



**Natural Resources Conservation Service**

**CONSERVATION PRACTICE STANDARD**

**SILVOPASTURE**

**CODE 381**

**(ac)**

**DEFINITION**

An application establishing a combination of trees or shrubs and compatible forages on the same acreage.

**PURPOSE**

This practice is used to accomplish one or more of the following purposes–

- Provide forage for livestock and the production of wood products
- Increase carbon sequestration.
- Improve water quality.
- Reduce erosion.
- Enhance wildlife habitat
- Reduce fire hazard
- Provide shade for livestock
- Develop renewable energy systems

**CONDITIONS WHERE PRACTICE APPLIES**

Situations where silvopasture establishment applies includes: 1) pasture where trees or shrubs can be added; 2) forest where forages can be added; 3) Land on which neither the desired trees nor forages exist in sufficient quantity to meet the land user's objectives.

This practice may be applied on any area that is suitable for the desired plants.

**CRITERIA**

**General Criteria Applicable to All Purposes**

Tree species must be adapted to the site and compatible with planned livestock management.

Forage species must be adapted to the site and compatible with the planned management of the site.

No plants on the Federal or state noxious weeds list shall be planted.

Where trees will be added to existing pasture, site preparation should be based on existing vegetation and soil conditions. Refer to the Texas NRCS Tree/Shrub Site Preparation (490) Standard. Trees will be planted at the recommended tree density. Refer to the Texas NRCS Tree/Shrub Establishment Standard 612 standard.

For existing forests remove a sufficient number of trees and/or prune existing trees to allow adequate light penetration for forage establishment. Refer to the Texas NRCS Forest Stand Improvement (666) and Tree/Shrub Pruning (660) standards.

Establishment of forage species will be in accordance with the Texas NRCS Forage and Biomass Planting (512) or Range Planting (550) standards.

If pesticides are used, follow label recommendations. Refer to the Texas NRCS Integrated Pest Management (595) standard for guidance on pest prevention, avoidance, monitoring and suppression strategies.

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

The planting shall be done at a time and manner to insure survival and growth of selected species.

Tree/shrub spacing needs to exceed width of equipment to be used in management.

**Additional Criteria to Provide Forage for Livestock and the Production of Forest.**

The forage species must be identified as suitable for the targeted livestock.

Livestock grazing shall be deferred until the average height of the tree's terminal bud exceeds the browsing height of the livestock or of sufficient size to resist breakage or until suitable use exclusion measures for the protection of the woody plants are established. A forage crop (hay, silage, etc.) may be harvested during this period.

Plant trees at an appropriate density to allow acceptable forage production and wood products.

The tree or shrub species must have potential to yield wood products.

**Additional Criteria to Increase Carbon Sequestration**

For optimal carbon sequestration, select plants that have higher rates of sequestration and are adapted to the site to assure strong health and vigor. Refer to the following list for recommended species:

|              |                      |
|--------------|----------------------|
| American elm | Green ash            |
| Bald cypress | Hackberry            |
| Basswood     | Kentucky coffee tree |
| Black cherry | Loblolly pine        |
| Black locust | Red mulberry         |
| Black walnut | Shortleaf pine       |
| Catalpa      | Sweetgum             |
| Cottonwood   | Sycamore             |

Plant and manage the appropriate stocking rate for the site to maximize biomass production.

**Additional Criteria to Improve Water Quality**

Favor trees, shrubs and forages that have growth characteristics conducive to high nutrient uptake.

**Additional Criteria to Reduce Erosion**

Place linear woody plantings on or near the contour when water erosion is a concern.

**Additional Criteria to Enhance Wildlife Habitat**

Establish forage species and understory shrubs that will provide forage, browse, seed, cover, or nesting habitat for the wildlife species of concern. For additional guidance refer to the Texas NRCS Upland Wildlife Habitat Management (645) Standard.

Favor herbaceous seed mixes that include a diverse mix of native forbs and/or legumes to benefit wildlife including pollinators.

**Additional Criteria for Develop Renewable Energy Systems**

Select plants that provide adequate kinds and amounts of plant material needed to produce bioenergy feedstocks.

Intensity and frequency of energy biomass removals will be managed to prevent long-term negative impacts on the soil and water resources.

The harvesting of energy biomass shall be accomplished in a manner that will not compromise the other intended purpose(s) and functions.

**CONSIDERATIONS**

Failure to maintain adequate forage for livestock may result in excessive tree damage and/or loss.

Location and distribution of facilities for water, minerals, or supplemental feed should be such that livestock are not encouraged to over-utilize areas of silvopasture.

Rows should be oriented in an east-west orientation where feasible and practical to allow maximum sunlight onto grass strips.

If grazing does not maintain reduced fuel loads, bush hogging or prescribed burning should be considered providing the woody plants are fire-adapted and will not be damaged.

Where water erosion and/or runoff from melting snow are a hazard, it should be controlled by supporting practices.

Wildlife and pollinators should be considered when selecting tree or shrub species. Species diversity, including use of native species, should be considered.

Consider using native vegetation. Also consider the invasive potential when selecting plant species.

Silvopasture establishment may not be feasible in some existing forest and woodland communities.

Consideration should be given to adverse offsite effects.

Plants established in cropping systems should have root systems that have minimal impact on crop growth.

For a silvopasture system there must be trees and forage being produced.

**PLANS AND SPECIFICATIONS**

Specifications for applying this practice shall be prepared for each site and recorded using approved specification sheets, job sheets, technical notes, and narrative statements in the conservation plan, or other acceptable documentation. Be sure to include the appropriate information depending upon going from pasture or no trees to trees and forage or starting in a forest and reducing the number of trees to a level that will support forages to grow beneath the trees.

1. Where trees are added to an existing pasture identify the tree species to be planted, the number of trees in a row, the number of rows and the width of the alley between the row or rows of trees.

2. Where the operator or landowner is going from a stand of trees to silvopasture, determine the current number of trees per acre or basal area and provide the landowner the target or residual number of trees per acre or residual basal area. The reduction of trees should be sufficient to allow sunlight to reach the forest floor. Also, identify the type of forages that need to be planted and the planting rate.
3. In some instances a parcel of land may not have sufficient trees or forages present on the site. Identify the tree species to be planted and the appropriate spacing (trees in a row, number of rows and the width of the alley). Trees do not have to be planted in rows, but the operation is easier to maintain that planting scattered trees on an acre. Secondly, the forage plants need to be selected and planted at the appropriate planting rate.

## OPERATION AND MAINTENANCE

The following actions shall be carried out to insure that this practice functions as intended throughout its expected life. These actions include normal repetitive activities in the application and use of the practice (operation), and repair and upkeep of the practice (maintenance):

- Forage and forest management will follow the Texas NRCS Prescribed Grazing (528) and Forest Stand Improvement (666) standards.
- Replanting will be required when plant survival is inadequate to meet practice and client objectives.
- Competing vegetation will be controlled until the trees are established.
- Periodic applications of nutrients may be needed for establishment and to maintain plant vigor. Refer to the Texas NRCS Nutrient Management (590) standard for further guidance.
- Inspect trees and shrubs periodically and protect from adverse impacts including insects, diseases or competing vegetation. The trees or shrubs will also be protected from wildfire and damage from livestock and wildlife.

## REFERENCES

Bendfeldt, E.S., et al. 2001. Establishing trees in an Appalachian silvopasture: response to shelters, grass control, mulch, and fertilization. *Agroforestry Systems*. 53:291-295.

Burner, D.M. 2003. Influence of alley crop environment on orchardgrass and tall fescue herbage. *Agron. J.* 95: 1163-1171.

Byrd, N.A., and C.E. Lewis. 1983. Managing pine trees and bahiagrass for timber and cattle production. USDA Forest Service, General Report R8-GR 2.

Clason, T.R. 1996. Timber-pasture management enhances productivity of loblolly pine plantations. *Louisiana Agriculture* 39(2): 14-16.

Clason, T.R. and S.H. Sharrow. 2000. Silvopastoral practices. Ch. 5 in *North American Agroforestry: An Integrated Science and Practice*. American Society of Agronomy, Madison, WI.

Clason, T.R. 1995. Economic implications of silvopastures on southern pine plantations. Louisiana Agricultural Experiment Station, in *Agroforestry Systems* 29:227-238.

Clason, T.R. 1999. Silvopastoral practices sustain timber and forage production in commercial loblolly pine plantations of northwest Louisiana USA. *Agroforestry Systems* 44: 293- 303.

Clason, T.R. and J.L. Robinson. 2000. From a pasture to a silvopasture system. USDA - NAC. *Agroforestry Note* 22.

Clason, T.R. and J.L. Robinson. 2000. From a pine forest to a silvopasture system. USDA – NAC. *Agroforestry Note* 18.

Cutter, B.E., K. Hunt and J.D. Haywood. 1999. Tree/wood quality in slash pine following long- term cattle grazing. *Agroforestry Systems* 44:305-312.

Fike, J.H., etal. 2004. Considerations for establishing and managing silvopastures. *Plant Management Network*. 1-12.

Lewis, C.E., etal. 1983. Integration of pines, pastures and cattle in south Georgia, USA. *Agroforestry Systems*. 1:277-297.

Sharrow, S.H. and I. Syed. 2004. Carbon and nitrogen storage in agroforests, tree plantations and pastures in western Oregon, USA. *Agroforestry Systems* 60:123-130.