

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE SPECIFICATIONS**

SILVOPASTURE ESTABLISHMENT

Acres

Code 381

GENERAL CRITERIA

Selected species will be adapted to the site and suitable for the use planned by the landowner.

Invasive or toxic species will not be used.

Only viable, high quality and adaptive planting stock or seed will be used.

1. PLANTING TREES INTO EXISTING STANDS OF GRASS

- **Species will be adapted to soil-site conditions.** The products the landowner wishes to produce, and the species adaptation to the site and soils will affect the decision-maker's choice of species. See **Table 1** for tree species.
- **Planting trees into existing pasture will require site preparation that will control the competing grass.** Refer to **Forest Site Preparation Standard (490)**.

Control of grasses – Mechanical		Control of grasses – Chemical*	
Method	Use	Method	Use
Mowing	Temporary control. Mow late in the growing season prior to planting	Banding	Apply in 4' wide strips in the rows into which the seedlings will be planted. May be applied before planting or as an over-the-top spray after planting and grass green-up.
Disking	Temporary control. Affects row orientation because it should be done on the contour. Schedule to allow for settling of the soil before planting.		
Scalping	May be suited for sands but affects row orientation because it should be done on the contour.	Directed Spray	Apply as an over-the-top spray in a 4' circle around each seedlings after planting and grass green-up
Burning	Temporary control. Should be done just prior to planting. Scheduling may be a problem.	* Use only approved herbicides and according to label directions	

- **Planting trees into existing pasture may require site preparation that will improve soil conditions to ensure root placement and tree development.**

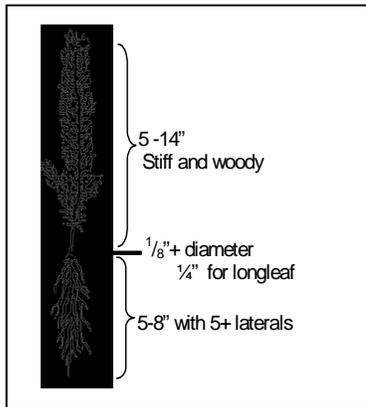
Method	Use
Sub-soiling or Ripping	Apply when compacted or dense clay layers occur within 15" of the surface. Allow for settling before planting
Disking	Disk to an 8" to 10" depth. Allow for settling before planting.

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

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- **Planting stock will be of the highest quality to insure successful establishment of trees.**

- **Seedling Sources.** Care must be taken that the seed sources come from the same geographic area in which the seedlings will be planted. Seedlings grown by the Texas Forest Service and local industry/private nurseries are acceptable.
- Seedlings obtained from other sources such as commercial nurseries must be from sources within a 150-mile North-South zone of the planting site. Seedlings should be ordered at least 6 months prior to the planting season.
- **Seedling Quality.** Only quality seedlings should be planted. General standards for quality seedlings are given below:



Criteria	Pine	Hardwood
Minimum root collar diameter	1/8"*	1/4"
Preferred height	5-14"	16-30"
Root length	5-8"	8-10"
Min. number of root laterals	5	5

*Minimum root collar diameter for longleaf pine is 1/4"

Seedling stems must be stiff and woody. In addition, the terminal bud must be inactive (not green or growing) and "hardened off".

- **Seedling Care.** Proper care of seedlings from pickup to planting is critical to the success of tree planting. Every effort must be made to plant immediately after receiving the seedlings. If planting will occur within one week, the seedlings must be kept cool and moist – from 33°F to 40°F. Seedlings should be kept no longer than two weeks out of cold storage. Only as many seedlings as will be planted in a day should be taken to the site. These must be kept cool and shaded. Keep the seedling roots thoroughly moist at all times.

Prune roots only if it is necessary to ensure proper planting. Pine taproots will not be pruned any shorter than 8 inches. If hardwood roots are pruned, prune the tap root no shorter than 8 inches, and the top may also be pruned to maintain the original top-to-root ratio.

Cull all poor quality seedlings.

- **The planting will be done at a time and manner that will insure survival and growth.**

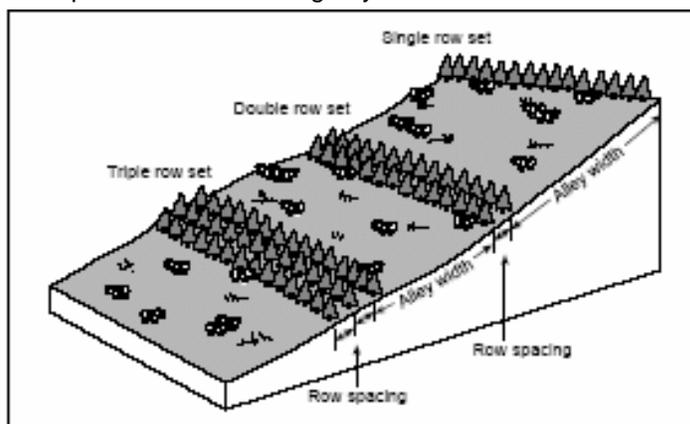
- **Planting Dates.** Containerized pine seedlings may be planted in the early fall (from mid-October on) if soil moisture is adequate. Bare root seedlings may be planted between mid-December and the first of April, but the optimum dates are January through mid-March.
- **Spacing and Stocking.** Pine seedlings planted for silvopasture should be planted to ensure grass growth and development. Possible planting rates and spacings are shown below:

Silvopasture Planting Options and Trees Per Acre											
Alley Width	Single Row Planting			Double Row Planting				Triple Row Planting			
	Within Row Spacing			Row Spacing	Within Row Spacing			Row Spacing	Within Row Spacing		
	6'	8'	10'		6'	8'	10'		6'	8'	10'
20 Feet	363	272	218	6'	558	418	335	6'	680	512	409
				8'	518	388	311	8'	605	455	363
				10'	484	363	290	10'	545	409	327
				12'	454	340	272	12'	495	372	297
30 Feet	242	182	145	6'	403	303	242	6'	512	390	311
				8'	382	287	229	8'	473	356	284
				10'	363	272	218	10'	435	328	262
				12'	345	259	207	12'	403	303	242
40 Feet	182	136	109	6'	315	237	189	6'	419	315	252
				8'	303	227	182	8'	389	292	234
				10'	290	218	174	10'	363	273	218
				12'	279	209	167	12'	340	256	204

Shaded / Bold numbers are preferred planting rates

Hardwood seedlings planted for silvopasture should be of a high commercial value and spaced according to the product that will be produced. In double row plantings, they should be planted close, but no closer than 8'x8'.

Figure 1 – Typical Silvopasture Tree Planting Layouts



Source: USDA, NRCS, Agroforestry Notes

- Planting Conditions. Seedlings should be planted when the weather and soil conditions are optimum. Critical planting days will be avoided.

Critical	Temperature: >75° Relative Humidity: <40% Wind Speed: Any Soil Moisture: Low to Absent Soil Temperature: Freezing
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- **Planting Methods.** Machine or hand planting with any tool that will accomplish satisfactory results is acceptable. Furrows and holes must be free of litter and large enough to adequately accommodate the roots. Soil around the roots must be firmed and free of air pockets. Place all roots into the hole or machine planting slit, ensuring that none are turned upward in the bottom of the hole ("J-rooted").

- Plant bareroot seedlings (pine and hardwoods) about 1" deeper than they grew in the nursery bed (evidenced by the root collar). In deep sands, plant seedlings about 2-4" deeper.
- Plant Longleaf bareroot seedlings with the root collar at or slightly below the soil surface so that the bud will be exposed after the soil has settled.
- Plant small containerized seedlings with the top of the soil plug at or slightly above the soil surface.
- Plant Hardwood cuttings about 15" deep.

See **Tree/Shrub Establishment** Specification (612)

- **Row Orientation.** Where practical and feasible, establish the tree planting rows in an east-west orientation.
- **Protect planted tree seedlings from grazing by domestic livestock.** The terminal bud must be well above maximum grazing heights of livestock species (6 feet high for cattle) before those animals are allowed back into the field(s).

Table 1. Tree Species Adaptation

SPECIES	SITE/SOIL
Loblolly pine	Acidic, coarse soils mostly; adapted to a wide range of sites but questionable on poorly drained soils with a hardpan. Grows where there is 40-60 inches of rainfall annually. Prefers humid long, hot summers and mild winters.
Longleaf pine	Acidic, coarse soils; best adapted to well-drained loamy sands.
Shortleaf pine	Prefers sandy-textured soils, but will grow well on clayey soils having good internal drainage.
Slash pine	Well adapted to dense, poorly drained, flatwoods and soils having a shallow claypan or hardpan, slow internal drainage, or a high water table. Site and geographic limitations due to its potential for root diseases on sandy soils and severe ice storm damage.
Baldcypress	Although commonly found on poorly drained wet or frequently flooded sites, it will thrive on deep, moist, yet well-drained soils.
Ash, Green	Adapted to acidic (3.6) to mildly alkaline (7.5), fine-textured soils in bottoms, including those that flood frequently. It is able to tolerate saturated and flooded soils for several months, except if the condition persists during the growing season.
Ash, White	Adapted to acidic upland and terrace soils. Prefers well drained soils that have a good supply of soil moisture.
Pecan	Adapted to a wide variety of sites but does best on well-drained, acidic to mildly alkaline loams of bottomlands. It can tolerate saturated or flooded soils for a short period.
Sycamore	Grows best on loamy, acidic to mildly alkaline soils that have a good supply of ground water.
Hybrid Poplar	Does best on deep, moist loamy soils. Several varieties are available.

2. PLANTING GRASS INTO EXISTING STANDS OF TREES

- **For existing forests remove a sufficient number of trees and/or prune existing trees to allow adequate light penetration for forage production.**
 - **Thinning.** The table below provides thinning/stocking guidelines for the establishment of a silvopasture system in an existing stand of pines. Although the lower stocking in the range is desired, it must be remembered that achieving this level may not be practical or appropriate in all situations, particularly in a previously un-thinned plantation. In such cases, two thinnings may be necessary.

Avg. DBH	Trees / Acre	Basal Area / Ac	Spacing
6	255 – 400	50 – 80	D+7 – D+4
8	145 – 230	50 – 80	D+9 – D+6
10	90 – 145	50 – 80	D+12 – D+7
12	65 – 110	50 – 85	D+14 – D+8
14	45 – 85	50 – 90	D+17 – D+9

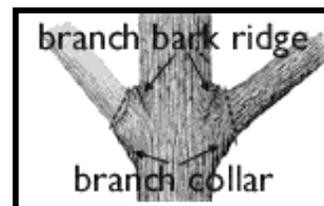
When converting pine plantations to a silvopasture system, use the row thinning method to reduce the stocking. Use the **Silvopasture Planting Options and Trees Per Acre** table as a guide. *For example*, if the plantation were originally planted to a 10' x 6' spacing, a double row system with a 40' alley (leaving 2 rows and removing 3) would reduce the stocking to 290 trees per acre.

In order to minimize damage to the residual trees and to facilitate the planting and management of the grass, consideration must be given to the equipment the landowner will use when planning the thinning.

- **Pruning.** Pruning of the residual trees after a thinning may be necessary to facilitate the grass planting and to allow adequate sunlight penetration for grass growth.

Pruning is best done during the dormant season or early spring. Limbs should be pruned to a height that will accommodate equipment use, but must not remove more than 50% of the live crown.

Pruning of smaller limbs is best accomplished with lopping shears, but saws may be used and may be necessary on limbs larger than 2" in diameter. A proper pruning cut will not damage either the branch bark ridge (on the upper surface of a limb that runs more or less parallel to the branch angle along the stem of the tree) or the branch collar (stem tissue that grows on the underside of the base of the branch).



- **Forage species must be adapted to the site and compatible with the planned management.** See **Table 2** for grass species commonly used in silvopasture. For other species refer to **Seeding Table, Appendix 1 – Planting rates for seeding and sprigging in Texas, in the Field Office Tech Guide.**
- **All seed and planting materials shall meet state quality standards Chapters 9, 10, 61, 62 and 64 of the Texas Agricultural Code.**

- **Seed or sprig adapted species will be planted in accordance with Pasture and Hayland Planting conservation practice standard.**
 - **Seedbed preparation.** Because understory brush, vines and trees may be present, seedbed preparation may need to include their control. In addition the accumulation of pine needles on the ground will affect the successful establishment of grasses. The application of approved herbicides along with prescribed burning (when possible) will normally be the first step in seedbed preparation.

Further preparation will include disking prior to planting. If sprigs are planted by broadcasting, a second disking after planting followed by cultipacking will be necessary. Care should be taken to avoid damage to the trees.

Consideration may be given to planting only the access rows in plantations if the grass is planted after the first thinning.

- **Seeding and Sprigging Rates, and Planting Dates**

Species	Rate	Seeding / Sprigging Dates
Bahigrass	15 to 20 lbs. PLS/acre	October through May
Seeded Bermudagrass	3 to 5 lbs/acre	March through May
Bermudagrass sprigs	25 to 35 bu./acre	Mid January through May
Bermudagrass tops		June
Alamo Switchgrass	2 lbs. PLS/acre	March through early May
Lometa Indiangrass	4.5 lbs. PLS/ac.	
Big Bluestem	6 lbs. PLS/acre	

For other species see: **Seeding Table, Appendix 1 – Planting rates for seeding and sprigging in Texas, in the Field Office Tech Guide**

- **Fertilizer and soil amendments.** Apply fertilizers and soil amendments for establishment according to a current soil test. Care should be taken with liming in order to maintain the soil's acidic condition in pine silvopastures.
- **Livestock will be excluded until the plants are well established.**
- **Any invasion by undesirable, competing vegetation will be controlled by mechanical and/or chemical means. Use only approved herbicides and according to label directions.**

Table 2. Grass Species Adaptation

SPECIES	SITE/SOIL
Bahiagrass	Best adapted to the high rainfall areas of East Texas and the Coastal Prairie. Adapted to a wide variety of soils with ph of 5.5 to 7.0; not recommended on soils with ph >7.0, or soils with >40" of sand at the surface unless in areas of annual rainfall.
Bermudagrass	
Seeded	Best adapted to well and moderately well drained soils of ph 5.5 to 8.0. Not recommended for deep sands or areas flooded for long duration
Sprigged	Best adapted to moderately to well drained sandy to loamy soils, but will persist on clayey soils. Some varieties such as Jiggs and Alicia have limited cold tolerance, and some such as Jiggs expand the adaptation onto clays and Tifton 85 onto sands.
Tall Fescue	Best adapted to bottomland soils and marginally adapted to clay, clay loam and loamy sites in East Texas that receive at least 40" of rainfall annually. Tolerates low pH and poorly drained soils.
Alamo Switchgrass	Adapted to most soils
Lometa Indiangrass	Adapted to soils from sands to clays, but best adapted to loamy soils.
Big Bluestem	Best adapted to loamy, upland sites