

NATURAL RESOURCES CONSERVATION SERVICE
 CONSERVATION PRACTICE GENERAL SPECIFICATIONS

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 riparian forest buffer and supplements the requirements and considerations listed therein.

NATURAL REGENERATION

Some riparian areas vegetative communities can stabilize through natural regeneration of the existing plants as long as there is an adequate density and the plant vigor is such that there will be adequate plant survival. If the vegetation in Zone 1 and Zone 2 meets the following criteria, natural regeneration is an option:

- Plants, must be native trees or shrubs, adapted to the area
- Have a density of 300 plants per acre (3 per 1/100 acre)
- Plants are at least 2 feet tall and in good health

Description of Zone 1 and Zone 2 .

- *Management zone 1 is the zone immediately adjacent to the water. Vegetation is normally dominant trees and shrubs.*
- *Management zone 2 is upgrade of zone 1 and contains trees and shrubs where more intensive management is allowed to help accomplish an intended objective.*

Sampling of riparian vegetation can be done in a variety of ways to accurately evaluate the plant densities. One method is to mark the perimeter of a 1/100-acre circular plot (approximately 12 feet in radius) and count all desirable woody plants. If the area of consideration is >100 ft. in length, several sites must be sampled and summarized to determine if the 300 plant per acre criteria is met.

MANAGEMENT

Refer to the Use Exclusion (472) standard and specification when exclusion of animals, people and vehicles is needed. Thereafter, use of the area should be limited to those activities that will maintain or improve the riparian plant community. Invasive and/or non-native plants shall be removed as feasible. Refer to other standards and specifications such as Brush Management (314), Stream Crossing (728), Fence (382), Pipeline (516), and Trough or Tank (614) as needed.

PLANT LIST

Table 1 lists woody plant species (trees and shrubs) commonly associated with and suited to riparian areas. Species are arranged alphabetically by management zone. (See practice standard for explanation of management zones)

Tree Species	Zone
alder	1, 2
ash, AZ	1, 2
birch, water	1
blacklocust	1, 2
boxelder	2
buckbrush	1, 2
buttonbush	1
cottonwood	1, 2
dogwood	2
hackberry	2
hawthorn	2

Tree Species	Zone
oak, gamble	2
pecan	2
plum	2
seepwillow	1
soapberry	1, 2
sumac	2
sycamore AZ	1, 2
walnut, black AZ	2
willow, black	2
willow, coyote	1, 2
willow, sp	1, 2

Conservation practice general specifications are reviewed periodically, and updated if needed. To obtain the current version, contact the Natural Resources Conservation Service.

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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 in feet:
• Shrubs less than 10 feet in height	3 to 8
• Shrubs and trees from 10 to 25 feet in height (includes columnar trees)	6 to 10
• Trees greater than 25 feet in height	8 to 18

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

Bareroot stock will be stored in a cool, moist environment (34-38 degrees F) or heeled in for long term storage. 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 excessive mold or other pests.

Live cuttings that will not be immediately planted shall be promptly placed in controlled storage conditions (34-38 degrees F) for long term storage and protected until planting time. The selected material for cuttings must be vigorously growing and a minimum 2 years old to assure the material is woody. All live cuttings must be taken during the dormant season. Remove side branches, and produce lengths long enough to reach adequate soil moisture required by the individual species during the growing season. If tops of cuttings are cut off they may be dipped into latex paint, paraffin or sealing wax to prevent desiccation and mark the end up. Most species suitable for planting of cuttings or poles must be planted to a depth of permanent water or will require temporary water until the

root system develops down to permanent water. Dormant cuttings of many species, particularly cottonwood and willows, may be stored with the butt end submerged in water for as long as 3 weeks. At a minimum, the butt end must be kept cool, dark and moist until the stock is planted.

Seedlings shall not be less than 1/4" in caliper at 1" above the root collar. Rooted planting stock must not exceed a 2:1 shoot-to-root ratio. Preferable shoot-to-root ratio for the New Mexico environment is 1:1. See figure 1. Minimum container size for rooted seedlings is 10 cubic inches. There are no restrictions for maximum container size. The preferred container shape is long and narrow so the taproot system of the transplant can begin to develop. For example, tallpots are containers 30 inches in length with a 4" in diameter. The long root systems that develop in this pot can be planted into the moist soil of the capillary fringe of the water table and may never have to be irrigated.

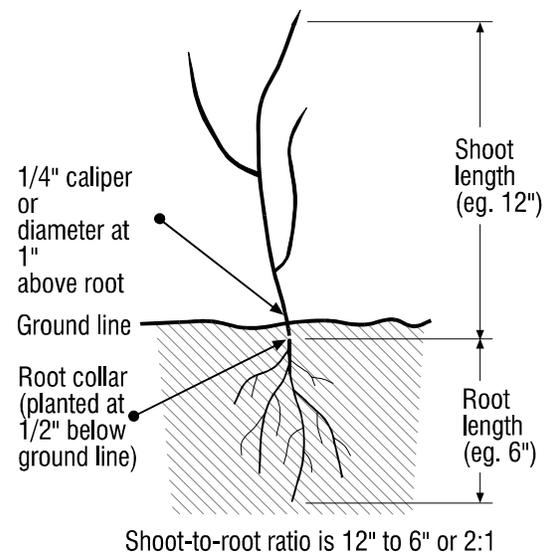


Figure 1. Plant or stock size requirements.

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. Pre-treat all stored cuttings with

several days of soaking prior to 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 but not excessively in fine textured soils. See figure 2.

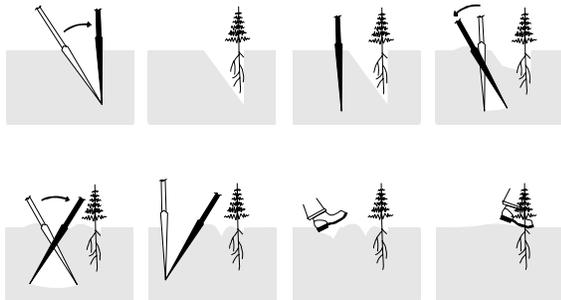


Figure 2. Proper plant and root placement of rooted stock using a planting bar.

Planting of cuttings and poles.

For planting of cuttings where no supplemental water is planned, the site must be evaluated for the maximum depth of the water table. Any cutting must be long enough to reach the lowest anticipated water table depth and have a minimum of 3 buds above the ground level.

In areas where this exceeds the normal tree planting depth, a hole must be dug for each individual cutting. This is often best accomplished with mechanical means but can be done by hand. Where the water table is less than a foot from the surface do not plant woody vegetation because they are not adapted to anaerobic condition of the wetland plant zone. The entire length of holes dug for cuttings must be filled with soil after planting.

Where supplemental water is provided to cuttings that are not established in a permanent water table, the cuttings must have a minimum of 6 inches in the soil and a minimum of 3 buds above the ground. Cuttings more than 2 feet long will have to have at least 1/3 of the total length in the soil to support the top growth. Supplemental water will be required to provide

moisture for the entire depth of the cutting. This may be required for the life of the plant or until the root system can reach the capillary fringe of the water table.

Please refer to and follow the latest New Mexico planting specifications. Applicable reference material includes but is not limited to: Biology Tech Notes 35, 40, and 42, Plant Material Tech Note 67, Engineering Field Handbook (part 650) Chapters 13 “Wetland Restoration, Enhancement or Creation”, 16 Streambank and Shoreline Protection”, 18 “Soil Bioengineering for Upland Slope Protection” and The Pole Cutting Solution and Guidelines for Planning Riparian Restoration in the Southwest brochures by the Los Lunas Plant Material Center.

BUFFER WIDTH GUIDE FOR SELECTED WILDLIFE SPECIES

Widths below 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 the practice standard for Tree/Shrub Establishment, practice number 612, in the FOTG for design information on upland forests).

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

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

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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 Mulching, Practice Standard 484 in the FOTG, for installation procedures.

Based on site conditions and predominant soil texture of the fine earth fraction, procedures include the following: (Whenever a non-selective herbicide is mentioned the chemical Glyphosate is a contact only, non-selective, no residual herbicide that meets this requirement.) (Rodeo is a selective herbicide that is registered for use in and around riparian areas. It is effective on problem phreatophytes.) (The mention of product names in no way indicates an endorsement by NRCS.)

Tillable sites with loamy/clayey soils

- Sod and alfalfa sites

Summer fallow 1 year is preferred to kill the sod or alfalfa. Till 1/ 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 2/. 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 1/ 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 small grains 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 prior to 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 1/ and plant to a spring cover crop 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 non-selective herbicides the year prior to planting 2/. Plant trees or shrubs in the remaining residue.

Tillable sites with sandy soils

- Sod and alfalfa sites (Cont.)

When hand planting, scalp or strip an area at least 3 feet in diameter and two-to-four inches in depth. (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 brushy 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 following may be used. Sites with undesirable brush will need initial treatments to physically remove and kill the brush species to facilitate planting of desired stock and prevent encroachment of the brush

back into the site. Suitable methods include hand-cutting and removal, brush hogging, brush-blading, or other equivalent procedure with repeated treatment or use of herbicides to control resprouting.

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.

Riparian sites with existing vegetation where additional plants or species are to be planted.

Tree or shrub plantings must have woody competition control for the planned crown spread of the planting. Tillage or chemicals shall be used to control all herbaceous vegetation for a minimum of 36 inches on all sides of the planting. If problem phreatophytes (like saltcedar) are located on the site, these plants should be controlled to the extent that none of their existing roots or new seedlings will interfere with the development or growth of the planted species. Problem hydrophyte species (like cattails) may need to be managed to allow for favorable site conditions for the growth and development of the plantings.

OPERATION AND MAINTENANCE

Management of competing vegetation for areas being established as new buffer plantings.

The area will be inspected at least annually for the presence of noxious plants. Noxious plants will be managed with in the requirements of parts A. and B. that follow.

A. On soils which are not susceptible to severe wind or water erosion competitive vegetation shall be controlled by the following alternative methods.

- Clean cultivation with a spring tooth harrow, sweep chisel plow (duckfoot),

disk (tandem disk only), shovel cultivator, or other tillage implement.

- Tillage depth should be two to four inches to avoid damage to tree roots and no closer than six inches to any desirable plants.
- Plant annual cover crops of grain sorghum, oats, corn, forage sorghum, etc. If perennial grasses are used, only short non-rhizomatous grasses will be allowed. Exceptions are western wheatgrass, alkali muhly, and vine mesquite which are rhizomatous species that create good cover. Approximately 4 feet should be left between the cover crop and the trees.
- In some cases, chemicals may be used on the entire buffer area to control competitive vegetation. If this method is used, caution must be taken to avoid erosion and potential concentration of chemicals during runoff. 2/
- Hand hoeing.
- Tractor mounted row hoes or weed badgers.
- Over the row cultivation with a flexible tine or finger type weeder, effective only when weeds are very young such as the two leaf stage.
- Chemical weed control in a 1.5 to 3 foot band adjacent to each side of the trees or shrubs, applied approximately once each month during the growing season, or use of soil applied herbicides. 2/
- A rototiller may be used, but not more than 4 inches deep.
- Polypropylene fabric mulch must be at least 6 feet wide.
- On sites prepared prior to tree planting, where severe wind or water erosion is a hazard or where tillage was not possible, competitive vegetation shall be controlled by the following methods.
- Cover crops of grain sorghum or forage sorghum or other adequate cover crops should be maintained in the area between trees. If perennial grasses are used, only short non-rhizomatous grasses will be allowed.

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- Approximately 4 feet should be left between the cover crop and the trees.
- For sites that are not clean tilled or with herbaceous cover, mow between trees approximately once each month during the growing season.
- Hand hoeing.
- Tractor mounted row hoes or weed badgers.
- Over the row cultivation with a flexible tine or finger-type weeder, effective only when weeds are very young such as the two leaf stage.
- Chemical weed control in a 1.5 to 3 foot band adjacent to each side of each plant approximately once each month during the growing season, or use of soil applied herbicides. 2/
- Polypropylene fabric mulch must be at least 6 feet wide.

Protection from Animal Damage

The best defense is maintaining weed control around plantings to reduce rodent habitat. Rodents are most dangerous to new plantings until the trees and shrubs reach three to four years in age. An exception to this is beavers. Beavers prefer young trees, but they will also damage or destroy mature trees. A poultry wire tree guard cylinder 5 feet high, with a 5-10 inch air space between the trunk and the wire, is an effective defense. Bury the bottom 4 – 6 inches of this cylinder treeguard so it supports itself without leaning into the cutting. Do not wrap the trees in wire for this will not prevent beaver predation but will be detrimental to the tree when the bark begins to grow into the wire. Control mice, gophers and other undesirable rodents by the use of poison baits. Mouse baits should be placed in tin cans nailed to a board. Gopher baits are best placed with a machine of the “gopher getter” type. Follow pesticide directions and heed all precautions on the container label. If they are not handled properly or if unused portions are disposed of improperly, they may cause injury to humans, animals, fish and other wildlife, desirable plants, honey bees and other pollinating insects, and may contaminate water supplies.

Physical barriers will deter grazing and browsing of plant materials. Acceptable material includes chicken wire (with a mesh that does not exceed 1 inch) which will be shaped to form a cylinder a minimum of 5” in diameter and 18” in height. A minimum of 1 24 inch 1” X 2” stake will be placed with 18 inches extending above the ground to support the chicken wire. The chicken wire will be fastened to the stake by 2 evenly spaced staples or 2 wire ties. The bottom the cylinder will be flush with the ground. The barrier must be removed when the tree trunk diameter is within ½ inch of the chicken wire diameter.

Fencing may exclude both elk and cattle. A well constructed, eight foot high fence composed of livestock wire or something similar will exclude elk.

Another acceptable physical barrier includes rigid polypropylene mesh tubes. Tubes will be of a diamond pattern with a minimum 30 mil standard diameter. The tubes will be a minimum of a 5-inch diameter and 18 inches high. The tubes will be fastened to a 24” long 1” X 2” stake with 18 “extending above the ground. Attachment will be with a single wire tie or staple. The bottom the cylinder will be flush with the ground.

Watering Requirements - All Species

Supplemental water must be planned for almost all species on all sites where the species roots have not been planted into the lowest anticipated level of the capillary fringe of the water table. This will be required to offset loss of trees in case of drought and in order for the plants to reach their full potential growth. All trees and shrubs, even those native to an area, are susceptible to extended droughts. Water must be planned for the dormant season since severe droughts during this period can have a significant impact on tree health. Do not water during the dormant season if the ground is frozen since the water will not soak into the ground and water lines may be frozen.

An exception to required supplemental water for riparian plantings is in areas where the planted species do grow naturally to their full potential. Seeding with adaptable native plants and satisfactory mulch may also be exempt from

supplemental water requirements on selected sites.

Irrigation intervals will lengthen as new plantings age and develop a deeper and more extensive root system. Set time must also increase to accommodate an increasing demand for water at greater depths.

Soak the soil profile within the drip line of the plants thoroughly to a depth of 3 to 5 feet and do not irrigate again until the profile has drawn down to 50 to 60 percent of available water holding capacity. This can be efficiently achieved by embedding watering tubes with transplants and bareroot plants at time of planting. These tubes may be PVC pipe, 1” to 3” in diameter, perforated at the bottom 1/3, and with a length at least 1/3 longer than the current root system of the transplant. Plants may be irrigated with portable water tanks. With the deep watering provided by the embedded tubes, less watering will be required. Surface weeds will not be able to access this water since the water will be applied subsurface. Irrigation may

also be achieved by adding drip lines or increasing the area of surface flooding as the trees mature. This would provide the needed water for an increasing root zone. For columnar trees, the root system develops well outside the drip line and watering methods must be adjusted to account for this.

If polypropylene fabric mulch is used for weed control and moisture conservation, the amount of supplemental water needed may be reduced. The amount of reduction may be up to 50% with monitoring and confirmation in the field to determine the effectiveness of the mulch. Care must be taken to not over water, which can drown out the roots and kill some plants.

All practices and procedures that involve ground disturbing activities will be in compliance with applicable Cultural Resource Protection laws, regulations, and policies.

Footnotes

1/ The term “till” includes the use of moldboard plows, disk plows, rototillers and similar equipment.

2/ CAUTION: “Weed and Brush Control” by NMSU will be used for all herbicide recommendations. If pesticides are used, apply only when needed and handle with care. Follow the directions, and heed all precautions on the container label. If the pesticides are not handled or applied properly, or if unused portions are disposed of improperly, they may cause injury to humans, animals, fish and wildlife, desirable plants, honey bees and other pollinating insects, and may contaminate water supplies.

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Scientific Name	Common Name	Growth Form	Shade Tolerance	Shade Value	Nutrient Uptake	Inundation Tolerance	Soil Saturation Tolerance	Drought Tolerance	Aesthetics	Native Species	Sediment Deposition Tolerance
<i>Atriplex canescens</i>	4-Wing Salt Bush	Shrub	M	L	M	M	M	H	H	Y	H
<i>Amorpha fruticosa</i>	(False) Indigo bush										
<i>Hymenoclea monogyra</i>	Burrobrush	Shrub	M	M	M	M	M	H	M	Y	H
<i>Celtis occidentalis</i>	Hackberry	Shrub	H	L	M	M	M	H	H	Y	M
<i>Baccharis salicina</i>	Seepwillow	Shrub	M	M	M	M	M	L	M	Y	H
<i>Sapindus saponaria</i>	Soapberry	Shrub	M	M	M	M	M	H	M	Y	H
<i>Lycium andersonii</i>	Wolfberry	Shrub	L	L	M	L	L	M	M	Y	H
<i>Ceratoides lanata</i>	Winterfat	Shrub	M	L	M	M	M	H	H	Y	H
<i>Rosa woodsii</i>	Woods Rose	Shrub	H	L	M	M	M	M	H	Y	M
<i>Fallugia paradoxa</i>	Apache Plume	Shrub	M	L	M	M	M	H	H	Y	H
<i>Fraxinus pennsylvanica</i>	Arizona Ash	Tree	M	M	M	M	M	M	H	Y	L
<i>Juglans major</i>	Arizona Black Walnut	Tree	M	M	M	M	M	M	H	Y	M
<i>Platanus wrightii</i>	Arizona Sycamore	Tree	M	M	M	M	M	M	H	Y	M
<i>Populus tremuloides</i>	Aspen	Tree	L	M	H	H	H	M	H	Y	H
<i>Salix bebbiana</i>	Beaked Willow	Tree	M	H	H	H	H	M	H	Y	H
<i>Acer grandidentatum</i>	Bigtooth Maple	Tree	M	H	M	L	M	H	H	Y	M
<i>Robinia pseudoacacia</i>	Black Locust	Tree	M	M	M	M	M	M	H	N	L
<i>Picea pungens</i>	Blue Spruce	Tree	M	M	M	M	M	M	H	Y	L
<i>Salix irrorata</i>	Bluestem Willow	Tree	M	H	H	H	H	M	H	Y	H
<i>Acer negundo</i>	Box Elder	Tree	M	M	M	M	M	M	H	Y	L
<i>Prunus virginiana</i>	Chokecherry	Tree	M	M	M	M	M	M	H	Y	M
<i>Salix exigua</i>	Coyote Willow	Shrub	M	H	H	H	H	M	H	Y	H
<i>Chilopsis linearis</i>	Desert Willow	Tree	L	M	M	M	M	H	H	Y	L
<i>Populus fremontii</i>	Fremont Cottonwood	Tree	H	H	M	H	H	M	H	Y	H
<i>Quercus gambelii</i>	Gambel Oak	Tree	L	M	M	M	M	H	H	Y	L
<i>Ribes aureum</i>	Golden Current	Shrub	H	L	M	M	M	M	H	Y	M
<i>Alnus tenuifolia</i>	Mountain Alder	Tree	M	M	M	M	M	M	H	Y	L
<i>Populus angustifolia</i>	Narrowleaf Cottonwood	Tree	H	H	M	H	H	M	H	Y	H
<i>Prunus Americana</i>	Native Plum	Tree	M	M	M	M	M	M	H	Y	M
<i>Alnus oblongifolia</i>	New Mexico Alder	Tree	M	M	M	M	M	M	H	Y	L
<i>Robinia neomexicana</i>	New Mexico Locust	Tree	H	L	M	H	H	M	H	Y	H
<i>Forestiera neomexicana</i>	New Mexico Olive	Shrub	H	L	M	H	H	M	H	Y	H
<i>Pinus edulis</i>	Pinon Pine	Tree	L	M	M	M	L	H	H	Y	L
<i>Pinus ponderosa</i>	Ponderosa pine	Tree	M	M	M	M	M	H	H	Y	L
<i>Juniperous scopulorum</i>	Rocky Mountain Juniper	Tree	M	M	M	M	M	H	H	Y	L
<i>Salix scouleriana</i>	Scouler Willow	Tree	M	H	H	H	H	M	H	Y	H
<i>Rhus trilobata</i>	Skunkbush Sumac	Shrub	M	L	L	H	H	M	H	Y	M
<i>Salix bonplandiana</i>	Toumey Willow	Tree	M	H	H	H	H	M	H	Y	H
<i>Fraxinus velutina</i>	Velvet Ash	Tree	M	M	M	M	M	M	H	Y	L
<i>Salix amygdaloides</i>	Peachleaf Willow	Tree	H	M	M	H	H	L	H	Y	H
<i>Salix goodingii</i>	Western Black Willow	Tree	M	H	H	H	H	M	H	Y	H
<i>Abies concolor</i>	White Fir	Tree	H	M	M	M	M	M	M	Y	M

EXPLANATION OF TERMS - TABLE 1.

Species are grouped by plant type and arranged in alphabetical order by common name. Heights are listed for applicable MLRA's (Major Land Resource Areas, USDA Ag. Handbook 296, Dec. 1981) and precipitation zones. Heights and attributes represent expected performance and characteristics of the individual plant at the reference age in dominant canopy positions on medium-textured, non-saline, neutral pH soils. The reference age for trees is 20 years of age. The reference age for shrubs is 10 years.

Attributes: (codes include H = High, M = Medium, L = Low, Y = Yes, N = No, with special notes about individual species denoted by a letter, e.g. "a")

1. **Shade Tolerance.** The plant's capacity to grow in a shaded condition. H = can grow in the shade of an overstory; M = can grow in partial shade; L = needs full or nearly full sunlight.
2. **Shade Value.** The density or fullness of shade provided by an individual plant's crown in a full leaf-out condition. H = provides full shade; M = a partially open crown that provides patchy or incomplete shade; L = a very open crown that provides little shade.
3. **Nutrient Uptake.** The plant's general capacity to use excess nutrients such as nitrate-nitrogen. H = can use large amounts; M = some excess nutrients used; L = plant is a low-nutrient user.
4. **Inundation Tolerance.** General capacity of the plant to withstand standing water, low soil aeration conditions. H = can tolerate 5 or more days of inundation; M = can tolerate 2-5 day events; L = can tolerate 1-day or less of inundation.
5. **Soil Saturation Tolerance.** The plant's capability to grow in near or saturated soil conditions. H = plant can withstand "wet feet;" M = some tolerance to saturated conditions; L = little or no tolerance of water-saturated soil.
6. **Drought Tolerance.** The plant's capability to grow in droughty or dry soil conditions. H = plant can withstand or has physiology to survive droughty periods; M = some tolerance to drought or dry conditions; L = little or no tolerance of dry soil conditions.
7. **Aesthetics.** A very general rating (H, M or L) that indicates some aspect of the plant, e.g., flowers, special foliage characteristic, or plant part color, that enhances the appeal or viewing of the planting.
8. **Native Species.** Y indicates the plant is native to the state; N indicates it is introduced.
9. **Sediment Deposition Tolerance.** H = plant can withstand repeated, deep deposits of sediment; M = plant can withstand repeated, shallow deposits of sediment; L = plant can withstand little or no sediment deposits.
10. **Special Notes.**
 - a. Species tolerate a relatively wide range of soil conditions including pH's less than 8.0 and saline conditions generally less than 4 mmhos/cm.
 - b. Species tolerate a wide range of soil conditions including pH's of up to 9.0 and saline conditions of up to 16 mmhos/cm.
 - c. Species tolerate a wide range of soil conditions including pH's of up to 9.0 and saline conditions of greater than 16 mmhos/cm.