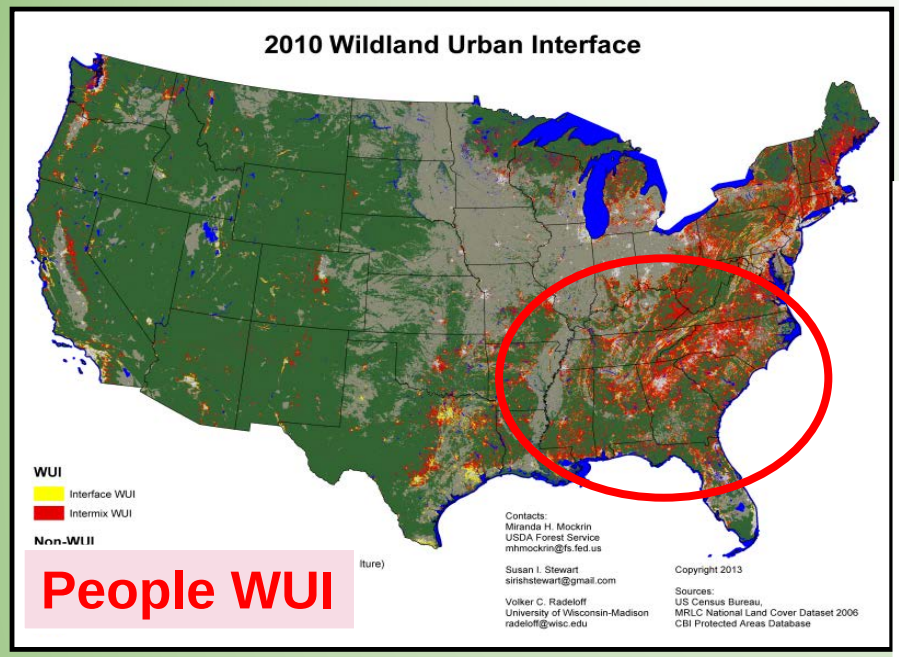


OAK field guide http://www.fs.fed.us/foresthealth/technology/pdfs/fieldguide.pdf

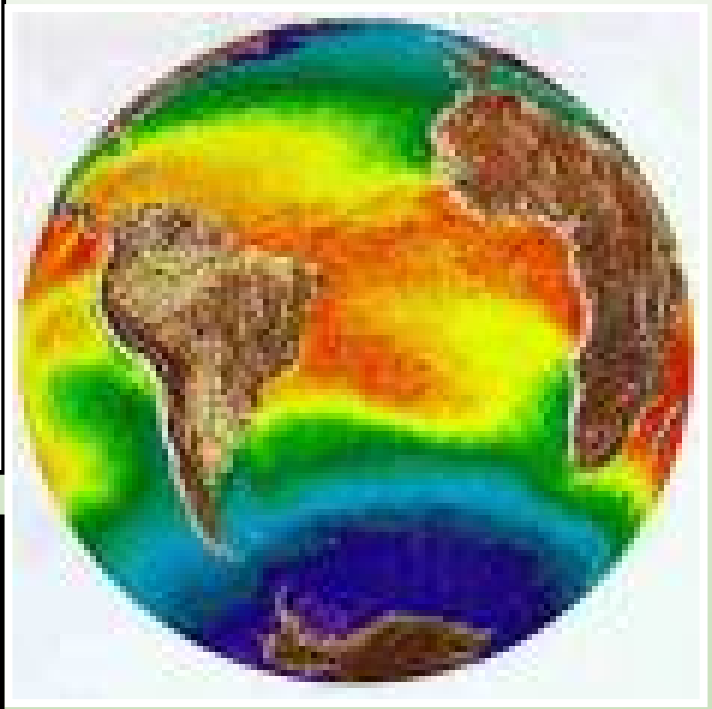
Tree species will adapt, migrate or die

Gene conservation has become increasingly more important

the WHY's

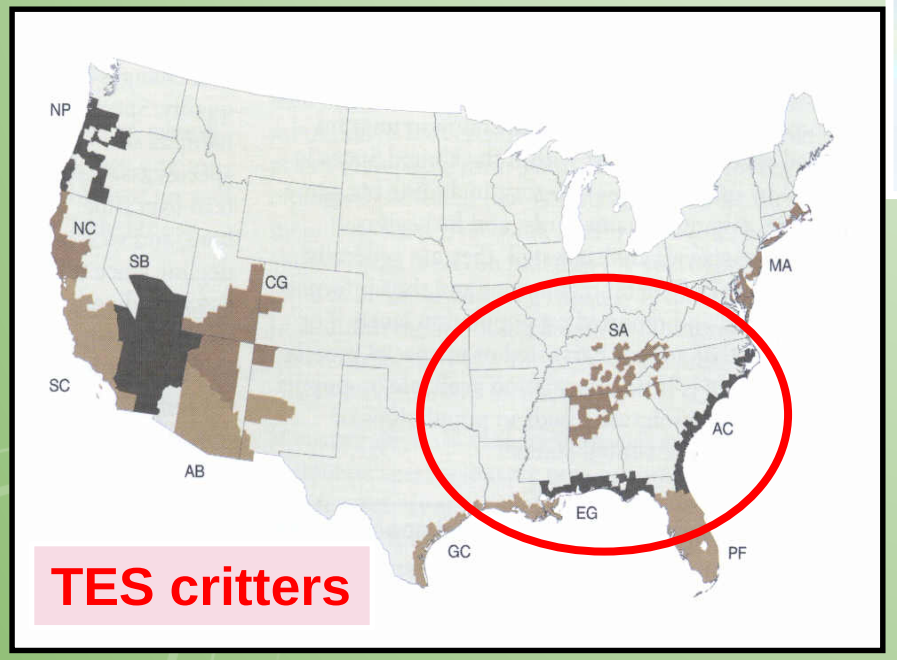


People WUI

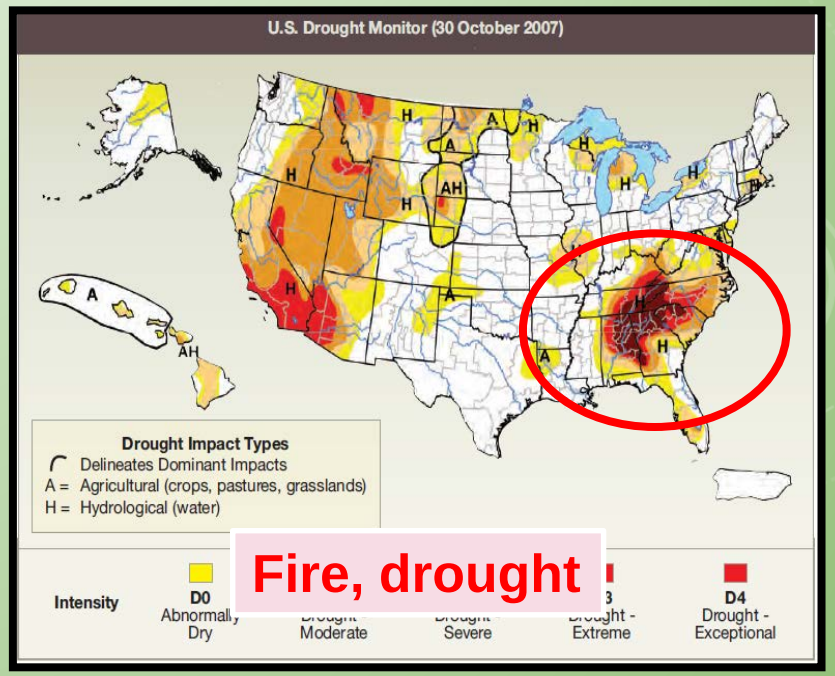


Climate change variability

Bugs & disease



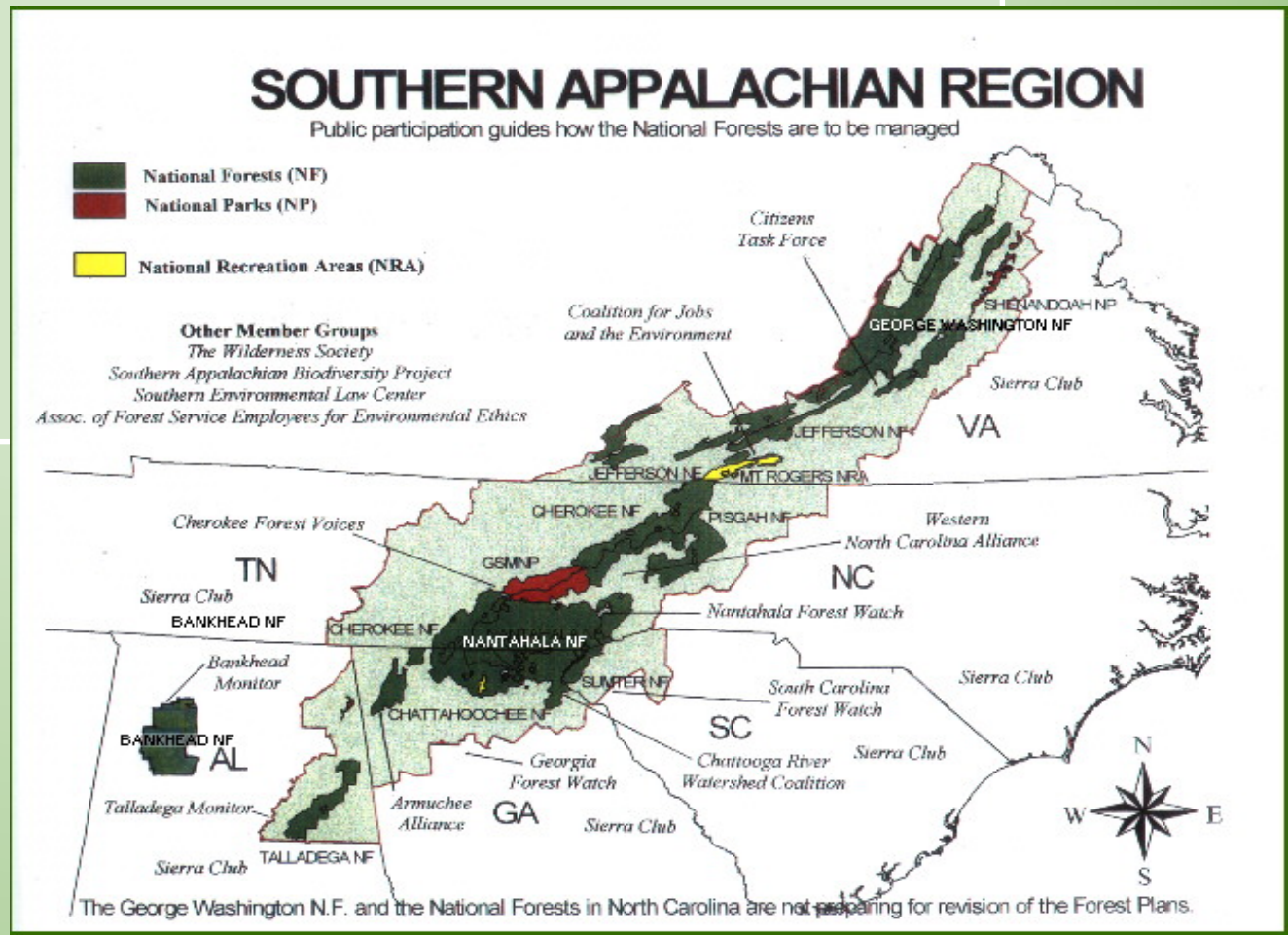
TES critters



Fire, drought

Priority focus on the Southern Appalachians first

- Most vulnerable to climate change
- Glacial refugia
- Hi genetic diversity
- Hi genetic variation
- Elevations up to 7,000 ft.
- Potter et. al.

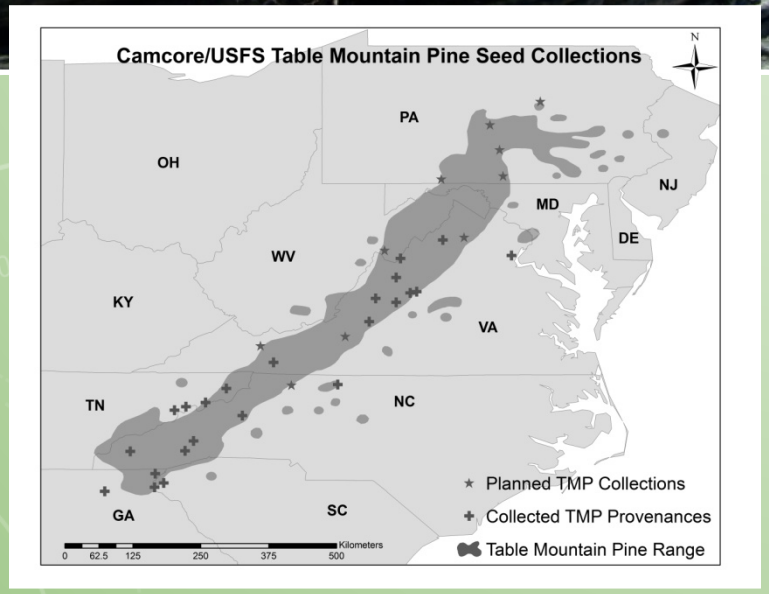


- *R8 has 140 tree species*
- *How do we know which ones are imperiled?*
- *How did we decide on which species to address first?*
- *Developed a ranking strategy in partnership with EFETAC Eastern Forest Environmental Assessment Center*

FORGRAS, R8 project, SFTIC 2011
Forest Tree Genetic Risk Assessment System
Potter & Crane, 2010, FS general technical report

CAPTURE, national project, SFTIC 2015 & 2017
Conservation & Prioritization for Trees Under Risk of Extirpation
Potter et. al, New Forests 2017 48(2)

Table Mountain Pine



- Less than 30,000 acres left
- 4 year collection project completed
- Seed in inventory – restoration work
- NFGEL genetic study underway
- Thanks to CAMCORE

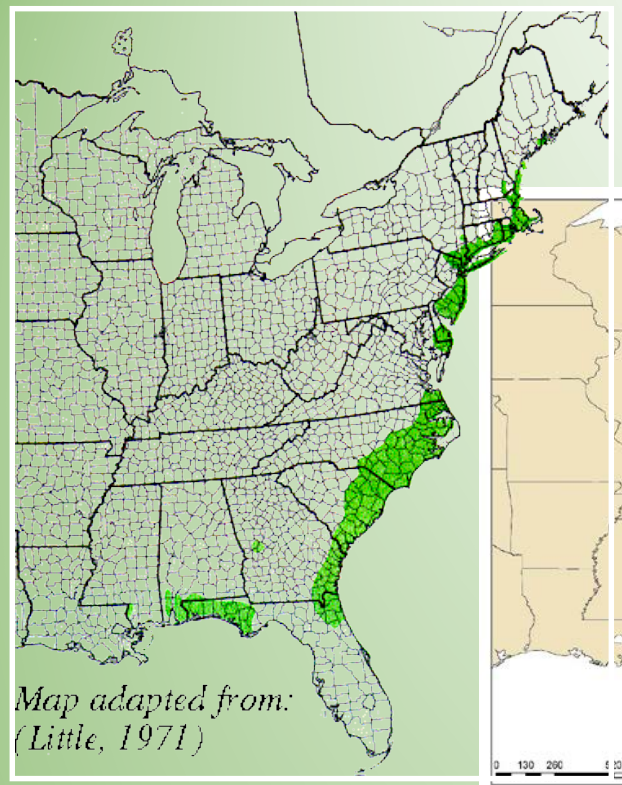
Red Spruce

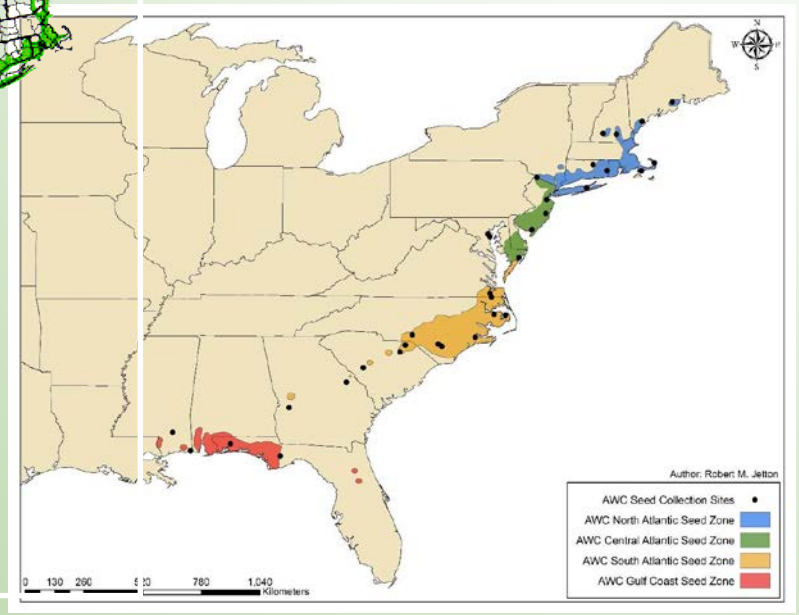
SASRI grass roots effort

Southern Appalachian Spruce Restoration Initiative

3 year collection project
SASRI consortium
Working with CAMCORE
NFGEL genetic analysis

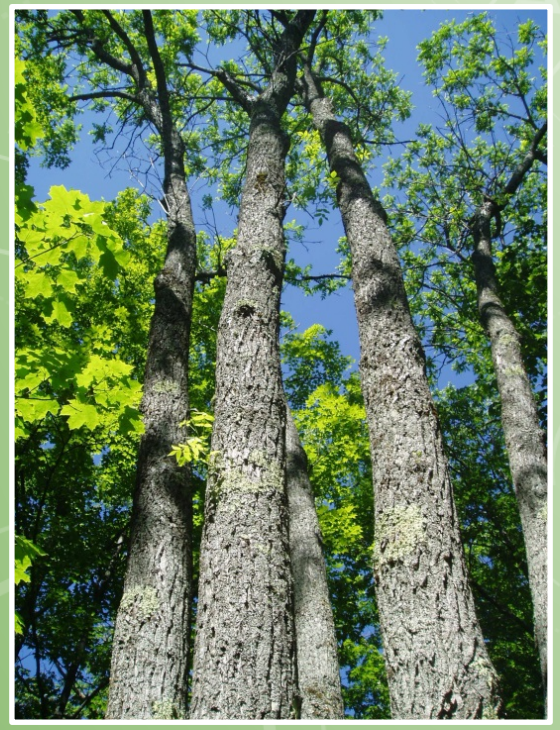
Atlantic white cedar





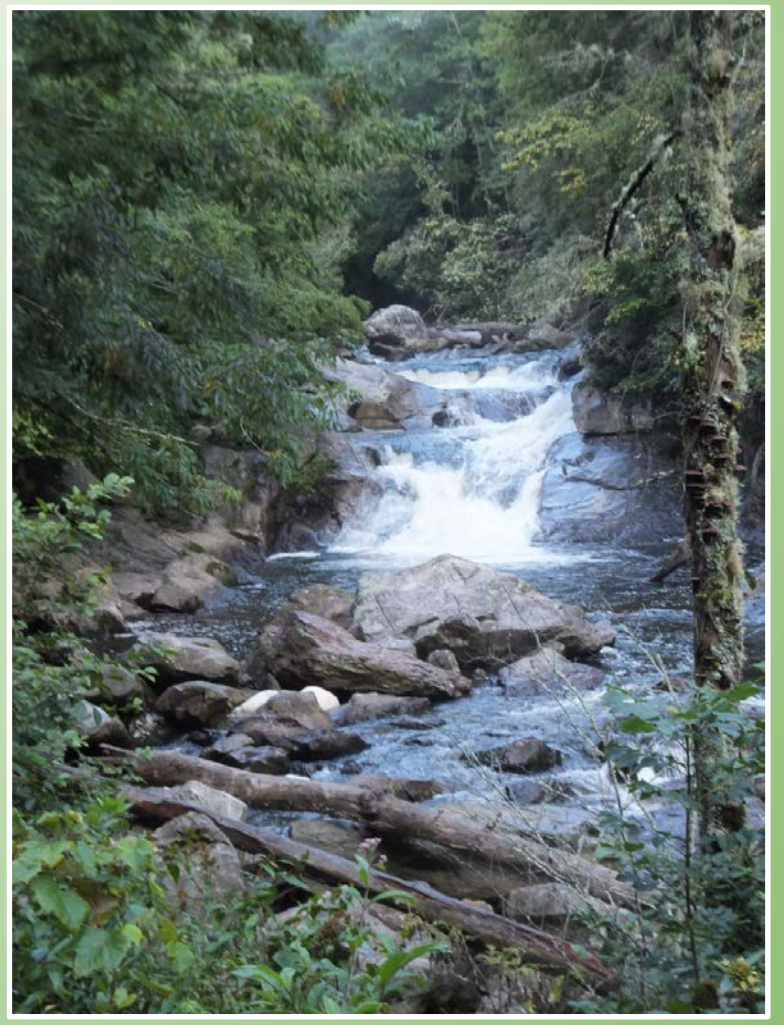
- 4 year collection project almost complete
- NFGEL genetic diversity analysis
- AWC consortium
- 95% gone due to logging, boats, fences, house shingles
- Working with Camcore
- Thanks to WO Forest Health Protection funding

National Genetic Conservation Charter 2012

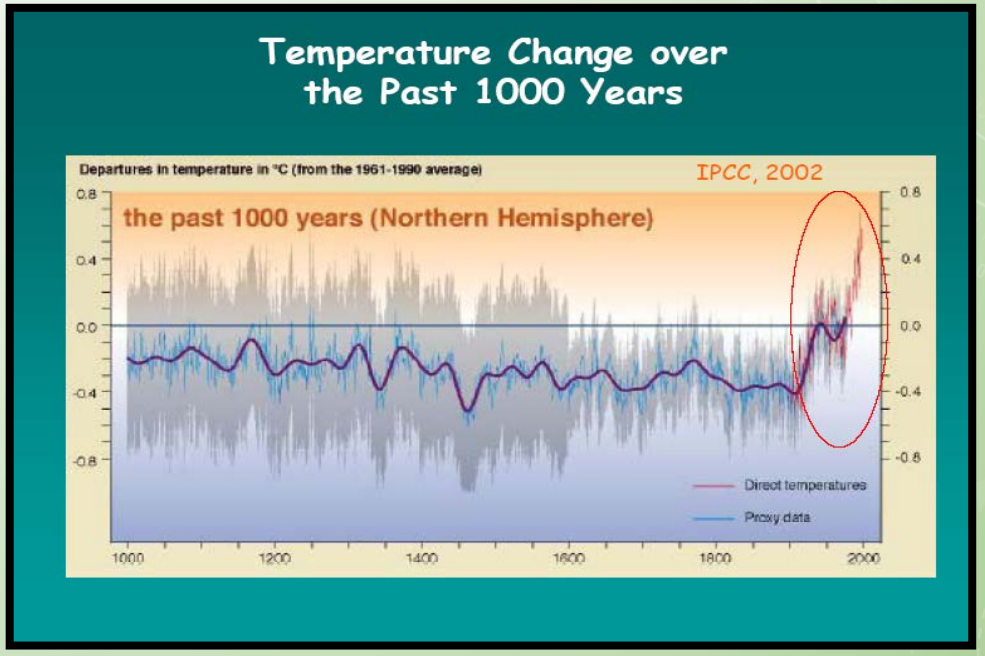


Many more species to work on:

Fraser fir
Balsam fir
Ash – TX, Carolina, Pumpkin
Pitch
Butternut
Etc.



Climate change



Increased need to keep *Genetic Resources In Transition*

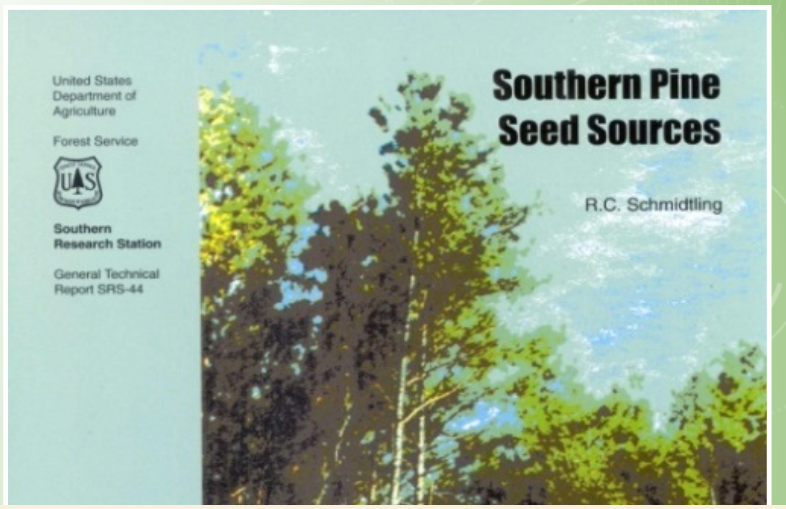
There are known knowns. These are things we know that we know. There are known unknowns. That is to say, there are things that we know we don't know. But there are also unknown unknowns. There are things we don't know we don't know.

(Donald Rumsfeld)

izquotes.com

CRITICAL QUESTION:

- ***What is the most appropriate genetic material to plant that will grow a healthy, diverse and sustainable forest?***
  - ***Into the next 100 - 200 yrs.?***



time for ver. 2 ?

Planting in the right areas – for now and for the future

- **Forest trees inherently maintain high levels of genetic diversity.**
- **This should facilitate their ability to evolve in response to changing climates, *but can tree species respond in time?***
- **The ability of forest trees to migrate and follow climate shifts is restricted by their long life span & long generation intervals.**
- **Tree populations are genetically adapted to their local climates, so some species may need assisted migration efforts to survive.**

"GENETIC OPTIONS FOR ADAPTING NATIONAL FORESTS TO CLIMATE CHANGE"

http://fsweb.wo.fs.fed.us/fm/genetics/index.shtml

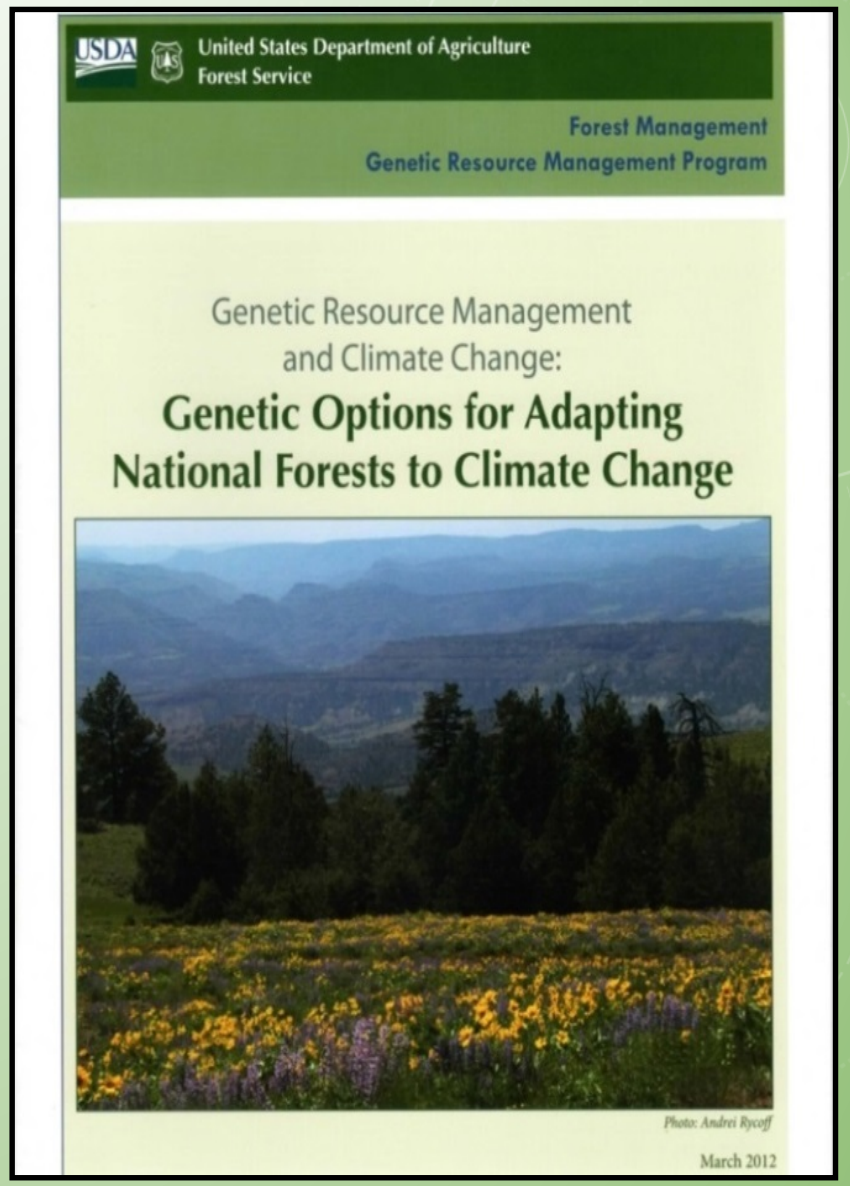
Erickson et. al. 2012

Genecology ***g*enetic & ecological factors controlling/ influencing speciation**

Assisted migration

Migration potential of tree species*:*

- **Evidence for range expansion northward and up in elevation**
- **Estimates of past migration rates vary - 300 – 1200 ft/yr (Davis & Shaw 2001, Aitken et. al. 2007)**
- **However current rates of climate change might require trees to migrate *9000 – 15,000 ft./yr.***

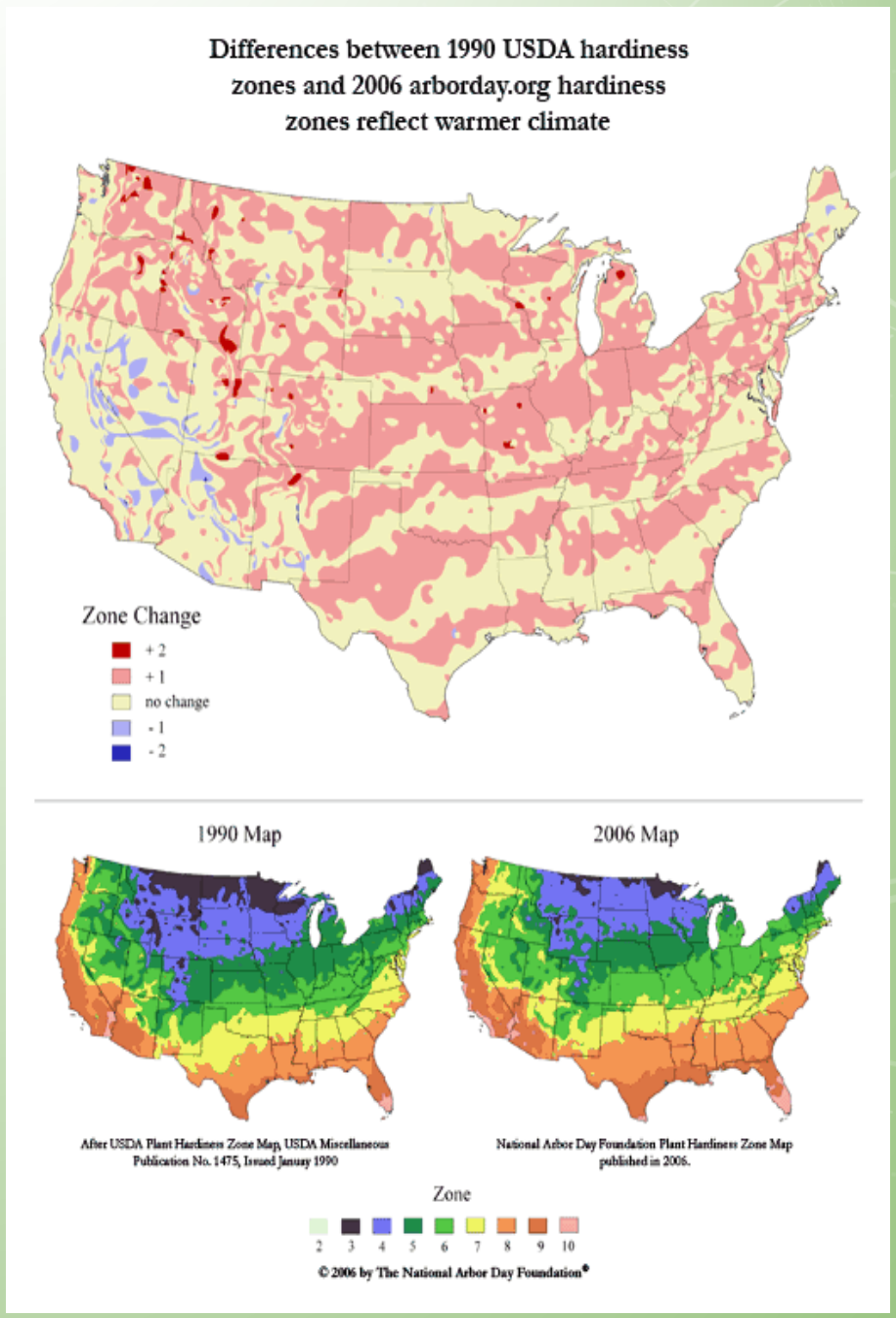


Guidance for future seed deployment

Eastern Seed Zone Project – R8 & R9

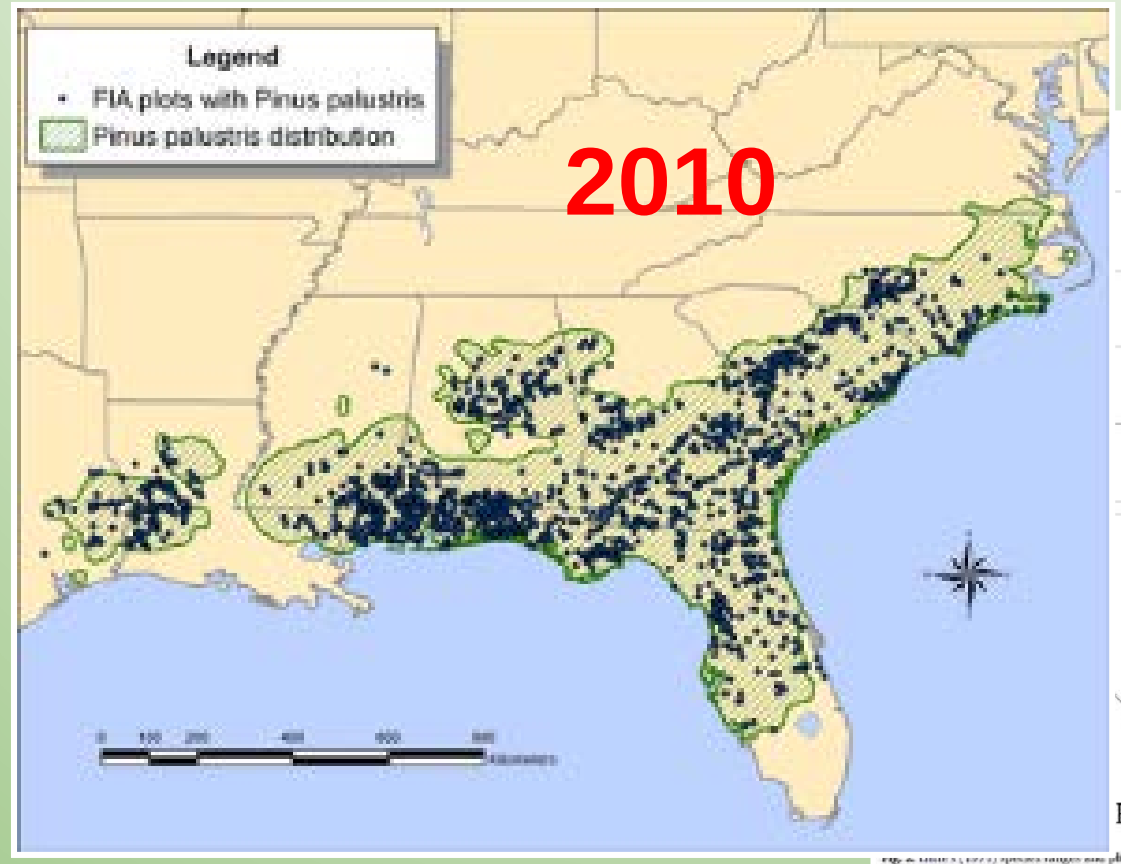
- **Developing new seed zones**
- **Updating current seed zones**
- **Mixing seed in south/north adjacent seed zones**
- **Webinars 2017 on-going**
- **May 2018 workshop**
- **Trees and small understory plants**
- **Botanical gardens & other partners**

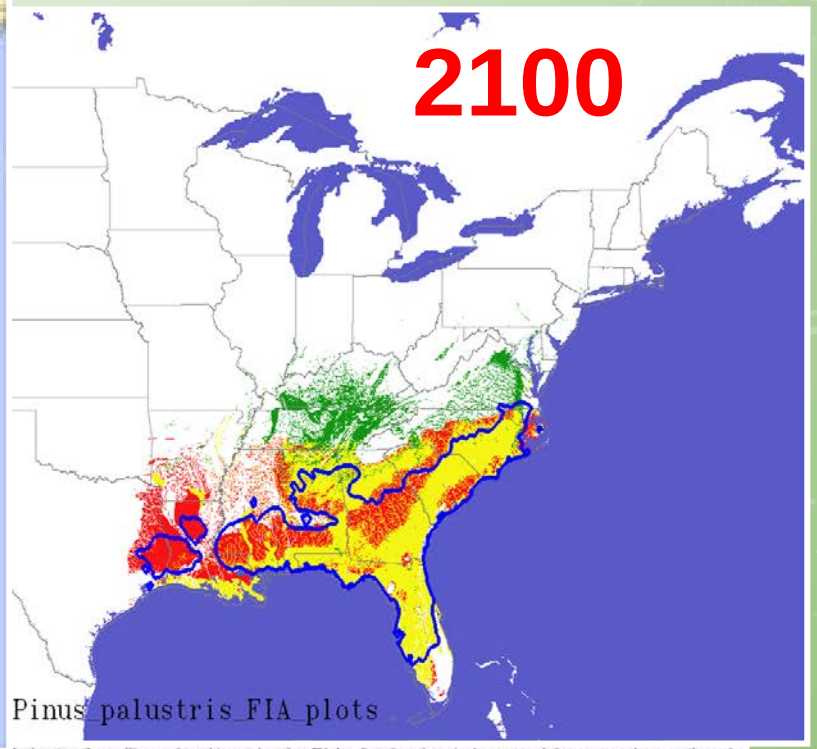
Eastern Seed Zone Forum
http://eszf.sref.info
Webinars, workshop 2018



EFETAC
Eastern Forest Environmental Threat Assessment Center

- Developing new range maps, ForeCAST, ForWARN
- R8 will use this information for updated seedling deployment
- “Determining Suitable Locations for Seed Transfer under Climate Change, Potter & Hargrove, 2014





plot locations for seedlings and tree biomass based on FIA data for selected species (a = tamarack, b = sugar maple, c = northern pin oak, d = shortleaf pine, e = southern magnolia, and f = sweetbay). Additionally, the mean latitude of tree seedlings and biomass based on FIA data are depicted.

SUMMARY

- **Maintain seed orchards for seed production to support operational reforestation & restoration**
- **Establish 2nd gen. longleaf seed orchards**
- **Increase acres of 2nd gen. shortleaf seed orchards**
- **DNA fingerprint seed orchard trees and seed bank for species purity**
- **Develop new/updated seed zones and planting zones**
- **Continue with tree conservation collections and conservation bank establishment**

Partnerships

- NFS field foresters & botanists
- SRS: SIFG, Upland Hardwood Ecology
- S/P/F: FHP
- Longleaf Alliance
- Shortleaf Initiative
- The American Chestnut Foundation
- Southern Appalachian Spruce Restoration Initiative
- Atlantic White Cedar Consortium
- National Seed Lab
- Universities
- Tree improvement co-ops
- State agencies, nurseries

camcore

Global partners for the future of our forests

National Forest Genetics Lab

Whitebark Pine

Linking Science to Management

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