Shortleaf Pine

Pinus echinata

As a Reclamation Species on Former Mine Sites

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& the Appalachian Regional Reforestation Initiative
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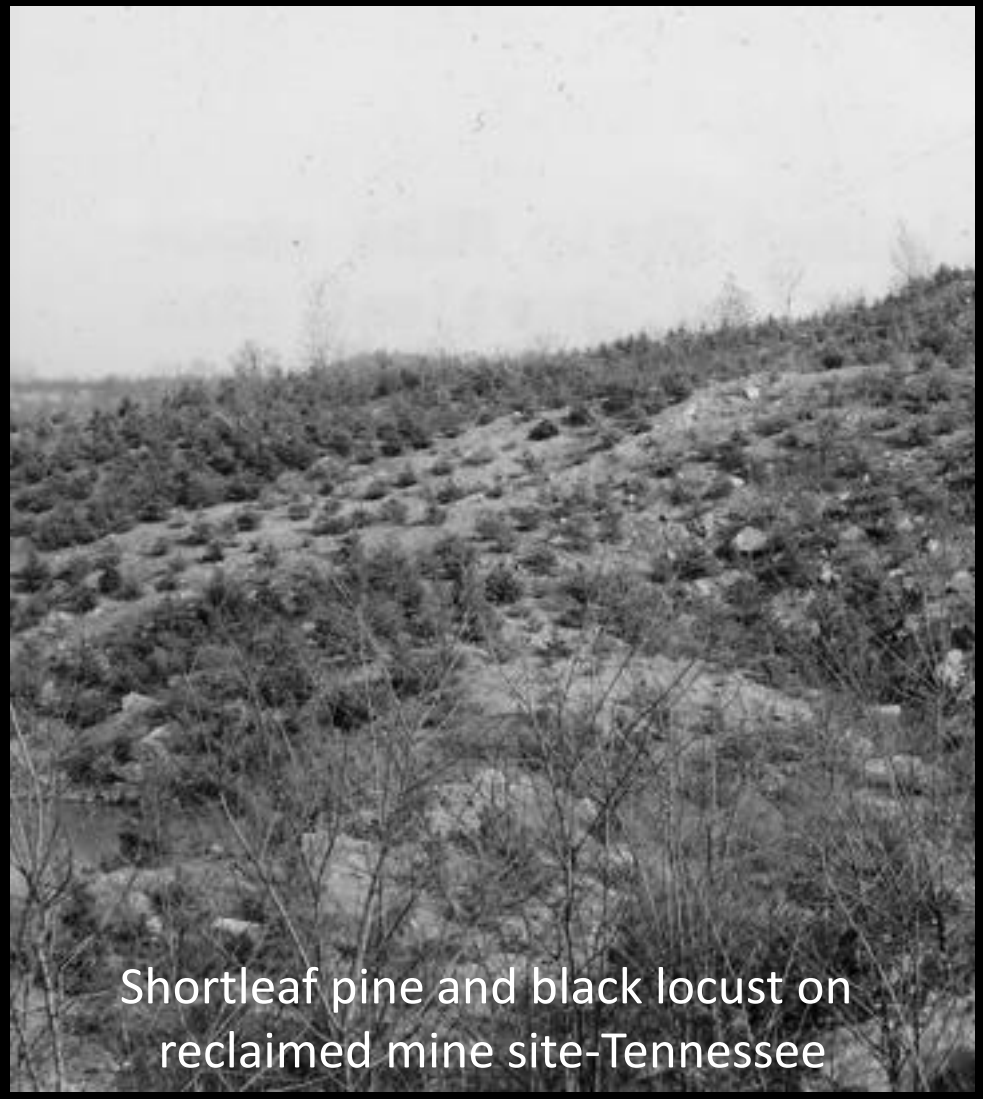
Mining in Appalachia

- 600,000 ha (1.5 million ac)
- SMCRA-1977
  - Erosion prevention
  - Wildlife habitat or grazing
- After bond release
  - Lands mostly unmanaged
  - Resulting vegetation
    - Moderate ecological value
    - Minimal/ no economic value
- ARRI created (2004)
  - Promotes Forestry Reclamation Approach (FRA)

Strip mine in West Virginia *Credit: National Geographic (2007)*

Forestry Reclamation Approach on former mining site with Dr. James Burger
Powell River Project, VA Tech

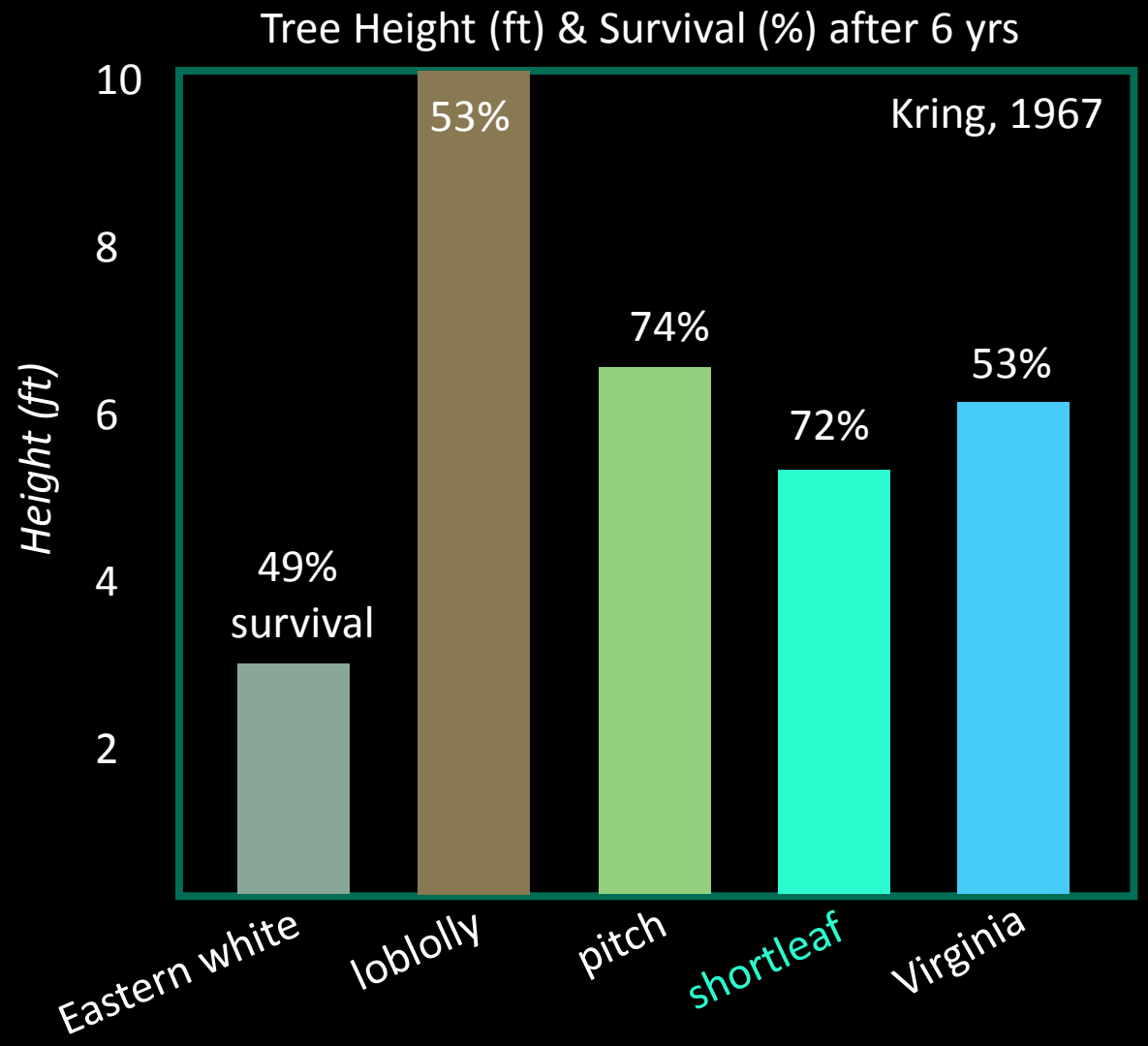
Pines & Reclaimed Mine Sites



Shortleaf pine and black locust on reclaimed mine site-Tennessee

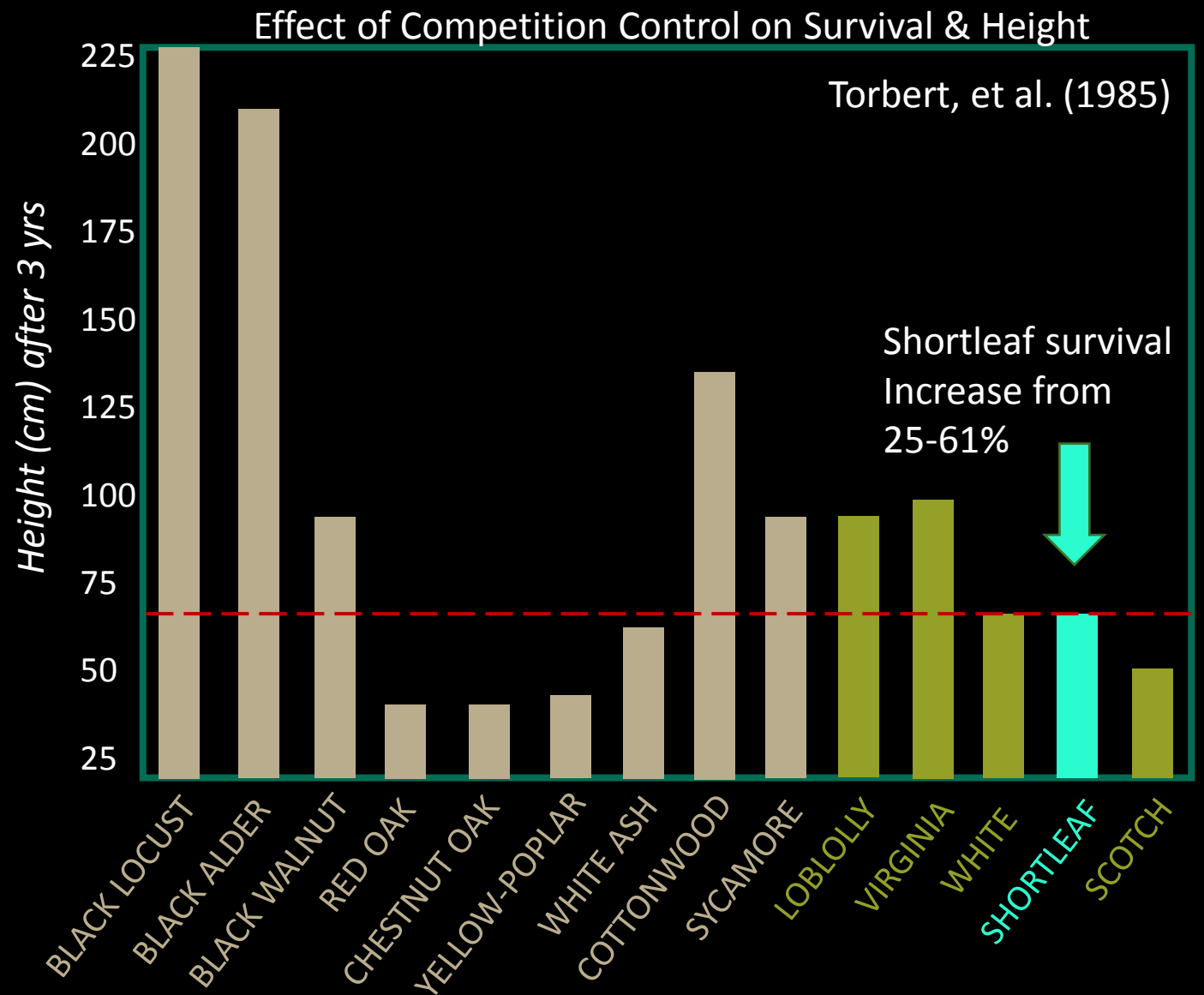
- Pine as a pioneer species-assist later successional species
  - Decrease bulk density (Asby, 1989)
  - Increase soil nutrients
    - Organic matter
    - Ectomycorrhizae (Callaway, 1995)
  - Provide shade (Bauman, et al., 2012)
- Pine as long term component of hardwood stands
  - Wildlife benefits
  - Economic benefits

Pre-SMCRA Research- *mixed results for shortleaf pine*



- Eastern Tennessee site-spoil bank (Kring, 1967)-5 pines
  - Soils: low pH (4.1-5.3), P, and K
- S. Illinois reclamation site (Ashby & Baker, 1968)
  - Soils: High pH (6.0-8.1), low N
- Wilson Mtn strip mine reclamation, TN (1975)
  - Slope influences species dominance
    - North Aspect-Yellow poplar
    - South Aspect-Shortleaf pine

Post-SMCRA Research- *shortleaf pine still struggles*



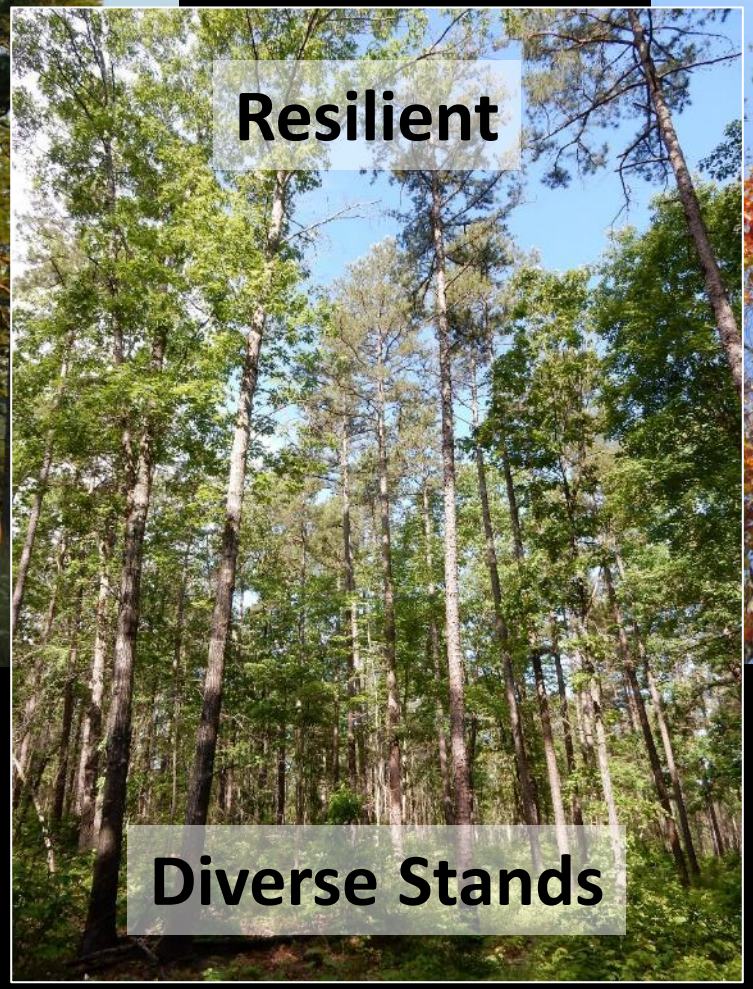
- SW Virginia reclamation site (Torbert, et al., 1985)
  - High Ca soils
- E. Tennessee reclamation site (Walker, et al., 1985)
  - *P. tinctorius* inoculation on height and survival of shortleaf, loblolly, Virginia
  - After 6 yrs, shortleaf 5 ft tall!

Shortleaf Pine's Tolerance is Tested

- Conditions not suitable for shortleaf pine:
  - Compacted & poorly drained soils
  - High Ca/ pH soils
  - *Very* low soil nutrients
  - Excessively well-drained
  - Heavy Competition/ shade in early stages of growth

Shortleaf pine competition-*Andy Scott*

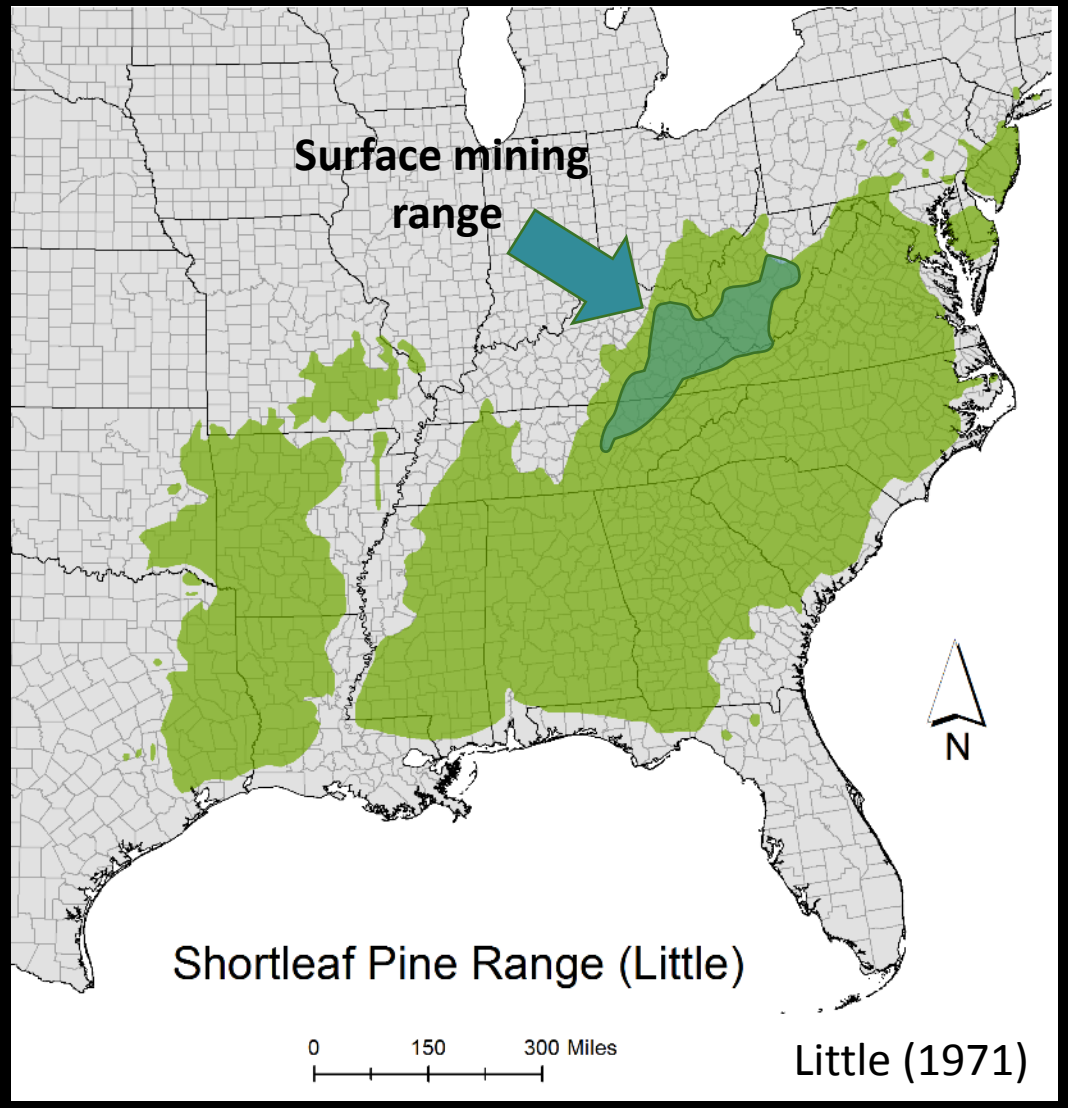
Why Shortleaf Pine?



Shortleaf Pine-*Wide Range* (Lawson, 1990)

- 1 of 4 major commercial species in SE
- 22+ state range (440,000 square miles)
- Wide precipitation range (40-60 in/yr)*
- Wide temperature range (48-70° F)*
- Wide elevation range (10-3,000 ft)

*average annual



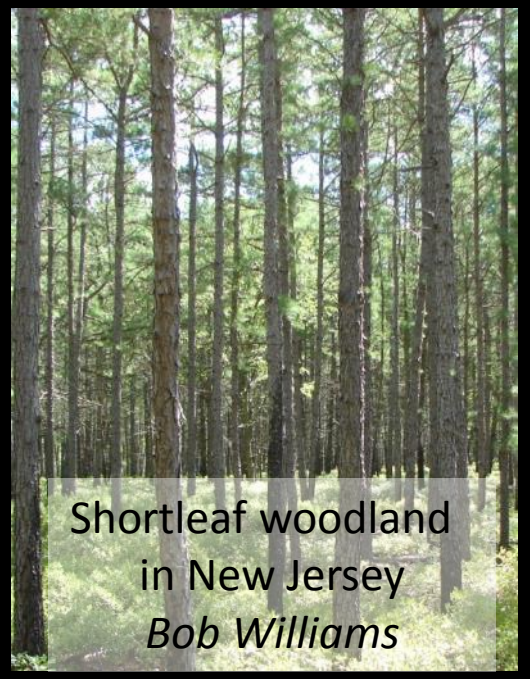
Shortleaf Pine-*Suited to Diverse Sites*

(Lawson, 1990)

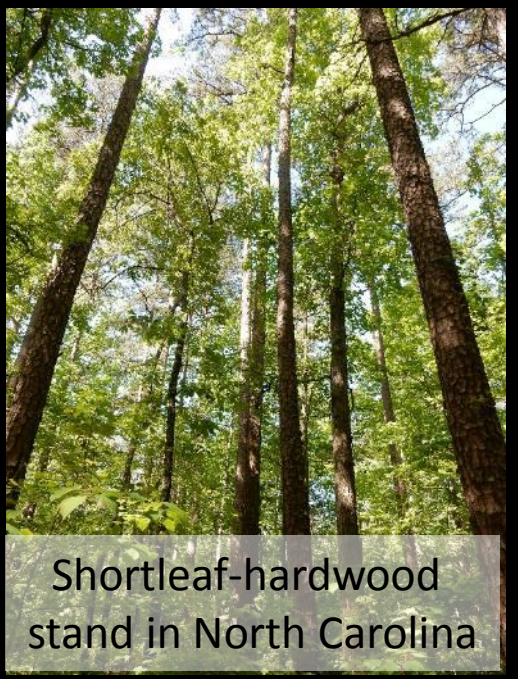
- Adapted to variety of soils
  - Shallow to deep, well-drained
  - Sandy & gravelly clay-best
  - Tolerates dry and low-nutrient soils
  - Lower pH preferred
- Adapted to a variety of sites
  - S and W aspects
  - 600-2,500 ft elevation
- Occurs in 18 SAF forest cover types
- Growth Rate

Savanna in Oklahoma
Clarence Coffey

Shortleaf-hardwood stand in North Carolina



Shortleaf woodland in New Jersey
Bob Williams

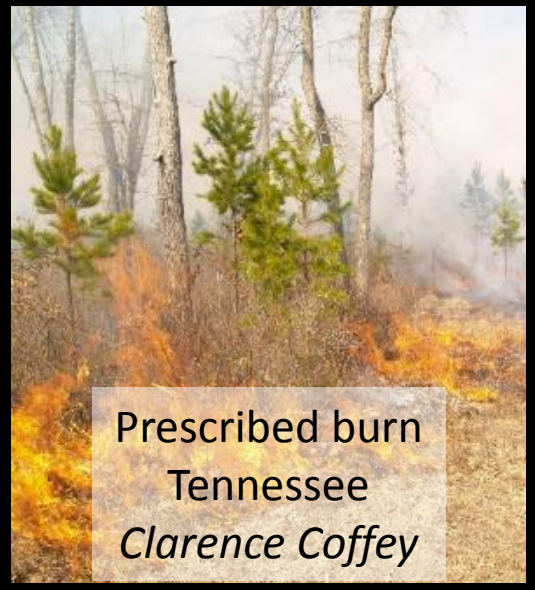


Shortleaf-hardwood stand in North Carolina

Shortleaf Pine-*Resilient* (Lawson, 1990)

Forest Health

- Fire, drought, wind-throw, and ice tolerant
- Fusiform rust resistance
- Fire scar resistance
- Susceptible to Nantucket pine tip moth, annosum root rot (low/ no SPB susceptibility in mine range)



Prescribed burn
Tennessee
Clarence Coffey

Shortleaf sprouts after top-kill

Ice damage on shortleaf
North Carolina
Rob Evans

Shortleaf Pine-*High Wood Quality*

- 80-100 ft tall, 2-3 ft. diameter
- 4-7 growth rings/ inch
- Straight and low taper
- Small & confined knots
- Thin bark/ higher volume
- Sawtimber (lumber, plywood, pulpwood) & poles

175 year old shortleaf core-*B. Pickens, NCFS*

Less taper
B. Pickens, NCFS

Shortleaf Pine-*Wildlife* (Masters, 2007)

- Seeds- food source for birds and squirrels
  - Preferred by Bobwhite quail
- Heartrot trees utilized by RCW
- Canopy provides habitat
  - Important winter protection in deciduous forests
- Savannah and Woodland management
  - Improve wildlife food and shelter
  - Habitat attracts: deer, turkey, quail, songbirds, and more

Shawn Nystrand

Bobwhite Quail- *Ted Borg*

Shortleaf Pine on Reclaimed Mining Sites:
Management Recommendations

- Site and soil selection
- Site Preparation
- Quality seedling selection
  - Containerized seedlings
  - Nursery list (website)
- Competition control
  - Low height herbaceous ground cover
  - Prescribed fire (generally used)
    - Every 3 years (regular disturbance)
    - 8-15 years (survival & recruitment in overstory)

Shortleaf Pine on Reclaimed Mining Sites:
Management Recommendations


McRee Anderson-TNC


Shortleaf-bluestem grass Ecosystem-*USFS*


Silvopasture with pines-*NRCS*

- Planting density
  - Generally, 681 trees/ ac (even age stand)
  - Increased wildlife & vegetation diversity
    - Savanna (30-45 sq. ft./ ac)
    - Woodland (45-70 sq. ft./ ac)
  - Pasture & timber (silvopasture)
    - 100-400 trees/ ac
- Mixed stands (shortleaf-oak)
  - Fire management (compatible species)
    - Chestnut, white, black, post, chinkapin, bur, and white oak
    - Locust and hickory

Shortleaf Pine-*Financial Assistance*

Cost share and grant

- NRCS-EQIP
- State programs
- International Paper & National Fish and Wildlife Foundation ($743,000)
  - Grant to restore Cumberland plateau forests (TN, KY)
  - Shortleaf forest

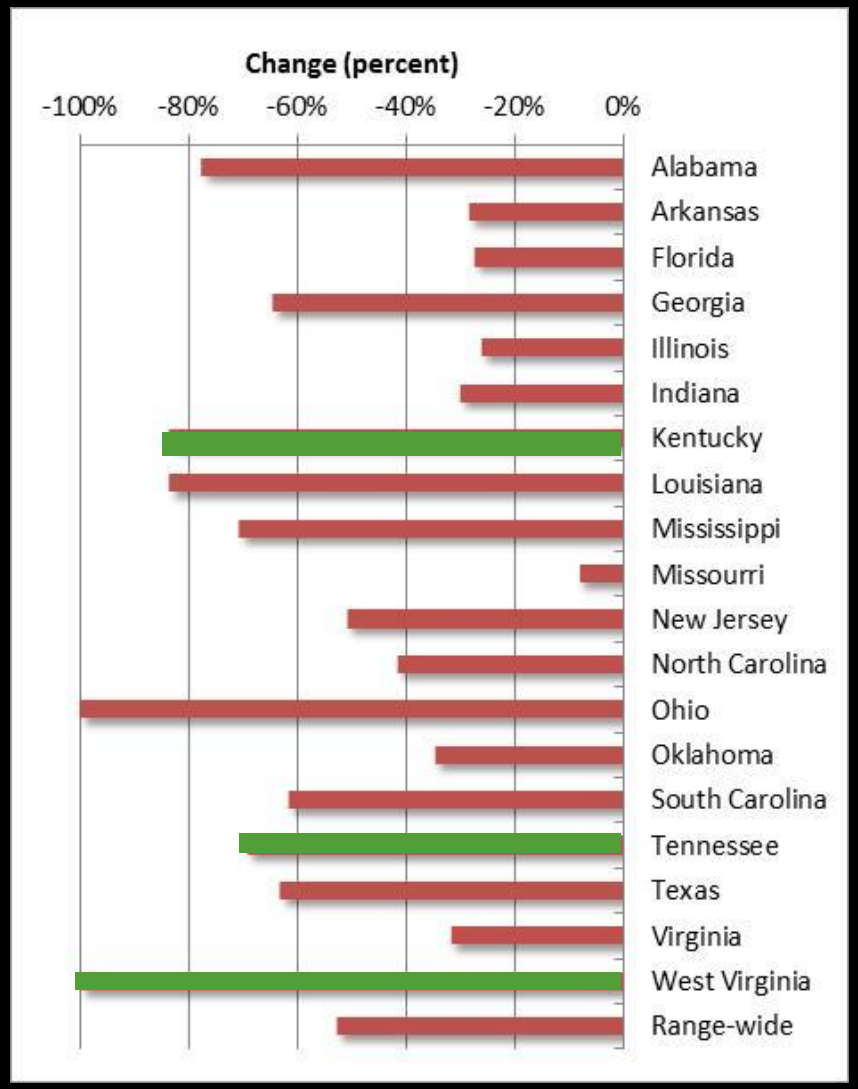
NRCS Natural Resources Conservation Service

National Fish and Wildlife Foundation

Addressing Shortleaf Decline

Forest History Society Images

Addressing Shortleaf Decline



- 53% reduction since 1980
- Greatest reduction east of the Mississippi river
- Why?
  - Land use change, species preference, forest health, fire suppression

Percent change of shortleaf (> 1” diameter) on FIA plots from 1980 to 2013. *FIA data-USFS*

Addressing Shortleaf Decline

2007-2015: Partnerships, research, workshops & symposia supporting shortleaf restoration

2013: Shortleaf Pine Initiative, Director Mike Black

2015: Shortleaf Restoration Plan & website

Future:

- Research
- Tree Improvement
- Diverse management demonstration sites
- Financial assistance

Shortleaf Pine -Conclusion

- Shortleaf not right for all sites
- Will need improved soil/ site conditions
- Can be planted with other desired timber species
- Resilient tree, but needs some management (competition control)
- Great timber quality and wildlife benefits
- Financial assistance to support its restoration

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Thank you. Questions?

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Shortleaf Pine Initiative

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Feedback is welcome!