NATURAL RESOURCES CONSERVATION SERVICE
MONTANA CONSERVATION PRACTICE SPECIFICATION

SILVOPASTURE ESTABLISHMENT (ACRE)

CODE 381

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

PURPOSE:

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

SCOPE: Situation 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.

SILVOPASTURE ESTABLISHMENT SPECIFICATIONS: Specifications for applying this practice shall be prepared for each site and recorded using approved specifications sheets, job sheets, and narrative statements in the conservation plan, or other acceptable documentation.

PLANT SELECTION

Select woody plants that produce a tree and/or shrub product (wood, nut, berries, fodder, mulch, etc).

Species must be suited and adapted to the soils, climate and purpose. See Conservation Tree/Shrub Suitability Group (CTSG) in Section II of the Montana Field Office Technical Guide (FOTG) for a detailed listing of woody species suited to the soils at the site. Also see the Forest Land Productivity Table in the County Soil Survey Manual for a list of trees that are common to the site and would be suitable for planting at that site.

Plants shall be marketable and suited to the landowners' equipment and management capabilities.

Establishment of woody species will be in accordance with the FOTG, practice standard, Tree/Shrub Establishment (Code 612).

Select forage species that are compatible and complementary to the woody plants and meets the landowner objectives. Select a forage species that will be suitable for the targeted livestock. Choose species that have shade tolerance and/or high net forage production.

Select forage species listed in the FOTG, practice standards, Forage and Biomass Planting (Code 512) or Range Planting (Code 550).

Moisture conservation or supplemental watering shall be provided for plant establishment and growth where natural precipitation is too low for the selected species. The use of a weed fabric barrier in the woody plantings is recommended to control vegetative competition, increase plant survival, improve plant growth, and reduce maintenance measures.

DESIGN

Silvopasture establishment applies to:

1) Pastures where trees or shrubs can be added;
2) Forests where forages can be added;
3) Land on which neither the desired trees nor forages exist in sufficient amounts.

Pastures where trees or shrubs can be added

Plant evenly spaced trees or shrubs in rows or randomly throughout planting. Rows will be single or multiple rows with forage species between the rows of woody plants.

Follow proper site preparation for establishment of trees or shrubs. See FOTG, practice standards and specifications for Tree/Shrub Site Preparation (Code 490) and Tree/Shrub Establishment (Code 612).

The distance between trees or shrubs will be determined by the following:

- Light requirements and growth period of the forage species.
- Tree and shrub environmental requirements.
- Machinery widths and turning areas.
- Landowner objectives.

Plant trees at an appropriate density to allow acceptable forage production and wood products. The spacing distance between tree or shrubs are found in Table 1.

Soil erosion by wind or water shall be controlled by vegetative or other means until the design is fully functional. Tree or shrub rows shall be oriented on the contour and perpendicular to erosive winds to control erosion.

Provide at least a 12-foot cultivated strip on all sides of the planting to serve as a fireguard, aid in the control of weeds, and reduce the amount of competition for available moisture.

Forests where forages can be added

For existing forests and plantations, remove a sufficient number of trees and/or prune existing trees to allow adequate light penetration for forage establishment and silvopasture use.

Maintain a 25-35% canopy cover for optimal forage production and livestock use. Follow FOTG, practice standards and specifications for Forest Stand Improvement (Code 666).

Tree pruning may be needed to adjust light levels, improve wood products, or provide adequate space for machinery. Follow FOTG, practice standards and specifications for Tree/Shrub Pruning (Code 660).

Choose forage species that have shade tolerance and/or high net forage production. Establishment of forage species will be in accordance with FOTG, practice standards and specifications for Forage and

Biomass Planting (Code 512) or Range Planting (Code 550). Use native forage species to maximize wildlife benefits.

Land on which neither the desired trees nor forages exist in sufficient amounts

Follow proper site preparation for establishment of trees or shrubs and forages. See FOTG, practice standards and specifications for Tree/Shrub Site Preparation (Code 490) and Tree/Shrub Establishment (Code 612).

Plant evenly spaced trees or shrubs in rows or randomly throughout planting. Rows will be single or multiple rows with forage species between the rows of woody plants.

Plant trees at an appropriate density to allow acceptable forage production and wood products. The spacing distance between tree or shrubs are found in Table 1.

Choose forage species that have shade tolerance and/or high net forage production. Establishment of forage species will be in accordance with FOTG, practice standards and specifications for Forage and Biomass Planting (Code 512) or Range Planting (Code 550).

TREE/SHRUB SPACING

New plantings

Establishment of woody species will be in accordance with the FOTG, practice standard for Tree/Shrub Establishment (Code 612). Plant spacing is based on plant type (shrub versus tree). Shrubs shall be planted closer together than trees.

TABLE 1 – Spacing Distances

PLANT TYPES	HEIGHT (FEET)	PLANT-TO-PLANT SPACING (FEET)	NO. PLANTS PER ACRE
Shrubs	<10	3–6	4,840–1,210
Shrubs /Trees	10–25	6–10	1,210–436
Trees	>25	10–15	436–194

Existing forests

Maintain a 25-35% canopy cover for optimal forage production and livestock use.

Use the D+X spacing in even-aged stands. Use Basal Area in uneven-aged stand. Refer to the National Forestry Handbook, Part 636.2 for proper inventory methods.

D+X is defined as: Average stand diameter (D) after treatment plus a constant (X).

EX. -- If D = 9” and X = 10, then average spacing is 9+10, or 19 feet. Stocking at 19’x19’=121 trees/ac.

Ponderosa pine

Even-aged:	D+ 10
Uneven-aged:	84 ft^2/ac

Specification MT381-4

Douglas-fir, Spruce, Fir, Cedar, Hemlock

Even-aged:	D+ 9
Uneven-aged:	88 ft^2/ac

Western larch

Even-aged:	D+ 10
Uneven-aged:	75 ft^2/ac

Lodgepole pine

Even-aged:	D+ 7
Uneven-aged:	110 ft^2/ac

SITE PREPARATION

Site preparation shall be sufficient for establishment and growth of selected species and appropriate for the site.

The planting area shall be free of living sod and perennial plants before planting.

The following will qualify for proper site preparation:

Tillable sites

1. Destroy competing vegetation through cultivation and/or chemical weed control. Sod and alfalfa should be tilled and not just chemically sprayed.
2. Summer fallow area. One year for cropped areas and two years for sod and alfalfa.
3. A fall-sown crop of small grain may be used where needed to control erosion.

Non-tillable sites

1. Destroy competing vegetation through chemical weed control and/or manually removing vegetation. Kill a vegetative area at least six feet in diameter and plant in the center.

CARE, HANDLING, AND SIZE FOR WOODY PLANTING STOCK

Planting stock will be stored in a cool, moist environment (33-38^{o} F; 90-95% RH). Keep stock tops dry and free of mold and roots moist and cool. Do not store seedlings in bucket of water during planting or storage.

The seedling should be dormant and will not need light. Seedling storage should be limited to a week or less if storage temperatures are higher than 38 degrees F. The seedlings should be left in their shipping package until planting. Upon receiving the seedlings, open the packages and check to see that the roots are moist. Dampen if necessary and reseal the package. Destroy stock that has been allowed to dry, heat up in storage or that has developed mold or other pests.

See Montana Plant Materials Technical Note MT-51 for *Temporary Storage and Handling of Container, Bareroot and Cutting Stock* for more detailed information.

NRCS, MT
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Planting Stock Grade Specifications:

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

SPECIES	CALIPER 1 INCH ABOVE ROOT COLLAR (INCHES)	HEIGHT RANGE (INCHES)	AGE (YEARS)
Broadleaf	3/16–3/8	12–24	1–3
Evergreen	1/4–1/2	6–12	2–4

Rooted planting stock must not exceed a 2:1 shoot-to-root ratio (SEE FIGURE 1). Container stock shall normally not exceed a one-gallon sized can.

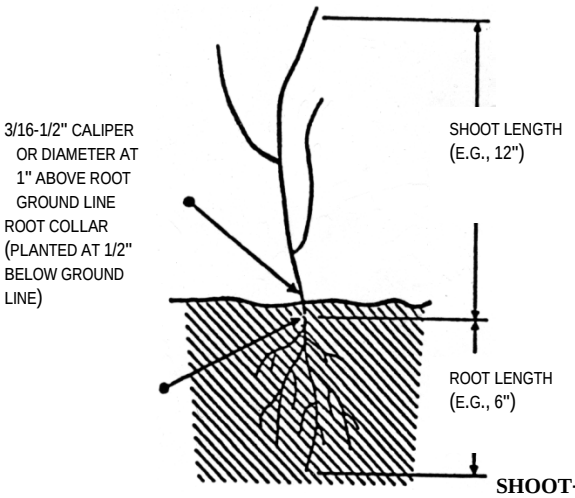

FIGURE 1. PLANT STOCK SHOOT–TO–ROOT RATIO REQUIREMENTS

PLANTING

Seedlings should be planted immediately after receiving them. Planting shall be done in early spring or late fall with dormant seedlings.

Spring – prior to full extension of new leaves. Typically April 1 to June 1.

Fall – after dormancy sets in (leaf drop). Typically October 15 to November 30.

Plant only when air temperatures are above freezing. Stock shall not be planted when the soil is frozen or dry.

Trees and shrubs may be planted by hand or with a planting machine.

Do not plant on hot, windy days to avoid excessive drying. When the weather is cool, the humidity is high and the winds are light is the time to plant trees. The seedling roots should not be exposed to the air for more than 30 seconds. In mixed plantings of conifer and deciduous seedlings, plant bare root conifers first for they are more susceptible to their roots drying out.

Roots of bare root stock shall be kept moist during planting operations by placing in water-soil (mud) slurry, peat moss, super-absorbent (e.g., polyacrylamide) slurry or other equivalent material. Rooting medium of container or potted stock shall be kept moist at all times by periodic watering.
Rooted stock will be planted in a vertical position with the root collars approximately 1/2-inch below the soil

surface. The planting hole or trench must be deep and wide enough to avoid bending and compacting roots. After planting of rooted stock, pack soil around each plant firmly to eliminate air pockets (SEE FIGURE 2).

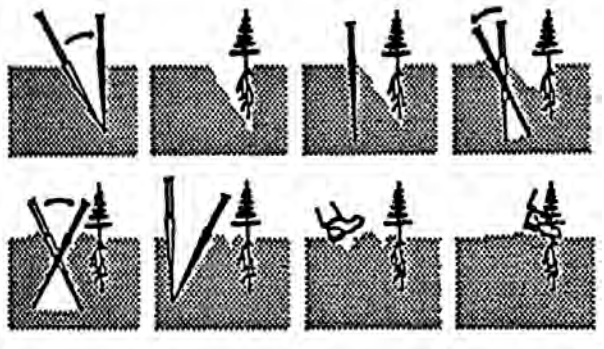

FIGURE 2. PROPER PLANT AND ROOT PLACEMENT OF ROOTED STOCK USING A PLANTING BAR

PROTECTION

The planting will be protected from adverse impacts such as livestock damage, wildlife damage or fire.

Protect plantings from livestock during initial establishment. Defer grazing until the average height of the tree's terminal bud exceeds the browsing height of the livestock or of sufficient size to resist breakage.

Reduce seedling damage from animal browsing and rubbing by the installation of seedling protector tubes. See Montana Plant Materials Technical Note MT-45 for the *Proper Installation, Maintenance, and Removal of Seedling Protector Tubes*. Provide seedling protection until the growing point exceeds the height of the browsing animals on the site (approximately two to six years). Prevent tubes from falling over or being knocked over by securely staking tube. Seedling protection is mainly for broadleaf species.

On hot, dry south and west aspects, protect evergreens with shingles or burlap shades for the first two growing seasons. To protect evergreens from winter desiccation, place shingles or burlap shades on the sides the prevailing winds are coming from.

FORAGE ESTABLISHMENT

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

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):

- Replacement of dead trees or shrubs will be continued until the practice is functional.
- Plants that have failed to grow shall be replaced not later than the second year. Void spaces are difficult to fill after the planting is over two years old. Gaps in the tree or shrub rows seriously reduce effectiveness and appearance of the planting.
- Regular vegetative competition control is needed to maintain the establishment, health, and vigor of the plantings. It shall be timely and frequent enough to keep the planting reasonably free from vegetative competition. The optimum time to perform this activity is several times throughout the growing season.
- Use caution in the application of chemical weed sprays in the vicinity of woody plantings. Strict adherence to label recommendations is essential to avoid damage to plantings.

- Mulches, fabrics, and tree mats will reduce the amount of maintenance needed to keep the planting growing and to control vegetative competition.
- Thin the woody planting to maintain forage production.
- Prune to eliminate weak or infected branches and repair injured trees.
- Damaging pests will be monitored and controlled.
- Maintaining the planting in a vigorous growing condition will aid in control of damaging pests. Early detection and application of control measures can often prevent extensive damage.
- Control deer and rodent damage by using fencing, repellents, or poisoning.
- Periodic applications of nutrients may be needed to maintain plant vigor.
- Protect plantings from fire by clean cultivation or the use of vegetative fire breaks.
- Supplemental watering may be desirable to ensure adequate survival.
- Replanting will be required when survival is inadequate.

SURVIVAL PERCENTAGES

For a successful tree or shrub planting, it is required that 75% of all trees or shrubs planted survive after “leaf out” during spring or summer of the second year with no two adjacent plants missing.