Woodland Management:

What is Right for You and Your Woodland

WOODLAND STEWARDS
A Regional Extension Program for Landowners

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Questions and Statements to Consider

- I plan to plant a particular high-value hardwood species on my property because I saw where my property is within its native range.
- Neighbors and acquaintances told me that I could plant pine over my entire property.
- What situations can lead to unsustainable hardwood management?

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Speakers

E. David Dickens, Ph.D.
Forest Productivity Professor
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Warnell School of Forestry & Natural Resources

David Dickens is a forest productivity professor with UGA Warnell School. He worked as a faculty member with UGA since 1999 and at Clemson University since 1988. He received a BA @ Furman Univ., a Forestry BS @ UGA, and a MS and PhD in Forestry @ Clemson Univ. His areas of expertise are soils/site & pine species selection, fertilization (inorganic and organic), herbicides, economics, and water quality. He has written over 200 forest productivity articles and currently has 35 applied research & demonstration study areas in Florida, Georgia, and South Carolina.

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Speakers

Dr. David Clabo, Ph.D.
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David Clabo is originally from Gatlinburg, Tennessee. He studied forestry at the University of Tennessee for his undergraduate and graduate degrees. He has been an assistant professor of silviculture outreach with the Warnell School of Forestry & Natural Resources since December 2018. Day to day activities include assisting county extension agents, private landowners, NGOs, and government agencies with forestry related questions and issues they have. David's outreach program includes delivery of continuing education programs for professionals and landowners, working with county extension agents to develop programming for forestry meetings, applied field research and demonstrations that address specific needs of clients, as well as publication of extension articles that provide forestry-related information for landowners and natural resource professionals. His research interests include forestry herbicide evaluations, prescribed fire application, forest regeneration methods, and mixed pine-hardwood management.

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Why is this Important?

- "Site"-Environmental factors that directly or indirectly influence tree survival and growth
- Correctly matching species to site will result in healthier trees that grow more vigorously over the long run
  - Environmental conditions for trees and trees themselves are not as easily manipulated as they can be for many row crops
  - Some factors on the site can be manipulated if objectives and economics allow e.g. vegetation, fertility, drainage/aeration
- Trees tend to grow best where they compete most effectively

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Why is this Important?

- Fewer insect and health issues
  - Less stressed trees
- Respond better to active management
  - Example-yellow-poplar will respond with better growth after crop tree release on more mesic sites with deep soils compared to thin, droughty soils (xeric sites)
- Regeneration failures less likely

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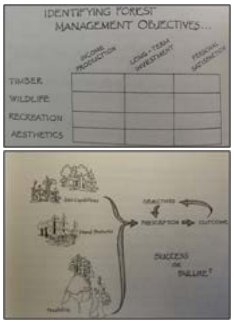

Define Objectives

- **Defining objectives for your land can help you know what types or species of tree(s) you need**

1. Timber-biomass, fiber, etc.
2. Wildlife habitat/forage opportunities
3. Agricultural commodities
4. Aesthetics-species may be less important
5. Conservation-same as above

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Climate Considerations

- Solar radiation, precipitation, and landform contribute to climate in a region
  - Solar radiation is dependent on latitude and landform
- Temperature regimes and extremes
  - Growing season length
  - Average monthly temps limit the northern range of many species-diversity decreases
  - Extreme cold or heat in the spring often has a major impact on young trees

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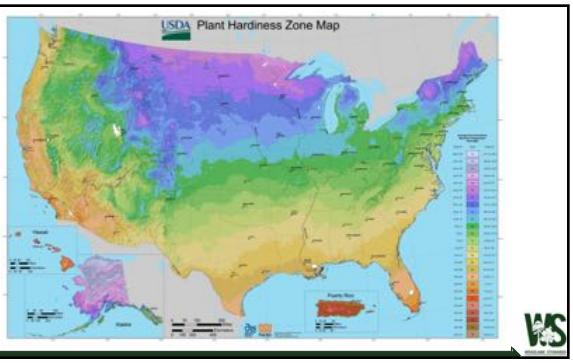

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Climate Considerations

- Annual amount and distribution of precipitation
  - Varies with latitude and altitude
  - Soil particle characteristics largely influence water availability to trees
  - Water often the most limiting requirement for tree growth-species have different requirements
- Amount of water available to plants at a given location is not always well represented by annual or even seasonal precipitation
  - Evaporation rates
  - Temperature/humidity

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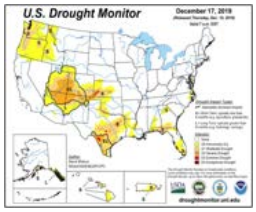
Climate Considerations

- Drought frequency and duration
  - Regeneration effects
  - Water stress makes secondary stressors more likely—e.g. insects and disease
  - Spring and early summer droughts most detrimental
- Precipitation variability has increased in the Southeast in recent decades
  - Increased importance of matching species to site
- Climate most important at a regional scale



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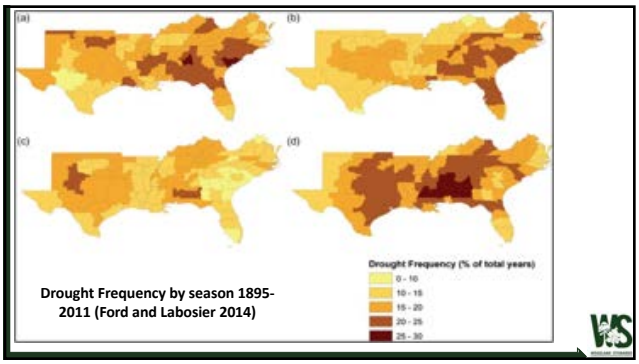

Drought Frequency by season 1895-2011 (Ford and Labosier 2014)

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Site Characteristics

- Physiographic province or region
  - Parent material, climate, organisms, topography and geologic history are similar to a degree—affect soil conditions
- Eleven physiographic regions in the Southeast
  - These regions can be broken down into more detailed sub-regions
  - Example: Interior Low Plateau-Eastern Highland Rim and Pennyroyal
  - Example: Middle Coastal Plain-Tifton Upland, Dougherty Plain, Southern Pine Hills, etc.
- Forest classification guides have been produced for some regions

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Site Characteristics

Eleven main physiographic provinces (L map), and individual provinces can be broken down to more detailed provinces (R map)

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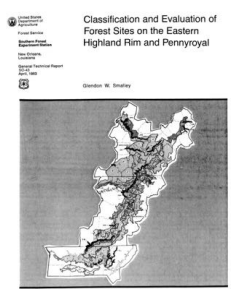
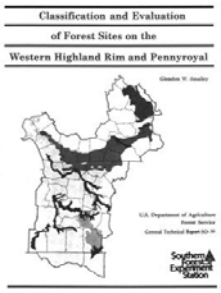


KY, AL, and TN (Smalley 1983)



KY, AL, and TN (Smalley 1980)

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Site Characteristics

- Landform and topography
  - Slope inclination—erosion potential, more open canopy on steeper slopes
  - Landscape position-ridge, valley, lower slope, etc.
  - Aspect-direction a landform faces
  - Mountain ranges often have different weather patterns associated with different elevations
- Microtopography
  - Tree uprooting-pits and mounds
  - Bottomland hardwoods-floodplains along rivers or wetlands-elevation changes as small as 3 ft have major impacts on tree species composition

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Site Characteristics

Landscape Position

Pit and Mound Topography

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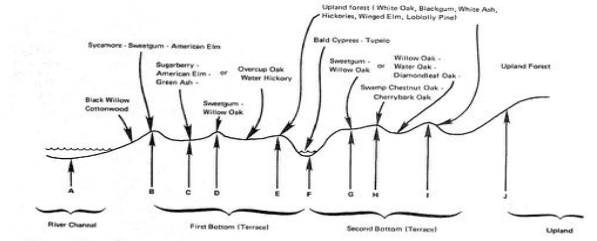

Figure 21. The correspondence between alluvial floodplain microtopography and forest cover types. (A) = river channel; (B) = natural levee (front); (C) = backswamp or first terrace flat; (D) = low first terrace ridge; (E) = high first terrace ridge; (F) = oxbow; (G) = second terrace flats; (H) = low second terrace ridge; (I) = high second terrace ridge; (J) = upland. The vertical scale is exaggerated.

Note: species composition changes associated with small differences in microtopography related to soil texture, microtopography position, and soil moisture

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Site Characteristics

Soils

- Soils supply trees with water and 13 essential nutrients as well as physical anchorage
- Eight soil orders in the South-all have shared characteristics that are important for tree growth and health
  - Depth of surface horizons with good rooting conditions
    - Availability of soil water is affected by depth to a restricting feature
  - Soil texture—proportion of sand, silt, and clay
    - Relationship among winter water table, rooting depth, and productivity as related to soil water storage and movement
    - Gas exchange with atmosphere

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Site Characteristics

Soils

- Organic matter content-Impacts water and nutrient supply
  - Important on coarse textured (sandy) soils-water holding capacity
- Soil pH-acidic or basic properties influence available supply of nutrients for tree growth
  - More acidic soils tend to have fewer available nutrients
  - Certain species adapted to more basic or acidic soil conditions
- Soil drainage class-important for oxygen transfer to respiring roots-some species more sensitive than others-E.g. bald cypress vs. sand pine
  - Soil texture impacts-water availability and content

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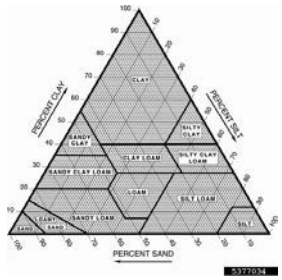
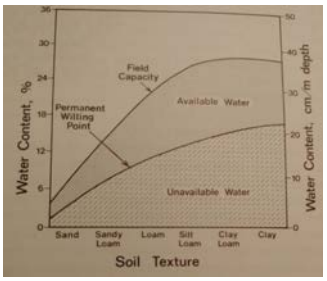


Texture is determined by sand, silt, and clay percent content



Effect of soil texture on soil water availability

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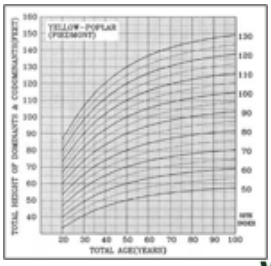
Site Characteristics

Site Index

- Measure of site productivity based on tree height and age
- Assumption is trees growing on a site will follow characteristic height growth curves associated with productive potential of site
- Single or group of species
- Index age commonly 50 or 25 years
  - Trees in upper canopy positions
- Site index can be altered through management—e.g. fertilization
- NRCS Web Soil Survey



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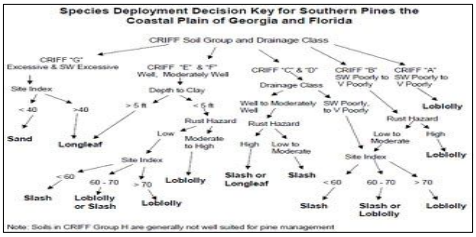
Site Characteristics—Species Selection Guides



Some regions have guides that can help with matching a species to a site based on basic physical soil characteristics (Fox 2004)

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Individual Species Characteristics

- Most tree species tend to do well where they are native or naturally found
  - Some species perform well on a variety of sites through a combination of inherent traits and genetic improvement—e.g. loblolly pine
- Silvics-deals with the growth and development characteristics of single trees as well as whole forest ecosystems
  - Important to understand for individual species and how they may respond to different sites and management practices
  - E.g.-Physiological adaptations allow some species such as oaks and pines to survive better on drought prone sites

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Individual Species Characteristics

- Two volumes provide information on 63 conifer and 128 hardwood species including:
  - Native range
  - Climate
  - Soils and topography
  - Associated forest cover
  - Life history
    - Reaction to competition
    - Damaging agents
  - Management considerations

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Individual Species Characteristics

Black Walnut Example

- Highly desirable hardwood
- Very site specific species, yet a large natural range
- Performs best growing in mountain coves and well-drained bottoms in the Appalachians and Midwest
- Sandy loam, loam, or silt loam textured soils-deep soil horizons



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Conclusions

- Many factors are involved with matching species to site
- Climate, landform, soil properties and individual species characteristics all need to be considered
- Manage for species that occur naturally on similar sites in your area to reduce risks of failure
  - Pines are typically most productive on more drought prone sites—hardwoods not planted as much for this reason
- Species grow where they can compete successfully and tolerate local conditions/environments, not necessarily where they grow the best
  - Black walnut and yellow-poplar example

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Pine Wood Products and Stand Management

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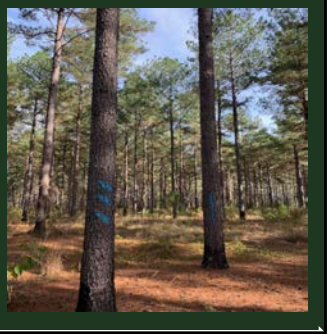

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Southern Pine Wood Products

- Poles (highest value)

*dbh >11" no visible stem defects to 40-48+ ft → trees that will be utility & barn poles, and pilings

- Sawtimber (ST; 2nd highest value)

dbh>12" no visible stem defects trees will be dimension lumber (2x4s, 2x6s, 2x8s)

*dbh (inches) = diameter at breast height (4.5 ft)

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Southern Pine Wood Products

- Chip-n-saw (CNS) 9-12"

dbh no visible stem defects (3rd highest $/ton value) for 2x4's and pulp chips

- Pulpwood (PW) 4.6-9"

dbh and trees with a visible stem defect <17 or 33 ft (generally lowest $/ton value except in GA coastal counties) for pulp and paper products

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Pine Stand Management

most southern pines are shade intolerant
Therefore need a "free to grow" full sunlight environment

THE ESTABLISHMENT PHASE

Artificial Regeneration
- Planting seedlings bringing in new genetics to site
- Higher upfront costs for site prep, seedlings and planting ($250+/ac)
- More uniform stand
- Much higher growth rates
- Shorter rotation age (17-33 yr)
- Easier to manage

Natural Regeneration
- Using seed trees left after final harvest to seed in stand
- Low upfront cost ($0-$75/ac)
- Stand stocking can range from 300 to 3000+ seedlings/acre (less uniform stand)
- Slower growth rate
- Longer rotation age (33-50 yr)
- Possible better option on poor sites

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Pine Natural Regeneration

Can burn in September to prepare seed bed prior to bumper cone crop

Needs

Overstory cone producing pines:
- Loblolly 6-12 per acre
- Longleaf 30+ per acre
- Slash 15-25 per acre
- Shortleaf 12 – 20 per acre

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Pine Natural Regeneration

Stocking will be variable (300-3000+/ac), longer rotation, later thinning, genetics from site (not from seedlings brought into site), no chem site prep, much lower cost

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Artificial Regeneration

= pre-plant site prep then plant high quality/genetics seedlings

Cut-over loblolly site
- pre-plant 2010 August Imazapyr+glyphosate,
- Early November burn,
- late December V-blade plant slash pine (7 years after planting, 85% survival, 20-25 ft height)

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Thinning Pine Stands

Minimum specifications:
- Logger needs at least 25-28 tons/ac
- Total tree ht of 50 ft (or 40 ft to 3" top outside bark)
- 4.6" dbh (diameter at breast ht = 4.5 ft)

Generally pine stands are thinned when basal area is **110-120 sq ft** and live crown ratios of **40 to no less than 33%** (20 ft live crown in a 60 ft tall tree)

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A highly stocked, unthinned loblolly pine stand approximately 15-yrs old in SE GA

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Unthinned loblolly pine stand (150 ft^2 BA/ac)

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Unthinned loblolly pine stand w/ high basal area (150 ft^2 BA/ac) and poor trees

First thinning should remove all trees with (1) a stem defect (fork, ramicorn branch, sweep, excessive branching) and (2) the smaller diameter, shorter trees that will not respond to the thinning

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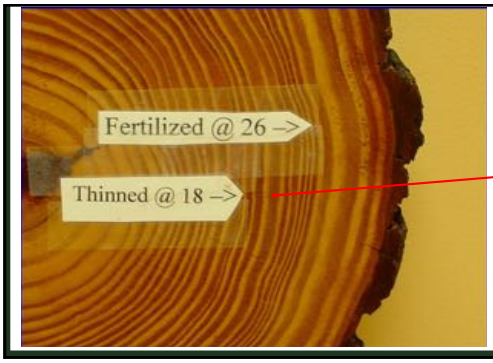

Loblolly Pine – Aiken Co, SC Orangeburg Soil

Note the large improvement in radial growth years 1-5 after thinning

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Row thin w/ select in a loblolly pine stand

Thinning types (especially 1st thin) are row+logger select or row+marked
Every 3rd, 4th, 5th (even 7th) row is removed in 1st pass and then trees with defects and Small, short trees are removed in 2nd pass with the feller/buncher

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Thinning a loblolly pine stand back to 60-70 ft^2 BA/ac

Thinnings thin back to the best trees generally leaving 60-80 sq ft basal area/acre

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The loading deck with every pine stem being sorted to its highest value and tops being piled for pulpwood

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A load of high valued loblolly pine poles

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Old-field planted, thinned 30 yr-old loblolly stand with 25%+poles

1st thin -80-90% pulpwood, 10-20% chip-n-saw (age 12-16 yrs)

2nd thin - mixed PW& CNS (age 18-23 yrs)

Final harvest: CNS, sawtimber, & poles (10-30%) (age 27-33 yrs)

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Thinning and Final Harvest Timing

Dependent on:

- Natural vs *artificial regen
- Pine species/genetics
- Site quality
- *Mgmt intensity (site prep, herbaceous weed control, fertilization)
- *Initial planting density and survival

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Hardwood Wood Products

What factors affect which species you should manage?

- Landowner objectives
- Site productivity
- Current stand conditions
- Ownership scale
- Presence of and proximity to various forest product mills
- Market demand

Low value stand, but aesthetics may take precedence

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Hardwood Wood Products

What factors affect value and product classification?

- Type, quantity, and quality of timber products that a tree contains
  - Large trees may contain several products, while small trees may only contain one product
  - Type-species-different species have inherently different values
  - Quantity-Scale-a measure of the quantity of lumber within a log—Doyle, Scribner, International ¼" Rule

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Hardwood Wood Products

What factors affect value and product classification?

- Quality-Grade-a measure of the quality of a log and the lumber it produces
  - Defects, log position, clear cuttings (2nd worst face), maximum sweep (% deduction)
- Harvest costs-affected by woodland terrain and public highway access
- Transportation costs-distance to a mill
  - Low value products less distance—supply and demand
  - Large areas may not have markets

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Hardwood Wood Products

https://www.forestproductslocator.org/welcome

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Hardwood Wood Products

- Many different hardwood products—ascending value
- Biomass and pulpwood
- Pallets and cants
- Tie logs
- Sawtimber
- Stave logs
- Veneer logs

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Hardwood Biomass and Pulpwood

- Biomass is used to generate heat or electricity while pulpwood is used to make paper, absorbent pulp, cardboard, fiberboard, etc.
- Pulpwood-usually all hardwood species except black walnut
- 3-4" top diameter
- Bottom diameter varies
  - May reach 24"—mill specs
  - Usually 5-10"
- 8-9' minimum length
- Minimal sweep/crook-char free

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Pallets and Cants

- Cants-construction materials
- Pallets-platforms that enable shipping
- Low grade hardwoods
- 10" minimum diameter
- Knots, stains, and blemishes are allowed
  - Varies by buyer
- Sound, straight logs (no dote, rot, holes, etc.)

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Tie Logs

- Crossties and switch ties (longer logs)
- Railways, bridges and landscaping
- Specs often buyer dependent
- 7x9" crossties most common
  - 8-9' length
- Switch ties usually 10'-16+'
- Relatively free of defects and decay—structural soundness important
- Many species suitable

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Sawtimber

- Wood used for paneling, flooring, lumber, etc.
- Many different grades and scales that can vary regionally
- Value is species sensitive-white and red oaks, walnut, black cherry historically highest demand
- Sound, straight, minimal rot and defects—affect grade
- 10-12" minimum diameter at small end-affect scale
- 10, 12, 14, and 16' lengths most common—3-4" trim allowance

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Stave Logs and Bolts

- White oak species used to make whisky, bourbon, and wine barrels
- Wood properties of certain white oaks (tyloses) prevent liquids from leaking
- Highest demand in central hardwood region
- 15-16" diameter optimum
  - Small end dib12"
- Minimum 8' length up to 20'
- At least two sides free of defect

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Hardwood Veneer

- Highest value timber product
- Dimensions vary by buyer-larger diameter logs
- Straight logs free of defects (clear faces) on 3-4 sides
- Red and white oaks (not all), black walnut, hard maple, black cherry, occasionally yellow-poplar and hickory
- Butt logs
- Rarely greater than 10-15% of stand volume

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Specialty Products

(4)

(5)

- Tool handles-hickory
- Baseball bats-ash
- Charcoal wood-sugar maple
- Drumsticks
- Furniture
- Other possibilities?
- Work with a consulting forester to know what is available in your area

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Management Considerations

- A variety of timber markets improves management options for hardwoods
- Harvesting is a management tool for hardwoods!
- Improves landowner ability to perform regeneration harvests and timber stand improvement
  - Shelterwood, group selection techniques, thinning, release, timber stand improvement
  - Create conditions for desirable regeneration

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Management Considerations

- Fewer markets can cause unsustainable practices
  - Example: High grading
  - Example: Removal of logging slash for biomass-soil nutrient issues
- Species grown should be matched correctly to site
  - We often rely on hardwood natural regeneration
  - Artificial regeneration suitable for some species and instances

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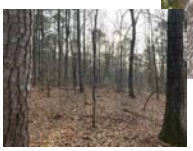
Management Considerations

- Pines and hardwoods may not always need to be managed exclusively of one another
- Pine-hardwood mixtures occur on nearly 20 mil acres across 10 SE states
- Diverse timber product potential
- Management more challenging
- Possible management alternative on moderate productivity sites



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Management Considerations

- Forest Certification
  - Verify sustainable forest practices on private forests
  - Usually not difficult to obtain
  - Several organizations
  - Forest Stewardship Council, Sustainable Forestry Initiative, Tree Farm
- Work with a state or private professional forester

(6)

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Questions?

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The Woodland Stewards Webinar Series Program was created by a team of Extension professionals from the following programs:

NC STATE EXTENSION
UTEXTENSION INSTITUTE OF AGRICULTURE THE UNIVERSITY OF TENNESSEE
UK UNIVERSITY OF KENTUCKY College of Agriculture Forestry Extension
CLEMSON COOPERATIVE EXTENSION
UNIVERSITY OF GEORGIA EXTENSION
Virginia Cooperative Extension Virginia Tech • Virginia State University
Southern Regional Extension Forestry

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Additional Resources

- Hardwood Sawtimber Grading:
https://extension.tennessee.edu/publications/Documents/PB1772.pdf

- Cross/switch ties
http://www2.ca.uky.edu/agcomm/pubs/FOR/FOR122/FOR122.pdf

- Southeastern timber prices (subscription required):
http://www.timbermart-south.com/

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Photo Citations

1. https://forestryforum.com/board/index.php?topic=89451.0 Date Accessed (1-22-20).
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