

TECHNICAL NOTES

U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

PLANT MATERIALS NO. 29

BOZEMAN, MONTANA

June 14, 1984

Re: TECHNIQUES OF TREE AND SHRUB PROPAGATION BY HARDWOOD STEM CUTTINGS

By: Larry K. Holzworth, Plant Materials Specialist
Ronald F. Batchelor, State Biologist



COTTONWOOD



ROSES



HONEY LOCUST

Stem cuttings can be divided into four groups according to the nature of their wood: hardwood, semi-hardwood, softwood, and herbaceous. In the propagation of stem cuttings, segments of shoots containing lateral or terminal buds are obtained with the expectation that under proper cultural conditions roots will develop and produce independent plants.

The type of wood, the stage of growth used in making the cuttings, the time of year in which the cuttings are taken, and several other factors, discussed below, can be very important in securing satisfactory rooting of some plants.

HARDWOOD CUTTINGS (DECIDUOUS SPECIES)

Cuttings offer a low-cost, quick, and easy means for critical area treatment and streambank stabilization. Even though rooted stock may provide for faster plant establishment, hardwood cuttings are easy to prepare, are not readily perishable, and may be shipped safely over long distances if necessary.

Cuttings are prepared during the dormant season--late fall, in winter, or early in spring--from wood of the previous season's growth (with some species, 2-year-old or older wood can be used). Many deciduous ornamental and native shrubs are started readily by this type of cutting. Some common species are privet, forsythia, willows, dogwood, lilac, honeysuckle, and spirea. Rose rootstocks, such as *Rosa* sp., are propagated in great quantities by hardwood cuttings, as are certain trees such as the willows, poplars, and cottonwoods.

The propagating material for hardwood cuttings should be taken from healthy, vigorous stock plants growing in full sunlight. The wood selected should not be from extremely rank growth with abnormally long internodes or from small, weakly growing interior shoots. Wood of moderate size and vigor is the most desirable. The cuttings should have ample caliper (1/4 to 1/2 inch minimum) to provide the energy needed for shoot and root development until the cutting becomes self sustaining. Tip portions of a shoot are usually low in stored energy and are discarded. Central and basal parts make the best cuttings.



ZABEL HONEYSUCKLE

Hardwood cuttings vary considerably in length--from 4 to 30 inches. At least two nodes are included in the cutting. The basal cut is usually made below a node and the top cut 1/2 to 1 inch above a node. However, in preparing stem cuttings of plants with short internodes, little attention is ordinarily given to the position of the basal cut, especially when quantities of cuttings are prepared and cut to length, many at a time, as by a band saw. However, the terminal and basal portion of the cutting needs to be marked for planting orientation.

The diameter of the cuttings may range from 1/4 inch to 1 inch or 2 inches, depending upon the species. Three different types of cuttings can be prepared as shown in figure 1: the "mallet," the "heel," and the straight cutting. The mallet includes a short section of stem of the older wood, whereas the heel cutting includes only a small piece of the older wood. The straight cutting does not include any of the older wood. It is most commonly used and gives satisfactory results in most cases.

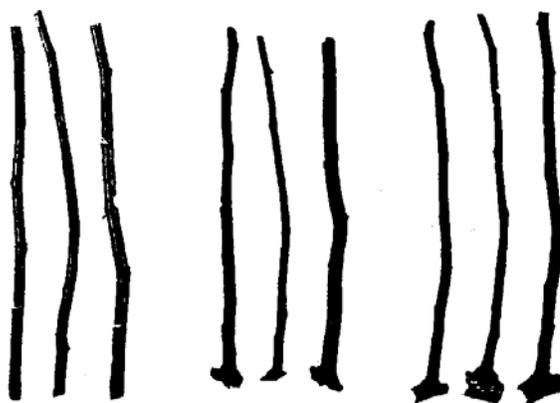


Figure 1--Types of hardwood cuttings. Left--straight--the type ordinarily used. Center--heel--a small piece of older wood is retained at the base. Right--mallet--an entire section of the branch of older wood is retained.)

PREPARING AND HANDLING HARDWOOD CUTTINGS BEFORE PLANTING

Winter callusing. During the dormant season, make the cuttings of uniform length, tie them into convenient-sized bundles, placing the tops all in one direction, and store them under cool, moist conditions until spring. One method is to place cuttings in buckets and cover them with a plastic bag to keep them from drying out if they have to be stored for an extended period. If planting is delayed until after high water, it is essential to store cuttings in a nursery cooler so they don't leaf and root prior to planting. A cellar that is cool, but has above freezing temperature, would be satisfactory. If refrigerated rooms are available, the cuttings can be safely stored during the



RUSSIAN OLIVE



VAN HOUTTE SPIREA

callusing period at temperatures of about 40 degrees F (4.5 degrees C) until they are ready to plant. The bundles of cuttings may be buried outdoors in sandy soil, sand, or sawdust in a well drained location. They may be placed horizontally or in a vertical position, but upside down with the basal end of the cutting several inches below the surface of the soil. This allows the basal ends to be somewhat warmer and better aerated than the terminal ends. The procedure tends to promote root initiation at the base, while retarding bud development at the top. At planting time in spring, the bundles of cuttings are dug up and the cuttings planted right side up.



BOLLEANA POPLAR

Direct spring planting. It is often sufficient with easily rooted species to gather the cutting material during the dormant season, wrap it in heavy paper or polyethylene with slightly damp peat moss, and store at 32 to 40 degrees F (0 to 4.5 degrees C) until spring. The cutting material should not be allowed to dry out or to become excessively wet during storage. At planting time, the cuttings are made into proper lengths and planted on the site.

Stored cutting material should be examined frequently. If signs of bud development appear, lower storage temperatures should be used, or the cuttings should be made and planted without delay. If the buds are far developed when the cuttings are planted, leaves will form before the roots appear, and the cuttings will die because of water loss from the leaves. Cuttings can be taken late in the dormant season after much of the cold weather is past and planted directly in the ground the same day or after a 24-hour water soaking.

PLANTING (OR SETTING) CUTTINGS



TATARIAN HONEYSUCKLE

Always set cuttings with the top end up and pointing downstream at an angle of 45 to 60 degrees. Completely bury to within an inch or two of the top bud. Always firm each cutting solidly with the foot. It is recommended that holes be made for the cuttings with a probe to avoid damaging the buds when the cuttings are inserted into the ground. A steel rod makes a good probe for this purpose.

OTHER TECHNIQUES AND USES

Native willows can be established by dormant hardwood cuttings in permanently moist zones along streams. Cuttings must be at least 1/2 inch in diameter and 12 inches long, but they can vary to as large as 8-foot, 3-inch diameter poles, or even entire plants cut off at the base.



ASPEN

The base cut can be treated with rooting hormone, i.e., Rootone with fungicide or Hormodin 3, although the treatment may not be necessary for willow cutting establishment. A willow extract, made from soaking short willow shoots in water for 24 hours and soaking cuttings in the extract for 24 hours has benefited the rooting of dogwood cuttings.

At least 75 percent of the dormant cutting, pole, or plant must be stuck or placed below the ground surface to provide adequate opportunity for rooting. This results in about three rooting nodes per one shoot node. It is recommended that cuttings be stuck in a diamond pattern in the moist zone on 12- to 18-inch centers.

Cuttings also can be planted on dry upper banks if they are stuck deep enough to reach the ground-water level. Poles stuck up to 6 feet deep to water have been successful--not only for willows but cottonwood also. Planting holes must be dug for each pole because driving poles into the ground removes the cambium layer necessary for growth.

Entire willow clumps can be cabled or otherwise buried and anchored to moist streambanks. Such plants root profusely to create dense vegetation rapidly. Bundles of 4- to 6-foot whips can be bound, buried, and anchored parallel or perpendicular to the water line.

Willow clumps with their root mass can be taken from point bars with a backhoe or other implement and transplanted at the streambank toe.

Cuttings of willows can be used for streambank stabilization. The cutting stock can be transplanted into good soil moisture immediately prior to or after initial spring runoff. The earlier planting provides a better time period for successful establishment. The cuttings must be placed facing downstream at a 45-degree angle to the soil surface and in rows perpendicular to the stream channel.

Cottonwood cuttings are not recommended for streambank stabilization. They do not have the root mass willows have for bank stabilization, will not allow other species to grow beneath their canopy, and are prone to toppling, which causes stream blockages, diversion, and instability.

Callused cutting stock or rooted stock should be planted prior to spring runoff when good soil moisture conditions exist. After runoff, soil moisture is of short duration. The end of their dormant season is usually over by the end of the high-water period. Rooted plant materials other than willow should be utilized in mid- and upland streambank zones, while unrooted cuttings are limited to moist sites along watercourses.

Where banks are vertical or on sharp curves and meanders, successful stabilization with cuttings is highly questionable. Vegetative measures appear to be most applicable to relatively straight stream reaches. Bank shaping may be necessary, and vegetative and/or mechanical measures must be used to stabilize and protect the area. Refer to the channel vegetation and streambank protection standard and specification for specific guidance.

One must realize that streambank stabilization with plant materials is a long process that requires a lot of patience and persistence. Undoubtedly, there are other methods of streambank stabilization that are faster, but all are expensive and cost/benefit analysis must be considered. The integration of vegetation into structural stabilization measures should be considered to cut costs and provide for an esthetically pleasing landscape.



WILLOW

PROPAGATION OF CERTAIN TREES AND SHRUBS BY HARDWOOD CUTTINGS

DOGWOOD (*Cornus* sp.). Hardwood cuttings taken while dormant and planted early in spring have moderate rooting success.

ELAEAGNUS (*Elaeagnus* sp.). Russian olive. Silverberry. Can be started by hardwood cuttings planted in spring.

FORSYTHIA (*Forsythia* sp.). This is easily propagated by hardwood cuttings set early in spring.

HACKBERRY (*Celtis occidentalis*). Select cuttings from vigorous trees.

HONEYSUCKLE (*Lonicera* sp.). Most species are propagated easily by hardwood cuttings in spring.

LILAC (*Syringa* sp.). Ordinarily, good rooting of lilacs can be obtained only with terminal leafy cuttings taken within a narrow period shortly after growth commences in spring. When the new green shoots have reached a length of 4 to 6 inches, they should be cut off and trimmed into cuttings. Because they are very succulent at this stage, it is difficult to prevent wilting.

POPLAR (*Populus* sp.). Cottonwood, aspen, hybrid poplars. Hardwood cuttings of *Populus* (except the aspens) planted in spring root easily. Treatments with indolebutyric acid are likely to improve rooting.

PRIVET (*Ligustrum* sp.). Hardwood cuttings of most species planted in spring root easily.

ROSE (*Rosa* sp.). Hardwood cuttings are widely used commercially in the propagation of rose rootstocks. The hybrid teas and similar everblooming roses can also be started by cuttings. In mild climates, the cuttings are taken and planted in the nursery in fall. In areas with severe winters, cuttings may be made late in fall or early in winter, tied in bundles, and stored in damp peat moss or sand at about 40 degrees F (4degrees C) until spring, when they are planted in the nursery row. The rootstocks are ready to bud by the following spring, summer, or fall. The cuttings are made into 6-or 8-inch lengths from previous seasons' canes of 1/4- to 3/8-inch diameter.

WILLOW (*Salix* sp.). Hardwood cuttings planted early in spring root promptly.

Reference: Hartman, Hudson T. and Kester, Dale E., *Plant Propagation Principles and Practices*, 1959, pp. 662.

/s/ by James S. Johnson (Acting for)

Glen H. Loomis
State Conservationist

File in Reference Material--PLANT MATERIALS.