

A close-up photograph of a young pine sapling with vibrant green needles, growing out of a forest floor covered in a thick layer of dry pine needles and brown leaves. The background is softly blurred, showing more trees and foliage.

# **Enviva Forest Restoration Plan:**

## **A Longleaf Forest High Conservation Value Program and Five-Year Ecosystem Restoration Plan**

**March 27, 2020**





*Gopher tortoises are an imperiled species that most often live in upland longleaf pine forests.*

# Executive Summary

## Global conservation value

The longleaf pine is a critical pine forest ecosystem in the Southeast U.S.

Longleaf pine forests are considered high conservation value (HCV) because of their rarity and biodiversity value. Once covering over 90 million acres, longleaf forests now encompass about 4.7 million acres. Longleaf stands can and do support high levels of biodiversity—in fact, some longleaf stands with high-quality understory support some of the highest levels of small-scale species diversity of any forest ecosystem in North America.

With relatively open canopies and diverse understory plant communities, well-maintained longleaf pine forests provide critical pine savanna forest habitat for 29 threatened and endangered species, including the red-cockaded woodpecker, gopher tortoise, and black pine snake. In fact, the longleaf pine savanna forests of the Southeast U.S. are not only one of the most biodiverse forests in North America, but they are one of the most valuable ecosystems on Earth, according to renowned Harvard biologist E.O. Wilson.<sup>1</sup>

## Historic decline and current challenges

Historically, longleaf forests extended from Virginia to Texas, encompassing over 90 million acres, but by 2005, only 2.6 million acres remained (about 2.2% of their original extent).<sup>2</sup> Almost all the longleaf forests had been converted to farmland, planted to other Southern yellow pine species, or lost to development.

Furthermore, many longleaf stands are in degraded conditions, primarily because their canopies and/or mid-story are too dense, which shades out critical groundstory plant communities. This excessive wood biomass buildup also inhibits using frequent, low-intensity prescribed fire, which is key for the maintenance of the fire-adapted/fire-dependent understory plant communities in well-maintained longleaf habitats (and other pine savannas).

## Longleaf restoration and the need for appropriate, restoration-focused wood biomass removal

Thanks to a broad, effective restoration effort over the last 10 years, the amount of longleaf forests has been slowly but steadily rebounding, with about 4.7 million acres of longleaf in 2019. The goal of America's Longleaf Restoration Initiative (ALRI) is to restore 8 million acres.

To restore overgrown longleaf stands as well as to remove offsite pine species as part of re-establishing longleaf forests, landowners and managers need certain trees and brush removed, which requires appropriate, restoration-focused forest management and logging. It also requires markets for a wide range of types and forms of low-value wood.

Because the trees and brush that need removal are usually low-value hardwood and pine, Enviva's sourcing, when done according to sound longleaf management practices, can be a critical step in the process of restoring longleaf forests. Enviva's sourcing has already supported the restoration of thousands of acres of longleaf, mostly on state and federal lands.

1 Wilson, Edward O. *Half-Earth: Our Planet's Fight for Life*. United States, Liveright, 2016.

2 Oswalt, Christopher M.; Cooper, Jason A.; Brockway, Dale G.; Brooks, Horace W.; Walker, Joan L.; Connor, Kristina F.; Oswalt, Sonja N.; Conner, Roger C. 2012. History and current condition of longleaf pine in the Southern United States. Gen. Tech. Rep. SRS-166. Asheville, NC: U.S. Department of Agriculture Forest Service, Southern Research Station. 51 p. <https://www.srs.fs.usda.gov/pubs/42259>

## Enviva's longleaf HCV program and five-year restoration plan

Enviva will include longleaf forests as part of our expanded HCV forest policy and procedures. We will only source from identified, mapped longleaf stands if the logging is consistent with the maintenance and improvement of the longleaf forest. We strongly prefer and encourage that landowners have management plans specifying long-term maintenance and management of longleaf, and we will cover the costs to have such a management plan written and for the stand to be certified as sustainably managed.

Enviva's five-year longleaf restoration plan describes the strategies we will implement to directly support longleaf restoration, chiefly through strategic, restoration-focused sourcing on public and especially private lands, but also through new collaborations and investments.

### Partnership with The Longleaf Alliance

Enviva will implement our longleaf HCV policy and five-year longleaf restoration plan as part of a memorandum of understanding (MOU) with The Longleaf Alliance that details shared goals as well as respective roles and responsibilities. Specifically, The Longleaf Alliance will provide technical expertise to ensure that Enviva's biomass sourcing in longleaf stands directly improves stand conditions. Enviva and The Longleaf Alliance will work together with landowners and land managers to support longleaf restoration on public and private lands. And every year, Enviva and The Longleaf Alliance will collaboratively monitor, track, and report progress on restoration-oriented biomass sourcing as well as work on specific restoration projects.

### Annual longleaf restoration goals

From 2021 to 2024, Enviva, in collaboration with The Longleaf Alliance, our consultants, and other partners, will set annual certification, restoration, planting, and restoration/enhancement investment goals.

As part of this plan, in 2020, Enviva, working with our partners, will:

1. Enroll 2,500 acres of private forestland into sustainable forest management certification specifying long-term longleaf management.
2. Restore 5,000 acres (or have 5,000 acres on the path toward restoration) through restoration-oriented biomass sourcing on public and private lands.
3. Plant 135,000 longleaf seedlings at the DeSoto National Forest and other locations.
4. Install 56 red-cockaded woodpecker nesting cavities and repair 112 nesting cavities on the DeSoto National Forest to increase the nesting potential of this federally listed endangered species.

Beyond the HCV procedures we will implement in 2020 and some of the additional steps we will take over the course of 2020, this plan recognizes the ongoing need for flexibility, learning, collaborative problem-solving, and adaptive management. In keeping with the need to integrate learning and flexibility, this plan includes prescriptive elements and quantified restoration sourcing goals for 2020, but also many suggestive and descriptive elements. Based on our progress, collaboration and feedback from partners, and other factors, Enviva will set annual sourcing goals, expressed in terms of acres and tons of fiber procured through longleaf restoration practices included in this plan.


For Enviva, supporting longleaf restoration with appropriate, restoration-oriented biomass sourcing will have the additional benefits of diversifying our wood sources, increasing the security of our wood supply, and increasing our purchasing of certified material. Enviva can source biomass, displace coal, and help restore one of the most important ecosystems on Earth.





*Wildlife biologist Joel Casto installs a nesting cavity for endangered red-cockaded woodpeckers (RCWs) on the DeSoto National Forest, March, 2020. Because suitable cavities are limited, inserting nesting cavities increases RCW reproductive success.*





*With the technical assistance of The Longleaf Alliance and the collaboration of the DeSoto National Forest, Enviva supported Casto's work installing new cavity inserts and rejuvenating existing inserts.*

## Acknowledgments

Enviva is grateful for the suggestions and assistance from the following individuals and organizations:

- Robert Abernethy, *past president* and Carol Denhof, *president*, *The Longleaf Alliance*
- Gary Burger, *past chair of the Longleaf Partnership Council (LPC) and Statewide Forester, SC DNR*
- Darrel Pendris and *Milliken Forestry Company*
- Rickie White and Carl Nordman, *NatureServe*
- Francesca (Csenka) Favorini-Csorba and Chris Raynham, *Earthworm Foundation*
- Jesse Wimberley, *Coordinator, NC Sandhills Prescribed Burn Association, and Enviva landowner outreach consultant (Hamlet, NC area)*
- Mickey Knapp, *Enviva landowner outreach consultant (Cottondale, FL area)*

## 1. Longleaf conservation value and restoration goals

Longleaf pine is a critical pine forest ecosystem in the Southeast U.S. Across its historic range and given the wide variety of hydrological/topographical conditions in which longleaf pine is found, there are an equally wide variety of longleaf habitat types.

Longleaf pine stands can be considered HCVs because of their rarity and biodiversity value. Once covering over 90 million acres, longleaf forests now encompass about 4.7 million acres. Longleaf stands can and do support high levels of biodiversity—in fact, some longleaf stands with high-quality understory support some of the highest levels of small-scale species diversity of any forest ecosystem in North America.

Through [America's Longleaf Restoration Initiative](#) (ALRI), a collaboration of state and federal agencies, NGOs, landowners, and the private sector, longleaf ecosystem restoration goals have been developed at both stand and landscape level; these stand and landscape-level restoration goals form the parameters and yardsticks by which we will evaluate Enviva's longleaf restoration progress.

At the stand level, longleaf restoration is a prescriptive approach based on individual stand needs and focuses on moving longleaf toward more desirable conditions, defined in terms of stand composition and structure. As a type of fire-dependent pine forest, desired conditions for longleaf habitats are characterized by having an open canopy of mature longleaf trees, minimal mid-story component, and a diverse understory plant community. ALRI's condition-class metrics detail the desired conditions of the canopy, mid-story, and understory (see Appendix A).<sup>3</sup>

NatureServe developed rapid assessment metrics that yield quantified assessment of stand conditions<sup>4</sup>, which our monitoring program will use.

Enviva's restoration-oriented sourcing will help move stands toward maintenance condition class (see Appendix A), so prescribed fire and other management techniques can keep them in generally good condition, with appropriate levels of mid-canopy.

***Enviva isn't planning on repeatedly sourcing or harvesting mid-canopy or other materials out of longleaf stands that are in maintenance class.***<sup>5</sup>

At the landscape level, ALRI has set a goal of restoring [8 million acres by 2025](#), with at least half of those acres in 16 identified significant geographic areas (SGAs) (see SGA map in Appendices). Accelerating restoration on private lands has been a challenge, but Enviva can help overcome this key challenge by providing a market for trees and other materials to be removed to restore stands to desired conditions and by providing certification and management plans to landowners.

<sup>3</sup> <http://www.americaslongleaf.org/media/14299/final-lpc-maintenance-condition-class-metrics-oct-2014-high-res.pdf>

<sup>4</sup> [https://www.natureserve.org/sites/default/files/projects/files/field\\_protocols\\_for\\_southern\\_open\\_pine-final.pdf](https://www.natureserve.org/sites/default/files/projects/files/field_protocols_for_southern_open_pine-final.pdf)

<sup>5</sup> In stands that are close to major highways (or have some other special consideration) and where prescribed fire cannot be used to control mid-story hardwood growth, it might be preferable to repeatedly harvest mid-story hardwood. But these cases are exceptional rather than typical.



## 2. How restoration-oriented biomass sourcing supports longleaf restoration

Enviva’s biomass sourcing will support longleaf restoration by providing a critical market to landowners and land managers who want to improve existing or restore new longleaf stands, which often requires removing certain kinds or amounts of trees.

In forestry terms, Enviva’s biomass sourcing can help alter stand structure and composition to directly improve stand conditions, specifically to move stands toward maintenance condition class. Structurally, biomass removals can thin canopy or mid-story, letting more light reach the ground. As important, restoration sourcing can reduce fuel loads, especially of the mid-story component, which reduces the risk of prescribed fire and increases the ability and likelihood that stands will get burned with the desired intensity and frequency (i.e., every 2-3 years in many cases).

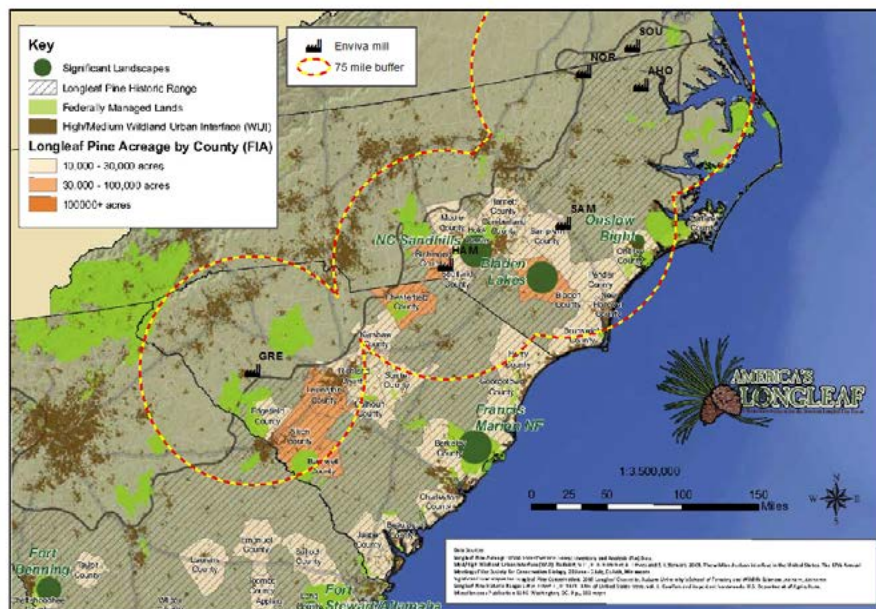
The following diagram illustrates generalized pathways for how Enviva’s sourcing helps restore stands in one of three main starting conditions.

<b>Existing longleaf pine stand needing thinning (canopy or midstory)</b>	<b>Thinning to open canopy or remove unwanted midstory</b>	<b>Ongoing maintenance, especially through prescribed fire</b>
<b>Offsite canopy species (sand, loblolly or slash or hardwood) to be restored to longleaf pine</b>	<b>Clearcut removal of offsite species</b>	<b>Ongoing maintenance, especially through prescribed fire</b>
<b>Mixed stand with minority longleaf pine to be restored to longleaf pine [‘game-changer’ strategy]</b>	<b>Heavy canopy thinning to restore longleaf as dominant canopy species</b>	<b>Ongoing maintenance, especially through prescribed fire</b>

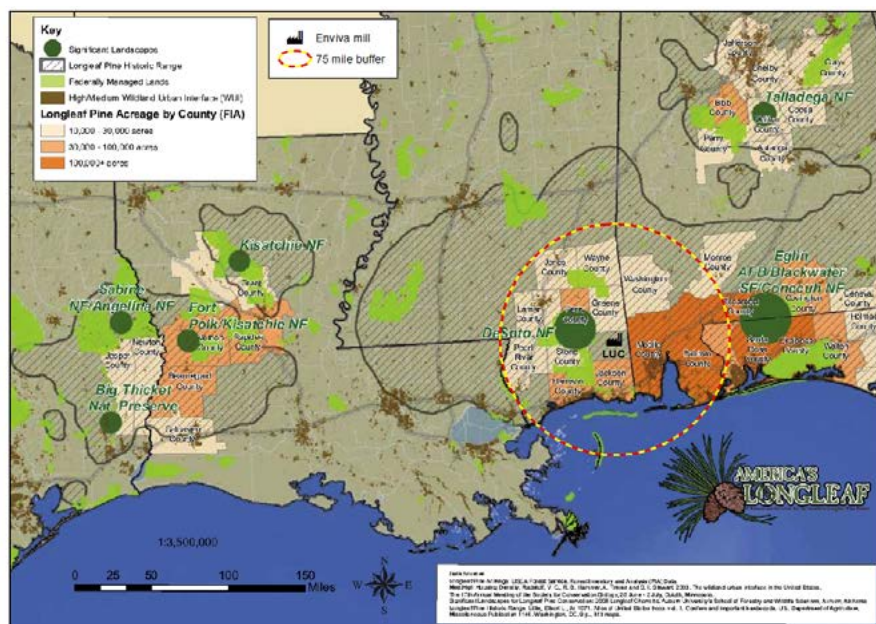
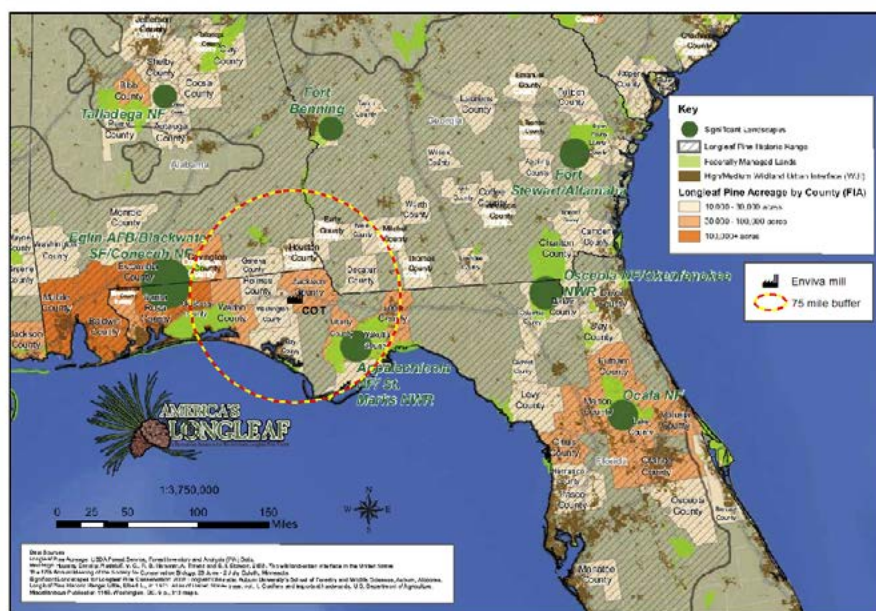
*Typical ‘starting conditions’ for longleaf stands in which biomass sourcing can support restoration*

At a regional level, because most Enviva plants are within hauling distance of SGAs, most restoration we support will be in SGAs (see maps on page 7), with the main exception being our plant in Cottondale, FL, which is midway between the Gulf Coastal Plain Ecosystem Partnership and the Apalachicola Stewardship Alliance.





Map showing the location of Enviva's plants relative to ALRI's Significant Geographic Areas (SGAs), showing a 75-mile hauling radius



### 3. Background and context of Enviva’s longleaf restoration

Enviva’s sourcing has supported longleaf restoration on thousands of acres of public lands. Though not all complete, the following chart illustrates its varied stand conditions, sourcing types, and broad geographic range (from North Carolina to Florida).

Examples of Enviva’s biomass sourcing that has supported restoration on public lands:

Forestry operation	Restoration goals	Examples
Thinning hardwood mid-canopy	Opening stand and improving wildlife habitat	650 acres at Fort Jackson (SC)
Thinning canopy	Microchipping to thin loblolly to restore gopher tortoise habitat	800+ acres at Geneva State Forest (AL)
	Thinning canopy to get light on understory community	Croatan National Forest (NC)
	Thinning canopy to get light on understory community	1,000+ acres at Eglin Air Force Base (FL)
Clearcutting (either roundwood or chipping) canopy and mid-story	On longleaf soils/sites, removing small-diameter sand pine or loblolly pine or scrub hardwood to restore longleaf	140 acres at <a href="#">Torreya State Park (FL)</a> & <a href="#">Falling Water State Park (FL)</a>

Enviva’s prior restoration-focused sourcing demonstrated the value of biomass sourcing to longleaf restoration as well as demonstrated that restoration-focused sourcing can be done at meaningful scale and at viable fiber costs.

Consider what Drew Nix, a forester with the Alabama Division of Wildlife and Freshwater Fisheries, said about how Enviva’s microchip sourcing for our Cottondale plant supported the restoration of 800 acres of longleaf at Geneva State Wildlife Management Area, located in southern Alabama:

*“[The stand that was microchipped by Kennedy Logging and purchased by Enviva Cottondale] was an older longleaf stand that had been burned previously, but still looked much like the adjoining stands... I cannot speak highly enough of the job that the contractor has done in thinning our timber, and the availability of hauling that product to Enviva. This project has put us several years ahead of the curve in restoring much needed habitat for the gopher tortoise [a threatened species in some parts of its range].*

*We hosted a [conservation community] field tour on Geneva State Forest Wildlife Management Area this past June, and this stand was one of the stops on the tour. Everyone there was complimentary of how the residual stand looked and the low impact ground disturbance created through the microchipping. Several folks asked about Enviva, and how far away Enviva would source fiber.”*



Enviva’s sourcing of microchips supported the thinning restoration of an 800-acre longleaf stand at Geneva State Wildlife Management Area in Alabama, which is managed for gopher tortoises, red-cockaded woodpeckers, and other species dependent on longleaf pine savanna habitat. The restoration-focused logging and microchipping removed the undesirable hardwood mid-canopy (left) that was shading out the critical understory plant community, which is now getting more sunlight and starting to develop (right).





*Thinned (left) and unthinned (right) stands at Geneva State Wildlife Management Area, AL.*



In 2018-2019, to increase our longleaf restoration sourcing, several Enviva staff and consultants conducted outreach, primarily by making presentations to Local Implementation Teams (LITs) and conservation collaboratives (NC and SC Sandhills LITs, DeSoto, etc.), and by engaging networks of longleaf landowners. Through these presentations we identified numerous restoration sourcing opportunities on public and private lands, as well as lands under conservation easement or managed by conservation organizations. In 2019, Enviva staff also met with National Wildlife Refuge managers, which also led to ongoing collaborations on restoration opportunities at Carolina Sandhills and Great Dismal Swamp National Wildlife Refuges.

In June 2019, Enviva released the new [Responsible Sourcing Policy](#) (RSP), which includes an expansion of our HCV policy and procedures supporting the restoration of critical forest types, both relevant to longleaf. In 2020, we will expand our HCV policy to identify and manage longleaf forests (see page 15 for our 2020 longleaf restoration goals). As part of our annual RSP implementation plans, we will make our longleaf restoration goals public and report our progress toward those goals.

*Jesse Wimberley, Coordinator of the NC Sandhills Prescribed Burn Association, is working with Enviva around our plant at Hamlet, NC to benefit the landowners with whom he works with to restore their longleaf forests.*

*As Wimberley puts it, the goal is “to develop and promote new markets to address the tremendous volume of hardwood mid-story that has accumulated on many private lands as a result of fire exclusion. This hardwood mid-story represents the greatest challenge for private landowners who wish to restore their longleaf habitat. Not only is removing this mid-story the most expensive part of their restoration, but also presents a barrier to using prescribed fire.*

*Converting this mid-story challenge from a liability to an asset for landowners could be the financial incentive families need in deciding to retain and restore their family forests. Developing a new biomass market could also be one of the ‘game-changing’ ideas needed to accomplish ALRI goals of restoring 8 million acres.”*

## Assisting private landowners

In 2019, we conducted a pilot project to demonstrate that we could recruit private forest owners with significant acreage of longleaf stands in need of biomass removals, with a goal to help landowners restore 500 acres. Originally our pilot was going to focus on the Sandhills around our new plant at Hamlet, NC, but we expanded its geographic scope to include our plant at Cottondale, FL. To identify interested landowners, we hired Jesse Wimberley, Coordinator of the NC Sandhills Prescribed Burn Association, and we hired a consultant in Florida who works for a microchipping supplier.

In the NC Sandhills, Jesse Wimberley focused on landowners with longleaf forests with mid-canopy that needed thinning, including public as well as private lands. Working with public land managers and private landowners, Jesse Wimberley and other partners identified about 775 acres of stands that can be restored with appropriate biomass harvesting.

In Florida, our landowner outreach focused on landowners who want to restore longleaf on longleaf suitable sites (well-drained, deep sandy soils) by clearcutting the current stands of scrub oak and other offsite hardwood or pine. Between late September and mid-November 2019, we recruited landowners wanting over 250 acres of longleaf to be planted.

## Challenges:

Our 2019 pilot did identify some challenges, including:

- a. Needing more logging crews willing and able to thin low-volume tracts, such as with scrub oak mid-canopy. This is the most important challenge we identified in 2019 and addressing it is a focus in 2020.
- b. Needing to streamline the coordination of management and/or harvest plan writing.



## 4. How Enviva's appropriate sourcing will increase the quantity and improve the quality of longleaf restoration on private lands

Enviva has supported longleaf restoration on a few privately-owned tracts. Some of these occurred before our pilot project to demonstrate that we can expand our private-lands restoration sourcing. Working with consultants in Florida and North Carolina, we recruited many more landowners as part of our pilot. To expand our restoration sourcing on private lands, we need to work with landowners, foresters, The Longleaf Alliance, and other nonprofit partners to develop and implement restoration-focused management plans, monitor progress (especially at the tract level), collaboratively recruit many more landowners interested in longleaf restoration, and resolve practical barriers to getting restoration-oriented logging done. This plan is focused on these aspects.

As an integral part of our effort to expand longleaf restoration on private lands, Enviva's policies and procedures will maintain and restore longleaf as an HCV. In our [Responsible Sourcing Policy](#) released in June 2019, Enviva committed to expand our HCV protections through the HCV Network Approach, and we specifically mentioned longleaf as an HCV we will start identifying and maintaining in 2020.

The HCV Network Approach has three steps or phases—identification, management, and monitoring. A major focus of our work in 2020 will be the implementation of the HCV Network Approach in longleaf. In 2020, with The Longleaf Alliance's technical input, we will test, finalize, and fully implement across Enviva's regions the following procedures:

### 1. Identification

We will use the best-available mapping data in our states to identify longleaf stands. We will only source wood from identified, mapped longleaf stands if the landowner or land manager intends to maintain and manage the stand as a longleaf pine forest.<sup>6</sup>

As part of our HCV expansion work in 2019, we obtained longleaf mapping data from NatureServe, which will use until the Longleaf Element Occurrence mapping project has updated longleaf mapping data available in the states where we source wood.

In early 2020, we will pilot our new longleaf HCV tract-level sourcing procedures, which will involve checking all prospective tracts from which we consider buying wood against the best-available longleaf mapping data. For us to source from tracts that have mapped longleaf, landowners and loggers will have to agree to the maintenance of management of longleaf, as described in the Management Section below.

After our trial and refinement period, we will implement our new longleaf HCV procedures company-wide by the end of 2020.

### 2. Management

Any Enviva sourcing from stands with mapped longleaf will have to be consistent with the maintenance and improvement of those longleaf stands. Conceptually, our sourcing will need to maintain or contribute to an improvement in longleaf stand conditions as defined by ALRI's Condition Class Metrics (see Appendix A).

<sup>6</sup> In rare cases, such as where longleaf was planted on an inappropriate site and is faring poorly, we will consider sourcing if the landowner intends to convert the stand to another forest type. But we will carefully review such potential exceptions to our policy and only approve them if there is a legitimate ecological rationale for not maintaining the longleaf stand.

In practical terms, our sourcing will have to be consistent with widely accepted longleaf management practices. With the assistance of The Longleaf Alliance, NatureServe, and Milliken Forestry Company, we developed generalized longleaf management guidelines (see Appendix B), which foresters will tailor and apply in site-specific longleaf harvesting and management plans.

In 2020, Enviva will require that for all our sourcing from identified, mapped longleaf stands, landowners will have to intend to maintain and manage longleaf stands in broad agreement with the longleaf management guidelines we collaboratively developed.

In addition, Enviva will strongly prefer (but not require in all cases) that private lands from which we buy longleaf restoration-oriented sourcing will be certified as sustainably managed, with the long-term management specified in the management plan. Enviva will pay all costs for management plans and certification, either through American Tree Farm System or Forest Stewardship Council® (FSC®).

### 3. Monitoring

Our monitoring program will assess restoration progress at the tract and landscape level, in keeping with the metrics and goals developed by ALRI. In 2020, working with The Longleaf Alliance, we will develop a stand and landscape-level monitoring protocol, which we will use as the basis for reporting our progress in restoration-oriented biomass sourcing from longleaf stands.

At the tract or stand level, we will assess outcomes according to ALRI's condition-class metrics. In 2020, we will develop and begin conducting stand-level assessments to quantify and document stand conditions before and after the restoration-oriented biomass harvest.

Based on these assessments, we will determine trends, areas of improvement, and recommend changes, especially to harvest plans.

At the landscape level, we will work with The Longleaf Alliance to monitor and confirm the acreage of longleaf restoration we support through restoration-oriented sourcing, longleaf establishment, and red-cockaded woodpecker and other habitat restoration activities.

With the assistance of The Longleaf Alliance, we will report progress toward ALRI goals. As part of [Enviva's Responsible Sourcing Policy \(RSP\) reporting](#), we will report twice a year, including a qualitative assessment mid-year (very short narrative description identifying steps/challenges) and a quantitative report at end of year (acres, seedlings, tons, etc.)



## 5. Proactive, strategic biomass sourcing strategies to support longleaf restoration

### Overarching strategies applicable to public and private lands

In 2020, Enviva will implement or expand these strategies to increase our strategic sourcing from the restoration of longleaf and other critical forest types.

- Connecting Enviva Sustainability and Wood Procurement Team foresters to the longleaf network, particularly by attending quarterly Local Implementation Team (LIT) meetings (see Appendix C). Much of the longleaf restoration is done collaboratively, between agencies and organizations, and knowing people and attending LIT meetings is a good way to learn of restoration sourcing opportunities. In some regions, LIT meetings are held in conjunction with broader conservation collaborative meetings. LIT meetings will also be a good way to educate the longleaf community on the markets that Enviva creates for low-value, small-diameter trees that may not have been marketable previously.
- In October 2019, Enviva's representative began serving on The Longleaf Partnership Council (LPC) as an industry representative, which facilitates our coordination with the major longleaf restoration partners, including connecting to the Department of Defense (DoD), U.S. Forest Service (USFS), Forest Landowners Association, Sustainable Forestry Initiative® (SFI®), and other large landowners. LPC meetings are open to non-members, and the meetings are held in various locations across the longleaf range, so Enviva will send local Sustainability and Wood Procurement staff to LPC meetings.
- Enviva Wood Procurement and/or Sustainability foresters who attend SFI State Implementation Committee meetings will describe Enviva's longleaf and other restoration goals.

### Enviva staff

- We will train and socialize the importance and opportunity of longleaf management. We will send our Wood Procurement and Sustainability foresters on longleaf ecosystem and restoration through attendance in regularly-scheduled [Longleaf Academies](#).

### Loggers and suppliers

- In all our regions, Enviva will explain our prioritization of procedures related to longleaf restoration to foresters, loggers, and suppliers.
- Enviva will find and/or recruit more logging crews that can and will focus on thinning, especially lower-volume stands (minimum of one load per acre).

### Strategies to increase our support for longleaf restoration on public lands

By expanding our collaboration and exploring ways to increase our purchase of fiber from public lands, we will increase our support of longleaf restoration on public lands.

Supporting additional longleaf restoration on public lands by increasing our sourcing from public lands, especially state wildlife management areas, state and national forests, and Department of Defense facilities and bases, but also state parks, National Wildlife Refuges, and other public lands managed especially for habitat conservation. Enviva can increase longleaf restoration-oriented sourcing from public lands under traditional timber sales and stewardship agreements.

Traditionally, timber sales on public lands are an open bid process. The Wood Procurement Team receives public bid notices from many public agencies, but possibly not all. Under conventional timber sales, we could be able to do more restoration sourcing from numerous public lands by:

- Including public lands restoration projects located on high, well-drained soils as part of our wet-weather stumpage program.
- Continuing to coordinate with federal agencies on Longleaf Partnership Council, especially the DoD and USFS. Directly discuss longleaf restoration plans with land-owning state and federal agencies in our sourcing regions.
- Explore potential for stewardship agreements. These innovative arrangements can and do take multiple forms, but they all involve ‘bartering’ timber for restoration work on public lands, either directly between the timber buyer and the public agency, or indirectly with a third party, usually a conservation organization.<sup>7</sup> We can develop and expand our restoration sourcing through developing stewardship agreements.

### **Strategies to increase our support for longleaf restoration on lands owned by conservation organizations**

Enviva’s sourcing has supported longleaf restoration on a handful of parcels owned by nonprofit conservation organizations in North Carolina and Florida.

- To increase our support for restoration of conserved lands owned by conservation organizations, we can develop a collaborative outreach effort with The Longleaf Alliance, focusing on the quality of restoration sourcing to ensure that all restoration work complies with restoration and habitat goals.

### **Strategies to increase our support for longleaf restoration on private lands**

Intentionally supporting longleaf restoration involves new and innovative sourcing strategies. Intentionally and strategically supporting forest restoration on private lands involves new ways of strategically identifying and connecting with varying types of landowners.

- Proactively engaging with private landowners. Small family forest owners often don’t have management plans or connections to professionals to assist them with special silviculture and operations necessary to manage longleaf stands. Our longleaf restoration program offers value to them because it provides a management plan that includes longleaf management.
- Restoration-oriented biomass harvesting can also be extremely valuable to small landowners. We will explore new strategies and collaborations to effectively and efficiently engage increasing numbers of small landowners as well as larger landowners interested in longleaf restoration.

<sup>7</sup> [http://www.pinchof.org/gp/Stewardship\\_Contracting](http://www.pinchof.org/gp/Stewardship_Contracting)



## 6. 2020 longleaf restoration goals

From 2021 to 2024, Enviva, in collaboration with The Longleaf Alliance, our consultants, and other partners, will set annual certification, restoration, planting, and restoration investment goals.

As part of this plan in 2020, Enviva, working with our partners, will:

1. Enroll 2,500 acres of private forestland into sustainable forest management certification specifying long-term longleaf management.
2. Restore 5,000 acres (or have 5,000 acres on the path toward restoration) through restoration-oriented sourcing on public and private lands.
3. Plant 60,000 longleaf pine seedlings on the DeSoto Ranger District of the DeSoto National Forest.
4. Plant 75,000 longleaf pine seedlings at sites to be decided by Enviva, The Longleaf Alliance, and other partners.
5. Work with Chickasawhay Ranger District of the DeSoto National Forest and install 56 red-cockaded woodpecker artificial nesting cavities in 14 clusters and inspect and maintain and repair 112 inserts in 28 clusters (4 inserts per cluster) across the district to increase the nesting potential for the Federally endangered species.

**As part of our Responsible Sourcing Policy's annual Implementation Plans, Enviva will release our annual restoration goals, including those regarding longleaf.**

## Appendix A

### ALRI Condition Classes

#### General Longleaf Pine Maintenance Condition Class Metrics

Metric	Maintenance Condition Class Minimum Standards	Field Observation Checklist
Overstory Canopy		
Longleaf Pine Canopy	Longleaf stand with two-tiered or uneven-aged structure; longleaf pine basal area 40-70 ft <sup>2</sup> /acre.*	
Canopy Hardwood or Off-Site Pine	Basal area ≤ 10 ft <sup>2</sup> /acres of canopy hardwoods or off-site pines ≥ 5" dbh.	
Evidence of mature characteristics in stand	Large longleaf present (BA at least 20 ft <sup>2</sup> /acre of trees ≥ 14" dbh class) or flat-top longleaf present in canopy.**	
Mid-story Canopy		
Shrub Cover	Shrub average ≤ 30% cover and average < 3 feet tall.	
Canopy Fire-intolerant Hardwood or Off-Site Pine	20% or less mid-story cover, with < 5% cover of fire-intolerant hardwood or off-site pine trees over 16 feet tall.	
Ground Layer		
Herbaceous Indicators	Herbaceous cover > 35%, with native pyrogenic species present in stand.***	
Longleaf Pine Regeneration	Advance longleaf regeneration cover is 5-15% of stand. Includes grass stage or regeneration < 2" dbh.	
Non-native Invasive Species	Cover of invasive exotic plant species ≤ 1%.	

*A longleaf stand or area is considered to be in the "maintenance" condition class if all identified metrics are checked; otherwise the stand is in an "improve" condition class. \*\*\*\**

Source: <http://www.americaslongleaf.org/media/14299/final-lpc-maintenance-condition-class-metrics-oct-2014-high-res.pdf>



# Appendix B

## Forest Management Guidelines For Longleaf Pine Tracts

### FALL 2019

#### Introduction

Milliken Forestry Company and Enviva developed this document as part of our collaboration to support 1) the restoration of longleaf pine (LLP) forests through strategic biomass sourcing and subsequent management, and 2) the certification of forestland in the Southeast U.S. under the American Tree Farm System (ATFS) or the Forest Stewardship Council® (FSC®). Through our collaboration and work with many partners in the longleaf community, we hope to support the goals of America's Longleaf Restoration Initiative (ALRI), particularly by increasing the pace and scale of restoration on private lands.

Specifically, we intend that Milliken, Enviva, and other foresters will use this document as a technical resource as they write forest management plans for landowners who want to restore LLP forests and who will have harvest activities conducted, in accordance with their management plans, from which some biomass will go to Enviva.

After describing generalized longleaf management guidelines, this document is organized around four main or typical original stand conditions that foresters often encounter and need to work with as they help landowners restore longleaf:

1. an 'offsite' stand like sand pine or loblolly on soils better suited to longleaf;
2. a longleaf stand with a hardwood mid-canopy that needs to be removed;
3. a stand with a minority longleaf component that could be converted to a longleaf stand through a heavy thinning of other canopy and mid-canopy trees; and
4. a gradual restoration of longleaf through planting small clearcuts.

Though stands begin with varying conditions, the management guidelines should help move stands toward similar conditions over time—longleaf stands with diverse groundcover that provides significant habitat value. To quantify the improvement in stand conditions through strategic biomass sourcing, we include the use, before and after harvest, of the rapid assessment tool developed by NatureServe.

Geographically, the scope of this document includes all of Enviva's sourcing regions, extending from Virginia to Mississippi (see maps below); as such, it encompasses almost the entire longleaf range, and applies to longleaf forests in the coastal plain, sandhills, and montane regions. We note that management considerations, particularly herbicide usage and prescribed fire frequency, will vary based on local contexts across these varying regions.

This document will be revised and improved over time based on experience and additional input. For example, in 2020, we look forward to integrating more local specificity and refining the herbicide and fire-frequency recommendations that vary across different regions.

**If you have feedback on this document, particularly suggestions for improvements, please email Ben Larson, Director of Sustainability at [ben.larson@envivabiomass.com](mailto:ben.larson@envivabiomass.com)**

Milliken Forestry Company and Enviva thank the following longleaf management experts for their assistance in writing and revising this document:

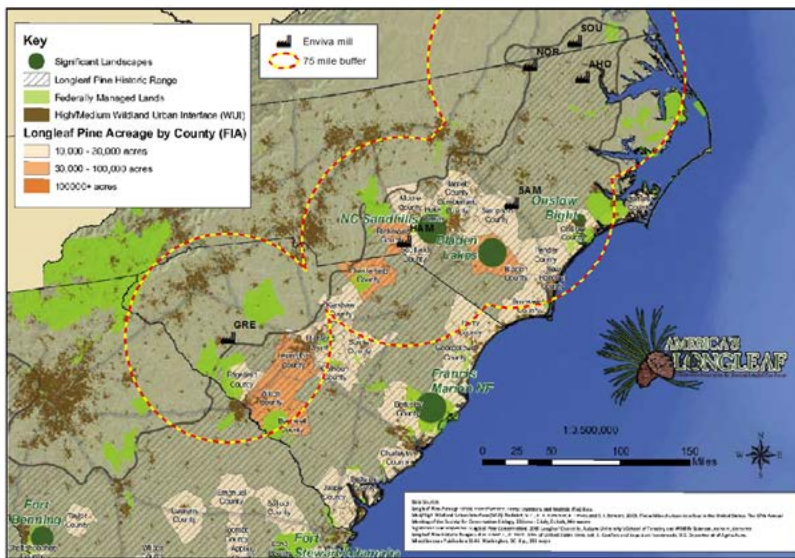
- Robert Abernethy, Carol Denhof, Lisa Lord, Ad Platt, and Ryan Bollinger at The Longleaf Alliance
- Gary Burger, former chair of the Longleaf Partnership Council and Statewide Forester, South Carolina Department of Natural Resources
- Ricky White, [formerly] NatureServe

#### **LLP CURRENT ACREAGE, HISTORICAL RANGE, AND TARGET REGION**

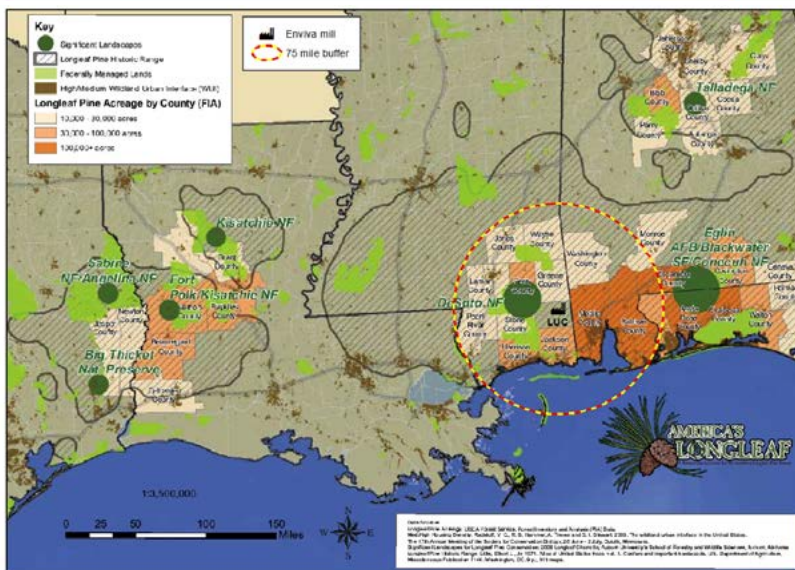
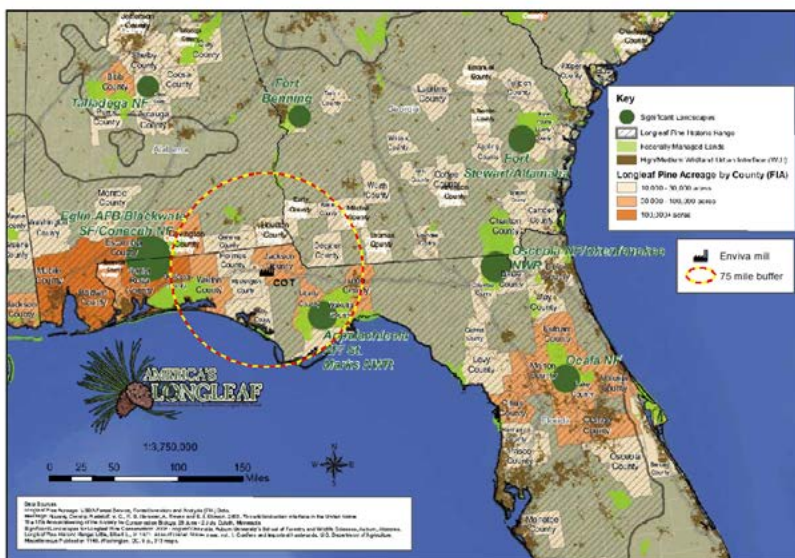
[Miles, 2016; Kirkman & Jack, 2018]

Enviva pellet plant locations in the longleaf range and in relation to Local Implementation Teams (LITs).





Map showing the location of Enviva's plants relative to ALRI's Significant Geographic Areas (SGAs), showing a 75-mile hauling radius



Source: Miles, 2016; Kirkman & Jack, 2018

Note: our plant at Lucedale, MS will be under construction in 2020 and will be operational in early 2021.

## MANAGEMENT CONTEXT & ASSUMPTIONS

[Adapted from MFC, 2019]

- Soils and site conditions of candidate FMUs are suitable for normal growth of LLP (*Pinus palustris*).
- Prescribed fire is an acceptable silvicultural tool (to the landowner, manager, and local community) for establishment and maintenance of LLP.
- Landowners and harvest operators are willing and able to implement LLP restoration plans.
- Markets exist to support implementation of certain silvicultural activities like establishment, maintenance, and periodic harvesting.

## LLP STAND CONDITION ASSESSMENT

To quantify stand conditions, use [NatureServe Rapid Assessment metric<sup>1</sup>](#) before and after harvest, particularly an app based on the metrics is developed.

## TARGET DESIRED FUTURE CONDITIONS

[Adapted from McIntyre et al, 2008]

- Presence of a significant component of older LLP trees in stands as well as cohorts of advanced (natural?) regeneration established at multiple times and locations within forests.
- Maintenance of structural elements such as snags, fallen logs on the forest floor, stump holes, and tip-up mounds.
- Multiple-age-class forest canopy that remains after small-scale disturbance events or harvesting operations that emulate these events.
- Frequent, purpose-driven prescribed fire.
- Intermediate stand treatments – thinning that moves the stand toward more complex, spatially variable multiple-age-class structure.
- Adequate residual stocking to provide fine fuels for prescribed fire after harvests.
- Harvest events emulate natural disturbance patterns (lightning and small-scale wind events) and frequency within the historic range of variability in the LLP target restoration area.

## PREPARATION FOR IMPLEMENTATION OF LLP SILVICULTURE

[Adapted from McIntyre et al, 2008]

- A standard 10 percent timber inventory should be conducted initially and every 10 years (or before the next harvest) to determine the volume of timber present

<sup>1</sup> [https://www.natureserve.org/sites/default/files/projects/files/field\\_protocols\\_for\\_southern\\_open\\_pine-final.pdf](https://www.natureserve.org/sites/default/files/projects/files/field_protocols_for_southern_open_pine-final.pdf)



## BEST PRACTICES FOR LLP ESTABLISHMENT ON CUTOVER LAND

[Adapted from Hains, 2003]

A consistent formula for artificially establishing LLP on cutover sites without a longleaf overstory is:

- clearcut;
- apply a chemical site preparation;
- site-prep burn; and
- hand-plant good quality container-grown seedlings early in the planting season.

Before planting an agricultural field or pasture, it is important to determine if the site is appropriate for longleaf pine. Some sites are inappropriate, especially on sites that have:

- high pH/basic soils (>7.0 pH)
- excessive soil nutrients
- excessively wet soils

After planting seedlings, consider applying an herbaceous release the spring following planting. The most commonly used herbicides for herbaceous release on cutover sites are hexazinone (Velpar DF® or L), sulfometuron (Oust XP®), and imazapyr (Arsenal®), with Milestone and Transline increasing in use.<sup>2</sup>

### SITE PREPARATION

Most attempts to establish LLP in pastures or agricultural sites with significant components of perennial pasture grasses including bahia (*Paspalum notatum* Fluegge), fescue (*Festuca arundinacea* Schreb.), and bermuda grass (*Cynodon dactylon* (L.) Pers) end in failure, unless grasses are removed or controlled through the site preparation prior to planting. Planting seedlings directly into pastures with the intention of controlling grasses through a post-planting herbaceous release is a recipe for disaster.

Survival and growth are significantly better on scalped plots as compared to subsoil only planting. Survival and growth of longleaf is also significantly better on scalped vs. chemically site prepared plots. Overall, scalping provides a much better return in seedling survival and growth as compared to chemical or site preparation.

### HERBACEOUS RELEASE

Root growth prior to herbaceous release is key to avoiding increased seedling mortality or injury following an herbaceous release. If good root systems are established prior to the herbicide application, seedlings appear to be more tolerant of soil active herbicides. If few or no fine roots have exited the plug, expect increased mortality associated with early applications of soil active herbicides. Plant good quality seedlings early in the planting season and excavate several seedlings prior to any herbicide application.

<sup>2</sup> This is highly variable and requires more detail than a broad recommendation. See our recommendations for cutover and ag sites. <https://www.longleafalliance.org/what-we-do/restoration-management/restoration/releasing-longleaf-pine-from-competition> These herbicides/mixes should be avoided: Escort (at any rate), Arsenal/Oust Tank mix (before May 15th), Atrazine/Oust Tank mix, Surfactants

## PLANTING DEPTH

Planting depth is the single most critical factor affecting seedling survival and growth. A large percentage of early unexplained planting failures were a direct result of planting containerized seedlings too deep. When soil covers the terminal bud, seedling mortality increases dramatically while seedling growth is set back with surviving seedlings. Seedlings planted with the plug exposed outperform seedlings planted with the terminal bud beneath the soil surface.

## TIME OF PLANTING

Given adequate soil moisture, experts recommend planting December-March. In moist soils, longleaf seedlings frequently initiate root growth very quickly. Early planted container longleaf seedlings appear more tolerant of winter droughts than bareroot seedling stock. Seedlings planted early in the planting season have more developed root systems come spring, and thus appear more tolerant of spring droughts and herbaceous competition.

## KEY STEPS

- Begin with a soil test for micronutrients.
  - Use good seedlings.
  - Scalp agricultural fields.
- [Adapted from LLA, 2019]

*\*NOTE: As with all forestry practices, there are potential negatives to scalping. If the soils are very wet, or the soils are very heavy (high clay content), scalped rows may hold water and drown the seedling. The major negative associated with scalping is the potential for increased erosion. It is critical that scalping, ripping/sub-soiling, and mechanical tree planting follow the contour of the land. Otherwise, there will be an unacceptable amount of erosion.*

*On most sites, soil moves away from newly planted tree seedlings. In scalped rows, the soil moves onto the seedling. For this reason, it is recommended that container longleaf seedlings be planted approximately 1" shallower in scalped rows. It is preferable to have the terminal bud at least ½-1" above the soil surface at the time of planting. In some cases, this means the plug will be exposed at the time of planting.*

- Plant as early as possible.
- Plant shallow with the terminal bud well above the soil surface.
- Release seedlings from herbaceous competition for increased growth.
- Examine roots before applying soil active herbicides.
- Interplant mortality (May-July) if soil moisture is adequate.



## BEST PRACTICES FOR LLP ESTABLISHMENT/RESTORATION

[Adapted from Franklin, 2009; McIntyre et al, 2008; Kirkman & Jack, 2018; MFC, 2019]

### GENERAL PATHWAY 1

#### Non-longleaf stand on suitable longleaf soil(s) that landowner wants to restore to longleaf

- Eliminate undesirable pine and/or hardwood species and replant with longleaf at 550 to 622 TPA; if pine straw production is a goal, replant at 700 TPA.
- If natural LLP (pure or in a mixed stand of loblolly and/or hardwood) is already present and desired, chip as many of the other species as appropriate and let stand recover for approximately six months.
- Replant LLP in openings as possible.
- Apply a glyphosate-based chemical and target waxy species as needed.
- Choose chemical based both on groundcover we want to keep, if any, as well as what we want to kill. May not always include glyphosate.
- Initiate prescribed burning plan after LLP reaches Year 1 and has vigorous size.

### GENERAL PATHWAY 2

#### Mixed LLP-hardwood stand with hardwood mid-canopy that landowner wants to remove

- Conduct harvest of hardwood trees for pulp, palletwood, and sawtimber products, leaving residual LLP.
- Retain wolf, mast, and den trees; favor retention of live oaks, particularly in areas not prone to long-term saturation or flooding. Avoid retention of aggressive sweetgum.
- Employ use of a fuelwood or microchipper where appropriate and available.
- To reduce sprouting, spray hardwood stumps with herbicides immediately after the harvest. After a full growing season, a broadcast herbicide may be applied to control additional sprouting of hardwoods in areas where pine stocking was insufficient to provide adequate amounts of fine fuels to carry prescribed fire.
- Manage for a target litter-layer depth <6" to increase probability of LLP seedling survival.
- Consider planting container-grown LLP seedlings into canopy gaps too large for adequate natural seeding from the mature LLP.
- Deploy prescribed fire on a return interval of 1-2 years.

### GENERAL PATHWAY 3

**In stands with a minority longleaf component that are not identified as longleaf stands, heavily thin non-longleaf canopy trees out of stands, thereby restoring longleaf stands. This is a so-called ‘game changer strategy’ recommended by ALRI.**

- Degraded sites with partial stocking of residual LLP offer excellent opportunities for restoration. Many candidate sites were likely dominated historically by LLP, with recent ingrowth of hardwood stems and other pine species caused by fire exclusion or fire that was applied with inadequate frequency, intensity, or both [Oswalt et al. 2012]. About 1.24–1.82 million acres in the Southeast contain 20%–49% stocking of LLP but are not currently classified as LLP forests [Guldin et al. 2016].
- This level of stocking [20%–49%] is considered high enough to provide fine fuels for prescribed fire and a seed source for natural regeneration in most cases, depending on the specific land use history and current site conditions. When compared to afforestation or reforestation scenarios, these degraded sites offer a quicker path to the desired forest structure. Restoration of degraded sites can also be more cost-effective because income derived from timber removals can partially offset the cost of restoration treatments.

### GENERAL PATHWAY 4

**Phase-in conversion to LLP over time by harvesting portions of a stand – creating small gaps and replanting gaps with longleaf.**

- At the time of loblolly stand’s first thinning (~15 years old), utilize existing openings and apply patch cuts on 20% of stand, with openings ranging from 0.25 acre up to 0.66 acre in size; average size is 0.5 acre. Enlarge existing openings as needed to create a desired patch size.
- In the remainder of a loblolly stand targeted for LLP restoration, 40% of the volume is selectively thinned and removed. The stocking should be varied to create a “thick and thin” pattern, leaving a varying stocking in the residual stand. Another way of achieving this is to set a target residual basal area of 60 square feet per acre with a range of 50 to 75 square feet of basal area per acre across the stand.
- In open patches, after chemical site preparation and as early in the planting season as practical, plant containerized longleaf seedlings at 622 trees per acre (7’x10’ spacing). Use prescribed burning on a two-year rotation in the entire plantation to control competing vegetation.
- An alternative LLP restoration pathway is managing for mixed uneven-aged LLP and loblolly stands. Apply large patch cuts of 8-10 acres across the stand and replant the clearcuts in LLP. Thin surrounding remnant loblolly to 40-50 ft<sup>2</sup>/acre and initiate prescribed burning cycle.



## BEST PRACTICES FOR LLP HARVEST DESIGN & CUTTING

(Adapted from McIntyre et al, 2008; MFC, 2019)

- Harvests are typically conducted in a given stand on average every 10 years.
- The allowable cut for a property is some percentage of the growth during the period between harvests. In determining the allowable cut, growth is determined for the property as a whole and the allowable cut calculated for the total area, even though harvest may occur in only a portion of the stands (i.e., those up for harvest).
- The percentage of growth that is chosen for harvest will vary with stand condition, stocking, age and structure, as well as ownership objectives, but will typically range from 60 – 80 percent.
- Harvesting in any given stand should be infrequent, with the goal of allowing herbaceous groundcover to recover from previous logging events. Typically, stands should be given eight to ten years to recover between harvests.
- In most cases, the openings that allow a transition from grass stage to sapling are relatively small, approximating the footprint of one or two mature tree crowns, and the removal of one or two trees in a harvest can provide adequate openings in the canopy to release regeneration.
- Single tree selection and group selection are the optimum tools to achieve the desired LLP objectives.
- LLP seedlings can grow well in canopy openings as small as 0.25 acres. Canopy openings created to release regeneration should not greatly exceed that size, normally ranging from a single tree to 0.5 acres.
- Build toward, or maintain if already present, a substantial component of older trees in the stand. Older canopy dominants are a valuable source of seed for regeneration, fine fuels for prescribed fire and nesting habitat for rare species.
- LLP trees should be preferentially retained when harvesting in upland mixed pine stands
- Defective trees should be preferentially harvested, but not totally eliminated from the forest. Such defects selected for removal include forked, crooked or diseased (e.g., fusiform cankers) trees and trees with severe basal fire scars.
- Suppressed trees in which the terminal bud has lost dominance typically do not respond and should be targeted for removal.
- Trees with low crown vigor will be preferentially removed, while retaining trees with large, dense crowns. Characteristics of low crown vigor include smaller crown ratio, sparse needle density and lighter foliage color.
- Trees that might otherwise be removed because of poor quality are often retained based on their location if needlecast or seedcast is needed in that area.
- Two to four standing and down dead trees should be continually maintained throughout the property for their wildlife value.
- Tops and slash should be removed from around the base of trees and from patches of regeneration.
- A comprehensive pre-harvest plan must be developed to ensure any harvest operator properly implements the LLP silvicultural plan.
- Logger selection and training is critically important for increasing the probability of achieving the desired silvicultural outcome.

## TEMPLATE FOREST MANAGEMENT PLAN LANGUAGE FOR SIMULTANEOUS MANAGEMENT OF UNEVEN-AGE LLP & RED-COCKADED WOODPECKER (RCW)

[Adapted from MFC, 2019]

CANDIDATE FMU consists of X# of major timber types. Management of these timber types is detailed below. Timber harvesting operations will meet or exceed state best management practices (BMPs) for protection of wetlands, streams, lakes and other unique wetland areas. Areas of concern will be identified in timber sale contracts.

### Uneven-Aged LLP (*Pinus palustris*) Stands

LLP stands on CANDIDATE FMU consist of approximately XYZ acres with an average age of one hundred ten (110) years. Past timber management within these stands has been single tree selection and small clearcuts utilizing natural openings, normally no larger than approximately twenty (20±) acres in size. This management strategy known as the Stoddard-Neal method, a conservation ethic that promotes aesthetics, recreational value, RCW habitat, healthy ecosystems, and biological diversity will continue to be utilized in managing these stands.

These longleaf pine stands are prescribed burned every two (2) to four (4) years. This fire regime keeps the LLP free of any mid-story and promotes excellent RCW and wildlife habitats. A majority of the federally protected plant species such as American chaffseed, Rough-leaved loosestrife, Micheaux's sumac, LLP upland and/or ecotonal habitats have benefited from prescribed burns.

The LLP ecosystem must be actively managed for various ages of LLP to ensure the future of this ecosystem and the RCW habitat. This management includes the selective harvesting of older trees and the establishment of seedlings. LLP is regenerated by natural methods where feasible with under planting of containerized LLP seedlings, as needed. Stocking densities within these natural longleaf stands will be influenced by habitat requirements for RCWs.

Planting densities in stands converted from loblolly to longleaf will average four hundred fifty (450) trees per acre. Longleaf stands being under-planted will average one hundred fifty (150) trees per acre. A stocking level of one hundred (100) trees per acre to three hundred fifty (350) trees per acre will be considered a success for underplanting in mature longleaf stands. Stocking levels in planted stands will be assessed at one year of age and natural stands at three years of age. A stocking level of five hundred fifty (550) trees per acre will be the goal for planted longleaf stands. A stocking level of three hundred (300) trees per acre to seven hundred (700) trees per acre will be considered a success. Stands falling above or below this level will be inspected, taking into account TPA and spatial distribution of the stems.

Machine and hand-planting will be utilized with stand conditions and soils determining the best method. Mechanical site preparation or herbicides will be used to prepare harvested areas for planting with only containerized longleaf seedlings being used. Chemical site preparation will be the preferred method utilized in areas to be planted in longleaf, unless scalping is required. This method promotes early seedling growth by removing competition for sunlight, nutrients and water. Additionally, site degradation is minimal due to removal of topsoil commonly associated with mechanical site preparation.

Planting costs for LLP currently range from Two Hundred Seventy-Five Dollars (\$275.00) to Four Hundred Dollars (\$400.00) per acre depending on site preparation methods being recommended.

LLP cones have been sold in the past and this practice will continue during good cone producing years.

Herbicides are being used to control undesirable hardwood species occurring in the understory of the LLP stands. This practice will continue in order to promote additional longleaf regeneration and improve the RCW habitat.

## Red-cockaded Woodpecker (*Picoides borealis*) Management

Candidate FMU is enrolled in STATE's RCW Safe Harbor program with a legal baseline of XY (XY) RCW groups and, as of DATE, has XY (XY) above-baseline RCW groups.

The RCW Recovery Plan (second revision), Appendix 5, Pages 291 – 296, pertains to the management of timber within these XY (XY) baseline groups. For privately owned lands, adequate RCW foraging habitat consists of approximately three thousand (3,000±) square feet of basal area with five thousand (5,000) pine stems more than ten inches (10") DBH, or a smaller number of pine twenty-five (25) years of age or older, located on at least seventy-five (75) acres contiguous to the RCW group.

CANDIDATE FMU has been actively managing the uneven aged pine stands for RCW foraging habitat and will continue to do so. Such management includes the selective harvest of older trees, the establishment of seedlings, and the installation of artificial nest cavities. Control of the hardwood mid-story is accomplished by mechanical means, herbicide applications, and controlled burning.

RCWs are a federally-protected species covered under the Endangered Species Act and are fully protected at CANDIDATE FMU. Because of the potential for harassment and/or harm under the definition of 'take' in the Endangered Species Act, the following activities shall not be allowed:

- Removing any RCW cavity tree, through cutting, bulldozing, or any other activity.
- Constructing roads and utility rights-of-way within a cluster.
- Construction of facilities including, but not limited to buildings, campgrounds, recreational developments, residential dwellings, and industrial or business complexes within a cluster.

## BURNING/RX FIRE GUIDANCE FOR LLP MANAGEMENT

[Adapted from McIntyre et al, 2008; MFC, 2019]

- Prescribed fire is the unifying theme of many aspects of LLP management. Needlecast from overstory pine is the most important component of the fuel bed in LLP grasslands.
- Frequency is regarded as the most important aspect of a prescribed fire regime. In general, the application of prescribed fire as frequently as fuels will allow is desirable from both the standpoint of biodiversity and habitat structure.
- For most sites, a fire return interval of no longer than two to three years should be a management goal. Prescriptions should be based on clearly stated goals and objectives for a given burn unit or stand.
- The frequent use of fire over time is the preferred management for the control of hardwoods in small size classes.
- Seedlings must grow for a full year before application of prescribed fire.
- Prescribed fire can be applied in both the growing season and/or dormant season depending on desired future habitat conditions.
- Fire frequency is every 2-3 years.
- Fire can also be beneficial for controlling insects and disease such as brown spot needle blight and red-headed pine sawfly.

[Adapted from LLA, 2009; MFC, 2019]



Seedlings should not be burned when:

- They've been in the ground for less than one full growing season or have not developed into vigorous grass-stage seedlings.
- Dramatic active height growth (called candling) is underway during late February through April when the terminal bud is covered again with green needles.

Seedlings can be burned but increased mortality or damage is expected when:

- Ambient temperatures are greater than 80°F and wind speed is less than 5mph.
- Humidity is lower than approximately 25%.
- Tree vigor is reduced by disease, insects, herbicide damage, drought or intense competition.
- Seedlings have emerged from grass-stage until they reach about 5 feet tall. (Note: this is aggravated as tree vigor declines, fuel loads increase and also by some firing techniques.)
- Backing fires (with longer residence times) are used on seedlings just emerging from grass-stage
- (basal diameter less than 1.5 inches). A grid ignition is a good substitute for backing and head fires if seedlings must be burned at this size.
- Headfires in seedlings above 5 feet tall that char up to  $\frac{3}{4}$  of the tree's height and/or consume all of the needles.
- Time since last burn or time of first burn exceeds 10 years or whenever shrubs, grasses or other fuels overtop the longleaf after longleaf has bolted. Although fire has typically been excluded from longleaf pine plantations when seedlings have just emerged from the grassstage, fire can (and should) be used if your objectives warrant its use.
- Non-native grasses such as cogon, bahia, and bermuda grass can significantly increase fire intensity and result in unacceptable levels of seedling mortality.
- Higher than average mortality can be expected when small seedlings are burned in the months of March and April with their terminal buds are actively growing (candling).
- Seedlings are planted near heavy logging debris or other heavy concentrations of fuels.
- Seedlings less than 5 feet tall are growing in fuel grasses such as bermudagrass, bahiagrass, or noxious weeds like cogon grass.

Seedlings can be burned with fewer ill effects when:

- Relative humidity is >35%.
- They are vigorous in the grass-stage or taller than 5 feet.
- The first application of fire is not a backing fire.
- Seedlings are not surrounded by 'collars' of needles.
- In recently planted areas where fuel load around seedlings is light, such as scalped agricultural fields.
- or cutover sites with little logging debris or waxy shrubs.
- Ambient temperatures are lower than 45°F.
- If burning seedlings in the spring, mortality may be reduced if fire is introduced after the "candle" has become covered with green needles, typically in May or June.

### **Pine straw raking recommendations**

Pine straw can provide important near-term income to landowners. Planted longleaf stands can be raked for pine straw with little or no damage to residual trees, but pine straw management can negatively impact habitat quality. For guidelines on managing stands to balance habitat and pine straw income, see Ecological Pine Straw module from LL 101, first presented by LLA with Randy Browning or the guidelines developed by the National Wildlife Federation.<sup>3</sup> Stands will be analyzed as to their suitability for pine straw production at age eight (8).

### **OTHER LLP FIRE CONSIDERATIONS**

[Adapted from McIntyre et al, 2008; MFC, 2019]

LLP tends to reproduce in masting events. Because cone development takes two years, managers are able to anticipate good seed crops well in advance. The fire regime should be modified to capture regeneration during these mast years in areas where recruitment of seedlings is needed.

Low-intensity, late-season burns preceding mast seed crops will prepare a bare mineral seedbed and reduce fuel loading in the following year, as seedlings should not be burned the year following establishment.

<sup>3</sup> <https://www.nwf.org/~media/PDFs/Misc/FINAL%20Pine%20Straw%20Management%20BMGs%20July%202015.ashx>

## Appendix C

### Longleaf Implementation Teams (LITs)

Enviva plant/region	Local Implementation Team (LIT) LIT coordinator & contact
SAM	<b>Onslow Bight Conservation Collaborative</b> <b>Hervey McIver</b> <a href="mailto:hmciver@tnc.org">hmciver@tnc.org</a>   (919) 794-4396
HAM	<b>NC Sandhills Conservation Partnership</b> <b>Jeff Marcus</b> <a href="mailto:jmarcus@tnc.org">jmarcus@tnc.org</a>   910-26-0300
	<b>Sandhills Longleaf Conservation Partnership (SC)</b> <b>Charles Babb</b> <a href="mailto:charlesbabb81@gmail.com">charlesbabb81@gmail.com</a>   843-623-2187 x3
GRE	<b>SoloACE Longleaf Partnership</b> <b>Bobby Franklin</b> <a href="mailto:bobby@longleafalliance.org">bobby@longleafalliance.org</a>   (843) 893-7775
COT	<b>Apalachicola Regional Stewardship Alliance</b> <b>Brian Pelc</b> <a href="mailto:bpelc@tnc.org">bpelc@tnc.org</a>   (727) 515-8313
LUC/PAS	<b>DeSoto/Camp Shelby</b> <b>Becky Stowe</b> <a href="mailto:rstowe@tnc.org">rstowe@tnc.org</a>   (228) 219-4580





