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FORESTRY TECHNICAL NOTE

Improving the Establishment of Willow Cuttings in Riparian Areas

Robert Logar, State Staff Forester
Joseph Scianna, Horticulturist

Introduction: Many riparian areas can be improved by supplemental plantings that enhance stream bank stability, increase biodiversity, create wildlife habitat, and improve water quality. One method of supplemental planting is using willow cuttings along the stream bank. Adventitious rooting of willows is easy and successful when performed properly. This Technical Note describes important establishment factors and techniques when using willow cuttings in riparian plantings.

I. TECHNIQUES:

A. Planning: Determine if willows are indigenous to the site you intend to plant. Determine if the site has the hydrology, soils, frequency, and duration of flooding needed to support adventitious rooting of willows, as well as successful long-term establishment and growth of plants. Proper riparian grazing management must be in place to allow establishment and growth of cuttings. Notify the appropriate agencies and obtain any needed permits prior to starting any reshaping work.

Note: 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 prior to riparian project initiation. Physical or electrical exclusion with fencing is necessary. Protection from wildlife including deer, moose, rabbits, mice, voles, and other rodents is also necessary. Use tree shelters, repellants, sacrifice crops, 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: There are numerous willow species with varying growth habits native to Montana. Select willow species and types appropriate for the planting site. Inventory the proposed planting site, or a comparable site within close proximity, for existing woody species and growing conditions (Riparian Planting Zone, elevation, etc.). On-site observation is the best method to assist in the species selection process. When possible, plant the same species and/or type of willow in stream locations and Riparian Planting Zones in which they are normally found. Success will significantly increase when these steps are followed. Select species with a high probability of producing adventitious roots. Reference Plant Materials Technical Note No. MT-36, *Users Guide to the Description, Propagation and Establishment of Native Shrubs and Trees For Riparian Areas in the Intermountain West* and *Plants for Riparian Buffers*, USDA-NRCS Plant Materials Centers, Idaho and Montana, for species root-ability.

C. Source of Cuttings: Willow cuttings may be procured from commercial nurseries as un-rooted or rooted cuttings, or they can be obtained from native stands located near the site. When using cuttings from commercial sources, select species and stock sources compatible with the planting site. If commercial cuttings taken from local donor plants are not available, use cuttings taken from parent plants found growing under similar environmental conditions, especially in relation to elevation and USDA Winter Hardiness Zone. When local stands of appropriate species are available, collect from native stands of healthy trees in closest proximity to the planting site. Do not over harvest cuttings from native stands. Commercial cuttings generally have better vigor, are more uniform and establish more successfully than native cuttings.

D. Cutting Diameter: Inadequate cutting diameter has been identified as a contributing factor to poor adventitious root formation from cuttings. Use or harvest cuttings that are ½ to 1 inch in diameter (at least index finger diameter). Take cuttings from wood that is 3 years old or less. Wood older than 3 years has decreased adventitious rooting ability caused by decreasing pre-formed initials, decreasing adventitious buds, and increasing bark thickness. Avoid small diameter, weak cuttings with low levels of stored carbohydrates needed for adventitious root initiation and growth.

E. Cutting Length: The optimum length of willow cutting is determined by the depth to summer water table. The cuttings must extend several inches into the summer water table, three to four buds are needed above the ground, with no less than ½ the total length of the cutting remaining in the ground. It is better to have excessively long rather than short cuttings. Short cuttings sometimes results in desiccation of the cutting before root initiation and establishment. Cuttings must be a minimum of 18 inches in length.

F. Harvesting Wildland Cuttings: Select wildland cuttings from healthy, disease- and insect-free donor plants. Avoid donor plants exhibiting any signs of stress or poor growth. Cuttings are taken from dormant willows in late fall or early spring before the buds start to break. A very shallow cut below the outer bark should reveal green cambium indicating live tissue. Avoid stems with a discolored, wrinkled, or shrunken appearance. Lopping or pruning shears or a small saw can be used to harvest cuttings. Avoid harvesting suckers: they typically lack the carbohydrate reserves necessary to produce adventitious roots once planted. Select branches that will not impair donor plant health and appearance once removed. Remove the terminal ends of the cuttings down to a diameter and length as previously described. Remove all lateral side branches from the cuttings.

Note: A major challenge of using wildland cuttings is the coordination of timing of removal from the donor plant with optimum planting time. Cuttings root best if planted when fully dormant. Warm periods in late winter may result in early bud break, increased cutting stress during transport and storage, and ultimately reduced rooting.

G. Sealing Cuttings: Sealing the terminal (top), cut ends of cuttings helps reduce moisture loss from the cuttings. To identify the top of the cutting, find and examine lateral vegetative buds on the stem. The buds are usually above the leaf scar and point upward toward the end or tip of the branch. Dip the top 2 to 3 inches of each cutting into a 50:50 mix of white latex paint and water or paraffin wax to prevent moisture loss from the cutting.

H. Transport of Cuttings: Whether transporting cuttings to a storage facility or the planting site for installation, keep cuttings as humid (not wet) and cool as possible above freezing. During transport store cuttings in a trash bag or wrapped in light-colored, opaque plastic. Add small amounts of water to the storage sacks to prevent desiccation. Keep cuttings out of direct sunlight or in other locations where they are likely to heat up. Avoid transporting cuttings in an open pickup or trailer if heat build-up or wind desiccation is likely. Minimize transport time when possible.

I. Cutting Storage: Store in a cool, dark, humid environment at 32° to 38°F. Properly held cuttings will store well for up to 6 months. Cuttings store best under controlled environmental conditions including high relative humidity and cool air temperature. Inspect the cuttings frequently to determine condition.

J. Pre-plant Treatment of Cuttings: Soak the bottom half of the cuttings in water for 1 to 2 days prior to planting. Soaking initiates the growth process within the inner bark in willows. Cuttings should not be treated with rooting hormone, fungicide, or fertilizer.

Pre-Plant Tip: Pruning tools and saws used for removing cuttings from donor plants often crush basal tissues and reduce water uptake (See Figure A). In addition, cuttings tend to desiccate and die back some distance from the base during storage. To remove dead or damaged basal tissue, and to increase the surface area of the base of the cutting, use a very sharp grafting or cutting knife to re-cut the base of the cutting at an angle prior to insertion in the soil (See Figure B).

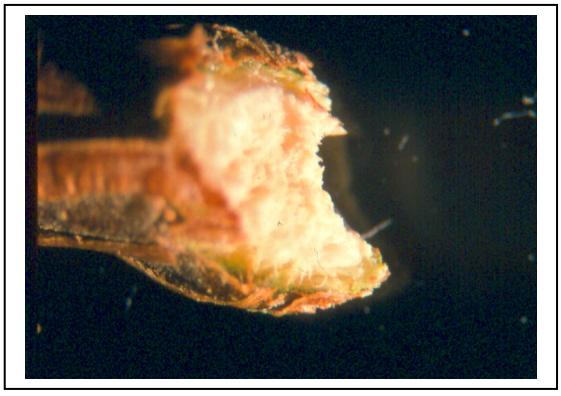

FIGURE A

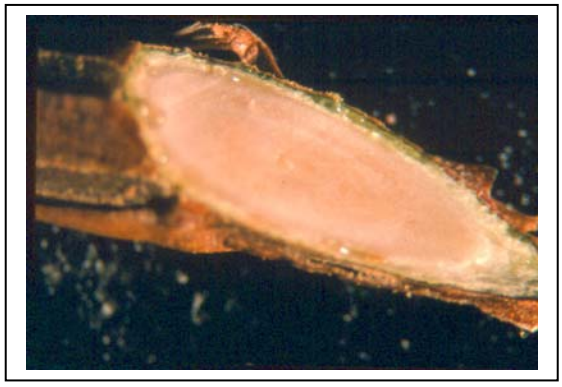

FIGURE B

K. Planting Cuttings: Plant cuttings with a shovel, rock bar, hand dibble or by merely pushing the cutting into moist soil. Maintain good soil to cutting contact by eliminating all air pockets around cutting. Eliminate air pockets by firming very moist soil around the cutting with your foot, or by adding water until the soil is saturated and slumps around the cutting. Plant cuttings deep enough so that several inches of the cutting extends into the summer water table. It is critical that un-rooted cuttings have nearly constant contact with saturated soil at the base of the cutting to meet early moisture demands until roots are developed. Un-rooted cuttings require adequate soil temperature (at least 50°F) and free water to stimulate and support adventitious rooting. Un-rooted cuttings inserted in soil too early may rot or decline in vigor before soil temperatures are adequate for root initiation. Fully dormant, properly stored cuttings allow planting flexibility and contribute to increased rooting percentage.

L. Cutting Spacing: Place shrub cuttings about 1 to 3 feet apart and tree cuttings about 6 to 12 feet apart.

M. Placement: Place cuttings at toe of slope where cutting will be in saturated soil during low water.

N. Planting Maintenance and Management: Replant dead cuttings the second and third years after installation. Monitor the site and remove any dead organic material covering cuttings. After 2 to 3 years, trim willows to stimulate smaller, denser shoot growth. Inspect plantings frequently for signs of animal damage and adjust protection accordingly. Control established herbaceous vegetation around new planting.

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:

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Stange, C., Ogle, D. and L. St John. 2002. Tree Planting, Care and Management. Technical Note Plant Materials No. 43, USDA-Natural Resources Conservation Service, Boise, Idaho.

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