NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE SPECIFICATION

RIPARIAN FOREST BUFFER
(Acre)
CODE 391

GENERAL SPECIFICATIONS

Procedures, technical details and other information listed below provide additional guidance for carrying out selected components of the named practice. This material is referenced from the conservation practice standard for the named practice and supplements the requirements and considerations listed therein.

PLANTING DENSITIES

Initial plant-to-plant densities 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) predetermined and documented heights using Conservation Tree/Shrub Suitability Groups, Section II of the Field Office Technical Guide. Planting density specifications are:

Plant Types/Heights:	Plant-to-Plant Spacing:
Shrubs less than 10 feet in height	3 to 6 feet
Shrubs and trees from 10 to 25 feet in height (includes columnar trees)	5 to 8 feet
Trees greater than 25 feet in height	8 to 12 feet

PLANT SELECTION

Refer to the following material in selecting plant species for buffers:

- NRCS publication BE-93-01 - "Conservation Planting for Natural Resources Management"
- Tree and Shrub Planting Handbook for Nevada and Utah
- FOTG Section II - Windbreak Interpretations

These references present plant species soil and climate adaptation information and list key plant attributes to assist with the design process for establishing new buffers.

CARE, HANDLING, SIZE AND PLANTING REQUIREMENTS FOR WOODY PLANTING STOCK

Planting stock will be stored in a cool, moist environment (34-38^{o} F) or heeled in. During all stages of handling and storage, keep stock tops dry and free of mold and roots moist and cool. Destroy stock that has been allowed to dry, to heat up in storage (e.g., within a bale, delivery carton or container), or that has developed mold or other pests. Live cuttings that will not be immediately planted shall be promptly placed in controlled storage conditions (34-38^{o} F) and protected until planting time.

Seedlings shall not be less than 1/4-inch in caliper at 1-inch above the root collar. For cuttings, avoid using material less than 3/4-inch in diameter, cut off tops with apical buds, remove side branches, and produce lengths long enough to reach adequate soil moisture required by the individual species during the growing season. Tops of dormant-season collected cuttings may be dipped into latex paint, paraffin or sealing wax to prevent desiccation and mark the up-end. 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. Roots of bareroot stock shall be kept moist during planting operations by placing in a 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

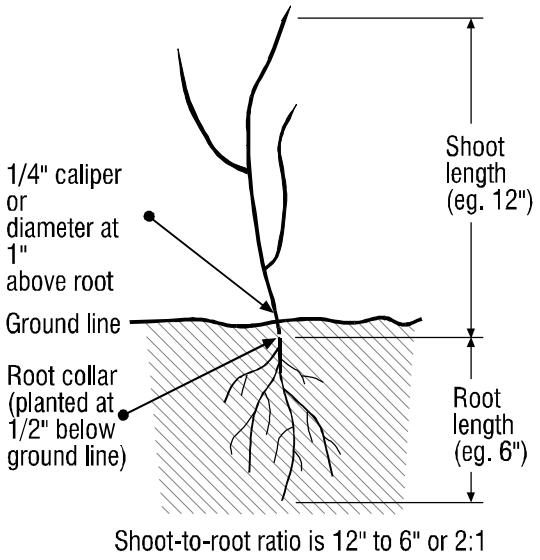

Figure 1. Plant or stock size requirements.

watering. Pre-treat stored cuttings with several days of soaking just before planting. Stock shall not be planted when the soil is frozen or dry. Rooted stock will be planted in a vertical position with the root collars approximately 1/2-inch below the soil surface. Insert cuttings to the depth required to reach adequate soil moisture with at least 2-3 buds above ground. The planting trench or hole must be deep and wide enough to permit roots to spread out and down without J-rooting or L-rooting. After planting of rooted stock or cuttings, pack soil around each plant firmly to eliminate air pockets. See Figure 2.

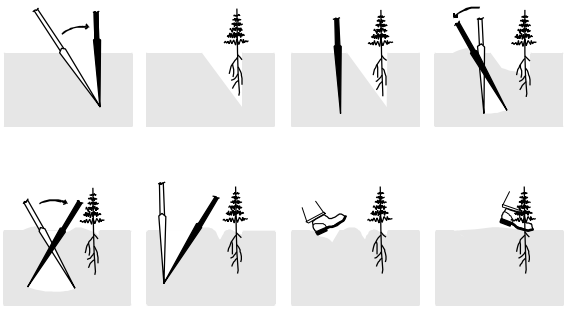

Figure 2. Proper plant and root placement of rooted stock using a planting bar.

BUFFER WIDTH GUIDE FOR SELECTED WILDLIFE SPECIES

Widths listed in the following table include the sum of buffer widths on one or both sides of water courses or water bodies and may extend beyond riparian boundaries (in such cases refer to conservation practice TREE/SHRUB ESTABLISHMENT, Code 612, for design of upland forests).

Species:	***Desired Width:***
Bald eagle, cavity nesting ducks, heron rookery, sandhill crane	600 feet
Common loon, pileated woodpecker	450 feet
Beaver, dabbling ducks, mink, salmonids	300 feet
Deer	200 feet
Lesser scaup, harlequin duck	165 feet
Frog, salamander	100 feet

PREPARATION OF PLANTING SITES

Planting sites shall be properly prepared based on the soil type and vegetative conditions listed below. For sites to be tilled, leave a 3-foot untreated strip at the edge of the bank or shoreline. Avoid sites that have had recent application of pesticides harmful to woody species to be planted. If pesticides are used, apply only when needed and handle and dispose of properly and within federal, state and local regulations. Follow label directions and heed all precautions listed on the container.

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 invasive, weedy species. Refer to conservation practice MULCHING, Code 484, for installation procedures.

Based on site conditions and predominant soil texture of the fine earth fraction, procedures include:

TILLABLE SITES WITH LOAMY OR CLAYEY SOILS

- Sod and alfalfa sites

  Summer fallow 1 year to kill the sod or alfalfa. Till (moldboard plow, disk plow, rototiller or similar equipment) in the spring before planting the stock. A fall-sown crop

of oats may be used where needed to control erosion.

Sod may be killed by non-selective herbicides the year previous to planting stock. Plant stock in the residue. On heavy soils, tillage is usually necessary to achieve a satisfactory planting when a tree planting machine is used.

- Small grain or row crop sites:

  If the site is in row crop, till (moldboard plow, disk plow, rototiller or similar equipment) in the fall or in the spring prior to planting the trees or shrubs. If the site has a plow or hard pan in subsoil, perform a deep disking or ripping operation in the fall. A fall-sown crop of oats may be used where needed to control erosion.

  If the site is in small grain stubble, the stock may be planted in the spring without further preparation. If fabric mulch is to be installed, till in the spring before planting.

  Tillage on steep slopes must be on the contour or cross-slope. A cover crop between the rows may be necessary to control erosion and sediment deposition on planted stock.

TILLABLE SITES WITH SANDY SOILS

- Sod and alfalfa sites:

  Till (moldboard plow, disk plow, rototiller or similar equipment) and plant to a spring cover crop (corn, grain, sorghum, etc.) the year prior to planting. Leave a stubble cover in which to plant. A light disking may be needed before planting if fabric mulch is used.

  Sod may be killed by nonselective herbicides the year prior to planting. Plant trees or shrubs in the residue.

  When hand planting, scalp or strip an area at least 3 feet in diameter and two-to-four inches deep. (place plants in the center of the scalped area.)

  Rototill a 3-foot wide strip. (Place plants in the center of the tilled area.) Where a drip watering system will not be used, rototill the strip the year prior to planting.

- Small grain or row crop sites:

  If the site is in small grain, corn, or similar clean tilled crop, and it is reasonably free of weeds, plant stock in the stubble without prior preparation. It may be necessary to till a narrow strip with a disk or other implement to kill weeds or volunteer grain, or to prevent stalks and other residue from clogging the tree planter. If fabric mulch is used, disking may also be needed. A cover crop or stubble may be needed between the rows to protect the planting from water or wind erosion.

NON-TILLABLE SITES AND/OR EROSIVE SITES
(*including sites with undesirable brush or herbaceous species)*

On sites where it is not practical or possible to operate equipment (steepness, rockiness, etc.), where tillage of the site will cause excessive erosion, or where tillage of the site is impractical, the methods listed below may be used. Sites with undesirable brush will need initial treatments that physically removes and kills the brush species to facilitate planting of desired stock and prevent re-encroachment of the brush. 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.

- Machine or hand scalp an area at least 36 inches in diameter with subsequent plant placement in the center of the scalped area.
- Rototill a strip at least 36 inches wide the year prior to tree planting with subsequent plant placement in the center of the tilled strip.
- Kill the vegetation in a 36-inch diameter or larger area or in a 36-inch or wider strip with a non-selective herbicide the year prior to planting and plant in the center or along the center-line of the treated area.

OPERATION AND MAINTENANCE

The following actions shall be carried out to insure that this practice functions as intended throughout its expected life.

- The riparian forest buffer will be inspected periodically, protected and restored as needed, to maintain the intended purpose from adverse impacts such as excessive vehicular and pedestrian traffic, pest infestations, pesticide use on adjacent lands, livestock damage and fire.
- Replacement of dead trees or shrubs and control of undesirable vegetative competition will be continued until the buffer is, or will progress to, a fully functional condition.

- As applicable, control of concentrated flow erosion or mass soil movement shall be continued in the up-gradient area immediately adjacent to Zone 2 to maintain buffer function.
- Any removals of tree and shrub products shall be conducted in a manner that maintains the intended purpose.
- For purposes of moderating water temperatures and providing detritus and large woody debris, riparian forest buffer management must maintain a minimum of 50 percent canopy cover. To achieve benefits provided by large woody debris, natural mortality of trees and large shrubs may need to be supplemented by periodically falling and placing selected stems or large limbs within water courses and water bodies to reach original design specifications.
- For providing habitat and corridors for wildlife, manage the buffer to favor food, shelter and nesting cover that would satisfy the habitat requirements of the indicator or target wildlife. Refer to Habitat Evaluation Procedures by the U.S. Fish and Wildlife Service or equivalent state document for the particular species.
- For purposes of reducing excess pollutants in surface runoff and shallow groundwater (Zone 1 and Zone 2), or providing habitat and corridors for wildlife (Zone 1 at a minimum), manage the dominant canopy to maintain maximum vigor of overstory and understory species.
- Any use of fertilizers, mechanical treatments, prescribed burning, pesticides and other chemicals to assure buffer function shall not compromise the intended purpose. Biological control of undesirable plant species and pests (e.g., using predator or parasitic species, or grazing of domestic animals) shall be implemented where available and feasible.

Additional operation and maintenance requirements shall be developed on a site-specific basis to assure performance of the practice as intended.

REFERENCES

Schen, D. et al. 1993. Tree and Shrub Planting Handbook - A Guide for Conservation Plantings in Utah and Nevada. Utah Division of State Lands and Forestry, Salt Lake City, UT.

University of Nevada Cooperative Extension and U.S.D.A. Natural Resources Conservation Service. 1993. Conservation Plantings for Natural Resources Management. NRCS/UNReno Joint publication BE-93-01. Reno, NV.

U.S.D.A. Natural Resources Conservation Service. 1994. Field Office Technical Guide - Section II, Windbreak Interpretations.