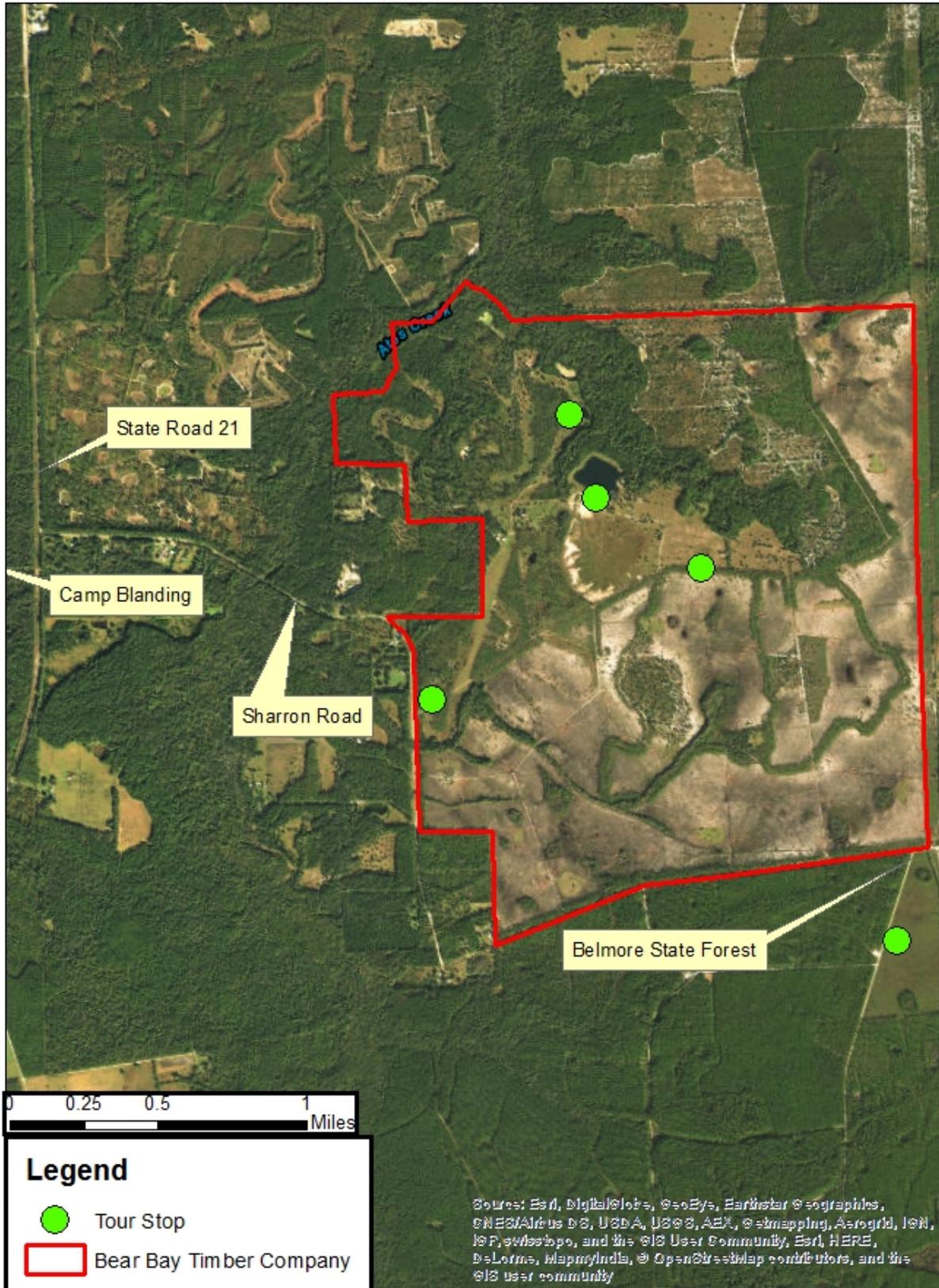




# Bear Bay Timber Company Forest Stewardship and Tree Farm Tour October 26, 2016



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<p>We appreciate the support of our  <b>2016 Florida Forest Stewardship Program Sponsors</b>            -listed on the back cover-</p>		



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# Forest Stewardship / Tree Farm Tour: Forest Management at the Landscape Level

## Bear Bay Timber Company Clay County, FL

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**Wednesday, October 26, 2016**  
**Meet at 9:00 AM ET, adjourn after lunch**

**Tour:** Thanks for joining us today to learn about and discuss slash and longleaf pine management, controlling invasive species like cogongrass, wildlife habitat improvements, Silviculture Best Management Practices and more. Take this opportunity to talk to your local contacts in the Florida Forest Service, UF/IFAS Cooperative



Extension Service, USDA Natural Resources Conservation Service, and other resource partners that can provide management and cost-share assistance, forest certification and many other resources and opportunities. After the tour enjoy networking and fellowship with other landowners in your area. Most of the tour will involve riding in vans with several discussion stops.



Funding for Florida's Forest Stewardship Program is provided by the USDA Forest Service through the Florida Department of Agriculture and Consumer Service's Florida Forest Service, a Tree Farm Program Education Grant, and the Florida Sustainable Forestry Initiative Implementation Committee.

## **Tour agenda**

**9:00 am**      **Sign in, meet and greet**

**9:15**            **Introduction, begin tour**

### **Stop 1 – Belmore State Forest**

Longleaf pine stand: Slash pines were harvested and the site was planted with longleaf pine containerized seedlings. This site has been burned once since planting. Due to its adaptation to fire and open canopy allowing light to the understory, longleaf pine is a good fit for landowners with both timber and wildlife habitat management objectives.

There are several cost-share assistance programs available from USDA Natural Resources Conservation Service, Florida Forest Service and other agencies that can assist with longleaf pine establishment and other forest and wildlife habitat improvements.

### **Stop 2 – Cogongrass**

In all forest operations it is important to consider that any mechanical disturbance of the soil with heavy equipment could potentially introduce and/or promote the establishment and spread of invasive exotic plants such as cogongrass. It is important to monitor all mechanically managed sites for subsequent invasive plant establishment.

### **Stop 3 – Planted slash pine, thinning**

Slash pine stand: machine planted and managed for timber production.

Thinning is a partial tree harvest at mid-rotation (age 10-15) to maintain or accelerate diameter growth of the remaining trees in a stand. If done properly, thinning can result in increased revenue at rotation's end when trees are harvested for higher-value products. Combined with prescribed burning, thinning can also greatly enhance wildlife habitat by allowing more light to the understory, promoting a diverse ground cover of grasses and forbs.

### **Stop 4 – Wildlife food plot, quail course, pond**

Wildlife food plots: supplemental wildlife food plantings are no substitute for good overall habitat management but can enhance the availability of certain types of food resources at certain times. Always take into account your region when choosing a cool-season forage. Make sure the forage is adapted to the soil conditions and local weather patterns in your area. Soil pH and soil drainage will play large parts in the success of a good cool-season crop.

Use Best Management Practices to protect water quality and wildlife habitat

**12:00 pm**      **Lunch at the pond pavilion**

**Please fill out your Tour Evaluation and give to Chris Demers before you go!**

## Resource Contacts

<p><b>LaKeisha Barber</b>  District Conservationist  USDA Natural Resources  Conservation Service  111 Yelvington Rd, Ste 4  East Palatka, FL 32131  (386) 328-5051 x. 3  <a href="mailto:Lakeisha.Barber@fl.usda.gov">Lakeisha.Barber@fl.usda.gov</a></p>	<p><b>Jack Hernandez</b>  Clay County Forester  Florida Forest Service  4980 SR 16 W  Starke, FL 32091  (904) 529-2356  <a href="mailto:Jack.Hernandez@FreshFromFlorida.com">Jack.Hernandez@FreshFromFlorida.com</a></p>	<p><b>Robin Holland</b>  Silvicultural BMP Forester  Florida Forest Service  Ocala Forestry Station  2735 E Silver Springs Blvd  Ocala, FL 34470  (352) 732-1273  <a href="mailto:Robin.Holland@freshfromflorida.com">Robin.Holland@freshfromflorida.com</a></p>
<p><b>Chris Demers</b>  Extension Program Manager  UF/IFAS School of Forest  Resources and Conservation  PO Box 110410  Gainesville, FL 32611  (352) 846-2375  <a href="mailto:cdemers@ufl.edu">cdemers@ufl.edu</a></p>	<p><b>Matt Kenyon</b>  Landowner  Bear Bay Timber Company  <a href="mailto:mkenyon@dbkenyon.com">mkenyon@dbkenyon.com</a></p>	<p><b>Greg Marshall</b>  Regional Cooperative Assistance  Coordinator  Florida Forest Service  410 SE Oleno Park Rd  High Springs, FL 32643  (352) 233-8342  <a href="mailto:Gregory.Marshall@freshfromflorida.com">Gregory.Marshall@freshfromflorida.com</a></p>
<p><b>Luke Harlow</b>  Extension Agent  UF/IFAS Clay County Extension  2463 St Rd 16 W  Green Cove Springs, FL 32043  (904) 284-6355  <a href="mailto:harlow1231@ufl.edu">harlow1231@ufl.edu</a></p>		<p><b>Ginger Morgan</b>  North Central Regional Coordinator  Landowner Assistance Program  Florida Fish and Wildlife  Conservation Commission  3377 East US Highway 90  Lake City, FL 32055  (386) 758-0525  <a href="mailto:Ginger.Morgan@MyFWC.com">Ginger.Morgan@MyFWC.com</a></p>

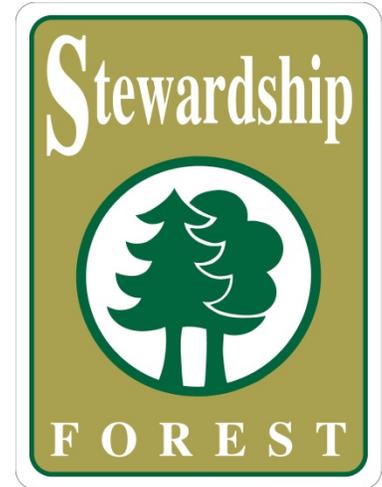
Questions about this or other Forest Stewardship Program activities can be directed to  
Chris Demers, (352) 846-2375 or by email at [cdemers@ufl.edu](mailto:cdemers@ufl.edu)  
Information online at:

[http://www.sfrc.ufl.edu/forest\\_stewardship](http://www.sfrc.ufl.edu/forest_stewardship)

# Florida's Forest Stewardship Program

**Forest Stewardship** is active management of forests and related resources to keep these lands 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 forestlands 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 have 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 future public recognition as a certified "Forest Steward".
- Educational workshops, tours and a quarterly Stewardship newsletter developed and distributed by the University of Florida, IFAS Cooperative Extension Service.

## Getting into the Program

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 here:

**<http://FreshFromFlorida.com/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 this 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. 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.
- Access to seminars, field days, and workshops to help manage their Tree Farm even better.
- 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 here:

<https://www.treefarmssystem.org/florida>



# Florida Forest Service

## Silviculture Best Management Practices

### Silviculture Best Management Practices (BMPs)

Silviculture BMPs are the minimum standards necessary to protect our state's waterbodies and wetlands from degradation and sedimentation that can sometimes occur because of erosion from 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.

### Silviculture BMP Courtesy Checks

Silviculture BMP courtesy checks are available for landowners, land managers, and loggers. These courtesy checks provide a "report card" on Silviculture BMP implementation for recent or ongoing forestry operations. This helps future management planning and evaluates the performance of contractors on your property.

### Silviculture BMP Site Assessments

On-the-ground Silviculture BMP site assessments are available to determine which Silviculture BMPs 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, indicating intent to adhere to 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* based on reasonable evidence with state water quality standards during future ongoing forestry operations. This is very important if a 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.

#### Roy Lima

Panhandle Area

Roy.Lima@FreshFromFlorida.com

(850) 681-5942



#### Robin Holland

Peninsula Area

Robin.Holland@FreshFromFlorida.com

(352) 732-1273



**Florida Department of Agriculture and Consumer Services**  
**Adam H. Putnam, Commissioner**



# Forestry Wildlife Best Management Practices for State Imperiled Species



- 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

Roy Lima  
Panhandle Area  
(850) 681-5942



Robin Holland  
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# Got Invasives?

## Invasive exotic plant problem? Find a program to help by using [FloridaInvasives.org](http://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](http://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](http://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](http://FloridaInvasives.org) help you?

FISP has created a searchable database, the [Florida landowner incentives database](http://FloridaInvasives.org), accessible at [FloridaInvasives.org](http://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](http://FloridaInvasives.org) will help provide focus to your search so that you can get the right person at the right program.

[FloridaInvasives.org](http://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](http://FloridaInvasives.org) to find out more.

Species Shown from top to bottom:

Mexican Petunia, Boston Fern, Mimosa, Cogongrass, Camphor



*Think Locally, Act Neighborly*

invasive species know no boundaries!

# Longleaf Pine Regeneration<sup>1</sup>

Chris Demers, Alan Long and Patrick Minogue<sup>2</sup>

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

1. This document is SS-FOR-13, one of a series of the School of Forest Resources and Conservation, UF/IFAS Extension Service, Institute of Food and Agricultural Sciences, University of Florida. First published January 2000. Revised November 2010. Reviewed August 2013. Please visit the EDIS website at <http://edis.ifas.ufl.edu>.

Chris Demers, forest stewardship coordinator; and Alan Long, former professor, Forest Operations and Environmental Regulations; and Patrick Minogue, assistant professor, Silviculture, Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville 32611.

The use of specific trade names in this publication does not constitute endorsement of these products in preference to others containing the same active ingredients. Mention of a proprietary product does not constitute a guarantee or warranty of the product by the authors or the publisher.

2. All chemicals should be used in accordance with directions on the manufacturer's label.

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 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 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 to check for new roots, which are white in color, prior to herbicide application. 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 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 DOF County Forester ([http://www.fl-dof.com/field\\_operations/county\\_foresters/index.html](http://www.fl-dof.com/field_operations/county_foresters/index.html)) 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 well above the soil surface. Tell planters to “leave the upper part of the plug exposed.” This insures the seedling is not planted too deep.

Don't 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, anticipate soil movement back into the scalped furrow and plant more shallowly, leaving approximately 1 ½ to 2 inches of the plug above the soil surface. Very shallow planting also works well on wetter sites.

## 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. Most of the mature stand is removed at the end of the rotation, but a portion is 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, (2) a receptive seedbed, (3) minimal vegetative competition and (4) ample soil moisture.

The shelterwood system requires 3 cuts that serve 3 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 is 10 or more years before the planned harvest date of the stand and at least 5 years before the seed cut. This 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 harvest date and leaves no more than 30 square feet BA per acre of dominant trees at least 15 inches diameter at breast height (dbh), with well-developed crowns. 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.

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 size 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.

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Table 1. Common herbicide treatments for longleaf pine establishment on sandy, Coastal Plain sites. Read and follow all label directions.

<u>Common Name</u>	<u>Herbicide Rate</u>	<u>Trade Name</u>	<u>Amount Product</u>	<u>Comments</u>
A. Site preparation of recently harvested forest sites primarily to control hardwood and shrub vegetation				
Hexazinone	1.9 to 3 lb ai/A	Velpar L	2.5 to 4 lb/A	Hand "spotgun application" on grid pattern or to individual rootstocks, same sites as above
Imazapyr + Glyphosate	0.625 lb ae/A + 3lb ai/A	Chopper Gen2 Accord XRT II	40 oz + 2.2 qts	Tank mix, broadcast aerial or ground sprayer, clay soils, where maple, ti ti present
B. Site preparation in established pasture or grass sod				
Glyphosate	2 lb ai/A	Accord XRT II	1.5 qts	Foliar application, broadcast or apply to a band on tree rows prior to planting
C. Herbaceous weed control (grasses and broadleaf weeds) over-the-top of planted seedlings				
Hexazinone + Sulfometuron	6 oz ai/A 1.5 oz ai/A	Velpar L Oust XP	24 oz plus 2 oz	Tank mix, very broad spectrum
Hexazinone Sufometuron	7.6 oz ai/A 1.4 oz ai/A	Oustar	12 oz	Pre-package mix, very broad spectrum Use 10 oz product on sandy soil.

# Cogongrass (*Imperata cylindrica*) Biology, Ecology, and Management in Florida Grazing Lands<sup>1</sup>

B. A. Sellers, J. A. Ferrell, G. E. MacDonald, K. A. Langeland, and S. L. Flory<sup>2</sup>

Cogongrass is found on every continent and is considered a weedy pest in 73 countries. In the U.S., cogongrass is found primarily in the Southeast. It was accidentally introduced into Alabama in the early 1900s, and purposely introduced as a potential forage and soil stabilizer in Florida (and other states) in the 1930s and early 1940s. However, soon after investigations began it was realized that cogongrass could be a weedy pest. Since its introduction, cogongrass has spread to nearly every county in Florida. In some cases, it has completely taken over pastures so that it is the only species present. This is a common thread where cogongrass invades; it quickly displaces desirable species and requires intensive management.

There are many reasons why cogongrass is such a prolific invader. It is a warm-season, perennial grass species with an extensive rhizome root system. In fact, at least 60% of the total plant biomass is often found below the soil surface. In addition to the rhizome root system, cogongrass adapts to poor soil conditions, and its fires burn so hot that they eliminate nearly all native species. Cogongrass is drought tolerant and has prolific wind-dispersed seed production. Additionally, it can grow in both full sunlight and highly shaded areas, although it is less tolerant to shade.

Cogongrass spreads through its creeping rhizome system and seed production. The rhizomes can penetrate to a depth of 4 feet, but most of the root system is within the top 6 inches of the soil surface. The rhizomes are responsible for long-term survival and short-distance spread of cogongrass. Long-distance spread is accomplished through seed production. Seeds can travel by wind, animals, and equipment. Seed viability is significant in north Florida and other states of the Southeast; however, there are no confirmed cases of viable seed production in central and south Florida.

An established cogongrass stand invests heavily in its perennial root system. These infestations are capable of producing over 3 tons of root biomass per acre. This extensive network of rhizomes is capable of conserving water while the top growth dies back during prolonged drought. This is essentially a survival mechanism to keep the rhizome system alive. Another key to cogongrass invasion is that the root system may produce allelopathic chemicals that reduce the competitive ability of neighboring plants.

## Identification

Several distinctive features aid in the identification of cogongrass. First, cogongrass infestations usually occur in circular patches. The grass blades tend to be yellow to green in color (Figure 1). Individual leaf blades are flat and

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serrated, with an off-center prominent white midrib (Figure 2). The leaves reach 2–6 feet in height. The seed head (Figure 3) is fluffy, white, and plume-like. Flowering typically occurs in spring or after disturbance of the sward (mowing, etc.). Seed heads range from 2 to 8 inches in length and can contain up to 3,000 seeds. Each seed contains silky-white hairs that aid in wind dispersal. When dug, the rhizomes (Figure 4) are white, segmented (have nodes), and are highly branched. The ends of the rhizome are sharp pointed and can pierce the roots of other plants.



Figure 1. Cogongrass plants are yellow to green in color. Note that the edges of the leaf tend to have more yellow than green.  
Credits: G. Keith Douce, University of Georgia, [www.forestryimages.org](http://www.forestryimages.org).

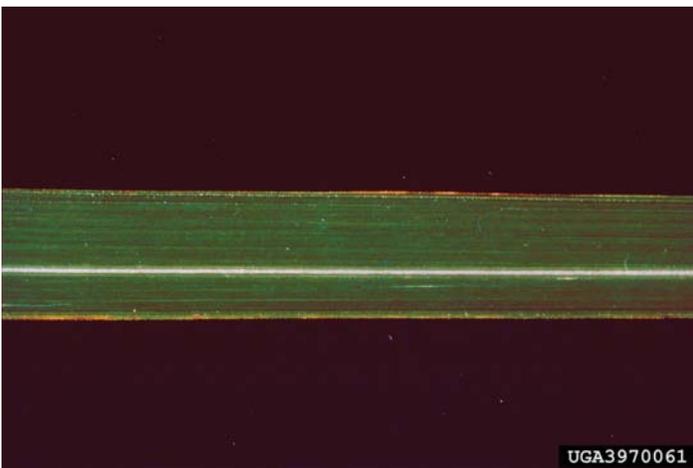


Figure 2. Cogongrass leaves have serrated edges and a prominent, white, off-center midrib.  
Credits: L. M. Marsh, Florida Department of Agriculture and Consumer Services, [www.forestryimages.org](http://www.forestryimages.org).



Figure 3. Cogongrass seed heads are fluffy and white. Each plant produces nearly 3,000 seeds.  
Credits: John D. Byrd, Mississippi State University, [www.forestryimages.org](http://www.forestryimages.org).



Figure 4. Cogongrass rhizomes are segmented (have nodes) where new shoots are able to grow.  
Credits: Chris Evans, River to River CWMA, [www.forestryimages.org](http://www.forestryimages.org).

## Forage Value

Cogongrass has been used in Southeast Asia as forage because it is the dominant vegetation on over 300 million acres. In these areas it was found that only very young shoots should be grazed or cut for hay. At this stage, the leaves lack sharp points and razor-like leaf margins. For about four weeks following a prescribed burn, crude protein of regrowth is comparable to bahiagrass. Crude protein of mature stands rarely attains the minimal 7% level needed to sustain cattle, making supplementation essential for livestock production. Cogongrass yields are relatively

low, even under heavy fertilization, and usually do not exceed 5 tons per acre.

## Management

For many years researchers all over the world have studied cogongrass control. During this time nearly all available herbicides have been tested, but few effective products have been found. For example, all of the commonly used pasture herbicides such as metsulfuron, 2,4-D, triclopyr, Velpar, and other combinations have little to no activity on cogongrass. Only glyphosate (Roundup, etc.) and imazapyr (Arsenal, Stalker, etc.) herbicides have been found to be effective, but long-term control is rarely achieved.

Imazapyr is an extremely effective herbicide that controls a variety of weeds, from herbaceous to woody species. One or two applications of imazapyr (0.75 lb/acre) will often effectively control cogongrass for 18–24 months. However, there are several disadvantages to using this herbicide. First, imazapyr will severely injure or kill forage grasses such as bermudagrass and bahiagrass. It also has a long soil half-life and will remain in the soil for several months after application. This often leads to “bare ground” for up to 6 months in the application area because of the non-selective nature of this herbicide. Imazapyr also has the potential to move down slopes during periods of rainfall, killing or injuring other species in the runoff area (oaks and other hardwood trees are especially sensitive). Second, imazapyr can only be used as a “spot-treatment” with no more than 10% of the pasture area treated per year.

Similarly, glyphosate is also a non-selective herbicide that effectively controls a variety of weeds. Unlike imazapyr, glyphosate possesses very little to no soil activity. Non-target effects caused by runoff during high rainfall events are not likely. Since glyphosate has no soil activity, it does not take very long for weeds or desirable grasses to reinfest the treated areas. Cogongrass will likely reinfest the area if only one application of glyphosate is applied during the same year. Research in Alabama has revealed that it takes approximately three years of two applications per year to reduce cogongrass rhizome biomass by 90%.

## Small Infestations

Early detection of cogongrass in any setting is extremely important. A young infestation will be much easier to treat and eradicate than established infestations. In this case, we would define a small patch as 20–30 feet or less in diameter. Even for a small patch, monitoring is required after the initial application to ensure that any re-sprouting is quickly

treated. See Table 1 for specific timelines and suggested herbicide rates.

## Large Infestations

Large infestations are 30 feet or larger in diameter. These types of infestations can be considered as established and likely have a large, intact root system. This will require more herbicide treatments to completely eradicate cogongrass. See Table 2 for specific timelines and suggested herbicide rates.

## Integrated Management

Herbicide inputs alone are rarely successful in eradicating perennial species like cogongrass. In these cases, we need to use all of the tools we have to remove an unwanted species to reestablish a desirable species. This type of strategy is best employed in an area where cogongrass has long been established and is the predominant species present. See Table 3 for specific timelines and suggested herbicide rates.

In general, burn the area infested with cogongrass in August to September. One to four months later, treat the burned area with a mixture of imazapyr and/or glyphosate. Take soil samples prior to spring tillage the next growing season to ensure that the soil pH is adequate for your desirable forage species. Till the treated area the following spring to a depth of at least 6 inches and prepare a seedbed.

Consult with your local county Extension agent to consider your options for forage cultivars and fertility recommendations. Getting a good start on the desirable forage will help limit cogongrass reinfestations in your pasture. Continue to monitor this area in six-month intervals until the fourth year. Spot treat with glyphosate when necessary to remove any new cogongrass growth.

Table 1. Herbicide suggestions for small infestations of cogongrass in grazing areas. This includes both improved and native rangeland. These concentrations are good for mixing in small (3–30 gallon) sprayers. Please read the entire label of the suggested products prior to treating existing cogongrass stands.

	<b>Timing</b>	<b>Herbicide Rate</b>	<b>Application Notes</b>
1 <sup>st</sup> year	Fall (August–November)	1% Arsenal/Stalker + 0.25% non-ionic surfactant	Treat only 10% of the area to be grazed. No grazing restrictions, but do not cut for hay for 7 days. Read the herbicide label for mixing instructions.
		3% glyphosate	No grazing or haying restrictions. Read the herbicide label for mixing instructions.
		0.5% Arsenal/Stalker + 2% glyphosate + 0.25% non-ionic surfactant	Treat only 10% of the area to be grazed. No grazing restrictions, but do not cut for hay for 7 days. Read the herbicide label for mixing instructions.
2 <sup>nd</sup> year	Spring (monitor regrowth)	2–3% glyphosate	See above.
	Fall (monitor regrowth)	2–3% glyphosate	See above.
3 <sup>rd</sup> year–until eradicated	Spring–Fall (monitor regrowth)	Spot treat at the above rates for the 2 <sup>nd</sup> year.	

Table 2. Herbicide suggestions for large cogongrass infestations in grazing areas, including both improved and native rangeland. These suggestions are intended for large (>1000 gallon) sprayers. Please read the entire label of the suggested products prior to treating existing cogongrass.

	<b>Timing</b>	<b>Herbicide Rate</b>	<b>Application Notes</b>
1 <sup>st</sup> year	Fall (August–November)	48 oz/acre Arsenal/Stalker + 0.25% non-ionic surfactant	Treat only 10% of the area to be grazed. No grazing restrictions, but do not cut for hay for 7 days. Read the herbicide label for mixing instructions.
		3 to 4 qt/acre glyphosate	Do not graze for 8 weeks. Read the herbicide label for mixing instructions.
		24 oz/acre Arsenal/Stalker + 2 qt/acre glyphosate + 0.25% non-ionic surfactant	Treat only 10% of the area to be grazed. No grazing restrictions, but do not cut for hay for 7 days. Read the herbicide label for mixing instructions.
2 <sup>nd</sup> year	Spring (monitor regrowth)	2–3% glyphosate	No grazing or haying restrictions.
	Fall (monitor regrowth)	2–3% glyphosate	No grazing or haying restrictions.
3 <sup>rd</sup> year–until eradicated	Spring–Fall (monitor regrowth)	Spot treat at above rates for the 2 <sup>nd</sup> year.	See above.

Table 3. Control of cogongrass using an integrated approach. Adjust your timelines based on your location in Florida. For example, burning should be performed earlier in north Florida than in south Florida because of the first onset of a potential killing frost. Please read all herbicide labels prior to treating cogongrass for restrictions and mixing instructions.

	<b>Timing</b>	<b>Herbicide Rate</b>	<b>Application Notes</b>
1 <sup>st</sup> year	Summer—Fall (August–November)	1. Burn	Cogongrass fires burn extremely hot. Be sure to have firebreaks in place before attempting to burn cogongrass.
		2. Apply herbicide: 24 oz/acre Arsenal/Stalker + 2 qt/acre glyphosate + 0.25% non-ionic surfactant	Treat only 10% of the area to be grazed. No grazing restrictions, but do not cut for hay for 7 days. Read the herbicide label for mixing instructions.
		3. Take soil samples.	Have the soil pH tested at a reputable laboratory. Amend the soil as needed to grow desirable forage.
2 <sup>nd</sup> year	Spring	1. Tillage	Prepare a seedbed for desirable forage species. Repeated tillage will help to desiccate any remaining cogongrass rhizomes.
		2. Plant desirable forage.	Please consult your local Extension agent for up-to-date recommendations on forage cultivars and fertility recommendations.
3 <sup>rd</sup> year	Spring (monitor regrowth)	2–3% glyphosate	No grazing or haying restrictions.
	Fall (monitor regrowth)	2–3% glyphosate	No grazing or haying restrictions.
4 <sup>th</sup> year–until eradicated	Spring–Fall (monitor regrowth)	Spot treat at the above rates for the 3 <sup>rd</sup> year.	See above.

# Thinning Southern Pines - A Key to Greater Returns<sup>1</sup>

Chris Demers, Michael Andreu, Babe McGowan, Alan Long, and Jarek Nowak<sup>2</sup>

Many landowners plant pines with the intention of harvesting them at some point in the future. When pulpwood markets are favorable, a complete stand harvest within 15 to 20 years is possible and may bring an acceptable return. However, longer rotations can bring higher financial returns on larger diameter trees if landowners are willing to begin thinning their pine stands when trees are 10 to 15 years old. Pine sawtimber, poles and/or plylogs are most often the forest products with the highest value and, if economic returns are a priority, the most desirable products to come out of a timber stand. Thinning is a partial tree harvest in an immature stand to maintain or accelerate diameter growth of the remaining trees. If it is done properly, thinning can bring substantially higher revenues when trees are harvested at 25 to 40 or more years of age. Trees will respond to thinning best if they are thinned before 16 or 17 years of age.

The increased diameter growth after thinning results from the greater availability of light, water, and nutrients to the remaining trees. Ideally, the best and biggest trees should be retained to assure the most rapid increase in timber value. For best results, thinning should favor the tallest, best-formed trees over those that are overtopped, crooked, forked, diseased or otherwise undesirable. Timberland owners who wish to harvest high-value sawtimber-, plylog- or pole-sized products at the end of the rotation should consider thinning a necessity.

For the landowner, thinning can bring

1. increased return on investment from the sale of higher-value forest products;
2. periodic income from the multiple harvests that lead to those higher-value forest products;
3. improved access for equipment, people and wildlife;
4. a healthy, vigorous forest with less risk of insect infestation, destructive fire, and wind damage; and
5. enhanced wildlife habitat with increased herbaceous ground cover

Before describing specific methods of thinning, we will review the underlying concepts of stand density, crown position and forest health. These will dictate if, when, and how to thin.

## Stand Density

Stand density describes how much a site is being used by trees and how much the trees are competing with each other for the site's resources (water, light, nutrients, space). At high densities, the growth rates of individual trees slow down because there are more trees competing for the site's limited resources. Trees are usually thinned to achieve a particular density target.

## Measures of Density

**Trees per acre.** In single-species, even-aged stands of known age, site quality, and history, the number of trees per

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acre is a useful measure of stand density. Typical densities in plantations range from 200 to 800 trees per acre.

**Volume per acre.** Because many management objectives relate to wood volume, it is often used as a measure of density. Stand volume is generally expressed as cubic feet (solid wood), board feet, or cords per acre. A cord is 128 cubic feet of stacked roundwood (whole or split, with or without bark) containing wood and airspace; an example of a cord is a stacked pile of firewood 4 ft high x 4 ft wide x 8 ft long. Tons per acre is a weight measure that is derived from volume. Tons is the unit of measure most commonly used to buy or sell wood.

**Basal Area.** Basal area is a measure of stand density developed by foresters. It is the total cross-sectional area of tree stems in a stand, at breast height (4.5 feet above the ground), measured in square feet per acre. Basal area (BA) of a single tree in square feet is calculated using the formula:

$$BA = 0.005454 \times d^2$$

Where: d = diameter (inches) of the tree at breast height (often abbreviated as “DBH”).

## Tree Crown Position

Thinning reduces stand density by targeting trees belonging to different tree crown classes. (Tree crown is composed of all the live branches of the tree.) Each tree class is described by the vertical crown position of its members relative to trees of lower or higher classes. Most planted pine stands have an even-aged structure, which means there is little or no difference in the age of the trees. However, as an even-aged stand grows, the trees compete for site resources and begin to differentiate in height and diameter. As the level of tree competition increases over time, individual tree growth slows down. This growth deceleration happens at different rates for different trees due to genetic, microsite and other differences. In the absence of thinning, the weakest and slowest-growing trees die and provide more room for larger and healthier neighbors. The variation in tree growth results in four distinct tree crown classes:

### 1. Dominant trees:

- crowns extend above the main tree canopy layer
- crowns receive full sunlight from above and the sides
- crowns are large and well-developed
- characterized by large diameters and exceptional tree vigor

### 2. Codominant trees:

- crowns form the main canopy layer
- receive sunlight from above but are restricted at the sides
- have medium-sized crowns and diameters

### 3. Intermediate trees:

- crowns reach only to the lower part of the main canopy
- receive sunlight from above only partially, if at all
- have small, crowded crowns and small diameters

### 4. Overtopped (suppressed) trees:

- crowns are entirely below the main canopy
- receive no direct sunlight
- are usually the smallest trees with poorly developed crowns
- show very low vigor

## Forest Health

Forest health is the focus of forest management and the purpose of thinning. The primary purpose of thinning is to remove poorly performing trees and leave a healthy, vigorous stand. A healthy forest produces more tons of valuable timber per acre resulting in more tons of higher quality wood available to sell. The various insects and diseases that affect pine stands in the South have evolved to exploit unhealthy, stagnated, or damaged trees that are stressed. Healthy pine stands resist damage from insects, disease and wind. If done early in the pines' development, thinning is an important tool to prevent problems with insects, diseases, or other stresses such as wildfire or strong winds.

## Fusiform Rust

Fusiform rust is a native, fungus-caused disease that deforms and kills pines. Since the late 1950s, it has increased to epidemic proportions in slash and loblolly pine plantations throughout the South. This disease was first reported in the early 1900s and was neither widespread nor prevalent at that time. The spread of fusiform rust increased as the acreage of young, intensively managed pines increased across the South. The fungus causing fusiform rust is greatly favored in young, rapidly growing pine plantations of slash and loblolly pines, especially when established in high rust hazard areas and in close proximity to oaks, especially water oak, which are alternate hosts for the fungus. Oak abundance generally increases in areas where fire is absent. Most stems infected with fusiform rust disease should be removed in a thinning. Larger diameter stems with minor disease on branches can continue to have good growth rates and withstand high winds after thinning. If the stem infection rate of a stand exceeds 50%, the best option may be to clearcut and regenerate with genetically improved, rust-resistant pines. However, if there are at least 150–200 healthy, well-formed trees per acre, removing the diseased trees and retaining the healthy ones

is usually the best option. If there is an abundance of red oak species, especially water oak, in surrounding stands, they should be reduced if possible. A professional forester can help you make appropriate management decisions to minimize or deal with problems associated with fusiform rust. More information about this disease can be found at [http://www.floridaforestservice.com/publications/fh\\_pdfs/fusiform\\_rust\\_of\\_pines.pdf](http://www.floridaforestservice.com/publications/fh_pdfs/fusiform_rust_of_pines.pdf).

## Southern Pine Beetle

Southern pine beetles (SPB) are native, aggressive insects that live predominantly in the inner bark of pine trees. Trees attacked by SPB often have hundreds of light-colored, dime-sized resin masses (i.e., pitch tubes) on the outer tree bark. SPB feed on living bark tissues where they construct winding, S-shaped galleries on the inside of the bark, which can effectively girdle and kill a tree. In addition, SPB carry and introduce blue-stain fungi into trees. These fungi colonize the water-conducting tissue and can block water flow within the tree. Once SPB have successfully colonized a tree, the tree generally will not survive, regardless of control measures. An important way to prevent SPB infestations in pine stands is to maintain high tree vigor. This can be achieved by thinning dense stands to a basal area of 80 sq. ft. per acre or less to reinvigorate tree growth. More information about SPB and its control can be found at <http://edis.ifas.ufl.edu/IN333>.

Cost-share assistance for thinning pine stands, prescribed fire and other treatments is available through the Florida Forest Service's Southern Pine Beetle Assistance and Prevention Program: [http://www.floridaforestservice.com/forest\\_management/fh\\_insects\\_spb\\_prevention\\_program.html](http://www.floridaforestservice.com/forest_management/fh_insects_spb_prevention_program.html)

## Annosum Root Rot

Loblolly and slash pine are particularly susceptible to this disease, which may be scattered through a stand or occur in pockets of dying or dead trees. Trees generally yellow and lose needles as they die from this disease, although they may just turn red in a short period of time. Dead trees gradually fall over from a loss of root support. Wind-blown fungus spores from nearby infection centers generally enter a stand by landing on freshly cut stumps or wounds during the colder months of the year. The stump and subsequent root infections spread to adjacent trees through root contact. The disease is most prevalent on well-drained sandy soils with higher pH, such as those found on old agricultural fields. Prevention measures include prescribed burning during winter months before thinning to eliminate the spore-producing conks, thinning in high hazard areas

during summer, and treating freshly cut stumps with borax immediately after thinning. More information about this disease is at: <http://www.freshfromflorida.com/pi/enpp/pathology/pathcirc/pp398.pdf>

## When and How Much to Thin Timing

The first thinning should take place shortly after the crowns of the trees start to close (tree branches of neighboring trees begin to touch each other). This is when diameter growth will begin to decrease due to the trees' limited ability to capture sunlight, which is needed to produce the carbohydrates necessary for diameter and volume growth. An important indirect measure of a tree's ability to capture sunlight is *live crown ratio*. Live crown ratio is the percentage of a tree's height occupied by branches with green needles. In southern pines, optimum growth and vigor are maintained when the live crown makes up at least 40% of tree height (a live crown ratio of 40% or higher). Thinning is most beneficial for stand growth before the average live crown ratio falls below 40%.

Another factor that influences thinning decisions is the marketability of the removed trees. The first commercial thinning should remove pulpwood-size trees and perhaps some chip-and-saw-size trees, if they are poorly formed or diseased. Pulpwood logs must be at least 10.5 feet long and 2–3 inches in diameter at the small end; some local markets require larger log sizes. To meet these minimum specifications, trees must be about 16 feet tall and have an average DBH of at least 5 inches before they are cut. It may be necessary to thin smaller trees if the average live crown ratio of the stand is below 40% and trees do not grow at least 5% in diameter per year. With the demand for woody biomass on the rise in some regions for energy production, these trees may have a market. Otherwise, “pre-commercially” thinned trees are usually left on the ground to decompose. In this case, thinning should be regarded as an investment in the quality of the stand for the future, when final harvest returns may justify the operation. See <http://edis.ifas.ufl.edu/fr243> for information on pre-commercial thinning loblolly pine.

## Thinning Intensity

The number of trees to remove depends on the initial stand density, site quality, and management objectives. For timber objectives, a thinning should reduce stand density to a level that maximizes individual tree growth without sacrificing full utility of the site. Density and stocking should be approached from the quality of the residual stand first; and

second, the density of the residual stand. Depending on the site, the density and quality of the trees in the stand you are working with, and your management objectives, the residual basal area after the first thinning will usually fall between 45 to 85 square feet per acre of the very best trees capable of producing a higher-value product. These will be the healthiest, best-formed trees in the dominant and co-dominant crown classes. A suggested rule of thumb is to use basal area as a result, not a target. Basal area does not take into account the age of the stand, site productivity, and tree health and quality. Focus growth on the best trees in the stand and the basal area will follow.

Thinning, especially when followed by prescribed fire, can be great for wildlife habitat. Thinning allows more sunlight to reach the forest floor, encouraging the growth of herbaceous plants and shrubs, which provide food and cover for many upland wildlife species in the southeast. Subsequent thinnings and a prescribed fire regime during the rotation will promote an open tree canopy, diverse groundcover, and productive wildlife habitat. See <http://edis.ifas.ufl.edu/uw132> for more information on the effects of fire on wildlife habitat.

## How to Thin

Most producers use a combination of thinning methods to reach economic and/or wildlife habitat objectives. No matter which thinning method you choose, avoid thinning during times of drought or extreme wet weather to prevent damage to the site, and take care not to damage residual trees during logging. When trees do become damaged (frequently, for instance, the “bumper” or “turning” trees at the ends of thinned rows suffer some damage), they should be removed at the end of the logging operation. Landowners are encouraged to consult with or hire a professional forester to assist with thinning and other forest management activities. See <http://edis.ifas.ufl.edu/fr125> for tips on selecting a consulting forester.

## Combine Row and Selection Thinning

Although most discussions about thinning southern pines are about which rows to thin, the focus should be on what comes out of the remaining rows. Modern equipment, though large, is capable of taking out trees in the rows between cut rows, as in a 5<sup>th</sup> or 7<sup>th</sup> row thinning. Generally, the further apart the cut rows, the better. Think of the cut rows as access for the harvester to cut selected trees out of the remaining rows. It is best to remove trees based on selection thinning from fewer cut rows rather than taking

out every 3<sup>rd</sup> or 4<sup>th</sup> row. The first thinning is the most important thinning and sets the growth rate for the rest of the rotation. Properly executed thinnings consistently produce higher valued products, and thus more revenue. In addition to revenue goals, thinning greatly enhances wildlife habitat by providing light needed for important food plants to grow. Removing every 3<sup>rd</sup> or 4<sup>th</sup> row is essentially clearcutting 33% or 25% of the stand without regard to quality, and leaves only 66% or 75% of the stand to select from. Unless there is excessive disease or extreme variability in density (see fusiform rust guidelines above), this should be avoided. Leaving the trees distributed over a larger portion of the stand can be much more profitable in the long term because you can select your best trees to grow into larger, more valuable products.

The premise for thinning is simply to take out the poor trees and leave the healthy crop trees for potential future harvest. Trees that are diseased, crooked, forked, suppressed or otherwise of poor quality or health should be removed in the first thinning. For best results, hire a professional forester to mark every thinning. If marking is not feasible for some reason, closely supervise each thinning, but especially the first, to ensure contractual guidelines are followed. Do not assume the logger or harvester operator will leave the trees most appropriate for the long-term health and productivity of the stand.

## Conclusion

Thinning is an important silvicultural practice that redistributes the growth potential of the site to the best trees. Diameter growth rates are maintained or increased on residual trees after thinning, which increases the return on investment from higher-value trees. Biologically, thinning accelerates stand development by favoring the tallest, best-formed trees over those that are diseased, overtopped, crooked, forked, or otherwise undesirable and likely to die on their own if left in the stand long enough. In addition, thinning provides periodic income, improves access for equipment, recreation and hunting, and creates a generally healthier stand. Thinning is also beneficial for wildlife, especially when combined with prescribed fire or herbicide use to control competing vegetation. By allowing more light to reach the forest floor, thinning promotes growth of plants important as food and/or cover for wildlife species. Landowners are encouraged to consult with or hire a professional forester to assist with thinning and other forest management activities.

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# CLAY COUNTY FACTSHEET



## 2016 Cool-Season Forage Variety Recommendations for Clay County, Florida

By Luke Harlow, Agriculture and Natural Resources UF/IFAS Extension Agent, Clay County

### Forage Considerations

Always take into account your region when choosing a cool-season forage. Make sure the forage is adapted to the soil conditions and local weather patterns in your area. Soil pH and soil drainage will play large parts in the success of a good cool-season crop.

As in most years, moisture is the key to successful fall forage plantings. Our current predictions for 2016 are for sufficient rainfall during our fall planting window, which generally starts in mid-September through mid-November. Certain cool-season forages like ryegrass will need to be watered either by natural rainfall or irrigation, while certain clovers, vetch, and winter peas are more drought tolerant.



Above Photo: Crimson Clover  
(Photo Credit: Luke Harlow)

Right Photo: Triticale  
(Photo Credit: Ann Blount)

For legumes, remember to add the correct inoculant (nitrogen-fixing bacteria) to the legume seed before planting. Coated (already pre-inoculated) seed is usually available, but seed coatings with bacteria have a limited shelf life and may be costly when compared to purchasing raw seed and inoculant separately and mixing just prior to planting.

The suggested seeding rate for all small grains is 90 to 120 lbs. per acre. If planting a mixture of cool-season forages, you should adjust the seeding rate for each component to half of the recommended rate. If you plant late in the season, use the higher end of the recommended seeding rates for each forage.



# CLAY COUNTY FACTSHEET



## TYPES OF FORAGES

- **Small Grains/Grass**

- **Oats:** Susceptible to freezes, Yellow Rust and Barley Yellow Dwarf virus (BYDV) diseases, but has Hessian Fly resistance
- **Rye:** High yield and drought tolerance, but usually high cost
- **Wheat:** Less costly and cold tolerance, but must use Hessian Fly resistant varieties
- **Triticale:** Good forage quality and disease resistance, but can't handle close grazing
- **Ryegrass:** Handles wide range of soil types, but can possibly delay overseeded summer grasses due to late season growth

- **Legumes**

- **White Clover:** Adapted to moist soils and is a fair seed producer but production can be limited by pests
- **Red Clover:** Works well in blends, provides high yields through season, but cannot handle poorly drained soils and is not a great reseeder
- **Crimson Clover:** Adapted to well-drained sites, high yields and good shade tolerance, but has shorter grazing season. Ideal for blends
- **Arrowleaf Clover:** Adapted to heavier soils, good production in late season, but cannot tolerate low pH soil
- **Balansa Clover:** Adapted to well-drained sites, cold tolerant. Ideal for blends
- **Ball Clover:** Adapted to wide range of soil types, tolerant to wetter soil, but cannot tolerate low pH soils and has lower yield
- **Berseem Clover:** Adapted to wide range of soils, but not as cold-tolerant as other clovers.
- **Medic:** Well adapted to soils, they are not considered to be highly productive forages in Florida
- **Lupine:** Adapted to well-drained soils. Only sweet lupine varieties are suitable for forage
- **Vetch:** Adapted to well-drained soils, high yield, disease resistant, but high cost and cannot handle overgrazing
- **Winter Pea:** Adapted to well-drained soils with high clay content



Above Photo: Winter Pea  
(Photo Credit: Luke Harlow)

## Planting Recommendations

Clean-tilled seedbeds will result in earlier and more complete forage production. A no-till seed drill can be used for increased production in established pastures. Another option would be a light disking, followed by broadcasting the seed, and then use of a "drag," roller, or cultipacker. Care must be observed for this option so seed is not planted and covered too deeply. If overseeding an established pasture, close graze before seeding and try an early or mid-maturity cool-season forage variety to prevent a delay in spring growth of the permanent pasture grass.

# CLAY COUNTY FACTSHEET



**Table 1. Recommended Forage Varieties for 2016-2017**

Oat	Horizon 201 SS 76-50	RAM LA 99016 Legend 567	Horizon 306
Rye	FL 401 (very early) FL 104	Wrens Abruzzi Elbon	Bates RS4 Oklon
Wheat	AGS 2038	SS8641	Southern Harvest 550 Dyna-Gro Savoy
Triticale	Trical 342	Monarch	SS 1414
Ryegrass	Attain Big Boss Bulldog Grazer Verdure Prine	Diamond T Earlyploid Flying A Jumbo Passeral Plus	Nelson Fria TAMTBO Winterhawk Marshall (gray leaf spot and rust susceptible)
White Clover	Ocoee Osceola	Louisiana S-1 Regalgraze	Regal Ladino Durana
Red Clover	Southern Belle	Barduro	Red Ace
Crimson Clover	Dixie	AU-Robin	
Arrowleaf Clover	Apache	Blackhawk	
Vetch	Hairy	Cahaba white	Nova II
Winter Pea	Austrian (common)	Maple	Whistler
Balansa	Fixation		
Ball Clover	Don	Grazer's Select	Segrest
Berseem Clover	Bigbee	Frosty	
Medic	Armadillo Burr	Devine Little Burr	
Lupine	Tifblue	Tifwhite	Frost

# CLAY COUNTY FACTSHEET



**Table 2. Planting dates, seeding rates, planting depths, and grazing parameters for certain cool-season forage crops.**

Seed-propagated crops <sup>1</sup>	Planting dates <sup>2</sup>	Seeding rates (lb/A broadcast)	Seeding depth (inch)	Grazing height (in.)		Rest period
				begin	end	
Clover, Arrowleaf	Oct. 1 - Nov. 15	8 - 12	0 - 1/2	8-10	3-5	10-20
Clover, Ball	Oct. 1 - Nov. 15	2 - 3	0 - 1/4	6-8	1-3	7-15
Clover, Berseem	Oct. 1 - Nov. 15	15-20	1/4 - 1/2	8-10	3-5	10-20
Clover, Crimson	Oct. 1 - Nov. 15	20 - 25	1/4 - 1/2	8-10	3-5	10-20
Clover, Red	Oct. 1 - Nov. 15	10-15	1/4 - 1/2	8-10	3-5	10-20
Clover, Subterranean	Oct. 1 - Nov. 15	15 - 20	1/4 -1/2	6-8	1-3	7-15
Clover, White	Oct. 1 - Nov. 15	3 - 4	0 - 1/4	6-8	1-3	7-15
Fescue, Tall	Nov. 1 - Dec. 15	20-25	1/4 -1/2	4-8	2-3	15-30
Oats for forage	Sept. 15 - Nov. 15	100-120	1 - 2	8-12	3-5	7-15
Pea, Austrian Winter	Oct. 1 - Nov. 15	40 - 60	1/2 - 1	Poor grazing tolerance. Better suited as a hay or silage crop.		
Rye for forage	Oct. 15 - Nov. 15	90 - 120	1 - 2	8-12	3-4	7-15
Ryegrass, Italian (annual)	Oct. 1 - Nov. 15	20 - 30	0 - 1/2	6-12	3-4	7-15
Sweetclover	Oct. 1 - Nov. 15	10 - 15	1/4 -1/2	8-10	3-5	10-20
Turnips	Oct. 1 - Nov. 15	5 - 6	1/4 - 1/2	6-8	2-3	varies
Vetch, hairy	Oct. 1 - Nov. 15	20 - 30	1 - 2	6-8	3-4	varies
Wheat for forage	Oct. 15 - Nov. 15	90 - 120	1 - 2	8-12	3-5	7-15
Triticale for silage	Oct. 15 - Nov. 15	90 - 120	1 - 2	Harvest for silage at milk or soft dough stage of maturity.		

<sup>1</sup> Always check seed quality. Seed germination should be 80% or higher for best results.

<sup>2</sup> Planting date range: in general, cool-season forage crops in northern Florida can be planted in the early part of the planting date range and in southern Florida, in the latter part of the planting date range.

The use of trade names in this publication is solely for the purpose of providing specific information. UF/IFAS does not guarantee or warranty the products named, and references to them in this publication does not signify our approval to the exclusion of other products of suitable composition.

All information for 2016 Cool-Season Forage Recommendations were contributed by Ann Blount, Patricio Munoz, Jose Dubeux, Joao Vendramini, Ali Babar, Kevin Kenworthy, and Ken Quesenberry (North Florida Research and Education Center, Department of Agronomy and the Range Cattle Research and Education Center)

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