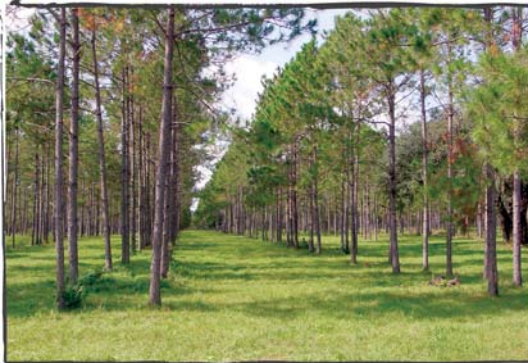


Arrangement & design

Common types of planting arrangements



SINGLE-ROW PLANTINGS consist of trees spaced about 8 to 12 feet within the row and 16 to 30 feet between the rows. Closer spacings restrict some equipment accessibility and can potentially reduce forage production if trees are not thinned and pruned in a timely manner. The wider row spacing tends to favor forage production over closer tree spacing.



DOUBLE-ROW PLANTINGS stagger tree rows with 8 to 10 feet between trees and rows. Once established, both forages and trees co-exist and can contribute to a highly productive silvopasture system. When setting the alley width, consider the width of the equipment that will be used in the management of the forages and plant the width of the alleys accordingly.



There seems to be no disadvantage to planting in double rows compared to single rows, although single-row plantings seem to exhibit less tree-to-tree competition. Research shows that legumes under the pine canopy perform better than legume forage in open areas.

MULTIPLE-ROW SPACING has two to three rows of trees at a fairly close spacing (8 feet x 10 feet or 10 feet x 10 feet) with an alleyway of 20 to 40 feet between sets of tree rows for forage production. Some feel this system tends to favor ease of forage and timber management and forage production systems.



While TRIPLE AND QUADRUPLE ROWS have been used in a silvopasture system, it has been found that trees in the middle rows typically grow more narrow and are of poorer quality the outer rows of trees out compete them for sunlight and soil nutrients. Thus, double row systems are considered optimal.





BLOCK PLANTINGS are evenly spaced planting arrangements with wider spacings than a traditional forest plantation. A typical silvopasture block planting would have trees on a 12 feet x 12 feet or 15 feet x 15 feet spacing. Some feel that this system favors timber production. Forages are more sensitive to canopy density and timely thinning must be conducted to maintain forage production.



FORAGE / HAY PRODUCTION: During the first 2 to 4 years, forage can be used for hay. Therefore, it is important that the row spacing is planned to fit the haying equipment that will be used. So, be patient with the establishment of the system and it will function and be a productive system throughout the whole rotation.

Tree pattern

Trees should be established or spaced to optimize growing space and light penetration for high-quality saw logs and forage. Forest sites may require thinning and some tillage to provide a favorable seedbed for



germination and growth of selected forages. On pasture sites, weed/forage suppression and competition control (through subsoiling, herbicides, tillage, and/or mulch) may be required for 2 to 3 years to establish tree seedlings but must be carefully selected to avoid damaging desirable plants.

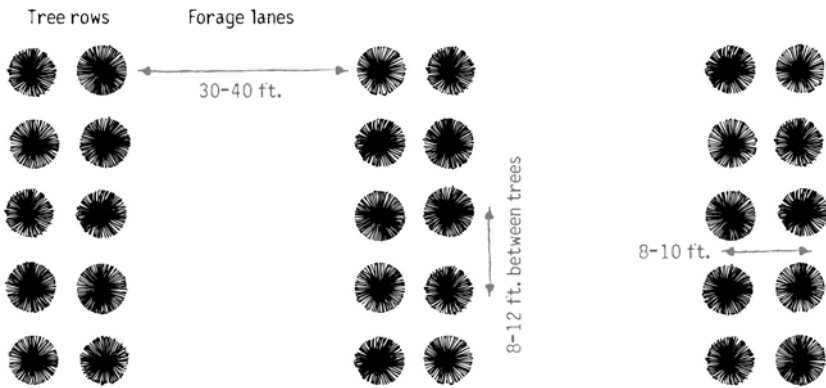
Spacing & stand density

For commercial conifer plantation establishment, four to six times as many trees are planted than will be harvested at the end of the rotation. This practice traditionally provided close spacing that encouraged self-pruning. Canopy density in a silvopasture system is generally managed between 25 to 60 percent, which

Shade from trees lengthens the forage growing season and improves forage quality. The shade also increases the comfort level for livestock which reduces stress. Additionally, the structure and plant diversity is attractive to many wildlife species including wild turkey, quail, deer, and many songbirds.



provides larger open spaces for forage production and management. Tree diameter growth in lower density stands is accelerated due to reduced competition. Trees planted in rows often perform poorly if they do not have at least one side in full sun. Therefore, for maximizing growth, single or double rows are generally preferred over triple or multiple rows of trees.



The planting arrangement for the tree component of silvopasture may change depending upon the landowner's objective in achieving timber and forage growth and wildlife habitat. It can also influence production costs and equipment accessibility. However, a healthy tree stocking range for silvopasture establishment is typically between 200 to 400 trees per acre.

The number of trees per acre will dictate the number of thinnings that will need to be carried out and the types of products that will be produced (e.g., poles, chip-and-saw lumber, or sawtimber). At 150 to 200 trees per acre, only one thinning may be necessary well into the rotation (20 years) to remove poles or saw/veneer quality logs and provide additional space for 10 more years of growth for the high quality saw logs that are left.

For landowners managing hay or other crops between rows of trees, appropriate management considerations must be made, such as suitable width of alleys (for planting and harvesting equipment) and chemical compatibility of herbicides and pesticides.

Establishment

Site preparation

There are several operations that should be considered when planting tree seedlings into an existing pasture to ensure good tree survival. Mowing or close grazing of grass residue is helpful to remove debris that may hinder planting, especially machine planting.

For establishment on existing pasturelands, the use of herbicides or tilling is recommended to remove competition and establish suitable rows for tree planting. This improves the ease of planting and improves rooting conditions for young seedlings, thus insuring better growth and survival.

In some areas, a prescribed burn in the late fall or pesticide treatment may be needed to control rodents prior to tree planting. Follow-up treatments with a

Apply a herbicide or till a strip 2 to 4 feet wide for each row of trees to be planted. If the soil has a compacted layer, rip or subsoil down the planting rows to loosen soil.



selective herbicide may be needed for 2 to 3 years until trees are well established.

Subsoiling is highly recommended when planting into pasture due to the potential compaction that may be present from many years of grazing. Subsoiling must be done on the contour or water erosion following the

sub-soiling channel will blow the trees out of the ground. Generally sinking the shank and ripping to a depth of 18 to 24 inches is adequate to eliminate compaction layers and improve water infiltration. Disking is sometimes used to help break up the sod and incorporate some herbicides.



For compacted soils, a typical single shank subsoiler mounted on a tool bar should suffice for soil preparation.

Tree planting guidelines

Seedlings should be stored in a shady place and roots kept moist until planted. Trees can be planted with a mechanical planter or by hand with a dibble bar, hoedad, or shovel. Maintaining straight rows and uniform spacing are important considerations for silvopasture. If the area to be planted is sloped, make sure to plant along the contour of the site.

When planting bare-rooted seedlings, make sure the root collar (the area between the seedling's roots and stem) is even with ground level. Seedlings that are planted too deep, too shallow, or "J-rooted" (pushed into the ground with the tap root facing up) might not survive. After planting, soil should be packed around the seedling. For longleaf pine, soil should not cover the terminal bud.

Management

Herbicides

Weeds and woody brush may be suppressed by browsing, mechanical treatment, or chemical herbicide application. A common approach to planting trees in established pastures is spraying a strip or circle around trees to provide a 4- to 6-foot diameter “competition-free zone” around each tree until the root system and canopy of the seedlings are well established.

Young seedlings are affected by the vigorous root system of forage grasses. There is concern that fescue could be toxic to trees in the seedling stage. It is highly recommended that an extra wide strip of herbicide application be used during establishment of trees into fescue.

Here are a few of the common herbicides used for herbaceous weed control during tree establishment:

- **Arsenal**®: common forestry herbicide used to control grasses and weeds throughout the rotation of pine plantations.
- **Stinger**®: primarily used in seedbeds of southern pine to control a number of broadleaf weeds.
- **Accord**®: when used with Oust, controls many broadleaves, grasses, sedges, and suppresses brambles/blackberries.
- **Roundup**® Ultra: controls perennial weed growth during plantation establishment of pines.
- **Velpar**®: effective for contact and residual control of many annual and biennial weeds and woody plants. May be sprayed in wet areas.
- **Oust**®: pre- and post-emergent herbicide. Commonly applied with fertilizer treatment before seedling establishment.
- **Fusilade**®: for post-emergent control on grassy weeds.

If herbicides are used, special attention must be paid to all environmental hazards and site-specific application criteria listed on the herbicide label and contained in Extension and crop consultant recommendations.



- **Oustar®**: broad-spectrum contact and residual herbicide. Requires rain/soil moisture to be absorbed into root systems of weeds.

Scalping is highly recommended when planting into sod (especially for longleaf pine). Because grass is such a tough competitor for young seedlings, a herbicide strip 4- to 6-feet-wide per tree row is recommended for most grasses with a strip 8 feet wide, or wider for very aggressive grasses, such as bermudagrass.

This conifer plantation was installed using scalping attachments on the tree planter to peel back the sod and create a furrow into which the seedling was planted. When scalping or ripping, it is important to follow the contour of the land to avoid erosion.



There are many herbicides on the market. An applicator's permit is required for many agricultural herbicides. Make sure the herbicide used is compatible with the tree species and local conditions, and approved for the target herbaceous weeds.