Longleaf pine has many favorable characteristics for landowners with long-term, multiple-use land management objectives. Longleaf pine is an important component of habitat for a diverse array of plants and animals, adapted to fire, and yields a large proportion of high value solid wood products. Today we’ll learn about longleaf pine forest habitat restoration and management, associated enterprises, and available technical and cost-share assistance.

Agenda:

8:30 am  Sign-in, meet & greet
9:00    Welcome & Introductions, Greg Barton, Florida Forest Service
10:00   Establishing Longleaf Pine, Ad Platt, The Longleaf Alliance
10:45   Break
11:00   Prescribed Fire: Why we Burn, Greg Barton, Florida Forest Service
11:30   Managing Wildlife in the Longleaf Forest and Getting Assistance, Mark Asleson, Florida Fish and Wildlife Conservation Commission
12:00 pm  Lunch
1:00    The Business of Pine Straw Harvesting - Gary Bozeman, American Pine Needles, Inc
1:30    Field tour – Natural longleaf sites in Silver Springs State Park, all staff
        Prescribed Fire Demonstration (weather permitting)
3:30    Conclusion, evaluation and adjourn

*This workshop is approved for 5.0 Cat. 1 SAF CFE credits. Be sure to sign the CFE sheet after the program.

The mission of the Florida Land Steward Program is to help and encourage private landowners to actively manage their land resources for long-term environmental, economic, and social benefits. The Program is supported by the USDA Forest Service through the Florida Department of Agriculture and Consumer Services Florida Forest Service, University of Florida IFAS, Florida Tree Farm Program, and the Florida Sustainable Forestry Initiative Implementation Committee.
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We appreciate the support of our
Florida Land Steward and Tree Farm Program Sponsors
-listed on the back cover-
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Questions about this and other Florida Land Steward activities can be directed to Chris Demers, (352) 846-2375, cdemers@ufl.edu. For more information and events see:  
http://www.sfrc.ufl.edu/forest_stewardship
Florida’s Forest Stewardship Program

Forest Stewardship is active management of forest land to keep it in a productive and healthy condition for present and future generations, and to increase the economic, environmental and social benefits of these lands. Forest Stewards are landowners who manage their forest lands on a long-term basis by following a multiple resource management plan.

The Forest Stewardship Program addresses the improvement and maintenance of timber, wildlife, soil and water, recreation, aesthetics, as well as forage resources.

Eligibility

Private forest landowners with at least 20 acres of forest land and a desire to manage their ownerships according to Stewardship principles can participate in the Forest Stewardship Program. Also, adjacent landowners, with similar management objectives, may combine their holdings to meet this acreage limitation.

Benefits to Landowners

- A customized management plan that is based on the landowner's objectives. The plan will include forest stand characteristics, property maps, management recommendations, and a five-year time line for future planning. This plan also serves as documentation of active management on the property that may help reduce tax liability.
- An opportunity for public recognition as a certified "Forest Steward".
- Educational workshops and tours, weekly Florida Land Steward email updates, and the quarterly Florida Land Steward newsletter produced by the University of Florida, IFAS Cooperative Extension Service and other partners.

How to Enroll

Contact your local Florida Forest Service County Forester and tell them that you would like to have a Forest Stewardship Plan prepared for your property. More information and application online at:

http://FDACS.gov/ForestStewardship
Tree Farm Program

The American Tree Farm System® is a program of the American Forest Foundation and was founded in 1941 to promote the sustainable management of forests through education and outreach to family forest landowners. Nearly 26 million acres of privately owned forestland and 80,000 family forest landowners in 46 states are enrolled in the program and committed to excellence in forest stewardship. About half of all Tree Farms are located in the South.

Eligibility

Private forest landowners with at least 10 acres of forest land and have a desire to manage their ownerships according to sustainable forestry guidelines can participate in Tree Farm.

Benefits to Landowners

Tree Farmers are good stewards of their forestland, committed to protecting watersheds and wildlife habitat and conserving soil. They manage their forestland for various reasons, including timber production, wildlife, recreation, aesthetics, and education/outreach. Florida Tree Farmers receive many benefits:

- Representation on local, state, and federal issues affecting forestland owners.
- Exposure to a network of forestry professionals and landowners committed to sustainable forestry.
- Invitations to workshops and tours, weekly Florida Land Steward email updates, and the quarterly Florida Land Steward newsletter produced by University of Florida IFAS and other partners.
- Certification that meets international standards of sustainable forest management.
- Participation in local, state, regional, and national Outstanding Tree Farmer of the Year awards and recognition.

Getting into the Program

Contact your local Florida Forest Service County Forester and tell them that you would like to join the Tree Farm program. More information is available at:

https://www.treefarmsystem.org/florida
SILVICULTURE BEST MANAGEMENT PRACTICES (BMPs)

Silviculture BMPs are the minimum standards necessary to protect our state’s waterbodies and wetlands from the degradation and sedimentation that can sometimes occur because of erosion during and immediately following recent forestry operations. Silviculture BMPs should be applied on all bonafide ongoing forestry operations, especially those adjacent to waterbodies and wetlands, and may be enforced by federal, state, and local authorities through reference of regulatory statute or rule.

SILVICULTURE BMP COURTESY CHECKS

Silviculture BMP courtesy checks are available to give landowners, land managers, and loggers a “report card” on Silviculture BMP implementation for recent or ongoing forestry operations. This helps with future management planning as well as evaluating the performance of contractors on your property.

SILVICULTURE BMP SITE ASSESSMENTS

On-the-ground Silviculture BMP site assessments are available to discuss which Silviculture BMPs will apply to planned operations on a specific site. This helps with harvest plan development, road layout, mitigation of existing problem areas, etc.

SILVICULTURE BMP NOTICE OF INTENT

The Silviculture BMP Notice of Intent (Rule 5I-6 F.A.C.) is a voluntary one-time pledge that a landowner signs to indicate his or her intention to follow Silviculture BMPs on their property. Once a landowner has signed the Notice of Intent, he or she will become eligible to receive a presumption of compliance with state water quality standards during future bonafide ongoing forestry operations. This is very important if the landowner’s property falls within an area covered by a Florida Department of Environmental Protection Basin Management Action Plan for impaired waters.

ADDITIONAL SERVICES

For information on the services listed above or any other services provided by the Florida Forest Service’s Hydrology Section please contact your local BMP Forester.

William McCarthy
Panhandle Area
William.McCarthy@FDACS.gov
(850) 681-5942

Robin Holland
Peninsula Area
Robin.Holland@FDACS.gov
(352) 732-1781
• Forestry Wildlife Best Management Practices for State Imperiled Species (WBMPs) were adopted into Florida Administrative Code (Rule 5I-8) on October 21, 2014.

• WBMPs were developed through a partnership between the Florida Department of Agriculture and Consumer Services’ Florida Forest Service and the Florida Fish and Wildlife Conservation Commission (FWC).

• WBMPs are voluntary practices designed as a practical approach for avoiding and minimizing the loss of State Imperiled Species due to silviculture operations.

• WBMP practices address the 16 State Imperiled Species which are considered to be potentially vulnerable to silviculture operations including ten aquatic species, two burrowing animals, and four nesting birds.

• WBMPs are designed to supplement the existing water quality-based Silviculture BMPs which already provide many valuable benefits to the conservation and management of fish and wildlife in Florida.

• Landowners and other forestry resource professionals can enroll in the voluntary program by completing a WBMP Notice of Intent. Those who do not wish to enroll will continue to be subject to all current laws and regulations regarding State Imperiled Species.

• Once enrolled, applicants who properly implement WBMPs will no longer be required to obtain a permit authorizing the incidental take of State Imperiled Species during bonafide ongoing forestry operations. In addition, they will not be subject to any fines or penalties associated with an incidental take of the State Imperiled Species covered by the WBMP Manual.

• WBMPs are not designed to facilitate wildlife habitat restoration or species recovery and expansion. Also, they do not address any Federally Listed Species. For information on Federally Listed Species, refer to FWC’s online “Florida Wildlife Conservation Guide.”

• To obtain more information or a copy of the WBMP Manual and Notice of Intent, contact your local Florida Forest Service BMP forester (see below) or a FWC Landowner Assistance Program biologist (850) 488-3831.

Florida Forest Service BMP Foresters

William McCarthy  Robin Holland
Panhandle Area  Peninsula Area
(850) 681-5942  (352) 732-1781
William.McCarthy@FDACS.gov  Robin.Holland@FDACS.gov
Florida Fish and Wildlife Conservation Commission-Landowner Assistance Program

The FWC Landowner Assistance Program assists private landowners to manage their land for fish and wildlife by:

- Providing fish and wildlife related technical assistance including invasive plant management.
- Supporting locally-led conservation efforts.
- Providing information about cost-share programs.
- Developing habitat-based management plans.
- Providing educational workshops for landowners and partners.
- Providing landowner recognition opportunities.

http://www.MyFWC.com/LAP
United States Department of Agriculture
Natural Resources Conservation Service

Get Started with NRCS
Do you farm or ranch and want to make improvements to the land that you own or lease?
Natural Resources Conservation Service offers technical and financial assistance to help farmers, ranchers and forest landowners.

1. Planning
   Visit your local NRCS field office to discuss your goals and work with staff on a conservation plan.

2. Application
   With the help of NRCS, complete an application for financial assistance programs.

3. Eligibility
   Find out if you're eligible for NRCS' variety of financial assistance programs.

4. Ranking
   NRCS ranks applications according to local resource concerns.

5. Implementing
   Put conservation to work by signing a contract and implementing conservation practices.

Get Started with NRCS

To do this, you'll need to bring:
- An official tax ID (Social Security number or an employer ID)
- A property deed or lease agreement to show you have control of the property; and
- A farm tract number.

If you don't have a farm tract number, you can get one from USDA's Farm Service Agency. Typically, the local FSA office is located in the same building as the local NRCS office. You only need a farm tract number if you're interested in financial assistance.

NRCS will take a look at the applications and rank them according to local resource concerns, the amount of conservation benefits the work will provide and the needs of applicants.

If you're selected, you can choose whether to sign the contract for the work to be done.

Once you sign the contract, you'll be provided standards and specifications for completing the practice or practices, and then you will have a specified amount of time to implement. Once the work is implemented and inspected, you'll be paid the rate of compensation for the work if it meets NRCS standards and specifications.

To find out more, go to: www.nrcs.usda.gov/GetStarted

USDA is an equal opportunity provider and employer.
Got Invasives?

Invasive exotic plant problem? Find a program to help by using FloridaInvasives.org.

The Florida Invasive Species Partnership has collected, evaluated and categorized assistance programs into a single resource, making it easier to find the financial and/or technical assistance available to Florida landowners to prevent or control invasive exotic species problems. FloridaInvasives.org has an online resource of management assistance programs to help in your fight against problematic plant species. This resource takes the guesswork out of finding the agencies or organizations offering assistance and will direct you to available programs. The Landowner’s Incentives Database will also provide the requirements for each program, to help you decide if they are a good match for your needs.

Why was FloridaInvasives.org developed?
Invasive species have been identified as being costly ecologically and economically statewide in Florida. The Florida Invasive Species Partnership (FISP) is a collaboration of public and private entities in Florida, formed to link efforts at preventing and controlling invasive exotic plants across agency and property boundaries. FISP has developed an on-line tool of available financial and technical assistance sources to make it easier for landowners and land managers to find them.

How does FloridaInvasives.org help you?
FISP has created a searchable database, the Florida landowner incentives database, accessible at FloridaInvasives.org that allows you to find an assistance program for your needs. Search by your county, target species or other pertinent information into the online tool, and you will retrieve a current list of available programs. FloridaInvasives.org will help provide focus to your search so that you can get the right person at the right program.

FloridaInvasives.org:
- Builds community awareness,
- Leverages limited resources through cooperation and
- May reduce individual land management costs.

This resource will be regularly updated with the most current program information to provide you the most up-to-date opportunities.

Go to FloridaInvasives.org to find out more.

Species Shown from top to bottom: Mexican Petunia, Boston Fern, Mimosa, Cogongrass, Camphor
Comparing Southern Pine Species for Forestry & Wildlife Objectives.

Stan Rosenthal
Florida Wildlife Federation, Forest Advocate
NRPS Senior Forester
UF/IFAS Extension Forestry Agent Emeritus

Southern Pines...
1. Longleaf
2. Slash (2 varieties)
3. Loblolly
4. Pond
5. Shortleaf
6. Spruce
7. Sand (varieties)

Two varieties of sand pine: Choctawhatchee & Ocala.
They differ appreciably in cone production, cone size, seed size, and several other characteristics. The majority of Ocala sand pine cones are serotinous whereas the Choctawhatchee cones open when mature.

Why what pines are where...
Fire (frequency/intensity)
Soil (moisture/nutrients)
Reproduction Source (available seed/seed bed/competition/planting & site prep).

Slash Pine

**PINUS ELLIOTTII**
COMMON NAMES: YELLOW SLASH PINE, SWAMP PINE, PITCH PINE, SOUTH FLORIDA SLASH PINE, DADE COUNTY SLASH PINE, DADE COUNTY PINE, CUBAN PINE, HONDURAS SLASH PINE

Variations

*Pinus elliottii* Englem. is divided into two geographic variations:

1. *Pinus elliottii* var. elliottii, North Florida slash pine
2. *Pinus elliottii* var. densa Little & Dorman, South Florida slash pine

Native Range

Relatively small natural range
- Within natural range, original distribution was limited by seedling fire susceptibility
  - Was common along margins of streams, ponds and bays
  - With fire protection and plantation silviculture, is now widespread within range
- Is planted in LA and TX
- Species range may be limited by minimum annual temperature
Native Range

Identification

Needles in bundles of two and three, 8-12 inches long.

Soils

Spodosols
- Ultisols
- Entisols
Grows best on pond margins and drainages where soil moisture is ample but not excessive
Growth is poor on sandhills and poorly drained savanna soils with high water tables

Ecology

Is one of the four most important commercial conifers in the Southeastern US and has the smallest native range of the four major southern pines.

- With improved fire protection and heavy cutting of longleaf pine (Pinus palustris), slash pine has spread to drier sites, replaced longleaf pine in mixed stands, and invaded abandoned fields. This increase in acreage was possible because of slash pine’s frequent and abundant seed production, rapid early growth, and ability to withstand wildfires and rooting by hogs after the sapling stage. Stands protected from fires are invaded and replaced by more tolerant hardwood species.
- Slash pine is a major component of three forest cover types including Longleaf Pine-Slash Pine, Slash Pine, and Slash Pine-Hardwood
- Slash pine makes rapid volume growth at early ages and is adaptable to short rotations under intensive management.
- It is a shade-intolerant species and does not survive or grow well when suppressed.
- Slash pine seeds are eaten by a variety of birds and small mammals.
- Older shortleaf pines with red heart rot are primary nesting trees for the red cockaded woodpecker.

Fertilizer Response of Slash Pine at Planting - 25 Years Later

Franklin Co., Florida

Control – 2043 ft³/ac
50 lb/ac P – 4502 ft³/ac

IMPAC Experiment – Age 4 yrs (Gainesville, FL)
**Damaging Agents**

- **Fusiform Rust**
- **Pitch Canker**
- **Tip Moth and Pitch Canker**

---

**Recommended Management**

- Reasonable site preparation (chemical site prep, bedding on poorly drained sites) and reforestation with bareroot seedlings of good genetic stock will generally pay dividends
- Alleviate nutrient deficiency with fertilizer
- If raking pine straw, pay special attention to fertilizer to avoid productivity declines
- Pay attention to stocking

---

**Prescribed Fire**

Slash pine is intolerant of fire until it is 10-15 feet tall and the bark has thickened
- Up to 50% of live needles can be scorched (but not completely consumed) with good survival and minimal growth loss

---

**Genetics Take Home**

- Ask for improved genetics
  - Growth
  - Disease, esp. fusiform rust and pitch canker
  - Form (?)

---

**Products/Uses**

- An important timber species, including pulpwood, plywood and veneer, lumber and other structural materials.
- **Pine Straw**
  - In urban areas planted as an evergreen ornamental and as a screen.

---

**Loblolly Pine**

*PINUS TAEDA*

Identification

Cones in pairs. Needles in bundles of three and 6-9 inches long.

Native Range

The native range of loblolly pine extends through 14 States from southern New Jersey south to central Florida and west to eastern Texas.

History of Loblolly Pine

- Originally a minor associate in upland mixed hardwoods and longleaf pine stands; component of mixed river bottom hardwood stands
  - <5,000,000 ac prior to European colonization
- Coastal Plain
  - Grew best along stream margins/swamps not subject to long periods of flooding or serious fires
  - Could not compete well with longleaf in the uplands because of limited fire tolerance.

Ecology

- Is one of the four most important commercial conifers in the Southeastern US. Loblolly pine is an adaptable species that has been successfully planted along the periphery of its natural range and has been introduced on other continents.
- Loblolly grows in a vary wide variety of forest types from pure stand or mixed with other pines and hardwoods. Stands protected from fires are invaded and replaced by more tolerant hardwood species.
- Growth of loblolly pine stands is inherently good when compared to most hardwood competitors and on highly productive sites will triple the production of common associates and is adaptable to short rotations under intensive management.
- Loblolly pine is moderately tolerant when young but becomes intolerant of shade with age. Its shade tolerance is similar to that of shortleaf and Virginia pines, less than that of most hardwoods, and more than that of slash and longleaf pines. Loblolly pine is most accurately classed as intolerant of shade.
- Natural loblolly pine stands as well as intensively managed plantations can provide habitat for a variety of game and nongame wildlife species depending on density and stage of stand development. Large tracts of mature timber with frequent openings and where prescribed burning is conducted are often the best.

Products/Uses

Loblolly pine is the leading commercial timber species in the southeastern United States. 750,000 ac are harvested each year for lumber and pulpwood.

- Most harvested pines are under 50 years old.
- An important timber species, including pulpwood, plywood and veneer, lumber and other structural materials.
- Pine Straw
  - In urban areas planted as an evergreen ornamental and as a screen.

Soils

- Best growth is on moderately acid soils with imperfect to poor surface drainage, a thick medium-textured surface layer, and a fine-textured subsoil.
- Poorest performance is on shallow soils, eroded soils, and very wet or waterlogged sites.
To Achieve High Yields, Integrated Silvicultural Systems Should Include:

- Clearly defined management objectives
- Site preparation
- High quality seedlings and proper planting
- Genetics (Species, Family, Variety)
- Competition control
- Nutrient management (throughout rotation)
- Pest Management
**IMPAC Experiment – Age 19 yrs (Gainesville, FL)**

CONTROL

FERTILIZER + WEED CONTROL

---

**IMPAC Experiment – Age 19 yrs (Gainesville, FL)**

Fert + Weed Control

Control

---

**Loblolly pine growing in Florida**

Phosphorus deficiency on poorly drained clay soils

---

**Lob or Slash?**

- Site quality available – plant lob on higher quality sites
- Drainage – slash is more tolerant of somewhat poorly and poorly drained soils
- Rust hazard – slash is more susceptible to fusiform rust
- Management intensity – if you are hesitant to invest in fertilizer or weed control, slash is more tolerant of nutrient deficiency
- Products – slash (and longleaf) are preferred over lob for pinestraw production

---

**Longleaf Pine**

*Pinus palustris*

---

**Longleaf – The Native Tree**

**Pre-settlement**
- Established on 90 million acres
- Dominant tree species on 60 million acres

**Today** 95% Reduction
- 3 million acres

Longleaf pine takes 100 to 150 years to reach their full size of 100-120 feet, and can live to 400 years old!
Historic range of Longleaf Pine

History of Longleaf Pine

- Virgin longleaf pine forest was almost completely eliminated by 1900
- Second forest was a result of haphazard self regeneration and covered 20 million acres in the 1930s
- Renewed interest = Hope

Virgin Longleaf Pine Forest covered ~ 60 million acres before European settlement

Thomas Caldwell Croker, Jr. 1987

Map from: Managing the Forest and the Trees, The Nature Conservancy et al. 1992

But, some areas can, and are, being restored
- Timberlands
- Agricultural Lands
- Public Lands

Longleaf – The Native Tree

Due to development & fire control, regeneration on much of its original range is no longer possible

Current range of Longleaf Pine

Identification

- Longleaf pine
- Slash pine
- Loblolly pine
- Eastern white pine
- Shortleaf pine

Joseph O’Brien, US Forest Service, Bugwood.org
Identification

Needles in bundles of three and 8-18 inches long.

Soils

• Well suited to a wide range of environments
  • Upland – Coastal Plain Soils
  • Flatwoods – Spodic Soils
  • Sand Hills – Deep sands (entisols)

Stands of the longleaf pine-turkey oak communities are most common in the central portion of Florida north of Lake Placid, and the interior panhandle.

Longleaf – The Native Tree

• Longleaf pine is highly resistant to most diseases and insects that infect other southern pines.

Such as the Southern Pine Beetle...

Images Curtesy of: http://entnemdept.ifas.ufl.edu/foltz/eny3541/pbb/SPB_Info.htm

Longleaf – The Native Tree

...and Fusiform rust

Longleaf – The Native Tree, does have native pests.

Brown spot needle blight

Images Curtesy of http://www.sfrc.ufl.edu/Extension/FFSnl/ffsnlb3.htm
Red headed sawfly.

Fire helps control some of these native pests.

**Longleaf – The Adapted Tree**

- Exceptionally well adapted to fire

It is ideally suited to a high-frequency (every 2 to 5 years), low-severity surface fire regime, and seed will germinate on the mineral soil exposed by fire.


**Longleaf – The Adapted Tree**

- In reality they are fire dependent.
- Fire controls competition allowing Longleaf to thrive.
- The grass-stage seedling is resistant to fire.
- Once the terminal bud develops, it is protected by a moist, dense, tuft of needles.
- As the tuft burns towards the bud from the needle tips, water is vaporized.
- The steam reflects heat away from the bud and extinguishes the fire.
- The bud also has scales for protection and a silver fuzzy covering that probably also reflects heat.

**Longleaf – Economic Considerations**

- Longleaf produces high value timber and non-timber products.
- Longleaf pine has clear, straight wood with few defects. It was used extensively in the past for timber and ship building.

The more adapted a species is, the safer an investment in the future it becomes.

As we’ve seen, Longleaf is adapted to a range of:
- Soils
- Pest & Disease
- Weather
- Fire
The financial viability of Longleaf becomes more apparent over time.

Artificial Regeneration (more costly for seedlings and site preparation than other pine species).

Whether natural or artificially regenerated, competition control is very crucial for longleaf regeneration.

• Thin 4 times from 17 to 45 years.
• Leaving shelterwood for subsequent stands.
• Subsequent stands can be established using natural regeneration and fire, virtually eliminating planting and site prep expense.

There are often a variety of opportunities available for financial assistance with the cost of establishing Longleaf.
**Longleaf – Economic Considerations**

*Longleaf pine straw*

Longleaf pine straw is generally more desirable than other straw.

**Longleaf – Economic Considerations**

Early raking, age 6 - low yields
- 50 to 75 bales per acre
Age 10 – higher yields
- between 125 to 200 bales per acre
Age 15 - maximum yield
- 200 to 300 bales per acre
Prices per bale: $.50 - $1.00

Recommend raking no more than 5 times during the life of the pine plantation (the rotation). Also soil test & fertilization recommended.

**Longleaf – The Ecologically Important Tree**

- A wide variety of wildlife depends on the longleaf pine-turkey oak ecosystem.
- Endangered species such as red-cockaded woodpeckers and indigo snakes are threatened by the loss of longleaf pine habitat.

(Photo by Chuck Hess)

(Photo courtesy Dirk Stevenson)

**Red Cockcaded Woodpeckers**

Sixty-eight bird species use longleaf pine forests.

The seeds are an excellent food source for many species.

Gopher tortoises, Florida mice, gopher frogs, and eastern diamond-back rattlesnakes are among the native animals in the ecosystem.

**Longleaf Range**

Red Cockcaded Woodpeckers

Longleaf Range
Components of a Longleaf Pine Understory

- Highest quality sites are maintained as early successional habitats with regular fire intervals. Very diverse understories.
- Largest plant families represented are grasses, legumes, and composites.

Basic Concept...

Longleaf pines leaf and branch structure will allow more light penetration to the understory and this can promote and maintain a diverse understory and benefit many species of wildlife.

Frequent low intensity (growing season) fires increases this effect.

Some Longleaf Resources:

- US Forest Service
  http://www.fs.fed.us/database/feis/plants/tree/pinpal/all.html
- Forest Stewardship Program-UF/IFAS
  http://sfrc.ufl.edu/forest_stewardship
- FDACS Florida Forest Service
  http://www.freshfromflorida.com/Divisions-Offices/Florida-Forest-Service
- University of Florida-UF/IFAS
  http://solutionsforyourlife.com/
- The Longleaf Alliance
  http://www.longleafalliance.org/

Silvics of North America

The goal of forest management is to meet landowners objectives within existing environmental, economical & social constraints.

<table>
<thead>
<tr>
<th>Biological Tree Growth</th>
<th>Economics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landowner Objective</td>
<td>Environmental Considerations</td>
</tr>
</tbody>
</table>

Species Deployment Decision Key for Southern Pines the Coastal Plain of Georgia, Florida and Alabama

Note: Soils in CRIFF Group H are generally not well suited for pine management.
Sweeping Generalizations...  

For Wildlife... except in natural stands of other species...  
Longleaf on uplands, (shortleaf in red hills can be added) slash is 2nd best.  
Wetlands, loblolly, pond and slash pines ok.  
Lower pine densities.  

For Production  
Sand pine on dry sandy sites.  
Loblolly on red hills sites (slash produces better quality wood).  
Slash on moister sandy sites.  
Note loblolly and slash respond to fertilizer if soil test indicates the need.  
The more spent on site preparation – the more production of pine trees and less of other plants – lower diversity.  

Ecological Adaptations  

<table>
<thead>
<tr>
<th>Species</th>
<th>Seedling tolerance to fire</th>
<th>Mature tree tolerance to fire</th>
<th>Minimum cone bearing age (yrs)</th>
<th>Shade tolerance</th>
<th>Soil moisture regime</th>
</tr>
</thead>
<tbody>
<tr>
<td>Longleaf</td>
<td>High</td>
<td>High</td>
<td>20</td>
<td>Intolerant</td>
<td>Very dry to moist</td>
</tr>
<tr>
<td>Slash</td>
<td>Low</td>
<td>Moderate</td>
<td>7</td>
<td>Intolerant</td>
<td>Moist to wet</td>
</tr>
<tr>
<td>Loblolly</td>
<td>Low</td>
<td>Moderate</td>
<td>5</td>
<td>Intolerant</td>
<td>Moist</td>
</tr>
</tbody>
</table>

The Stoddard-Neel Approach  

• Developed by Herbert Stoddard in 1930-40’s  
• Refined and adapted by Leon Neel since 1950’s  
• Developed through their work on shooting plantations with objectives of aesthetics, wildlife management & hunting, and timber production

Central Tenets of the Stoddard-Neel Approach: A Summary  

• The resources come first; i.e., the primary goal is to maintain and perpetuate the resources (though resource utilization and income are encouraged and expected)  
• The forest is never terminated  
• Be patient and think long-term – the process cannot be hurried  
• Heterogeneity embraced, not eliminated  
  • In structure, spacing, tree characteristics, species

Ecologically-focused Management System  

Use Prescribed Fire to Control Understory Vegetation, Fuel Load Build-up & provide wildlife habitat for key species.

Stylized representation of the development of structural complexity during stand development. In traditional forest management, stands are harvested prior to significant levels of complexity developing.
Establishing Longleaf

Most landowners have multiple objectives for their land. It is essential to be clear about YOUR objectives. Then, ask the question, is this the right site? Landowner desiring to establish longleaf can begin from many different starting points. The methods and approach used will differ depending upon the previous land use, and much more information and assistance is available from The Longleaf Alliance at www.longleafalliance.org. In the following notes, we will look at three of the most common approaches; beginning following a timber harvest, restoring lands previously in agriculture (cultivation or pasture), and converting forest from mixed timber to longleaf over time.

Scenario 1 - Cutover Land

In general, even inexperienced foresters or landowners should be successful planting longleaf pine on cutover sites. Planting longleaf pine in these situations does not require extraordinary site preparation and herbaceous release.

We have found that a chemical site preparation is a good first step. A chemical site preparation has three main advantages over a mechanical site preparation.

- A chemical site preparation tends to yield better and longer-lasting control of woody and shrubby competition on most sites. While we want to maintain as much of herbaceous community as possible, it is to our advantage to control oaks, gums, hollies, and other unwanted hardwood species. Mechanical site preparation may give you a site that looks clean, but subsequent sprouting and competition will typically be more severe when compared to a good chemical site preparation.

- Chemical site preparations tend to retain more of the native perennial herbaceous community that is especially valuable for wildlife food and diversity. For instance, most native legumes are tolerant of two of the three most commonly used chemicals: hexazinone and imazapyr. Following a chemical site preparation, legume rootstocks often remain intact and viable, and will frequently bloom profusely one to two years after the site preparation was applied. On the other hand, an intensive mechanical site preparation will generally eliminate many of these root systems, shifting the plant species more to weedy annual invaders.

- A chemical site preparation causes less soil movement. Less soil movement means more consistent planting depth and seedling placement. Since incorrect planting depth or seedling placement frequently causes planting failures, decreased soil movement gives chemical site preparation a major advantage.
A consistent formula for artificially establishing longleaf pines on cutover sites is:

- apply chemical site prep in late spring,
- burn in early fall, and
- plant by winter.

For landowners seeking to retain or restore native groundcover species and wildlife, where maximizing growth of longleaf pine is not the driving management force, fire remains the least expensive and most effective option for site preparation. In other areas where target groundcover species are already in place (such as wiregrass) and more emphasis is placed on tree survival and growth, the judicious use of herbicides is a useful tool in the restoration and management toolbox.

Selective herbicides can be used strategically to remove certain competition while maintaining key components of the understory. For example, one study in a Florida sandhill community found that 1 - 2 lbs / acre broadcast application of hexazinone removed some plants that are of ecological importance to targeted species, e.g., gopher apple. However, spot application at the aforementioned rates resulted in fewer effects on forbs cover, species richness, and diversity.

Note: other studies have shown that two passes of a drum chopper in similar dry, wiregrass sandhills (a typical site preparation technique) will nearly eliminate wiregrass from a site. A single pass of a drum chopper generally will suffice.

For more information on planting longleaf on cutover sites, check our website at www.longleafalliance.org for Longleaf Note #6.

**Remember:**

- Fire used along or in combination with an herbicide, aids in the control of unwanted competitive vegetation. If used alone, most of the existing plant community will remain intact. Some woody plants may be eliminated and desirable grasses and forbs enhanced by the fire. Selective herbicides will likely kill some desirable plants, but will improve longleaf survival and growth.
- Know your site before using herbicides; choose the chemical based first on what you want to keep more than what you want to kill.
- Sites where competing vegetation is completely removed are ideal for seedling survival and early growth, but risk erosion and provide little or no wildlife habitat value for some time.
Establishing Longleaf on Agricultural Fields and Pastures

Although these areas can appear to be "blank slates", they may be the most difficult of all sites to restore to longleaf ecosystem function. The pasture grass and agricultural weed complex is aggressive and most of these sites have little or no residual seed bank from the early native forest. The usual first step in converting these sites to longleaf forest is to establish the trees themselves. Reforestation, of course, must be through planting. Seeding directly with longleaf seed is seldom successful. If seed is broadcast, germination is uncertain and predation on the seeds by birds and small mammals can be severe. Planting individual seeds by hand or drilling the seed into the soil is labor intensive and usually success is spotty.

Preparing the site for planting seedlings is critical. If there are pasture grasses present, they should be killed before planting is attempted. Killing grasses like Bermuda, fescue and Bahia is difficult and requires herbicides and more than one year or treatment. An effective technique includes mowing, allowing the grass to grow back to about 6 inches in height, and then applying either 5 quarts of Roundup or Accord or 20 ounces of Arsenal per acre. The Roundup/Accord treatments can be applied anytime the grass is growing. The Arsenal approach is most effective in late spring or early summer. Follow-up spot treatments will likely be necessary to control these tough competitors, especially the Bermuda.

In both pastures and old fields, the next step is to scalp the site. Scalping peels back the top 2-3 inches in old fields and 3-4 inches in sod pastures in a shallow furrow 24-36 inches wide. Scalping implements are available commercially or may be made from modified fire plows. There are commercial vendors in many areas that will provide scalping services. It is extremely important to rigorously follow contours when scalping, and to leave soil plugs in the rows. Soil movement along the scalped furrow can not only doom the planting effort, but damage water quality and ruin the productivity of the field for future generations as well.

Unless the site has been sub-soiled within the past two years, it is usually a good idea to pull a ripper bar along the furrow. Depth of the rip should be from 18 to 24 inches. If planting is to be done using a mechanical planter, it is recommended that the rip be oriented as much as a foot off center in the scalped area. This is done so that the seedlings may be planted in the center of the furrow and not in the ripped area. If trees are to be planted by hand, they should not be planted in the rip, but 6 inches or more to one side. Scalping greatly improves survival in agricultural areas. The furrow typically remains virtually weed free for much of the first growing season, reducing competition for moisture and nutrients. In addition, there is evidence that scalping reduces loss to a number of pests and diseases, including white fringed beetle grubs and charcoal root rot.
A period of several weeks and rains should be allowed to pass after the scalping and ripping operation before planting. The soil disruption caused by the ripping should be allowed to settle as much as possible to eliminate washing and air pockets. Planting should be accomplished as soon in the fall as there is adequate moisture in the soil. All planting should be completed before Christmas if at all possible. Planting earlier in the fall gives the seedlings a chance to initiate root growth before entering dormancy and gives them a head start the following spring. It is recommended that planting be done with containerized seedlings in these situations. Recent research indicates that seedlings should be planted so that $\frac{1}{2}$ to 1 inch of the plug is exposed, especially in scalped areas. Soil tends to move into these areas and seedlings with terminal buds covered by soil are not likely to survive.

In the spring following planting, an herbaceous weed control treatment might be desirable. One frequently recommended treatment is 2 - 3 ounces of Oust per acre in March or April. The addition of 10.67 ounces per acre of Velpar DF gives broader spectrum control and may extend the effectiveness of the treatment. A mixed version of these two chemicals, formerly sold as Oustar, can also be applied at a rate of 10.5 ounces per treated acre. These treatments are applied directly over the top of the seedlings and generally in a band 3-4 feet wide or in 4 foot diameter spots over each seedling. In banded treatments, total volume of spray (chemical plus water) should be at least 10 gallons per acre.

Before spraying, one or two seedlings should be excavated and checked for new root growth. If the seedlings have not begun to initiate new root growth outside the plug, delay spraying until that occurs. Also, areas where soil pH is high (greater than 6.0) should not be treated with Oust. Oust is a root growth inhibitor and high pH tends to exacerbate its effectiveness. If root growth on new seedlings is retarded by the chemical, April and May droughts may cause high mortality.

Another herbicide combination that has proven to be successful in these situations is Arsenal and Oust. However, Arsenal should not be applied over longleaf seedlings before May 15th. One treatment combines an early treatment with 2 or 3 ounces of Oust per treated acre in March or April followed by a subsequent treatment, if needed, with 5 or 6 ounces of Arsenal per treated acre after May 15th or later. The Arsenal and Oust may be applied together in one treatment after May 15th. Late germinants, such as crabgrass, can prove disastrous to old field and pasture plantings if only the early treatment is used. The Alliance staff can help you with more information on some common herbicides, how they work, what species they are likely to control, which species are tolerant or resistant, and recommended methods of application.

Since these sites generally have no remnants of the native forest understory vegetation and little or no seedbed to draw on, the use of chemicals to control vegetation does little damage to the total restoration effort. Once the trees are established on agricultural sites, they can be burned after a year’s growth. It may be difficult to use fire effectively on many of
these sites because there is often very little fine fuel on the ground to carry the fire. Old field weeds like dog fennel, ragweed, and goldenrod do not burn well and are not effective at carrying fire. Broomsedge (Andropogon) is a better fuel and will carry a fire if there is a slight wind.

Longleaf is fire tolerant, but the stage when they are 6 inches to three feet tall is the most vulnerable. Trees in this size class should not be burned in the growing season when they are "candling" (when the terminal bud is elongating and is tender and white). Young longleaf may be burned successfully with strip headfires, although other types of fires may be successful as well. Mowing between rows may be helpful for access and to help carry fire, but care should be taken to avoid damaging seedlings.

Restoring the understory in these situations is extremely difficult because there is typically no seed source in place and the competition from agricultural weeds is fierce. The protocols for establishing native plants on these sites are still in the development stage and can be very expensive. Seeds of some of the legumes, like partridge pea, are readily available commercially and are relatively inexpensive. Planting is not difficult and they will re-seed following disturbance (e.g., fire or light disking) for several years after establishment. Most of the other desirable natives are not widely available (at this time) and success in re-establishing them is spotty at best. Wiregrass can be started from seed or containerized plugs. Plugs are more expensive, but more reliable. Seed is not readily available, and germination is unpredictable at this point. Other native grasses and forbs can also be planted from seed with planters like the Truax or Wildlander brands, but the species most readily available are not necessarily native to the longleaf region. Many native grass and legume species are slow colonizers, so spread from adjoining forest land or from newly established sources in the field itself is likely to be extremely slow. Continued burning of old field sites over many years can eventually restore native ground cover species. The cost in dollars is relatively low, but the time investment may be high.

Pine Stands (not Longleaf) With No Recent Fire History
There are many essentially pure stands of pines of species other than longleaf on former longleaf sites. Some of these are the result of earlier removal of longleaf and re-colonization by loblolly, shortleaf, or, occasionally, slash pine. Many more are the result of deliberate replacement of longleaf by planting either loblolly or slash pine. These sites must be reforested to longleaf by planting as there is no available seed source. The task of restoring the groundcover is directly linked to the previous history of fire in the stand.

To restore the form and function of a longleaf ecosystem from this forest type requires the re-introduction of fire into the system first. If the period without fire has been extremely long and fuel accumulations are high, some type of fuel treatment may be necessary to avoid
damage to the existing stand. These treatments might include mowing and/or herbicides prior to the burn to reduce "laddering" of fuels and get fuels down onto the ground where they can deteriorate prior to the fire. In any event, if fuel buildup is a concern, the first burn should be a cool one. For example, the burn should be in the dormant season on a cool day with moderate humidity, fuel moisture, and wind to carry the heat out of the canopy quickly. The type of fire can vary, but strip headfires with a chain (66 feet) or less between strips is a good compromise between a slow backfire and hotter fires. On-site observations are necessary to prescribe fire correctly.

It may be necessary to follow this initial fire with a second dormant season fire within two years under similar conditions. The first fire will reduce fine fuels on the forest floor, but only top kill woody vegetation, creating a potential problem for the next fire. A second dormant season fire will "knock down" and begin to consume some of that dead fuel. An assessment of fuel conditions should be made after the second fire to determine if fuel conditions will allow a growing season fire.

If the stand is dense and the owner is patient, a thinning might be performed at this point to encourage groundcover plants. If a thinning is performed, planning for the next fire should take into consideration the resulting slash and protect the residual trees. After the thinning and the first growing season burn, fire should be continued on at least a 3-year and preferably 2-year interval for at least 2 cycles. Ideally, at least 2 successive growing season burns should be performed prior to harvest of the overstory in preparation for reforestation.

The regeneration harvest can take two forms. The typical technique is to clearcut the existing stand and, after site preparation, replant with longleaf seedlings. If the burning regime has been effective, the site preparation can be minimal, consisting of reducing or removing the woody debris to allow the planters access to the site. Spot herbicide treatments might be desirable to control persistent woody clumps, but broadcast chemicals should not be necessary. Optimal growth of the seedlings will require control of the herbaceous vegetation with chemicals, but care should be taken to protect desirable native understory species.

Another less frequently used technique is to leave some of the existing stand intact to act as a fuel source for future fires and to maintain the appearance of a forest while the new stand develops. Under-planting with containerized seedlings can be accomplished in the newly created gaps. Growth and survival of the new stand will be affected negatively. Competition by seedlings from the residual trees poses a greater problem. Fire will be necessary to control that regeneration while the longleaf becomes established. Eventually, the overstory should be removed in a series of steps, creating or enlarging existing gaps for under-planting. The size of the gaps is important. If they are much more than ¼ acre in size, it is difficult to get enough fire into the centers to control invading pines or hardwoods. Gaps of
that size or smaller allow few resources for the new seedlings and make survival and
growth problematic.

In either case, fire must continue to be used regularly to maintain the stand and to
encourage desirable native understory plants. The new seedlings can be safely burned
within a year of planting. When the seedlings are just emerging from the grass stage (0.5 - 4
feet tall), they are vulnerable to fire and should be burned very carefully or not at all. Once
the trees are 4 feet tall or taller, they can be burned fairly safely unless they are
candling. Once they are more than 6 feet tall, they can be burned safely in any
season. Remember, they are fire-tolerant, not fire-proof. One recommended technique
employs narrow strip headfires for the early burns. Later fires can take many forms, but
growing season fires should be part of the mix. If the understory does not respond, it may
be because the site was farmed prior to the previous stand, not uncommon in the
Southeast.
The historical relationship between Florida and fire:

- Lightning-caused fires - mainly summer months - most areas probably burned in May-June
- Human-ignited fires
  - native Americans used for variety of reasons
  - widely applied in early 1900s - mainly winter
- Fire exclusion policy 70+ years

Prior to European Settlement

Two Main Causes

- Lightning
- Indigenous People

Natural Forces in FL

- Unique vegetation
- Hydrology and flat terrain
- Intense storms
- Drought cycles

Suppression to Prevention

Two Main Influences

- You can stop this shameful waste!
Sandhill
Fire return interval 1-4 years

Mesic flatwoods
Fire interval: 1-7 years in S FL
2-7 years in N FL

Scrubby flatwoods
8-25 yr return interval prevents sand pine encroachment

“The annual burning….is the prime preserver of the grand forests of *Pinus Palustris* (Longleaf)……we believe that total abolition of fire ….would mean the annihilation of her grand lumbering pineries.”
Ellen C. Long, 1889

If Fire is Absent?

- Vegetation
  - tree density & cover increase
  - composition shifts to shade tolerant species
  - growth rates & tree vigor decline
  - herbaceous forage and shrubs decline

- Soils
  - organic matter accumulates
  - nutrient cycles slow

Relationship between Florida & Fire
A few months makes a difference: Wiregrass seed production

Common Reasons why we prescribe fire

- Ecological
- Wildlife
- Protection
- Forest Management
- Range Management
- Water Management
- Access
- Exotic Control
- Aesthetics

Highlands County sandhill 1929
Burned in 1927

Highlands County 1987
60 years fire exclusion
Transition to sand pine scrub
Low-bush blueberry
Fruit yield increases 1 season following fire

(The bobwhite might probably be called the “fire bird,” so closely is it linked ecologically with fire in the coastal pinelands.
— Herbert L. Stoddard, Memoirs of a Naturalist

Effects on Animals:

* Many Florida species have evolved in a fire environment
* Mortality levels are generally low
* Effects on cover and food sources are substantial but vary across the landscape
* Fire intensities may be:
  * reduced by grazing
  * increased by insect damage

Long leaf pine release

Longleaf Pine Seedling

Brown spot
Southern Pine Beetle
Hardwoods
Japanese and Old-World Climbing Ferns

Lygodium

Cogon Grass

Summary

Effects on Plants

- Plant community responses are predictable
- Fire effect is created by interaction of weather, fuel conditions & site moisture
- Plants vary in adaptations to fire
- Post-fire conditions significantly effect recovery & productivity
- Landowner should document burning conditions and post-fire responses
Direct Effects on Animals

- Vertebrates
  - Mortality: mobility decreases this risk
  - Loss of nesting sites and young
  - Immediate increase in food source for predators
- Invertebrates (*Spiders, insects, etc.*)
  - Mortality high in burn area for life stages in litter or on plants, but rapid invasion by some species may follow burn

Indirect Effects on Animals

- Cover is temporarily decreased
- Microclimate is modified
- Food sources & nutritional quality increase
  - Plant species diversity increases
  - Foliage of new herbaceous plants and shrub sprouts is more palatable and higher in nutrients (N,P) and crude protein
  - Seed production of many species increases
  - Abundance and diversity of insects may increase
  - Prey are more visible for predators

Plant Adaptations to Fire

- Flower & seed production stimulated
- Seed germination stimulated (*seed or soil conditions*)
- Rapid growth & development (*longleaf pine*)
- Fire-resistant bark (*pines, mature hardwoods*)
- Adventitious buds (*gallberry, pond pine*)
- Root sprouting (*oaks, grasses*)
- Serotinous cones (*sand pine*)

Every Rx fire:

- Provides some Ecological Benefit
- Tradeoffs

Pyro-Possum!
Managing Wildlife in Longleaf Forests

Mark Asleson
Landowner Assistance Program

FWC Mission Statement

Managing fish and wildlife resources for their long-term well-being and the benefit of people.

Office of Conservation Planning Services (OCPS)
What we do!

Landowner Assistance Program
• Technical Assistance - Habitat
• Technical Assistance - Species
• Management Plan Development
• Landowner Cooperatives
• Outreach/Inreach

Land Use Planning Program
• Private Sector Collaboration
• Public & Government Coordination
• Resource Identification
• Avoidance and Minimization
• Site Recommendations

What makes a longleaf pine forest?

“…expansive, airy pine forests…the earth covered with grasses, interspersed with an infinite variety of herbaceous plants, and embellished with extensive savannas, always green…”

William Bartram

What happened?

• Longleaf occurred on an estimated 90 million acres at its peak, dominating on an estimated 60 million acres - probably the largest area on the continent dominated by a single tree species.
• By the mid-1900’s, over half of that forest was gone.
• By 1995, an estimated 3 million acres remained, most of it in poor condition.

What happened?

• Logging, especially following development of steam technology.
  3.7 billion board feet in 1896
  From 1870-1930, all virgin forests logged.
• Naval Stores industry, especially after development of the copper kettle still in 1834
  Net profit per tree about 32¢
What is the significance to wildlife?

• Among the most biologically diverse communities in the U.S.

• 80+ species of birds (excluding migrants) utilize this community to fulfill essential aspects of their life histories (Engstrom 1993).

Longleaf Pine Ecosystem

29 species (27 vertebrates, 2 invertebrates) listed as special concern, rare, threatened or endangered are associated with this ecosystem

Bachman’s sparrow

• Benefits from frequent fires
• Three year burn rotation
• Declines after four years of no burn; gone by seven
• Growing season burns most beneficial
• More than one brood per season
• Benefits from RCW management

Henslow’s sparrow

Overwinters only, likes moist, grassy sites and will abandon if fire excluded more than three years

Southeastern American kestrel

• Nest in large dead trees, uses cavities excavated by woodpeckers
• Feeds primarily on insects and small lizards.

Red-cockaded woodpecker

• Endangered
• Cooperative Breeder
• Family Groups
• Territorial
• Old Growth Pines
• Free of Midstory
• Rich Groundcover
• Fire Maintained
BREEDING BIRD SURVEY (FWS REGION 4) INDICES FOR NORTHERN BOBWHITE AND LOGGERHEAD SHRIKE, 1966-2000

What practices can be used to manage longleaf forests to ensure that they support essential life behaviors (feeding, reproducing, nesting, loafing, etc.) for wildlife?

Benefits of Prescribed Fire

- Frequent (2-3 year cycle, on very dry sites 3-4), low-intensity fires are the most cost-effective habitat management tool.
- Late dormant to early-growing season (March-July)
- Mosaic of small burn units - 20 to 100 acres each

Benefits of Fire:
- Kill off competing species
- Remove fuel
- Recycle nutrients trapped in litter
- Expose mineral soil for seed bed
- Scarify seeds
- Increase legume abundance
- Increase soft mast
- Maintain usable structure of ground cover

Forestry Practices

- Thin your stand at the earliest age possible
- Burn your stand on a short rotation (2 to 4 years)
- Manage for longer rotation
- Favor longleaf pine over slash or loblolly, where appropriate
- Leave snags (Dead Trees)
- Reduce and rethink the need for scorched-earth herbicide use.
- Do not bed the stand
- Plant at lower densities – 450 to 600 trees/acre

Getting Assistance

- Florida Fish and Wildlife Conservation Commission – Landowner Assistance Program (LAP)
- U.S. Fish & Wildlife Service (USFWS) - Partners for Fish and Wildlife
- USDA Natural Resources Conservation Service - Environmental Quality Incentive Program (EQIP)
- Florida Forest Service - Forest Stewardship Program
- Florida Land Steward (http://flsteward.org/)
- University of Florida, Institute of Food and Agricultural Sciences (UF/IFAS)
Longleaf Pine Regeneration

Chris Demers, Alan Long, and Patrick Minogue

Longleaf pine (*Pinus palustris*) has many favorable characteristics for landowners who have long-term, multiple-use resource management objectives. Of all the southern pine species, longleaf pine is the most insect-, disease-, and fire-resistant and has the greatest longevity. When burned regularly, longleaf pine forests develop a stable grass savannah ecosystem, providing ideal habitat for many plants and animals.

Longleaf pine is a pioneer species on a variety of sites but is intolerant of competition and flooding during its grass stage, when it appears like a clump of grass. Historically, fire and moisture have been the principal factors controlling longleaf distribution within its natural range. In the lower Coastal Plain longleaf grows on sandy, well-drained to excessively well-drained soils where loblolly or slash pine perform more poorly. Fire removes competing vegetation, exposing the bare soil necessary for successful seedling establishment. In the historic fire-dominated longleaf pine grass savannah ecosystem, relatively stable plant communities are characterized by an overstory of uneven-aged, widely spaced longleaf pines and fire-tolerant oaks such as bluejack oak (*Quercus incana*) and turkey oak (*Quercus laevis*) and a predominate ground cover of bunch grasses such as wiregrass (*Aristida stricta*) and bluestems (*Andropogon spp.*) which facilitate ignition and spread of periodic fires (Landers 1991). It is interesting to note that, despite this tree’s performance on high, dry ground, its Latin name means “swamp pine.” It does grow sparsely in wet areas as well.

**Artificial Regeneration**

Options for artificial regeneration include planting of bareroot or containerized seedlings or direct seeding. Control of pine stocking (density) is best when seedlings are planted and container-grown seedlings generally provide the best survival rate. However, direct seeding may be a viable option for some situations, such as regenerating relatively small areas.

**Site Preparation**

Longleaf pine is very intolerant of shade and is difficult to regenerate successfully without vegetation control. Vegetative competition around seedlings must be kept at a minimum until an adequate number of seedlings emerging from the grass stage are at least as tall as the competition. The type and degree of site preparation and the choice of site preparation methods before planting longleaf seedlings will depend on the regeneration technique used, site conditions and your management goals.
At the very least, prepare the area for direct seeding by first performing a prescribed burn. Disking also enhances seeding establishment by exposing mineral soil and reducing competing vegetation for a short period of time. More challenging site conditions require more extensive site preparation techniques to increase the likelihood of success.

The most common situations encountered include recently harvested forest sites and conversion of old fields and pasture land. On recently harvested forest sites, most residual hardwoods should be removed with heavy machinery such as a root rake or controlled using various herbicides (Table 1). Following herbicide treatment, broadcast site preparation burning is often done to improve hand or machine planting access. V-blade planters are used to improve machine planting access by pushing debris away from the planted row. On old fields and pastures ripping will help break hardpans (compacted soil layers) and scalping a narrow (1–2 ft) strip, about 2 to 3 inches deep, along the planted row will break up the sod and improve the effectiveness of the planting machine in setting the seedlings with good soil contact. Scalping and ripping are usually done following the contour on sloping land to avoid erosion problems. It is best to rip the soil during dry periods in the summer to obtain good soil fracture and well in advance of the planting season, so that eventually rain will settle the soil prior to planting in the late fall or winter. When planting into established grass sod, the most effective practice is to deaden the sod with glyphosate herbicide (Table 1) either by broadcast application or by treating a 5–6 ft wide band centered on the planted row prior to planting. Herbicide control of grasses is very important for successful longleaf establishment, and glyphosate is most effective when applied during periods of active grass growth. Disking established sod prior to planting is not recommended because it makes herbaceous vegetation control after planting very difficult.

The best results are obtained when vegetation is managed both before and after planting. During the first and sometimes the second growing season following planting, selective herbicides are used to control grasses and broadleaf weeds (herbaceous weed control). This practice significantly improves seedling survival, and accelerates seedling growth rates by reducing the period that seedlings remain in the grass stage by one or more years. In longleaf plantations in the sandy soils of the Coastal Plain, hexazinone and sulfometuron methyl are the most commonly used herbicides for herbaceous weed control in longleaf pine plantations (Table 1). These herbicides may be applied directly over planted seedlings safely when care is taken to ensure the proper herbicide rate is applied and labeled method is followed. Pine tolerance to these herbicides is best when seedlings have initiated new root growth following transplanting. Many growers excavate a few trees prior to herbicide application to check for new roots, which are white in color. Herbaceous weed control treatments are most effective when weeds just start to develop in the Spring, which is typically in late March through mid-April.

Once seedlings are established, a prescribed burning program is a natural and cost-effective means to manage hardwood vegetation and also shift the ground cover to grass savannah species which provide desirable habitat for many desired wildlife species (Platt et al. 1998; Noss 1989).

**Planting**

Since longleaf pine seedlings do not become truly dormant, they require greater care in handling and planting than other southern pines. The success of longleaf pine planting depends on (1) good soil moisture at and following planting; (2) a well-prepared, competition-free site; (3) fresh, healthy, top quality planting stock; (4) extreme care in handling the stock from lifting to planting; (5) quality planting; and (6) managing competing vegetation through stand establishment. High quality seedlings can be grown as either bareroot or container stock, but container stock is somewhat more forgiving of less than optimum conditions.

The appropriate planting density will depend on your objectives. Low planting densities, 300 to 500 seedlings per acre or less, may be appropriate for longleaf ecosystem restoration and/or to provide wildlife habitat (such as that for bobwhite quail), whereas as many as 750 seedlings per acre or more may be desirable to optimize timber production and pine straw raking.

Supplies of longleaf pine seedlings may not be sufficient to meet demands, so order your seedlings by early summer at the latest. For a list of longleaf nurseries, call your Florida Forest Service County Forester (http://www.freshfromflorida.com/Divisions-Offices/Florida-Forest-Service/For-Landowners/County-Foresters) or the Longleaf Alliance, at 334-427-1029, and request a copy of the Longleaf Nursery List. This is also available on their website: http://www.longleafalliance.org/.

Choose a tree planting contractor that has experience with planting longleaf pine. Planting failures frequently result from improper seedling handling and planting. Hiring an experienced and reputable contractor may help to ensure...
seedling survival and minimize the possibility of having to replant.

BAREROOT SEEDLINGS
Longleaf pine seedlings at the nursery are stem-less and resemble a carrot with a clump of pine needles on top. Ideally, bareroot seedlings should have (1) a root collar diameter (RCD) of 0.4 to 0.6 inch; (2) a stout, 6- to 8-inch or longer tap root; (3) at least 6 well-developed, 6- to 8-inch lateral roots with evidence of ectomycorrhizal development; (4) a winter bud with scales; (5) abundant, large, fascicled needles that are free of brown-spot disease; (6) been grown at a reputable nursery; (7) been undercut in the nursery bed well before lifting; and (8) a seed source from the same region as the planting site. Seedlings with a RCD of 0.3 inch or less generally have low survival rates.

Longleaf seedlings come out of the grass stage and initiate stem height growth when the seedlings have a RCD of about one inch. After planting, longleaf seedlings allocate their growth to develop a tap root prior to initiating stem height growth. As noted above, seedlings may initiate height growth at a younger age if competing vegetation is controlled. Once the seedlings emerge from the grass stage, height growth is comparable with loblolly or slash pine of the same age.

CONTAINERIZED SEEDLINGS
There is increasing interest in using containerized longleaf pine seedlings (plugs) because they generally have greater survival than bareroot seedlings. Also, containerized seedlings can be planted throughout the year, whenever soil moisture is adequate before and after planting. Containerized seedlings have even been successfully planted during the hot summer months, when afternoon rains are common. They can be used to replant partial regeneration failures in the year they occur as well. Studies have shown that both fall-planted and late winter-planted containerized longleaf seedlings often have better survival and growth than winter-planted bareroot seedlings. Seedlings grown in large containers (large plugs) can enhance survival on adverse sites, but to ensure success sufficient site preparation and vegetation control measures must be taken.

The main drawback of containerized seedlings is cost. On average, the price per thousand is about twice as much for container-grown seedlings as the cost for bareroot seedlings. The larger the plug volume, the greater the cost to produce the plugs. Also, containerized seedlings are more bulky to handle during shipping and planting. However, cost-share programs and increased survival make them a feasible option.

NURSERY TO FIELD
Proper care and handling of seedlings from the nursery to the field includes several steps: (1) pick up seedlings from the nursery the day they are lifted; (2) protect roots from desiccation; (3) protect seedlings from wind and refrigerate them if possible during transportation to the planting site (place plugs loosely in large coolers or waxed boxes); (4) store seedlings in a cool, well-ventilated area for no more than three days before planting (or up to 3 weeks in refrigeration, 5 weeks with humidity control); and (5) do not expose seedlings to sunlight or heat. To optimize success, plant seedlings within three days of pickup from the nursery. Large planting jobs may require multiple trips to the nursery.

Longleaf seedlings are normally planted between November and the beginning of March when cool temperatures are prevalent and soils are normally moist. Planting during the early part of this time frame is best to give seedlings time to grow new roots before the dry weather of April and May. Containerized seedlings can be planted earlier whenever available soil moisture is adequate and rainfall occurs as noted above, but risks are diminished during the winter planting season. Avoid planting during periods of low soil moisture, dry weather, high temperature, low relative humidity, high winds or when soil is frozen.

Take enough seedlings to the field for one day of planting and keep them moist, but not submerged. When hand-planting bareroot seedlings, keep a little water or wet Tera-Sorb in the bottom of the planting bag. Make sure tree planters carry seedlings in the bag to prevent the roots from drying out.

For bareroot seedlings, machine planting is preferable to hand planting because the larger slit created by the machine provides for better root alignment. If hand-planting, bareroot seedlings should be planted with a shovel or large dibble. Containerized seedlings can be planted with a cylinder-type dibble or any of the flat-bladed implements used to plant bareroot stock.

For bareroot stock, position seedlings with taproots straight down and root collars at or slightly below the ground line (no more than 1 inch below), which allows the bud to be exposed once the soil has fully settled. Attention to detail during planting is critical—a seedling planted too shallow will die quickly, and a seedling planted too deep will die slowly.
For **containerized seedlings**, position the plug so that the terminal bud is just slightly above the soil surface to insure the seedling is not planted too deep; the terminal bud must remain above the soil surface. Planting plugs too shallow could cause them to dry out and die.

Do not plant directly in a subsoiled/ripped furrow because the seedlings may sink. Instead, offset 2–4 inches to the side of the ripped furrow.

On scalped sites with sandy soil, soil movement back into the scalped furrow should be anticipated, and containerized seedlings should be planted somewhat more shallowly. Optimum planting depth will depend on conditions; sandy soils and sloping ground tend to have more soil movement. Recent research by the Longleaf Alliance suggests that on scalped sites prone to soil movement leaving approximately ½ to 1 inch of the plug above the soil surface may position the terminal bud at an optimum final height, favoring good survival. However, keep in mind that planting plugs too shallowly will increase the risk of the seedlings drying out and dying, especially if an extensive dry period follows planting.

**A WORD ABOUT COST-SHARE CONTRACTS**

If you have a cost-share contract under the USDA’s Conservation Reserve Program or Wildlife Habitat Incentives Program, the planting crew must know about it. If not, they may plant more than the maximum number of seedlings allowed in the terms of the contract, causing problems with your funding.

**POST-PLANTING CARE**

Once seedlings are planted, the principal factors affecting seedling development are vegetative competition and brown-spot needle blight. Prescribed fire is the most common cultural treatment used to control both. If average brown-spot infection exceeds 20% of the cumulative foliage on sampled seedlings, a burn will be needed to control the disease unless it will result in excessive mortality. Seedlings in the early stages of height growth (coming out of the grass stage) are most susceptible to fire kill, especially when heavily infected by brown-spot.

**Direct Seeding**

Due to increases in seed costs, this once cost-effective regeneration option is now potentially cost prohibitive, and it involves substantial risk. Failure can occur as a result of inadequate control of competing vegetation, low seeding rates, using seed not treated with bird or rodent repellent, seeding at the wrong time, or adverse weather conditions. Often, direct seeding results in stands with patchy stocking, with some areas not adequately stocked and some areas with too many trees. Low, poorly drained sites that are likely to be covered with standing water a week or more after seeding should be avoided. Likewise, deep upland sands that dry out rapidly after a rain are also unsuitable for direct seeding. Generally, sites that can be successfully planted can also be successfully seeded. As with planting, site preparation methods must control vegetative competition and expose at least 50% of the mineral soil. Seeds must be in contact with the mineral soil for germination to take place. Seeds lodged in non-soil material will probably not become established.

In general, local seed sources are best. Seed or seedlings from North and South Carolina tend to grow poorly when planted on the Florida peninsula and vice versa. Most genetic improvement work with longleaf pine is concentrated on breeding for brown-spot disease resistance and accelerated initial height growth.

Purchase seeds from a reputable seed dealer. Longleaf seeds should be refrigerated at subfreezing temperatures until sowing. Sowing can take place in fall, when moisture is adequate and maximum daytime temperatures drop below 85 degrees. Seed can be sown at low cost by broadcast seeding at 3 pounds per acre, or spot seeding (dropping 3 to 5 seeds per spot). Row seeding, at 1 to 2 feet spacing between seeds, can be used when better control over spacing and density is desired. Large areas are best seeded by aircraft which use carefully calibrated equipment. After establishment (two to three years), clumps of seedlings can be thinned down to one tree.

**Natural Regeneration For Even-Aged Stands**

Landowners who already have stands of longleaf pine can take advantage of a practical, inexpensive natural regeneration method known as the *shelterwood* system, a natural seeding method well-suited to the biological requirements of this species. The shelterwood method maximizes per-acre seed production and yields sufficient needle litter to fuel fires hot enough to inhibit hardwood regeneration and to prepare a seed bed. Regular prescribed burns should be scheduled throughout the rotation to maintain a low understory. The mature stand is removed in a series of three harvests, with a portion left standing as a seed source until regeneration is well established. Success with this method depends on (1) a good seed year with adequate seed supply,
Longleaf Pine Regeneration

Longleaf Pine Regeneration

The three harvests of the shelterwood system serve three basic purposes: (1) to prepare the stand for production of abundant seed, (2) to modify the environment in a way that promotes germination and survival, and (3) to build up the amount and size of advance regeneration to ensure a well-distributed stand following overstory removal.

Preparatory Cut

The preparatory cut may be 10 or more years before the planned final “removal” harvest date of the stand and at least 5 years before the “seed cut”. This preparatory cut is essentially a thinning which reduces the basal area (BA) of the stand to a maximum of 60–70 square feet per acre of dominant and codominant pines. This cut promotes crown development and cone production. Most of the hardwoods not controlled by fire should also be cut at this time.

Seed Cut

The seed cut is made 5 years prior to the planned removal harvest and leaves no more than 30 square feet BA per acre of the largest dominant trees, with well-developed crowns and best stem form, typically 15 inches diameter at breast height (dbh) or greater. Trees with evidence of past cone production are favored. Cone production peaks in the range of 30 to 40 square feet BA per acre, but the lower end of this range is preferred because logging-related seedling losses increase when more trees are removed in the final cut.

Monitor the cone crop by taking spring binocular counts of both flowers (next year’s cone crop) and 1 year-old conelets (this year’s cone crop) on selected sample trees in the regeneration area. These counts will give an estimate of the potential for the cone crop to regenerate the stand so that the seedbed can be prepared before the cones open. Generally, few seeds are produced by trees under 30 years old or under 10 inches dbh.

In order to achieve adequate natural regeneration, the available seed supply must feed various forms of wildlife with enough left over to establish a satisfactory stand. A minimum of 750 to 1,000 or more cones per acre is needed for successful regeneration. Longleaf cone crops are highly variable. Good seed crops occur every 5 to 10 years. Seedfall begins in late October and continues through November, but most seeds fall within a period of 2 to 3 weeks. About 70% of viable seeds fall within 65 feet of the parent tree. Under favorable weather conditions, seeds will germinate one or two weeks after dispersion. A prescribed burn 1 year before seedfall will remove accumulated litter and expose sufficient mineral soil for seedling establishment. A late-spring burn is most effective in controlling woody stems.

Removal Cut

Once an acceptable stand of seedlings is established, the parent overstory can be removed. This cut can be delayed if necessary for management needs or market conditions. Seedlings can survive 8 or more years under the parent overstory with little or no effect on survival given exclusion of burning. However, logging damage becomes more serious once seedling height growth begins and fire exclusion leads to encroachment of competing hardwoods.

Naturally regenerated stands require the same attention as planted stands with respect to brown-spot disease and competing vegetation. Young stands should not be burned until at least 2 years after the removal cut to allow time for logging slash to decay and the seedlings to respond to release.

Natural Regeneration for Uneven-Aged Stands

Uneven-aged stands are created using the selection system. In the selection system, trees representing a range in diameter classes are harvested at fixed intervals (called the cutting cycle, which ranges from 10 to 25 years). Regeneration (either natural or artificial) occurs in the harvested openings. This management approach allows periodic harvests, while maintaining a continuous forest cover. Smaller, lower quality trees are also removed to improve the overall quality of the stand. This method is covered in detail in this publication on opportunities for uneven-age management: http://edis.ifas.ufl.edu/fr132.

Conclusion

Longleaf pine has many desirable characteristics for landowners who have multiple-use forest management objectives. On appropriate sites, and with careful attention to detail during the regeneration phase, it is possible to enjoy the versatility of this species without compromising growth rates.

References

Anon. “Keys to successfully planting longleaf pine.” Brochure by the Longleaf Alliance. Andalusia, AL.


Table 1. Common herbicide treatments for longleaf pine establishment. Read and follow all label directions.

<table>
<thead>
<tr>
<th>Common Name/Soil Texture</th>
<th>Rate of Active Ingredient (ai) or Acid Equivalent (ae) per Acre</th>
<th>Trade Name</th>
<th>Amount Product per Acre</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hexazinone/For soil types:</td>
<td>2-3 lb ai/Ac</td>
<td>Velpar® L</td>
<td>4-6 qts/Ac</td>
<td>Hand “spotgun application” to soil on grid pattern or to soil around individual rootstocks in spring (see label). Works well for oak control on sandy soils.</td>
</tr>
<tr>
<td>Sand, loamy sand, sandy loam</td>
<td>3-4 lb ai/Ac</td>
<td></td>
<td>6-8 qts/Ac</td>
<td></td>
</tr>
<tr>
<td>Loam, silt loam, sandy clay loam</td>
<td>4-5 lb ai/Ac</td>
<td></td>
<td>8-10 qts/Ac</td>
<td></td>
</tr>
<tr>
<td>Silty clay loam, clay loam, sandy clay, silt, silty clay, clay</td>
<td>0.625 lb ai + 3.0 lb ai/Ac</td>
<td>Chopper® Accord® XRT</td>
<td>40 oz mass + 2.2 qts/Ac</td>
<td>Broadcast by helicopter or ground sprayer. Very broad spectrum hardwood control. Add 1% (v:v) methylated seed oil (MSO) surfactant to improve control.</td>
</tr>
<tr>
<td>Herbaceous weed control (grasses and broadleaf weeds) applied over-the-top of planted longleaf seedlings in early spring, at least one month after planting to allow for new root growth prior to herbicide treatment.</td>
<td>6 oz ai/Ac + 1.5 oz ai/Ac</td>
<td>Velpar® L Oust® XP</td>
<td>24 oz liq. + 2 oz mass/Ac</td>
<td>Tank mix, very broad spectrum for grasses and broadleaves.</td>
</tr>
<tr>
<td>Hexazinone plus Sulfometuron</td>
<td>7.6 oz ai/Ac + 1.4 oz ai/Ac</td>
<td>Oustar®</td>
<td>*12 oz/Ac</td>
<td>Pre-packaged mix, very broad spectrum. *Use 10 oz product on sandy soils.</td>
</tr>
</tbody>
</table>
Enhancing Habitat for Wildlife

Southern forests have the potential to provide productive wildlife habitat for a variety of species. Landowners interested in promoting wildlife must recognize that each wildlife species requires a specific set of habitat conditions. Animals will frequent your property depending on the condition, type, and variety of food and cover that are present.

Production of timber products and enhancement of wildlife diversity are compatible objectives. However, some tradeoffs may be necessary because strategies that maximize timber growth are typically not exactly the same as strategies that will provide habitat for a wide variety of wildlife species. For this reason, it is important to prioritize your objectives and decide where wildlife ranks relative to timber production in your land use planning.

Ten Tips for Increasing Wildlife Biodiversity in Your Pine Plantations: [http://edis.ifas.ufl.edu/uw319](http://edis.ifas.ufl.edu/uw319)

Ten Tips for Encouraging the Use of Your Pine Plantations by Game Species: [http://edis.ifas.ufl.edu/uw318](http://edis.ifas.ufl.edu/uw318)

Forest Groundcover Restoration: [https://edis.ifas.ufl.edu/uw314](https://edis.ifas.ufl.edu/uw314)

Establishing and Maintaining Wildlife Food Sources: [http://edis.ifas.ufl.edu/fr062](http://edis.ifas.ufl.edu/fr062)

Making the Most of Your Mast: [https://edis.ifas.ufl.edu/fr036](https://edis.ifas.ufl.edu/fr036)

Managing Oaks to Produce Food for Wildlife: [http://edis.ifas.ufl.edu/uw293](http://edis.ifas.ufl.edu/uw293)

Providing Wildlife Cover: [https://edis.ifas.ufl.edu/fr124](https://edis.ifas.ufl.edu/fr124)

The Importance of Bottomland Hardwood Forests for Wildlife: [http://edis.ifas.ufl.edu/uw316](http://edis.ifas.ufl.edu/uw316)
Cogongrass Control

Cogongrass (*Imperata cylindrical*) is a warm-season perennial grass species found throughout tropical and sub-tropical regions of the world. Native to Southeast Asia, cogongrass is an aggressive invasive plant that has spread to all continents except Antarctica and is considered among the worst problematic weeds in the world. In the United States, it is naturalized in Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Texas, and Oregon. It was first accidentally introduced in the United States near Mobile Alabama in 1912 and subsequently intentionally introduced from the Philippines into Mississippi as a forage crop in 1921. Early regional introductions contributed to the establishment of cogongrass in the Southeast. Cogongrass is regulated as a federal noxious weed.

Control of cogongrass is difficult because it spreads in two ways: by extensive rhizome systems and by seeds. Cogongrass rhizomes can comprise more than 60% of the total plant biomass. The rhizomes support rapid re-growth following mowing or burning.

**Control in Pine Forests**
Chemical control is required. Glyphosate, imazapyr, and combinations of the two herbicides are most effective. Eradication requires multiple applications. In many instances, selective control of cogongrass without damage to desired vegetation is not possible, but where the canopy of shrubs and trees is above that of cogongrass, glyphosate sprays may be directed to cogongrass in the understory with fair selectivity to the taller vegetation. Imazapyr, however, used in the quantities and at the application frequencies necessary to eradicate cogongrass, will kill hardwood trees and shrubs.

**Control in Hardwood Forests**
To avoid injury to hardwood trees or shrubs in mixed pine-hardwood stands, glyphosate alone is commonly used at 3 to 4 lb ai/acre (3 to 4 quarts per acre for many common 4 lb ai/gallon product formulations), and selectivity is obtained by spraying cogongrass in the understory and avoiding any spray contact near the crowns of trees and shrubs. Imazapyr will kill hardwood trees and shrubs.

**Biology and Control of Cogongrass in Southern Forests:** [https://edis.ifas.ufl.edu/fr411](https://edis.ifas.ufl.edu/fr411)

**Cogongrass Biology, Ecology, and Management in Florida Grazing Lands:** [https://edis.ifas.ufl.edu/WG202](https://edis.ifas.ufl.edu/WG202)
Pine Straw

Pine straw has gained popularity as a mulch in residential and commercial landscaping with increased interest in natural landscaping in urban and suburban areas. It is attractive, relatively low-cost, easy to work with, and suitable for various locations, including slopes. It plays an important role in water-efficient landscaping (xeriscaping) as water becomes an increasingly limited resource.

In Florida, pine straw raking has become an important industry, with an output similar to the value of pulpwood. Longleaf and slash pines are the favored southern pine species because their long needles bale well. However, loblolly plantations can be raked when demand is not met by the preferred species. Pine straw raking may begin when stands are as young as seven or eight years old, when pine straw yield is expected to be between 100 and 150 bales per acre. Trees yield the most pine straw at the age of about fifteen years, potentially producing between 200 and 300 bales per acre, depending on site quality, pine species, and management intensity.

The Importance of Pine Straw in Pine Stands and Potential Consequences of its Removal

Pine straw is the uppermost layer of forest floor consisting of recently fallen pine needles that have not yet decayed. Pine needles fall year-round with the peak fall in southern pines occurring late in the growing season and early winter, two years after the needles are produced. Pine straw used as mulch in landscaping has the same positive effect on plant growth that it has in the forest. The layer of pine needles, fresh and at various stages of decomposition, has many important functions in the forest, affecting its productivity.

- Pine straw plays an important role in nutrient cycling - as the needles decompose, the nutrients revert to available forms (available meaning that they can be absorbed by plant roots again) in a process called mineralization.
- After mineralization by soil fungi, bacteria, insects, and earthworms, pine straw contributes organic matter to the soil and improves its nutrient- and water-holding capacity.
- Pine straw reduces water loss from the soil surface, and it has great water-holding capacity, two qualities that help ensure that pine trees have the water they need to grow.
- Pine straw helps insulate the soil from temperature extremes and reduces the rate of moisture and temperature change.
- It reduces erosion and weed growth.
- Pine straw provides habitat and food for many animals and microorganisms that are important to the forest ecosystem because they contribute to litter decomposition or are a source of food for many wildlife species.

Harvesting Pine Straw for Profit: Questions Landowners Should Ask Themselves:
https://www.aces.edu/blog/topics/business-opportunities-forestry/harvesting-pine-straw-for-profit-questions-landowners-should-ask-themselves/

Guide to Fertilization for Pine Straw Production on Coastal Plain Sites:
https://edis.ifas.ufl.edu/fr395
Hurricane season is June 1 through November 30. As we have learned in recent years, powerful hurricanes can make their way inland and do considerable damage to forest and agricultural lands and enterprises. It’s never too early to start planning for a major hurricane that could make a direct hit on your land. There is no way to fully prepare for major devastation in advance, but there are some strategies and steps you can take to prepare you and your land for a major storm and recover more smoothly.

**Connect with Professionals**
Don’t go it alone. There are resources and services available to help with your land management activities, and these connections can give you a leg up in the event of a hurricane or other natural disaster.

**Work with a Consulting Forester and Get a Forest Inventory**
Consulting foresters provide technical assistance in all phases of forest management for a fee. Their services include management plan preparation, forest inventory, timber sales, thinning, tree planting, herbicide and fertilizer application, and prescribed burning. The expertise, guidance, and connections of a consultant can be invaluable in the recovery process after the storm. If you have a lot of value in standing timber, a forest inventory will provide a detailed account of that value, which can be important for documentation for financial assistance after a hurricane or other natural disaster.

**Get Connected to Assistance before the Storm**
Don’t wait for disaster to strike to contact the people and agencies that can help and provide management and recovery assistance. Get to know your University of Florida IFAS County Extension Agent and Florida Forest Service County Forester. They can provide valuable management assistance and will be knowledgeable about local recovery efforts, workshops, and available assistance after a hurricane.

Also contact your USDA Natural Resources Conservation Service and Farm Service Agency to see what assistance they can offer to help you reach your land management goals. Having your land or farm enrolled in an assistance program will help you get connected to recovery assistance when it is available after a natural disaster.

**Pre-Storm Preparation**

**Do some pruning** — Trees, especially those over structures and fences, should be pruned regularly to reduce broken or dead limbs that could cause damage.
Fill the tanks — Tanks containing fuel, herbicides, fertilizer, and other materials should be kept full, or otherwise secured, and to ensure that sufficient fuel is available for machinery used in recovery efforts after the storm.

Keep ditches clean — If present, ditches should be kept clean so excess storm water can drain properly.

Emergency equipment — Make sure that all emergency equipment; including generators, chain saws, air compressors, and other equipment; is on hand and in good working order.

Communications equipment — If you have them, ensure that radios are in good working order. Have hand-held portable radios with extra charged battery packs available for family or hired help after the storm. Direct truck-to-truck radio communication is most reliable when phone lines are down, but cellular phones with radio capabilities and standard cellular phones can help family and workers save valuable time during the recovery process, as opposed to communication systems that require communications to be relayed through a base unit.

Hazardous materials — Hazardous materials should be secured prior to a storm, and gasoline pumps, if present, should be shut down.

Emergency contacts — Have a list of phone numbers you might need in an emergency, including numbers for phone and internet service, utilities, fire department, police, and medical facilities.

Take photos — Take photos of your stands and/or fields before the storm so you can have a record of the condition of these areas before damage occurs. This could help with records needed for insurance claims and/or government assistance programs.

Time for harvest? — If in line with your management plan and objectives, consider harvesting mature timber stands to capture the full market value of the products you have. A salvage sale of a storm-damaged stand will only yield 10-15% of the normal market value. See Steps to Marketing Timber, https://edis.ifas.ufl.edu/fr130, for important considerations for selling your timber.

References


More Resources and Links

University of Florida / IFAS and other Extension Publications:

Considerations for Developing Effective Herbicide Prescriptions for Forest Vegetation Management, https://edis.ifas.ufl.edu/fr335

Herbicide Application Techniques for Woody Plant Control, https://edis.ifas.ufl.edu/ag245


Groundcover Restoration in Forests of the Southeastern United States, handbook available for download at: http://sfrc.ufl.edu/cfeor/publications/handbooks/


Resources from Partner Organizations:

The Longleaf Alliance is the “Go-to Resource for all things Longleaf", www.longleafalliance.org


The Natives, Inc., http://www.thenatives.net/

Florida Association of Native Nurseries, http://www.floridanativenurseries.org/
Forest Management and Stewardship Publications:
http://edis.ifas.ufl.edu/TOPIC_Forest_Management_and_Stewardship

- Assessing the Economic Feasibility of Short-Rotation Woody Crops in Florida
- Assessment and Management of Hurricane Damaged Timberland
- Beyond the Trees: A Systems Approach to Understanding Forest Health in the Southeastern United States
- Carbon Stocks on Forest Stewardship Program and Adjacent Lands
- Florida’s Forest Stewardship Program: An Opportunity to Manage Your Land for Now and the Future
- Forest Management in the Interface: Forest Health
- Forest Management in the Interface: Practicing Visible Stewardship
- Forest Resource Information on the Internet: Connecting to Today’s Online Resources
- Genetically Improved Pines for Reforesting Florida’s Timbers
- Improving, Restoring, and Managing Natural Resources on Rural Properties in Florida: Sources of Financial Assistance
- Improving, Restoring, and Managing Wildlife Habitat in Florida: Sources of Technical Assistance for Rural Landowners
- Longleaf Pine Regeneration
- Making the Most of Your Mast
- Management Practices to Support Increased Biodiversity in Managed Loblolly Pine Plantations
- Marking First Thinnings in Pine Plantations: Potential for Increased Economic Returns
- Opportunities for Uneven-Aged Management in Second Growth Longleaf Pine Stands in Florida
- The Optimal Forest Management of an Even-Aged Stand: The Biological Rotation versus the Land Expectation Value
- Ownership Succession: Plan Now for the Future of Your Land
- Selecting a Consulting Forester
- Steps to Marketing Timber
- Stewardship Ecosystem Services Study Series: Assessing Forest Water Yield and Regulation Ecosystem Services in the Lower Suwannee River Watershed, Florida
- Ten Tips for Encouraging the Use of Your Pine Plantations by Game Species
- Ten Tips for Increasing Wildlife Biodiversity in Your Pine Plantations
- Thinning Southern Pines—A Key to Greater Returns
- Tips for Integrating Land and Wildlife Management: Deer in Forests
- Tips for Integrating Land and Wildlife Management: Quail and Timber
- What Is in a Natural Resource Management Plan?
- What to Expect in a Forest Inventory
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