Ecological Forestry Practices for Bottomland Forests of the Southeastern U.S.

Bottomland and Swamp Forest Symposium
Wilmington, North Carolina
November 1, 2017

Amanda Mahaffey
Northeast Region Director
Forest Stewards Guild

Symposium Recap

Tuesday
• Panel of Southern States
• Policies and Partnerships
• History of Research
• Water Quality and Regulatory Issues
• Bonus: Dendroclimatology

Wednesday
• Extent of the resource
• Ecology
• Cypress-Tupelo & Harvesting
• Restoration & Artificial Regen
• NC Coastal Plain Survey
• Ancient Bald Cypress
• Stakeholder Panel
What’s left to talk about?! 

- Ecological Forestry in Bottomland Hardwood Forests of the Southeastern United States 
- The Ecological and Economic Values of Bottomland and Swamp Hardwoods 
- Field trips!
Forest Stewards Guild

The Forest Stewards Guild practices and promotes ecological forestry as a means of sustaining the integrity of the forest ecosystem and the human communities that depend upon it.

- Research
- Training
- Education
- Outreach
- Policy analysis
- Stewardship
- Support
- Community

Forest Stewards Guild report

http://www.forestguild.org/southeast

- 35+ pages:
  - Background on bottomland hardwood forests in the Southeast
  - General guidelines and specific recommendations for bottomland hardwood forest management practices
  - Synthesis of science and practice (and more questions!)
The Forest Stewards Guild would like to acknowledge the members of our bottomland hardwoods working group, field forum participants, and reviewers, including Devendra Amatya, Danielle Atkinson, Alex Finkral, Brent Frey, Larry Fuller, Jim Gregory, Wade Harrison, Brad Hutnik, Joe James, Bob Kellison, Justin LaMournain, Duck Locascio, Mark Megalos, Stephen Montgomery, Joe Schwartz, John Simpson, Jim Slye, Jeremy Whigham, Bruce White, Fred White, and David Whitehouse. This report would not have been possible without their contributions.

Bottomland Forests:
• Why are they important?
• Where are they?
• What are they?
• Threats
• Silviculture
• Recommendations
• Questions
Why are bottomland hardwood forests important?

- Clean water
- Reducing the risk and severity of flooding
- Productive habitats for animals ranging from beetles to black bears
- Forest products
- Carbon storage
- Recreation

Where are bottomland hardwood forests?
What are bottomland hardwood forests? Recommended Reading


What are bottomland hardwood forests?

- Floodplain forests
- Alluvial soils
- Hydrology-driven
- Minute elevation
- Dynamic ecosystems
<table>
<thead>
<tr>
<th>Hardwood Site Type</th>
<th>Surface Water Classification</th>
<th>Indicative Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marsh Swamp</td>
<td>Flooded 10 to 12 months</td>
<td>Baldcypress, tupelo</td>
</tr>
<tr>
<td>Floodplain of major drainage system originating in the Piedmont or Mountains.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black river bottom</td>
<td>Flooded winter, spring</td>
<td>Tupelo, swamp black gum</td>
</tr>
<tr>
<td>Floodplain of major water system originating in the Coastal Plain.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Branch bottom</td>
<td>Boggy throughout year</td>
<td>Swamp black gum</td>
</tr>
<tr>
<td>Relatively flat, alluvial land along minor drainage system which is subject to minor overflow.</td>
<td></td>
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</table>

**Cypress strand**
Low areas in south Georgia and northern Florida where shallow water flows during the wet season above the hardpan, which is usually present. Cypress forests in these strands are usually open with sedge beneath. The values for pH and available nutrients are generally low.

**Cypress dome**
Isolated peaty acid depression (dome) usually found in Florida, which is moist or inundated for weeks or months at a time. Ground cover is usually absent except on hummocks, and the tallest trees occur in the center of the domes.

**Piedmont bottomland**
In lower Piedmont, identical to red river bottom; upstream, however, features decrease in frequency and area until only well-drained bottomland is encountered.

**Yellow-poplar, sweetgum**

**Flooded winter, spring, summer**

**Baldcypress, baldcypress, pondcypress, baldcypress**

**Ground Line Water Table**

**Forest Stewards Guild**
Why are bottomland hardwood forests threatened?

Chief threats include:

- Land conversion
- Economic drivers
- Climate change
- Invasive species
- (Mis)management practices

Forest type conversion

- Agriculture
- Flood control - levees
- Development
- Insufficient CWA protection
- Conversion to intensively-managed pine plantations
Potential for continued land use change

Economic drivers

- High-grading ?
- Hardwood pulp markets ↓
- Wood pellets ↓
- Sawlog markets ↓
- Hunting leases ?
Climate change = “Global weirdening”

- Temperatures ↑
- Drought ↑
- Precipitation in the form of more extreme weather events ↑
  - Hugo - wind
  - Joaquin – rain
- Saltwater inundation ↑
- Predictability ↑

Invasive species
Invasive species

Most problematic in NC

- Chinese Privet
- Japanese stiltgrass (*Microstegium*)
- Nonnative Rose (multiflora)
- Autumn Olive (*Eleagnus*)
- Wisteria
- Bradford Pear
- Tallow Tree/Popcorn Tree

Most annoying
- Tufted knotweed
- Mile-a-minute weed
- Garlic mustard
- Mimosa trees
- Kudzu
- Asian bittersweet
- Cogon grass
- Japanese stiltgrass

Others to consider:
- Emerald Ash Borer
- Feral hogs
- ?

Photo: UFL extension leaflet, photo credit USDA
(Mis)management practices

- Upland silviculture in bottomlands
- Hydrologic alteration

Threat or Opportunity: New Markets

- Forest bioenergy could grow by 100% by 2050
- Markets for low-grade wood
- Opportunity to drive ecological management
- Challenge of threats to bottomlands
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Silviculture

• Regeneration Treatments
• Intermediate Treatments
• Restoration
• Harvesting Operations and Hydrologic Impacts
• Red River Bottoms
• Black River Bottoms
Silviculture

- Basics of silviculture apply: start with site evaluation before prescribing treatment.
- Baker-Broadfoot method and other resources helpful for guiding restoration.
- High-quality stands may be managed; poor-quality stands may be regenerated.

Regeneration Treatments

Need:
- Seed Source
- Timing
- Light
- Favorable hydrology
- Silvics
# Regeneration Treatments

<table>
<thead>
<tr>
<th>Silvicultural Treatment</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
</table>
| **Clearcut**            | (+) Relatively simple to implement operationally  
                          | (-) Often effective way to "restart" degraded stands  
                          | (x) Treatmen area of 20 acres can balance silvicultural and aesthetic goals |
|                         | (x) Visual impact  
                          | (x) Significant alteration to wildlife habitat  
                          | (x) Potential alteration of hydrologic patterns  
                          | (x) Great variation in minimum economically-viable clearcut size |
| **Patch clearcut**      | (+) Less visually intrusive than a full clearcut  
                          | (-) Requires frequent stand entry  
                          | (x) May not create optimal wildlife habitat |
| **Shelterwood cut**     | (+) Less hydrologic alteration  
                          | (+) In some systems, can be effective for oak regeneration  
                          | (-) Appropriate harvesting equipment and operation care are required to implement treatment with minimal disturbance to the residual stand |

**Silvicultural strategies for southern bottomland hardwood forests per Hicks and others**

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# Regeneration Treatments

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| **Seed-tree cut**       | (+) Seed trees provide wildlife, ecological, and aesthetic values  
                          | (-) Most trees in floodplain systems regenerate successfully through means other than gravity-borne seed dispersal (i.e., sprouts, dispersal via water or wind) |
| **Two-aged system**     | (+) An overstory is present through all stages of stand development  
                          | (+) Crop trees can be retained for the next cutting cycle  
                          | (+) Requires relatively few entries on wet sites  
                          | (-) Leave trees are vulnerable to windthrow and epicormic branching |
| **Group selection**     | (+) Limited visual impact  
                          | (+) Retained forest structure benefits wildlife  
                          | (-) Frequent entries may be impractical to implement and/or damaging to sensitive soils  
                          | (x) May not favor desired shade-tolerant or mid-tolerant species |
| **Single-tree selection** | (+) Visually non-intrusive  
                          | (+) Retained forest structure benefits some wildlife species  
                          | (+) Very difficult to apply in practice without increasing potential site damage  
                          | (+) Often results in a selective or diameter-limit cut |

**Silvicultural strategies for southern bottomland hardwood forests per Hicks and others**
### Regeneration Treatments

<table>
<thead>
<tr>
<th>Species Association and Site Preference</th>
<th>Silvicultural System</th>
<th>Species Favored</th>
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<tbody>
<tr>
<td>Cypress–water tupelo Swamp in major bottoms; slough in minor bottoms</td>
<td>Group selection</td>
<td>Baldcypress, water tupelo, sometimes green ash, overcup oak, bitter pecan</td>
</tr>
<tr>
<td></td>
<td>Clearcut</td>
<td>Baldcypress, water tupelo, sometimes green ash, overcup oak, bitter pecan, or elm and maple</td>
</tr>
<tr>
<td>Elm–ash–sugarberry Rove flats in major bottoms</td>
<td>Clearcut or group selection</td>
<td>Elm, green ash, sugarberry, Nuttall oak, willow oak</td>
</tr>
<tr>
<td>Sweetgum–red oaks Ridges in major bottoms; high flats in minor bottoms</td>
<td>Clearcut</td>
<td>Sweetgum, red oaks, green ash</td>
</tr>
<tr>
<td></td>
<td>Shelterwood</td>
<td>Sweetgum, red oaks, and green ash favored, with sweetgum favored the most</td>
</tr>
<tr>
<td>Red oaks–white oaks2 Second bottoms, high ridges in major bottoms; terrace in minor bottoms</td>
<td>Shelterwood or group selection</td>
<td>Red oaks, white oaks, hickory, green ash, sweetgum, American hornbeam</td>
</tr>
</tbody>
</table>

*Example from Meadows and Stanturf (1997).*

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### Intermediate Treatments

<table>
<thead>
<tr>
<th>Silvicultural Treatment</th>
<th>Advantages</th>
<th>Disadvantages</th>
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</table>
| Intermediate thinning  | (+) Provides periodic economic income  
                        | (+) Enhances wildlife habitat  
                        | (+) Increases growth rates of timber and value | (-) Requires expertise to plan and implement  
                        | (-) Appropriate harvesting equipment and operator care are required to minimize damage to residual stand and site |
Intermediate Treatments
“In southern hardwoods, thinnings often become economically feasible at about 30-50 years in an even-aged stand, with a thinning repeated every 10-15 years until rotation harvest at 60-100 years. Good practitioners always use improvement thinnings to achieve the landowner’s objectives. Periodic thinnings in both even- and uneven-aged systems provide periodic income to the landowner and cannot be ignored. The intermediate treatments provide land managers with the opportunity to use the culture in silviculture to shape the stand into the desired condition to provide the future benefits being managed for. Growth in timber volume and value, wildlife habitat, and other objectives can be significantly increased with application of improvement thinnings over the life of a stand.”

Restoration
Restoring hydrologic function is the key to restoring bottomland hardwood ecosystems
Harvesting Operations and Hydrologic Impacts: Tip #1

Study site hydrology before, during, and after harvest.
- “Poor drainage is a silent killer. Stagnant, hot water can prevent desirable regeneration on a site.”
- “Late spring and early summer is the worst time for bottomland species encountering impounded conditions because the impounded water temperature increases, which impedes seed germination, sprout regeneration and plant growth.”
- Simple monitoring can be done with photos, cheap plastic rain gauges, or consultation with a hydrologist.

Harvesting Operations and Hydrologic Impacts: Tip #2

BMPs for water quality can also protect hydrologic function. Applicable BMPs from FL and NC:
- Work with loggers to plan your harvest and minimize activity in sensitive or exceptionally wet areas.
- Protect ditchbanks and ephemeral streambanks.
- Put in culverts, dips, bridges, or box culverts in roads to enable water flow. Build in fencing features around culverts and drainage areas to prevent backup of logging slash and debris.
- Reduce evapotranspiration by harvesting smaller areas or maintaining residual trees and canopy cover. This protects hydrologic functions as well as a seed source.
Harvesting Operations and Hydrologic Impacts: Tip #3

Help the ecosystem to adapt to the new “normal” after a harvest.

- Minimize human alteration
- Soil compaction
- Rutting, churning
- Wet-weather harvesting
- Consider intensity and frequency of local weather events

Prepare the stand to be resilient in the event of significant hydrologic change

Recommendations: Biodiversity

- “Wildlife forestry” can = income from hunting leases
- Many species prefer a complex understory and midstory
- Retain dominant trees, coarse woody material, and cavity trees
- Retain microhabitat features
Recommendations: Conservation

• Conservation can be a tool for management
• For some places and natural communities, the highest management priority may be protection through a working forest conservation easement or outright preservation

Recommendations: Red River Bottoms

- Harvesting a mature stand of hardwoods in red river bottoms will favor pioneer even if oaks are present in the overstory.
- To promote oaks on these sites, plan for longer rotations to allow the shade- and mid-tolerant oaks to gain a competitive advantage.
Recommendations: Red River Bottoms

- Consider silvicultural treatments such as shelterwood harvests or patch cuts
- Bottomland red oaks given some direct sunlight during early stand development will eventually surpass other species

Recommendations: Black River Bottoms

- Keep in mind that soils in black river bottoms originate in the coastal plain and are less nutrient-rich than those of red river systems. Stands dominated by tupelo gum, swamp blackgum, cypress, Carolina ash, and similar species will regenerate largely by sprout origin
Recommendations: Black River Bottoms

Black river bottom
Floodplain of major water system originating in the Coastal Plain.

- Cutting stumps low (10 to 14 inches) and harvesting while trees are dormant are also recommended for encouraging coppice
- Group selection or patch cuts can be used to regenerate sweetgum or water tupelo

Report Info:

- Forest Stewards Guild report
  http://www.forestguild.org/southeast or
- http://www.forestguild.org/publications (print-friendly version)
- Check out tables, Resources, References
Final Thoughts on Bottomland Forests

• Keep on questioning, learning, exploring, and adapting
• Increase our collective knowledge of these systems
• Do your part to understand these systems and be able to relate them to the people we serve

THANK YOU!

Amanda Mahaffey, Northeast Region Director, Forest Stewards Guild
amanda@forestguild.org, (207) 432-3701
www.foreststewardsguild.org