

FORESTRY TECHNICAL NOTE

Establishment of Bareroot and Container Stock in Riparian Areas

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Introduction: Many riparian areas can be improved by supplemental tree and shrub plantings that increase biodiversity, create wildlife habitat, enhance stream bank stability and improve water quality. Supplemental plantings generally use bareroot and container stock. This Technical Note describes important establishment factors and techniques when using bareroot and container stock in riparian plantings. Riparian areas can contain challenges such as existing vegetative competition, equipment limitations and wildlife browsing.

I. TECHNIQUES (continued on next page):

A. Planning: Determine if trees and shrubs are indigenous to the site you intend to plant. Determine if the site has the hydrology, soils, and frequency and duration of flooding needed to support successful long-term establishment and growth of plants.

Several management factors have been determined to be critical in Montana for successful plant establishment in riparian conservation practices. Livestock exclusion until woody plants are adequately sized to tolerate browsing, trampling, and rubbing is necessary. It may be needed to exclude livestock three to five years to establish plantings. Protection from wildlife including deer, elk, moose, rabbits, mice, voles, and other rodents may be necessary. Use tree shelters, fencing and other animal control techniques to exclude or minimize damage to woody plantings in riparian projects. Drift from non-selective and broad-leaf selective herbicides, especially when applied to adjacent pasture and rangeland from aircraft or large ground sprayers, can be detrimental to woody plant survival, establishment, and growth. Herbicides with lengthy residual soil activity may prevent adventitious root formation or survival of transplanted nursery stock. Examine past and planned herbicide prescriptions and applications for the riparian area and adjacent land prior to project initiation. Make sure that herbicides are labeled for use near riparian areas (surface water) and are compatible with woody plants.

B. Species Selection: Select species and types appropriate for the planting site and native to Montana and the site. Inventory the proposed planting site, or a comparable site within close proximity, for existing woody species and growing conditions (micro eco-sites, elevation, etc.). On-site observation is the best method to assist in the species selection process. When possible, plant the same species in locations and micro eco-sites in which they are normally found. A portion of the selected species should be those with a suckering, rhizomatous and/or spreading root systems (see Table A).

Table A. Riparian Species with Suckering, Rhizomatous or Spreading Root System

Species
Acer negundo Boxelder
Alnus incana spp. Tenuifolia Thinleaf alder
Betula occidentalis Water birch
Crataegus douglasii Black/Douglas hawthorn
Elaeagnus commutate Silverberry
Pentaphylloides floribunda Shrubby cinquefoil
Philadelphus lewisii Mockorange
Populus tremuloides Quaking aspen
Prunus virginiana Chokecherry
Rhus trilobata Skunkbush sumac
Ribes aureum Golden current
Rosa woodsii Wood's rose
Sambucus coerulea Blue elderberry
Shepherdia argentea Silver buffaloberry
Symphoricarpos albus Common snowberry

Refer to the *Classification and Management of Montana's Riparian and Wetland Sites* publication to determine plant species that may occur on the site. Some species may no longer be present on the site but possibly should be. Table 1. Plant List, of the Montana Riparian Forest Buffer – Code 391 practice specification, lists trees and shrubs commonly associated with and suited to riparian areas.

C. Source of Plant Materials: Use high quality and adapted planting stock. Trees and shrubs may be procured from local commercial, state or conservation nurseries as bareroot or containerized stock. When using bareroot and containerized stock from commercial sources, select species and stock sources compatible with the planting site.

D. Plant Spacing: Initial plant-to-plant spacing for trees and shrubs will depend on their potential height at 20 years of age. Heights may be estimated based on:

- 1) Performance of the individual species--or comparable species--in nearby areas on similar sites, or
- 2) Pre-determined and documented heights using Conservation Tree/Shrub Suitability Groups (CTSG), Section II of the Field Office Technical Guide.

Plant spacing or density 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

E. Estimating Planting Stock:

- To determine the plantable area, deduct from the total buffer area those areas already stocked, anticipated to regenerate naturally, and those areas desired to be non-stocked.
- Determine the percent composition (ratio of plants or canopy cover based on mature crown width) of each species in the planting.
- To determine the actual number of plants by species apportion the plantable area for each species based on its percent composition, then divide by the area of its plant spacing or mature canopy.

Most buffers do not require planting 100 percent of the area or a 100 percent canopy cover. Consider using Montana Forestry Technical Note MT-21 *Estimating Planting Stock for Woody Plantings* dated March 2002 to estimate planting stock for woody plantings. The technical note is a spreadsheet that provides an efficient means of calculating the amount of plant materials needed for area plantings.

F. Planting Stock Grade Specifications:

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 sized can.

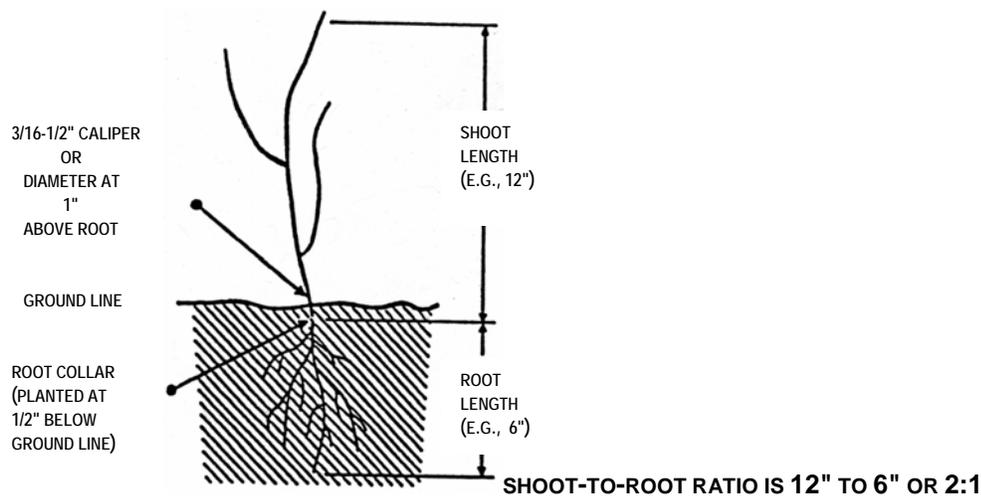


FIGURE 1. PLANT STOCK SHOOT-TO-ROOT RATIO REQUIREMENTS

G. Care and Handling of Woody Planting Stock:

Planting stock will be stored in a cool, moist environment (33-38° 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° 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](#) *Temporary Storage and Handling of Container, Bareroot and Cutting Stock* for more detailed information.

H. Preparation of Planting Sites:

Planting sites shall be properly prepared based on the conditions listed below. For sites to be tilled, leave a minimum 3-foot untreated strip at the edge of the bank or shoreline.

The following will qualify for proper site preparation:

Tillable Sites

1. Destroy competing vegetation through cultivation and/or chemical vegetative control. Sod and alfalfa should be tilled and not just chemically sprayed.
2. Summer fallow area. One year if possible for optimum results. Chemically or mechanically control competing vegetation through this fallow time period.

Non-tillable Sites

1. Destroy competing vegetation through chemical vegetative control and/or manually removing vegetation. When manually removing vegetation through scalping it is important in sod to get below the root mat and expose the mineral soil. Kill a vegetative area at least three feet in diameter and plant in the center.

Competing vegetation will need to be controlled for the first five years. The use of fabric squares, chemical or mechanical control are tools used to control the competing vegetation.

Sites with undesirable noxious weeds (salt cedar) or shrubs (Russian olive) will need to be controlled to facilitate planting of desired stock and prevent re-encroachment of the plant. Suitable methods include hand-cutting and removal, brush hogging, brush-blading, or other equivalent procedure with repeated treatment or use of herbicides to control re-sprouting.



I. Planting Time:

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.

J. Planting:

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 one-half 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).

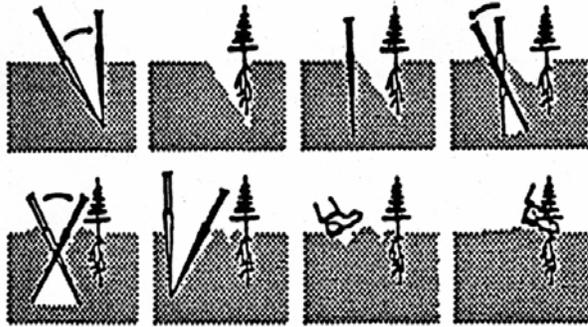


FIGURE 2. PROPER PLANT AND ROOT PLACEMENT OF ROOTED STOCK USING A PLANTING BAR

Random scattered plantings in areas lacking woody vegetation throughout the riparian site would look more natural and are encouraged.

Avoid sites that have had recent application of pesticides harmful to woody species to be planted. If pesticides are used, apply only when needed. Handle and dispose of pesticides properly and within federal, state, and local regulations. Follow label directions and heed all precautions listed on the container.

K. Fabric Mulch:

Fabric mulch will 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 mulches will be a minimum of three feet by three feet in size. Place fabric around planted stock. Place a minimum of a 6 inch "x" cut around the stock. Anchor fabric with staples or rock (no dirt). Rodent damage may occur if they are not properly secured.

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

Woven Polypropylene Fabric

Ultra Violet (UV) resistance: 5 year (minimum)

Substrate weight: 3 ounces per square yard (minimum)

Mullen Burst Strength: 325 pounds per square inch (minimum)

Thickness: 15 mils (15/1,000 inch) (minimum)

Must be permeable to water



Note: Picture above planted in tilled site. Site should also be chemically sprayed to control competing vegetation around edge of fabric.

When organic mulches are used, the material shall be placed a minimum of four inches deep and in at least a three 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.

L. Seedling Protectors:

Seedling protector tubes can reduce seedling damage from animal browsing and rubbing. Seedling protector tubes protect the plant allowing it to establish a root system. There are two kinds of tubes – solid and mesh tubes. Solid tubes are used to help control damage done by mice and voles. Mesh tubes are used to protect plant from animal browsing. Seedling protector tubes should be three to four feet in height. See [Montana Plant Materials Technical Note MT-45](#) for the *Proper Installation, Maintenance, and Removal of Seedling Protector Tubes*. Prevent tubes from falling over or being knocked over by securely staking tube (Bamboo stakes are generally not effective). Seedling protection is mainly for broadleaf species.



An alternative to seedling protector tubes is to use fencing around clumps of plantings. Provide seedling protection until the growing point exceeds the height of the browsing animals on the site (approximately two to six years). Refer to Montana Fencing – Code 382 practice standard and specification for guidelines on wildlife fencing.

M. Survival Percentages: For a successful tree or shrub planting, it is required that 75 percent of all trees or shrubs planted survive as inventoried after "leaf out" during spring or summer of the second year.

N. Maintenance and Management: Replant dead plant materials the second and third years after installation. Monitor the site and control competing herbaceous vegetation around new plantings. When using fabric mulch, control competing vegetation an additional foot around the fabric mulch by either chemical or mechanical methods. With chemical control, care must be taken to avoid chemical contact with leaf, stem, and bark of planted stock. Inspect plantings frequently for signs of animal damage and adjust protection accordingly.

Where to get help

For more information, contact your local USDA Service Center, or Natural Resources Conservation Service or Soil and Water Conservation District office.

REFERENCES:

Logar, R.D. 2002. Estimating Planting Stock for Woody Plantings. USDA NRCS [Forestry Technical Note No. MT-21](#), Bozeman, Montana.

Ogle, D.G., Hoag, J.C., and J.D. Scianna. 2001. Users Guide to Description, Propagation and Establishment of Native Shrubs and Trees For Riparian Areas in the Inter-Mountain West. USDA NRCS [Plant Materials Technical Note No. MT-36](#), Bozeman, Montana. 22p.

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