

# **Instructions for Harvesting, Transporting and Storing Live Cuttings**

**for**

## **Vegetating and Stabilizing Streambanks**

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## INTRODUCTION

Live cuttings are leafless stem cuttings of woody plant species. These cuttings can be planted in various configurations to achieve certain vegetative and stabilization goals. The planting method(s) will be specified in the project or planting design. These methods may include: live siltation, brush layering, branch packing, brush mattress, live stakes, live poles, vegetated geogrids, live crib-walls, joint planting, live fascines, and many others.

Willow and cottonwood cuttings are commonly used for riparian rehabilitation because they are easily established from cuttings. Although this document is primarily intended for willow species, the occasional inclusion of cottonwoods, sycamores, or other species as cuttings is acceptable. For additional species suitability, see the USDA, NRCS, publication National Engineering Handbook (NEH) Part 650. Chapter 16: Streambank and Shoreline Protection.



Cuttings can be obtained from commercial nurseries or cut from native stands located near project sites. When buying cuttings from commercial sources, the source and species shall be compatible with the planting area, i.e. native to the area and suitable for the local climate.

## CUTTINGS FROM NATIVE STANDS

Native willow stands located near the project site are the best source of cuttings. On large stream systems, native willow stands are normally found on point bars directly across the river from project areas. Native stands of willow and cottonwood may have insect and disease infestations which can stress the plants. Extremely dry years or long periods of drought may also cause plant stress. This stress may reduce plant energy reserves resulting in decreased plant survival. When planning the number of cuttings to harvest, take stress indicators into account and harvest extra plants if needed.



Permission to harvest from the landowner, private or public, must be obtained prior to harvesting live cuttings.

## CUTTINGS

Establishment success is significantly increased if cuttings are taken from live willows during the dormant season. This is the period between the fall leaf drop and the plant leaf budding in the spring.

See "Storage" section for procedures when harvesting well before the projected planting date.

### Cutting Diameter

Cuttings shall be 1/2 inch diameter or larger depending upon the species. Ideal trees for cuttings should be from 3/4 inch to 3 inches in base diameter. Larger diameter cuttings have more energy and stored reserves than smaller diameter cuttings, but are often more difficult to place into the ground. Cuttings from 2 to 3 inches in diameter typically have the highest survival rates.

Cuttings as large as 8 inches can be used as poles instead of live stakes. Live poles provide more resistance to higher velocity flows and create roughness which reduces water velocity. However, larger diameter cuttings require longer cutting lengths and should be planted deeper in the soil. Deciding factors for selecting the cutting diameter are: stand density, size of the selected native species, and the selected planting method. When planting, cuttings should be large enough that they will not bend or break while being driven during installation. Smaller diameter cuttings, or limbs removed from larger cuttings are more suitable for brush mattresses, brush layering, branch packing, live fascines, or vegetated geo-grids.

### **Cutting Length**

Cuttings shall have at least two leaf nodes, or bud scars, above the ground as illustrated on page 6. Cutting length is largely determined by the depth to the mid-summer vadose zone, or the area of moist soil at the lower bank. For ease of handling and transportation, cuttings should be harvested and stored at full length and then cut into shorter lengths prior to planting. Plantings should be placed on the lower portion of the streambank slope. Cuttings shall be long enough so the stem base reaches into the vadose zone. This zone extends slightly above the water surface elevation in most situations (See illustration on page 6).

- Several inches of the bottom of each cutting should be in the vadose zone.
- Each cutting should have a minimum of 2-4 buds above the ground.
- Observe the 2/3 or 3/4 rule: 2/3 to 3/4 of the cutting length should be placed below the soil surface.

### **Harvest of Cuttings**

Once cutting size, source location is determined — and landowner permission obtained — the actual cutting process can begin. Lopping shears, pruning shears, a small wood saw, brush cutters, or a chain saw are appropriate tools for harvesting cuttings. Desired cutting size will determine the appropriate tool(s).

- Make clean cuts. Ensure all equipment is sharp.
- Use live wood at least 1 year old or older. Do not use very old or dry wood.
- Larger wood is difficult to root. The best wood is 2-5 years old with smooth bark which is not deeply furrowed.
- Avoid current year's growth. It lacks the stored energy reserves necessary to consistently sprout when planted.
- When harvesting from native stands, make sure the stand will not be denuded or destroyed by your cutting activity; most willow species will sprout and grow from base of harvested plant.
- Trim off all side branches so only the main stem remains.
- The side branches can be used in live fascines, branch packing, brush layering, etc.
- Harvested plant material shall be 3/4 inch to 3 inches in diameter at the base and 6 to 12 feet tall.
- A processing alternative, when cutting limbs into live stakes, is to cut the top of cutting with a horizontal cut and bottom of cutting with a 45 degree cut, (See illustration on page 6). This allows quick recognition of the cutting top (see Caring for Harvested Cuttings).
- Care should be taken to select plant materials that are free of physical damage, disease, and insect damage.



## Caring for Harvested Cuttings

One of the most important steps in this process is the identification of **TOP** of cutting. If cuttings are planted upside down, mortality will occur. Leaf scars are the most reliable indicator to identify the cutting top. Buds emerging from leaf scar always point up. Another key is the stem. Usually, the smaller diameter end is the top of cutting; however this is not always obvious.

## Transportation and Storage

After being harvested, the cuttings should be tied into bundles small enough to be easily carried by 1 or 2 people. Each bundle may contain 25 – 50 trees, depending on their size. Placing the same number of cuttings in each bundle makes it easier to count the number of harvested cuttings.

During harvesting, transportation, and storage, willow bundles should be kept moist and protected from sunlight and wind by covering or wrapping the bundles with wet burlap or a reflective moisture barrier to protect cuttings from becoming desiccated.

To minimize storage time, harvest cuttings in early spring within two to three weeks of the planned planting date. If this is not possible, cuttings can be harvested in late fall or winter and stored in a large cooler at 34-38°F until immediately prior to planting. Cuttings can be stored for several months in this manner. If cuttings are kept in a cooler, root cellar, garage, or shop floor, make sure the storage area is dark, moist, and cool at all times. Maintain a storage temperature slightly above freezing. Cuttings may be wrapped in a black tarp or plastic to be kept dark, if stored in an out building. Cuttings should be checked periodically for signs of frost damage and/or to insure that mold is not forming.



## Pre-plant Soaking of Cuttings

Soaking plant material, prior to planting, significantly increases the survival rate. Prior to planting, all cuttings should be soaked for a minimum of 36 hours, regardless whether they are stored or harvested for immediate planting. Research shows that soaking the cuttings for 7 to 10 days can double the survival rate. Cuttings should be removed from water prior to root emergence from the bark. This normally takes 7 to 10 days. Soaking initiates the root growth processes within the inner layer of bark in willows and cottonwoods.



Only the bottom 1/3 of the cuttings needs to be soaked. However, soaking the entire cutting is not detrimental. Soaking can be accomplished in any container that will hold enough water to the required depth. Cuttings can also be soaked in streams, ponds, lakes, or other bodies of water. Avoid soaking cuttings in areas that are susceptible to flooding or where beavers are present.

## PLANTING LIVE CUTTINGS

### Spacing Considerations

Plant the cuttings about 3-4 feet apart for most live cuttings. This spacing is suitable for both within and between rows. Normally, only the lower slope should be planted with willows. Live cuttings should be

planted on the first and/or second row above the edge of water. The first row is normally planted approximately 4 feet from the waters edge at low flow. Subsequent rows should be planted an additional 3 - 4 feet up slope from the previous row. Each row should be planted on an off-set pattern from the previous row (See attached design details on pages 6 and 7).

### **When to Plant**

Cuttings should be planted in early spring after frost has left the soil, but no later than June 1. Avoid planting cuttings or rooted stock in summer because of heat stress and a shortened growing period.

### **Planting Methods and Planting Cuttings**

One or two-person posthole power augers, hand soil augers, planting bars, shovels, soil probes, or simply pushing or driving the cutting into moist soil are appropriate tools to plant cuttings. When planting, keep several things in mind:

- Push the cutting into the soil when possible.
- If the soil is too firm to push the cutting into the soil, the cutting can be driven into the soil using a hammer. A 2-3 pound “dead blow hammer”, or shot filled mallet, works well to drive cuttings. This type of hammer reduces the chance of splitting the cutting or stake.
- If a cutting is split while driving, trim the cutting to below the split to prevent desiccation and plant mortality.
- It is essential to have firm contact between the cutting and soil. Avoid creating air pockets around the cutting that can prevent roots from developing. Holding on to the cutting with one hand while driving reduces air pocket formation.
- Avoid damaging buds when inserting the cutting into the hole or when driving the cutting.
- If the soil is too compacted to drive the cutting, a hole can be formed by driving a rebar or other metal rod into the soil first and then placing the cutting into the hole. The hole diameter shall be smaller than the cutting diameter to prevent air pocket formation.
- Holes can be created with any of the tools mentioned at the start of this section.
- The planting depth will determine the planting method. Deeper holes will be made easier by using a power auger.
- If the hole dug is larger than the cutting, additional soil will be required to form a good soil to stem contact. Preference should be given to local topsoil to encourage mycorrhizal formation and/or nodule formation by nitrogen-fixing organisms. Do not backfill with clay.
- Carefully tamp the soil around the cutting firmly several times as you fill any drilled or augured hole.
- “Water In” the back-filled soil around large cutting holes to settle soil and provide good soil to cutting contact.



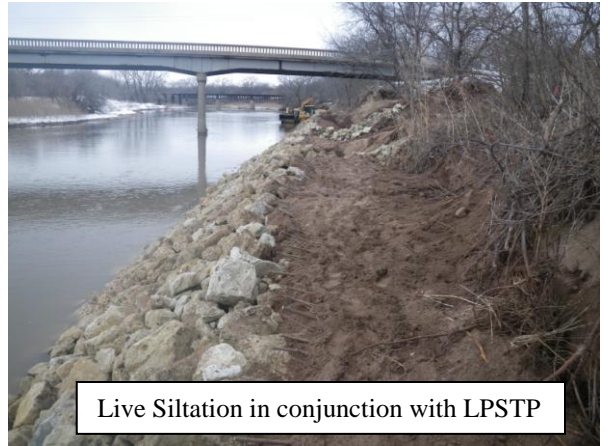
### **Live Siltation**

Live siltation is simply using a 6 inch live cuttings spacing. Live siltation can be used effectively adjacent to LPSTP or along one or both sides of rock key trenches. By using 6 inch a spacing between cuttings, the dense row of live cuttings will slow water velocities and induce sediment deposition. Cuttings for live siltation are normally 4 feet in length and are planted during construction prior to backfilling soil along LPSTP or the key trenches.

## MANAGEMENT AND MAINTENANCE

Proper management is necessary to maintain healthy, competitive plants that perform the desired function. This is as important as the initial planting to ensure rehabilitation of the riparian area. Some maintenance is expected on-site for several years after planting. For the first few years after planting, vegetation should be evaluated and monitored annually, or after any flood event. Some replanting may be needed in succeeding years in order to insure the establishment of a functioning riparian corridor.

Monitoring of the site is necessary to detect any in-stream dead organic material (i.e. old logs, dead root masses, branches, etc.). In-channel organic material may cause erosive cross currents that can erode a planted streambank. If this condition develops, the organic material should be removed or repositioned. Any trimming of cuttings should be done in the dormant season so growth will not be slowed during the growing season. During the establishment period, leave standing dead branches within the plantings to reduce stream flow velocities, thus protecting the established plantings.



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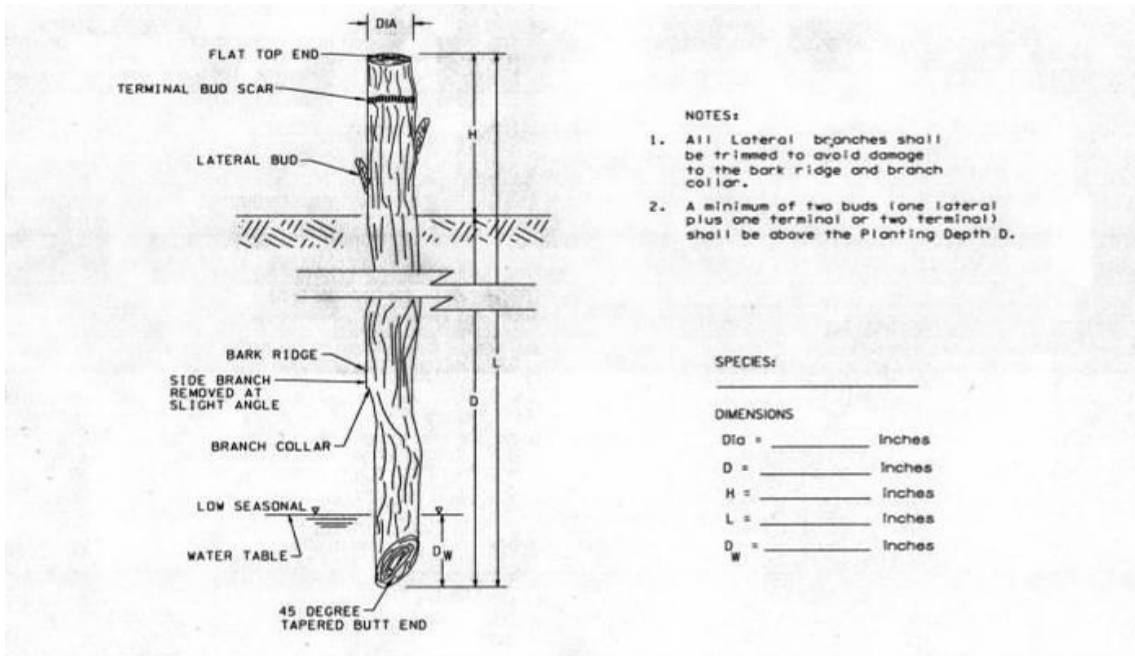
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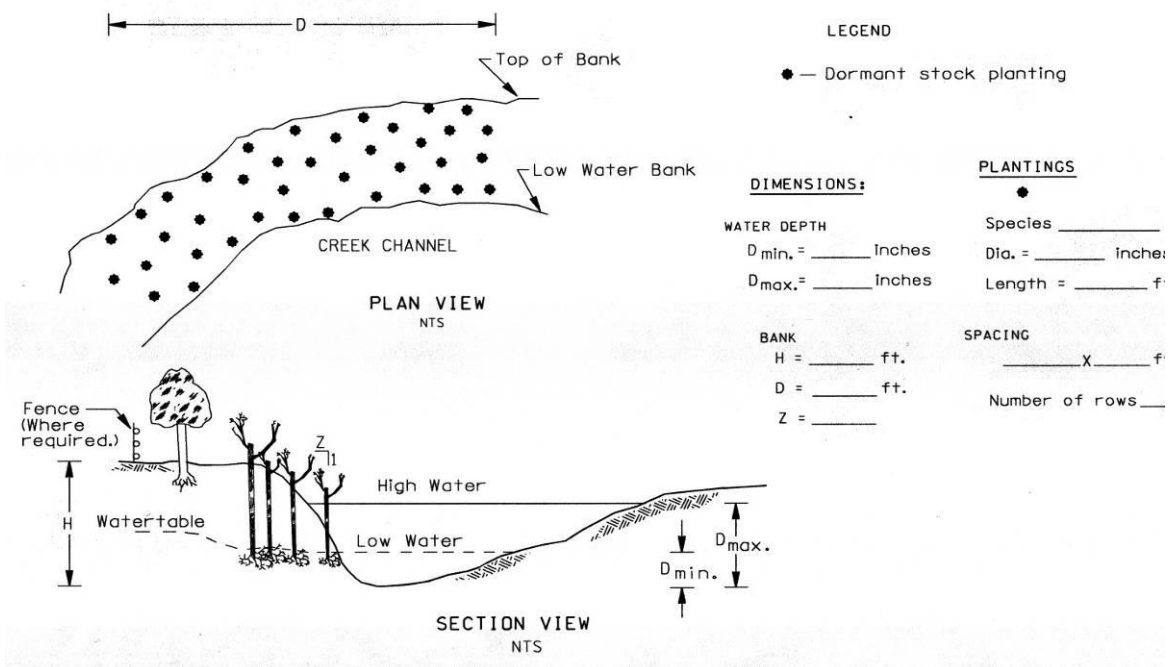
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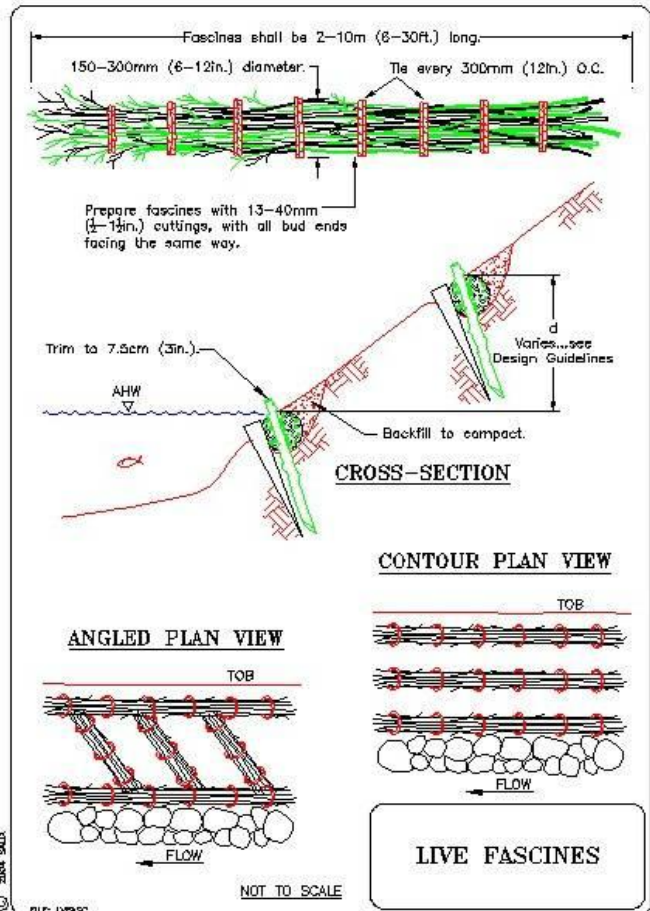
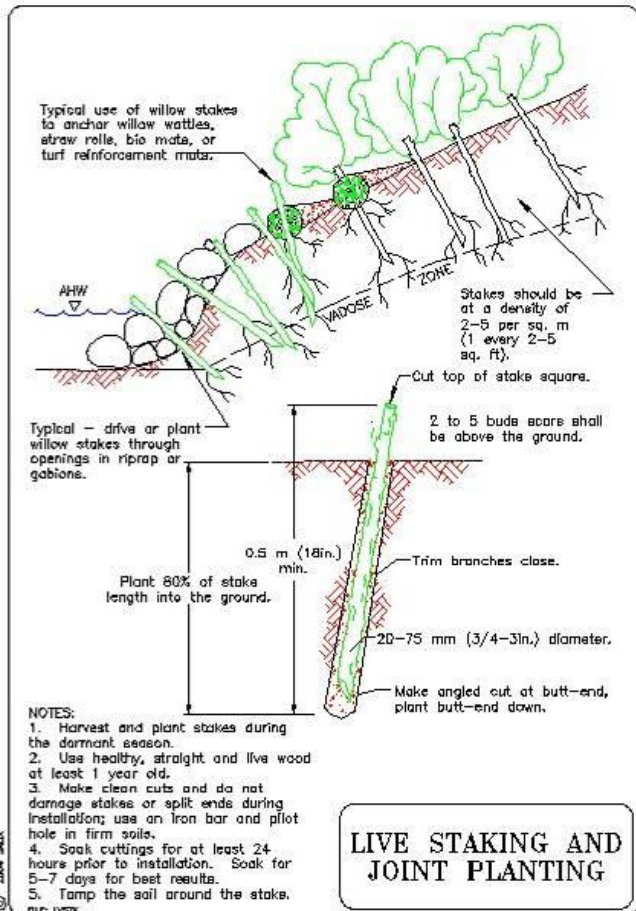
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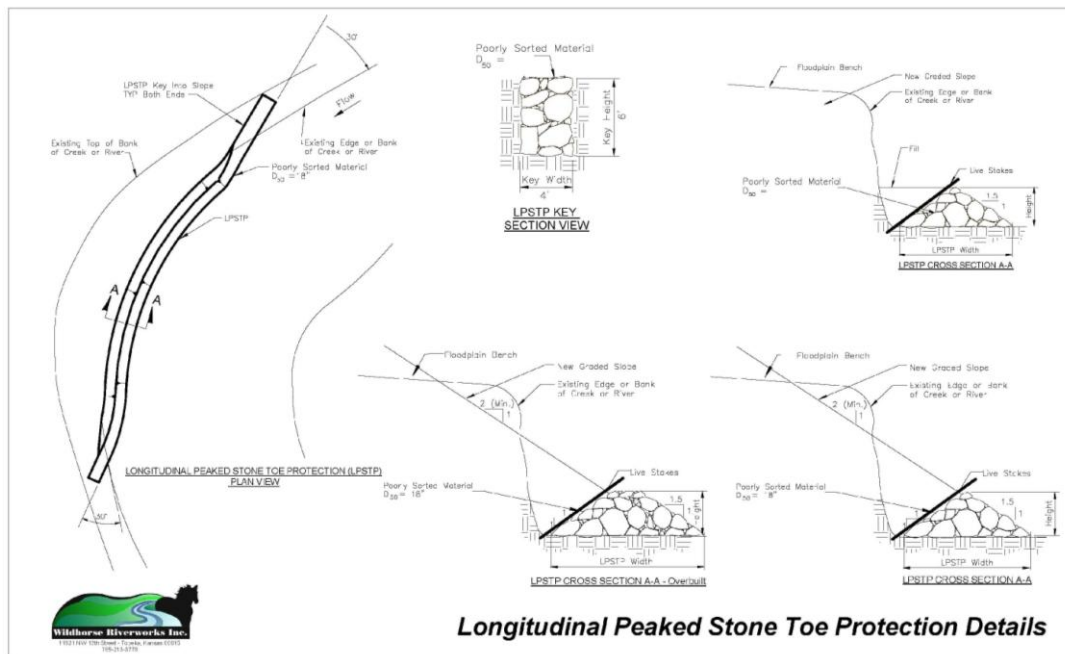
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WRI LPSTP Design Detail showing live siltation