Reforestation, Recreation Tech Tips

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Collecting Dormant Hardwood Cuttings for Western Riparian Restoration Projects

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What Are Cuttings?

Dormant hardwood cuttings are sections of woody stems that can develop into new plants complete with stems, leaves, and roots. Cuttings differ from seedlings because all new daughter plants that arise from cuttings are genetically identical to the parent plant. Cuttings can be long or short, depending on how they are used.

For most riparian projects (figure 1), cuttings are collected from woody plants on the site during the winter (dormant) period. Once buds begin to swell and leaves begin to appear, the plant is no longer dormant. Dormant cuttings grow roots easier and are better able to resist environmental stresses.

The *hardwood* in hardwood cuttings means that plants have dropped their leaves and have firm stems. If you intend to use cuttings from plants that are not dormant, this tech tip is not for you. To collect dormant hardwood cuttings, you must be able to identify the plant species, safely use hand tools, collect healthy stem wood complete with intact leaf buds, and follow the procedures described below.

Figure 1—Cuttings were planted to stabilize an eroding creek bank.—*Kristi DuBois photo*

Highlights...

- Short sections of dormant woody stems (cuttings) can be planted to grow into new trees or shrubs.
- Cuttings often are used to plant trees or shrubs in the moist areas along the edges of streams or lakes where they can grow roots easily.
- This tech tip summarizes what you need to know to take cuttings correctly and to plant them properly.

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Identifying Plants During Winter

Because you will be collecting dormant hardwood cuttings from late fall to early spring, you must be able to identify trees and shrubs that don't have leaves or flowers. You'll need to become familiar with some basic features of dormant stems and buds (figures 2, 3, and 4). Let's discuss stems first. A stem node is where buds are attached. The region between nodes is the internode. Leaf scars are visible just under the buds. These scars are left after leaves drop off in the fall. Vascular bundle scars are dots located within the leaf scar, formed when leaves fall off and break the vascular tissues that carry fluids from the twig to the leaf. Lenticels are pores on the stems that allow gas exchange for some species. Hardwood stems can be either solid or hollow, depending on the species. The color and shape of the stems also are useful for identification.

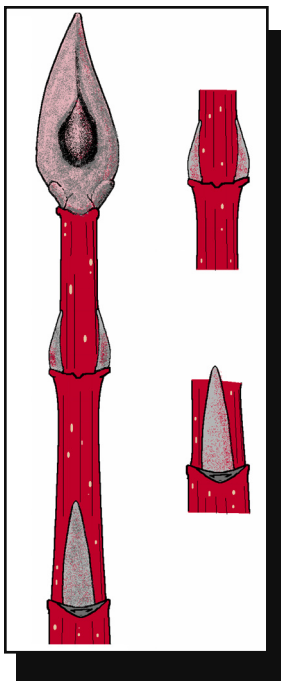


Figure 2—Redosier dogwood buds on a dormant plant. Left: note the light bulb-shaped terminal bud. Top right: buds are in pairs on opposite sides of the stem. Bottom right: the vascular scar is visible beneath the dormant bud.

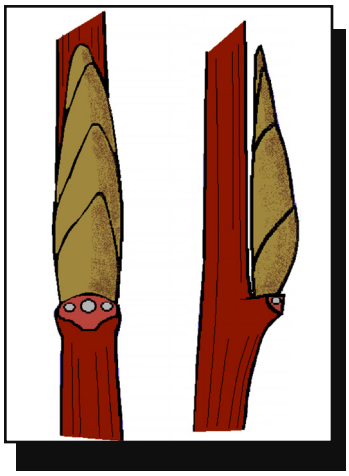


Figure 3—Cottonwood buds have three or four large bud scales. Below the bud is a triangular- to crescent-shaped leaf scar.

—Illustrations 2 through 4 by Steve Morrison

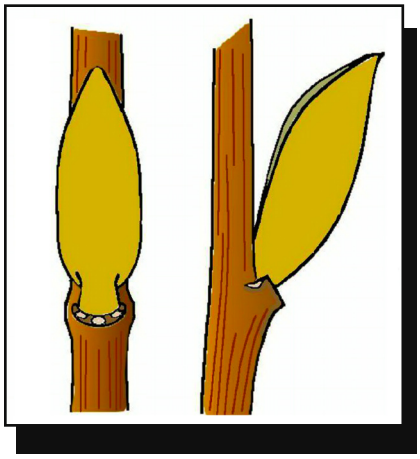


Figure 4—Willow buds are covered with a single scale. Below the bud is a narrow, crescent-shaped scar with three vascular bundle scars.

Buds also are important for identification. Buds protect tissues that will develop into leaves or flowers the following spring. Leaf buds are usually small and narrow, while flower buds are larger and rounder. Buds are covered with papery, specialized leaves (usually brown) called bud scales that protect embryonic leaves and flowers during winter. Buds may be naked, meaning they don't have bud scales. The terminal bud is at the tip of the stem. All other buds are called lateral buds. An important characteristic is whether the lateral buds are opposite from one another or alternate from one side to the other. For example, redosier dogwood has opposite buds, while willow and cottonwood have alternate buds (see figures 2, 3, and 4).

Stem and Buds of Common Species Used for Riparian Projects

- **Redosier dogwood (*Cornus sericea*)—**Leaf buds are reddish, opposite, naked and covered with fine hairs. Leaf buds are long and slender. The flower bud is the terminal bud on the end of the twig and is shaped like a light bulb (see figure 2). Stems are solid, red to reddish purple, and often have prominent white lenticels on the stems. Don't confuse redosier dogwood with Rocky Mountain maple. Maple also has red stems and opposite buds, but the buds are rounder and covered with bud scales.

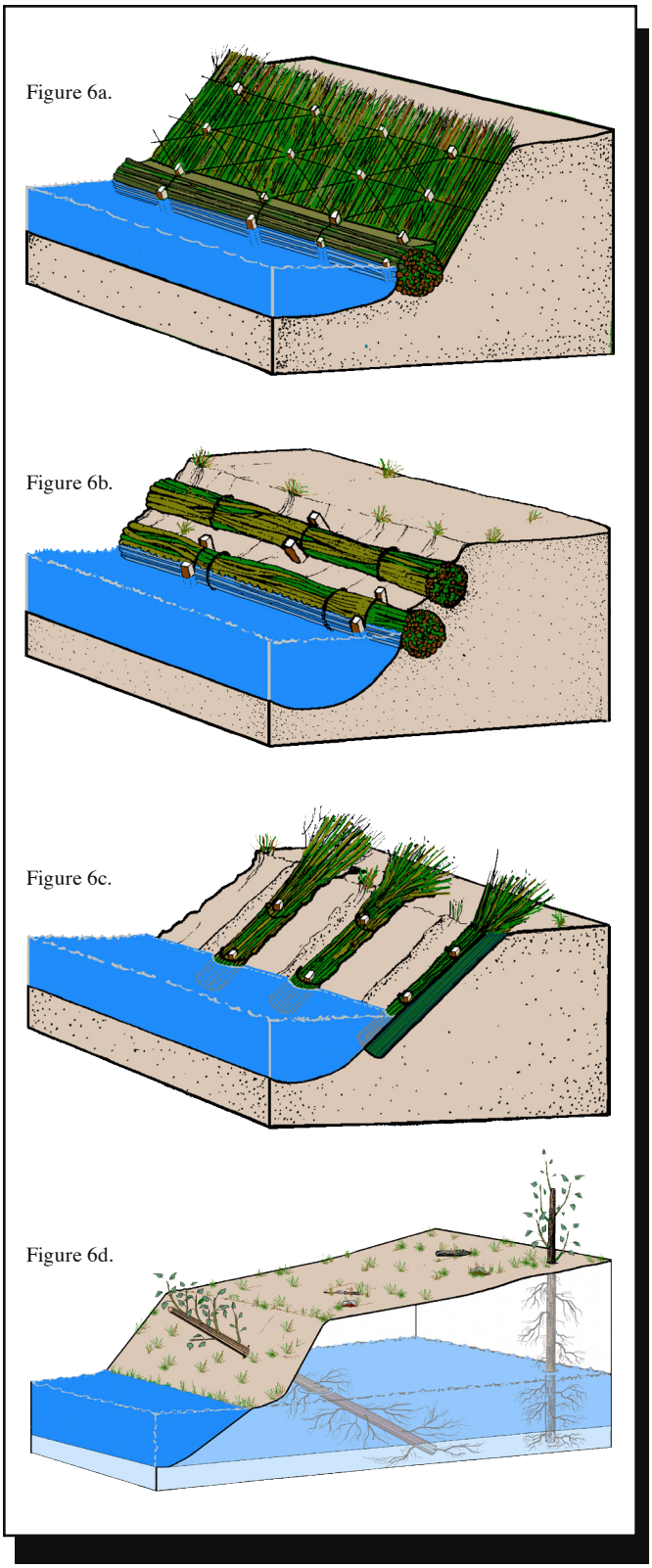
- **Cottonwood (*Populus* species)—**Leaf buds are large, golden-brown, alternate, and slender. The buds often have red aromatic resin, and are covered with three or four large bud scales (see figure 3). Flower buds are plump and are on the upper branches of the tree. Leaf scars are either triangular or crescent shaped. Stems are solid, brownish green, and shiny. Young sucker shoot stems are angular with obvious white lenticels. Older stems are round, gray, and smooth.

• **Willow (*Salix* species)—**Many species of willow (figure 5) grow in the Western United States, and they can be very difficult to identify. All willows, however, have leaf buds that are small, variously colored, narrow, thin, and alternate (see figure 4). Buds are covered with a single cap-like bud scale. Flower buds usually are plumper and are on the upper stem tips. Leaf scars are generally narrow and crescent shaped with three vascular bundle scars (see figure 4). Stems are solid and may be yellow, red, green, brown or gray, depending on the species.

Figure 5—A little more than a year after being planted, these willow cuttings are thriving.—*Kristi DuBois photo*

Types of Cuttings

Dormant hardwood cuttings can be collected for two reasons: to plant in a riparian project as "nonrooted cuttings," or to send to a nursery to be rooted, grown for a year, and then outplanted on the project site as a "rooted cutting." Three types of nonrooted cuttings are used: live stakes (12 to 16 inches long), branched cuttings (2 to 6 feet long), and pole cuttings (12 to 16 feet long). These cuttings are used to construct fascines and other bioengineering structures (figures 6a, 6b, 6c, and 6d). If rooted cuttings are required, contact the nursery to determine size specifications.



Figures 6a, 6b, 6c, and 6d—Streambank bioengineering uses dormant nonrooted hardwood cuttings for a variety of treatments: brush mattress (6a), wattle (6b), vertical bundle (6c), and pole plants (6d).—*Illustrations by Steve Morrison, reprinted from* Riparian Zone Reforestation: Field Requirements and Nursery Opportunities *by J. Chris Hoag and Thomas D. Landis (2001),* Native Plants Journal *2 (1): 30–35. Used with permission from Native Plants Journal, Inc.*

Characteristics of Good Cuttings

A good cutting, regardless of size, will always include healthy stem tissue with some intact buds and enough stored food reserves to sustain the cutting until it grows new roots. You will need to inspect each potential donor plant carefully to ensure that it is healthy. Never collect cuttings from donor plants that are dying or that are obviously infected with disease or insects. Some common pest symptoms include brittle or blackened stems, shrunken areas with pimples, and tumor-like growths (insect galls).

The age of the wood can influence rooting success. Stem sections from the previous year's growth are ideal. In addition, "juvenile" wood is found near the stem base or root crown as long shoots that don't flower (sucker shoots), but root better than those collected from older mature wood.

Individual willow and cottonwood plants are either male or female, so you need to collect cuttings from both to ensure future seed production. Sexual identification is difficult at first, but a local plant expert or botanist can provide training in determining sexes.

Tips for Collecting Cuttings

1. Locate a harvest site and obtain permission to collect cuttings. Because species identification is easier when leaves are present, identify collection areas in the spring or summer. Sometimes, collection areas may have nonnative, invasive willows or cottonwoods that you don't want to collect by mistake.

2. Collect dormant cuttings during January and February. Late winter cuttings can be stored for a few weeks in a cooler. You can collect cuttings in early spring, if the plants have not leafed out already. Try to collect a few cuttings from all the individual plants and native species at the collection site. If you are uncertain about proper identification, collect a sample for later confirmation. Inspect each individual to ensure that it is healthy and free of disease or insect galls.

3. Use sharp, well-maintained shears, hand pruners, hand saws, and pole pruners to make clean cuts. Wipe the cutting surfaces of tools with a disinfectant after collecting cuttings from each plant. A disinfectant such as rubbing alcohol can help prevent spreading bacteria or fungal spores from plant to plant.

4. Avoid sections with flower buds ("pussy willows"). Flower buds typically occur at the tips of branches produced during the last growing season.

5. For live stakes and pole cuttings, select branches ½ to 2 inches in diameter and at least 5 feet long. If necessary, branches can be cut shorter later. Longer cuttings (called whips) are less likely to dry out while being stored.

6. Do not leave sharp stumps or stubs in collection areas, because they create a safety hazard for people, pets, and wildlife.

7. Remember, all cuttings, regardless of size, must have leaf buds on the stem so the cutting can manufacture food while it is rooting (figure 7). For smaller cuttings, especially those destined for a nursery, the stem cutting usually must include at least two nodes.

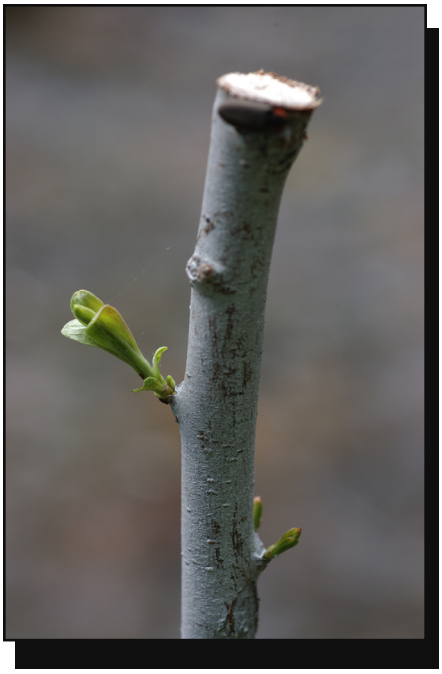


Figure 7—A little more than 2 months after being planted, this live stake is sprouting.—*Kristi DuBois photo*

8. All cuttings must be planted with the correct orientation. To mark the top of the cutting, make a straight cut (figure 8) at the narrow end (toward the tip). At the thicker end (toward the base), make an angled cut. These cuts will help distinguish the top from the bottom and also will make the cuttings easier to plant. After harvesting a cutting from a donor plant, either trim the branches flush with the plant's main stem or make a right-angle cut just above a leaf node. Attention to this detail will help the plant heal.

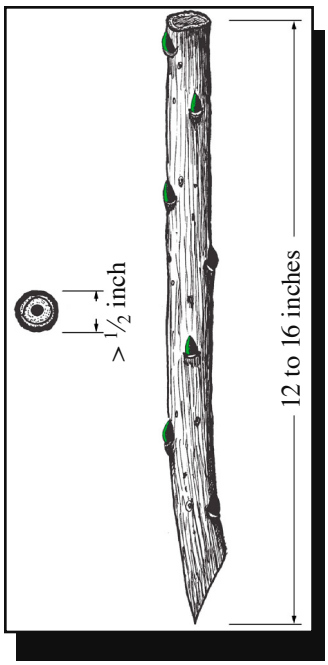


Figure 8—A typical live stake for planting in riparian restoration projects. Cuttings are generally 12 to 16 inches long, at least ½ inch in diameter, and have several buds. Note that the top cut on the cutting is perpendicular to the branch, while the bottom cut is on an angle. The angle helps identify which end of the cutting should be inserted into the ground, and the point makes it easier to plant the cutting.

9. Place all cuttings in the same direction in the bundles. This will prevent the wrong end from being planted. Cuttings should be kept moist by wrapping them in wet burlap or placing them in buckets with water until they are transported back to the nursery cooler. Cuttings may be tied in bundles with colored twine to help identify them and to make them easier to carry. Label each bundle with the species, date collected, number of cuttings, and harvest location.

10. Dip the top (straight cut, narrow end) of the cutting bundles in any latex paint immediately after cutting. Don't dip any buds into the paint. The paint not only marks the end that goes up, it also seals the exposed end to prevent the stem from drying and cracking. You can use different colors of paint to color code different species of cuttings and different types of treatments. The paint will make the stakes visible after they have been planted so people won't trip over them.

How To Store and Handle Hardwood Cuttings

Cuttings are highly perishable. Collect cuttings for live stakes, poles, or branches just before installing bioengineering structures on the project site, but before the plants begin to leaf out. When collecting material during freezing weather, keep bundles as cool as possible and out of direct sunlight.

With proper collection and storage, hardwood cuttings can be stored for several weeks at temperatures down to 0 degrees Fahrenheit without damage. Adding snow to stored bundles helps prevent them from drying out. If temperatures are above freezing (especially during sunny weather), cuttings should be refrigerated at 34- to 40-degrees Fahrenheit and 60- to 70-percent humidity. Some collectors wrap hardwood cuttings in moist peat moss or wet burlap before placing them into refrigeration, while others use wet sand. Some collectors seal moist paper towels in plastic bags with cuttings and refrigerate them until planting. Regularly monitor the condition of stored cuttings to detect problems such as drying, sprouting, or mold. Some restorationists advocate soaking bundles of cuttings in running water for several days to hydrate them completely before they are planted.

When preparing cuttings for planting, just remove enough cuttings from storage to meet the current day's needs. Discard any cuttings that have mold, are sprouting, or that appear to be brittle and dry. Soaking stored cuttings in water for 24 to 48 hours can improve their chance of survival, especially if the weather at the restoration site is windy or warm. Cottonwood live stakes and pole cuttings may root better if they are treated with a low concentration (1,000 parts per million) of liquid rooting hormone before planting.

At the planting site, the cuttings should be stored away from direct sunlight and heeled into moist soil or stored in water. A common practice is to put the butt end of long cuttings into streams. *Be careful that beavers don't carry them away!*

If a spring project is delayed or rescheduled for the fall, do not attempt to store cuttings in coolers over the long-term. It's much more effective to collect new material when plants go dormant during the fall.

Additional Information

These World Wide Web sites have good information about planting hardwood cuttings. All were available on May 8, 2006.

• ***http://www.srs.fs.usda.gov/pubs/6079—***This link at the U.S. Department of Agriculture Forest Service Southern Research Station's Web site provides access to: Landis, TD; Dreesen, DR; Dumroese. RK. 2003. Sex and the single *Salix*: considerations for riparian restoration. Native Plants Journal. 4 (2):111–117.

• ***http://rngr.net—***The Reforestation, Nurseries, and Genetics Resources site has many publications on native plant propagation and a digital, searchable library of papers relating to reforestation and afforestation (planting trees in open areas), including riparian restoration. This site also has a directory of native plant nurseries.

• ***http://plant-materials.nrcs.usda.gov/idpmc/publications.html#TN—***The U.S. Department of Agriculture Natural Resources Conservation Service, Aberdeen (Idaho) Plant Materials Center has more than a dozen publications on riparian restoration, including information on riparian plant identification, defining riparian zone planting locations, designing riparian projects, planting techniques for many types of cuttings, specialized equipment, costs, and streambank bioengineering.

—Kristi DuBois photo

About the Authors

Tara Luna is a botanist. She worked for more than a decade at the native plant nursery at Glacier National Park in Montana. Tara has authored and coauthored many articles detailing proper propagation techniques for native plants.

R. Kasten Dumroese is a research plant physiologist and the national nursery specialist for the USDA Forest Service. Kas conducts research to help nurseries grow native plants and is responsible for transferring nursery technology to private, tribal, State, and federal nurseries.

Thomas D. Landis was the national nursery specialist for the USDA Forest Service until his retirement in 2002. Tom has received several national honors for his work in transferring nursery technology and spends his retirement working on nursery-related projects he finds satisfying.

Library Card

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This tech tip describes how to cut sections of dormant woody stems (cuttings) that can be planted to grow into new trees or shrubs. This technique is often used when planting trees or shrubs in moist areas along the edges of streams or lakes where the cuttings will be able to grow roots easily. Detailed information is provided about cuttings from redosier dogwood, cottonwood, and willow.

Keywords: bioengineering, dogwood, cottonwood, propagation, reforestation, riparian restoration, willow

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