NATURAL RESOURCES CONSERVATION SERVICE
MONTANA CONSERVATION PRACTICE SPECIFICATION

TREE/SHRUB ESTABLISHMENT (ACRE)

CODE 612

DEFINITION: Establishing woody plants by planting seedlings or cuttings, direct seeding, or natural regeneration.

SCOPE: This specification provides direction in establishing woody plants for forest products, wildlife habitat, erosion control, improving water quality, treating waste, storing carbon in biomass, energy conservation, develop renewable energy systems, improving or restoring natural diversity, and enhancing aesthetics.

ESTABLISHMENT RECOMMENDATIONS: This practice applies to any appropriately prepared site where woody plants can be grown.

Species Selection

Care should be taken to select species that are adapted to the soil-site conditions. Select species that will be suitable for the planned purpose(s). Utilize local nurseries for planting stock.

See the Field Office Technical Guide (FOTG), Section II, Conservation Tree/Shrub Suitability Group (CTSG) for a listing of conservation trees and shrubs suited to the soils and environmental factors at the site.

Shrubs adapted to particular range sites are listed in the ecological range site descriptions located in FOTG, Section II - E-8.

Trees and shrubs suited for riparian areas are listed in the FOTG, Section IV, Practice Standards and Specifications, Riparian Forest Buffer (Code 391).

See the Woodland Management and Productivity Table of the Soil Survey Manual for which tree species are found on forested soils and which trees to plant. Common species for timber production are Ponderosa pine, Douglas-fir, Western larch, Lodgepole pine, and Engelmann spruce.

Common species for Christmas tree plantations are White spruce, Colorado blue spruce, Austrian pine, Scotch pine, Douglas-fir, Grand fir, and Concolor fir.

Spacing

Planting or seeding rates will be adequate to accomplish the planned purpose(s).

Initial planting densities or spacing for trees and shrubs will depend on their potential height at 20 years of age. Heights may be estimated based on the performance of the individual species - or comparable species - in nearby areas on similar sites. Planting density or spacing specifications are:

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

On harsh sites, use the lower planting density to accommodate the limited supply of moisture and nutrients.

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Direct Seeding

Success of direct seeding depends upon the following factors:

- site preparation
- rodent population
- seed scarification
- aspect
- plant competition
- soil moisture
- timing
- predators
- overcoming seed dormancy
- species requirements

Direct seeding should be done in the spring or fall depending upon species.

- Spring = Engelmann spruce, Western larch
- Fall = Lodgepole pine, Ponderosa pine, Douglas fir

Direct tree seeding has had limited success and is generally not recommended due to the high cost per surviving seedling.

The recommended direct seeding rate for re-forestation purposes are as follows:

	POUNDS PLS[1] / ACRE
Douglas-fir	1/2 to 1-1/2
Engelmann spruce	1/2 to 1
Lodgepole pine	1/2 to 1
Ponderosa pine	2 to 4
Western larch	1/2 to 3/4

[1] PLS = Pure Live Seed

Seeding rates for some shrubs can be found in:

- Montana Plant Materials Technical Note MT-46:
  Seeding Rate Specifications and Recommended Cultivars and Germplasm for all Vegetative Practices in the Montana Field Office Technical Guide.

- Montana Plant Materials Technical Note MT-31:
  Restoration of Woody Plants within Native Range Communities.

Site Preparation

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

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 6 feet in diameter and plant in the center.

Care and Handling 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^{o} 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.

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 1-gallon can size.

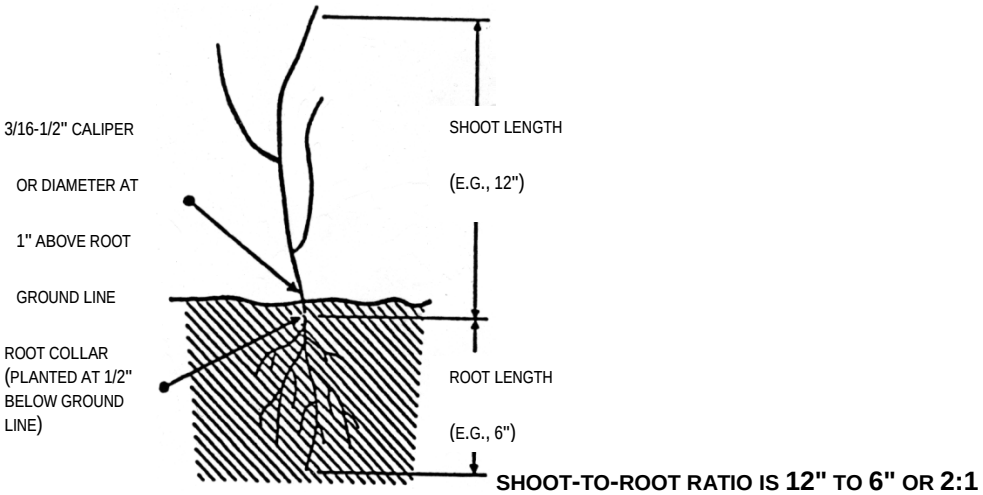

FIGURE 1. PLANT STOCK SHOOT–TO–ROOT RATIO REQUIREMENTS

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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 bareroot 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).

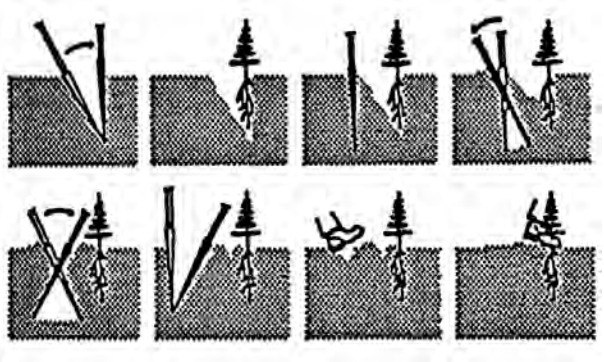


FIGURE 2. PROPER PLANT AND ROOT PLACEMENT OF ROOTED STOCK USING A PLANTING BAR

To allow seedlings to become established, competing vegetation should be controlled by scalping, cultivation, chemical control, and/or the use of fabric barrier. Remove or kill all competing vegetation for at least a 6-feet wide strip or spot on which the seedlings will be planted.

Protection

The planting will be protected from adverse impacts such as livestock and wildlife damage.

Protect plantings from livestock with fence. Protect plantings from wildlife damage with nets, tubes, baits, traps, repellents, and/or fencing.

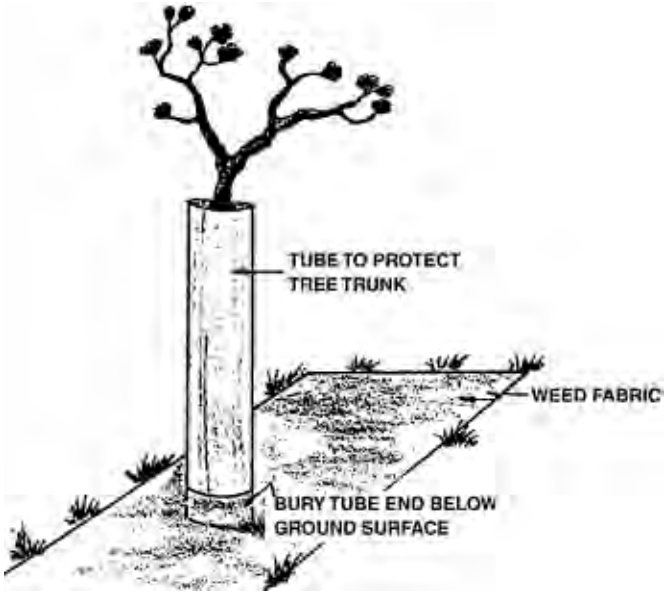
Reduce seedling damage from animal browsing and rubbing by the installation of seedling protector tubes. See Montana Plant Materials Technical Note MT-45 for the *Proper Installation, Maintenance, and*

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.

An alternative to seedling protector tubes is to use fencing around non-linear block plantings. Deer can damage plantings by browsing and rubbing. In areas where this is a concern, a temporary wildlife exclusion fence is needed to allow plants to get established. Provide seedling protection until the growing point exceeds the height of the browsing animals on the site (approximately two to six years). Refer to FOTG, Practice Standard and Specification, Fence (Code 382) for guidelines on wildlife fencing.

On hot, dry south and west aspects, protect conifers with shingles or burlap shades for the first two growing seasons. To protect conifers from winter desiccation, place shingles or burlap shades on the sides the prevailing winds are coming from. Use natural shade behind stumps, downed logs, or dead brush whenever possible.

The diagram to the right illustrates the use of a solid tube for rodent protection and a fabric mat used for weed control and moisture conservation.



Mulches, Fabric, and Mats

Fabric mulch may be used for weed control and moisture conservation for new plantings on all sites, particularly those with pronounced growing season moisture deficits or with competitive vegetation.

Acceptable mulches, fabric, or mat materials must allow for water infiltration and air movement. Fabric mats will be a minimum of six feet by six feet in size and properly secured. Rodent damage may occur if they are not properly secured.

The minimum fabric mulch specifications for weed control on new tree plantings:

Woven Polypropylene Fabric:

Ultra Violet (UV) resistance: 5-year (minimum)
Substrate weight: 3 ounces per square yard (minimum)
Mullen Burst Strength: 250 pounds per square inch (minimum)
Thickness: 15 mils (15/1,000 inch) (minimum)
Must be permeable to water.

When organic mulches are used, the material shall be placed a minimum of four inches deep and in at least a six feet wide diameter around the seedling. Organic mulches should be kept at least six inches away from the main stem of trees and shrubs to minimize possible rodent damage.

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Regeneration

Protect existing regeneration from damage.

Natural regeneration is successful with most forest tree species. Ponderosa pine and Western larch do not always produce a good cone and seed crop every year. Residual overstory trees of these species must be observed for adequate seed source.

Aesthetics

For plantings along farmstead entrance lanes the nearest row of woody plants is at least 100 feet from centerline of the lane.

Micro-Irrigation

Established plantings should receive sufficient water to fill the soil profile to a depth of six feet where soils permit. Infrequent deep irrigation will help control weeds and provide deep rooting for future dryland survival.

General irrigation should cease around September 1 to permit trees to harden off before frost. On sandy or gravelly soils, the shutoff date can be later. But after trees/shrubs have harden off, a late fall supplemental application of irrigation water, just before soil freezing is very beneficial to trees if the soil is very dry. This is especially true for evergreens.

Maintenance

Controlling competing vegetation is needed to maintain the establishment, health, and vigor of the plantings. Control the competing vegetation for the first three to five years of establishment. In areas of low precipitation, continued control of competing vegetation is needed throughout the life of the practice.

Cultivate no deeper than three inches and no closer than two feet from the base of the plant. This shall be done frequently enough to keep the planting reasonably free from plant competition. The optimum time to perform this activity is several times throughout the growing season. Supplemental watering may be desirable to ensure adequate survival.

Woven fabric shall be periodically inspected to ensure tree girdling is not occurring. Inspect plantings frequently for signs of animal damage and adjust protection accordingly. Replace or re-stake any protector tube that has been damaged, fallen or been knocked over.

Replanting will be required when survival is inadequate.

Survival Percentages

Planting dates, care in planting of the seed or seedlings and controlling competing vegetation will ensure that planted materials have an acceptable rate of survival.

For a successful tree or shrub planting, it is required that 75 percent of all trees or shrubs planted survive after “leaf out” during spring or summer of the second year. As part of maintenance, replant trees or shrubs when the survival is less than 75 percent. Take necessary steps to ensure survival.

References

American Nursery and Landscape Association web-site; American Standards for Nursery Stock; (110 pages), 2004 version.