

**Suggested
Methodologies for
Cottonwood Pole
Willow Whip
and Longstem
Plantings**

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INTRODUCTION

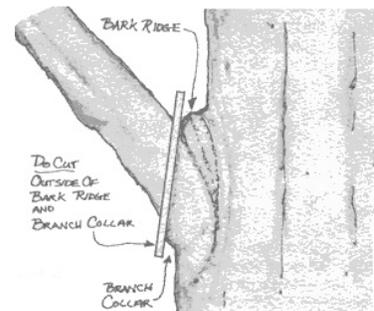
The following guide describes techniques for harvesting, storing, and planting various types of plant materials, including dormant cottonwood pole cuttings, willow whip cuttings, and longstem products. This guide was prepared by Tamarisk Coalition, based on input provided by Dave Dressen and Greg Fenchel at Los Lunas Plant Materials Center. Several excellent documents, links to which are listed at the end of this guide, provide additional details, considerations, and alternate techniques.

DORMANT NON ROOTED COTTONWOOD POLES

Woody riparian species that form adventitious roots can be used as pole plantings, a technique that places un-rooted tree stems in direct contact with the water table. Species typically used for pole cuttings include cottonwoods and some tree type willows, such as Goodding's and peachleaf willow. The following information is geared towards cottonwood pole planting but the information may be relevant for pole plantings of other species.

Harvesting method

- Poles, which can be obtained from plantations or naturally collected, should be harvested while they are dormant. While poles can be cut in the late fall/early winter, best results are typically obtained when harvested in very early spring (e.g. February or March in the Grand Junction area). Trees can be harvested after bud formation but before bud break.
- Poles are typically cut 12-16' long and 2-3" in diameter. Look for healthy materials from trees that do not appear stressed. Poles should be relatively smooth and not affected by pathogens.
 - If using plantation stock, choose poles that are 2-7 years old
 - To ensure a clean cut, a chainsaw or sharp loppers should be used to cut poles. Poles can be cut at an angle, or straight across. Hand pruners can be used to clean up side branches.
 - If harvesting from natural stock, poles may be larger diameter near the bottom; you may need to reconsider planting tools if this is the case.
 - If cutting plantation stock, make the cut approx. 4' above the ground to minimize the circumference of the pole at the bottom.
- If wildland collecting, do not harvest more than 40% of any given stand. If possible, collect from areas near your project location to capture genetic stock most suitable to your site.
- After cutting the poles, remove smaller diameter branches from the stem (or ones that will impede planting); some branches can be left on the upper reaches of the pole.
 - When cutting, try to leave branch collars intact; cut approximately 1/8" away from main stem (*drawing: cal.s.arizona.edu*).



- In areas with high moisture regimes or supplemental watering, 7-8 branches can be left on the pole; in areas with limited water availability, it may be best to reduce the number of branches to 2-3 to minimize transpiration.
- Bundle poles and tag with date, species, and location of cutting.
- Plantation poles can first be cut after 2-3 years (from the date of seedling planting).
 - After the first harvest, poles can typically be cut every 2 years, up to ten years or so.

Soaking method

- Store bottom of poles in water (not just wet burlap or similar) from immediately after cutting until immediately before planting. While pole cuttings can tolerate being out of water for approximately one day prior to planting, it is best to minimize exposure. If poles are out of water too long, it might be useful to recut bottom end of pole to encourage water uptake just prior to planting. Note: only soak the portion of the pole where you want root (bud) development to occur.



- Poles that have formed un-opened buds can be put into cold storage.
- If you are only soaking poles for a short period of time, they can be stored in the field. For longer periods of time, poles should be kept in cold storage at approximately 32-39 degrees F.
 - Water should be changed if it starts to take on an odor; typically 3-4 weeks.
 - Practitioners have different recommendations on how long to soak poles prior to planting. At a minimum, most suggest soaking poles for 24 hours. Los Lunas Plant Materials Center recommends soaking poles for a week prior to planting, if time permits. Poles soaked up to 3 months have also been planted successfully.
- Rooting hormone is not necessary for vigorous cuttings.

Planting method

- Poles can be directly planted after cold storage (don't need to warm them up).
- Be sure to plant poles with the top up (point tips on lateral buds should be facing up).
- In order to ensure contact with the groundwater, it is best to plant poles in the early spring, when groundwater is at its lowest point; this may vary by site or region.
- Immediately prior to planting, recut the bottom of the pole if you suspect that the pole has really dried out, or conversely, if the pole appears to have rotted slightly.

- The exact location for cottonwood planting is site dependent and will be driven by where you find water and where soils are conducive for planting (e.g. high soil salinity or coarse materials such as cobble may prevent planting in that area). Poles should not be planted in the extremely shallow groundwater directly adjacent to the river/stream.
- An auger, stinger bar, or other machinery can be used to dig planting holes. Ideally, cottonwoods should be planted as deeply as possible in the water table to ensure adventitious root growth in the capillary fringe directly above the water table.
- For cottonwood poles, make sure that there is at least 3' of aerated soil at the time of planting between the soil surface and the top of the groundwater table (see page 7 for diagram). Other species such as willows may tolerate shallower aerated soil (e.g. 2').
- In certain soils, it is critical to plant the pole as quickly as possible after digging the hole, in order to avoid collapse of the hole.
- Be sure to maintain soil contact with poles. If necessary, tamp soil around the poles, or if need be, pour a mix of soil and water into the hole to displace air pockets.
- The typical length of pole that will be sticking out above the soil surface is 6-8' with a 12-16' pole. We recommend leaving the top of the pole intact (as opposed to cutting).
- Planting density and location will largely be dictated by soils and water availability; strive to emulate natural groves.
- Cage all pole plantings if there is any potential threat of herbivory.
- May not want to do deep pole plantings in wet meadows (too wet) or on high elevation sites where soils stay cold into midsummer (as root development can only begin when soils warm up). Since soils often do not warm up until August on high elevation sites, it may be more productive to plant potted plant material with developed roots on high elevation sites (and plant in August when soils are warmest and have a little time to spread out into new environment).



DORMANT WILLOW WHIP PLANTINGS

Whip planting is typically done where there is shallow groundwater, which is usually a good environment for willows but not for cottonwoods. Willows or other species such as red osier dogwood that can tolerate shallow groundwater are good candidate species for this technique.

Harvesting method

- Like cottonwood poles, whips should be harvested while dormant, before bud break (typically February to March work best).
- Utilize healthy materials without much bark.
- Whips are typically cut 5-8' long; they can be cut close to the ground
 - Loppers or a chainsaw can be used to cut whips. If using a chainsaw, cleanly re-cut the bottom of the whips. Use hand pruners to take side branches off.
- The ideal diameter of a cut whip is < 1" (approximately diameter of thumb), especially if using a hammer drill for installation
 - Larger materials may work, however, consider the planting equipment you have access to (don't want a whip that is bigger than your hole!).
 - Cleanly cut bottom of whip at an angle or straight across
- Remove all side branches except for a few at the top; the idea is to plant the whip in ground as deep as possible. Leave branch collars intact.
- Remove, at most, 1/3 of the branches from a particular willow. Do not remove more than 40% of any given stand. Spread the harvest out throughout a stand.

Soaking method

- Store bottom of whips in liquid water (not just wet burlap or similar) from immediately after cutting until immediately before planting.
- Whips can tolerate being out of water for approximately one day prior to planting but try to minimize. If whips are out of water too long, it might be useful to recut bottom end of whip to encourage water uptake just prior to planting. *Note: only soak the portion of the whip where you want root (bud) development to occur.*
- Soak water should be changed once it starts to stink. In general, material soaked for 1-2 weeks will probably not need water changed, but material soaked for 3-4 weeks will likely need at least one change of water. *Note: Some species such as coyote willow seem to tolerate 'stinky water' much better than other species and thus might be able to go longer without changing water.*
- If whips will only be soaked a short time and there is no concern over bud break on stems occurring, whips can be soaked in the field. However, if long term 'cold storage' is desired, then the ideal temperature for cold storage is below 40 degrees but above freezing.
 - The ideal length of time to soak whips is about one week (once you see 'root bumps' emerging)

- While some plantings have been observed to do okay with no soaking, the minimum length of time to soak whips is approximately 24 hours. Generally, the maximum amount of time that whips should be stored is 3 months.

Planting method

- Whips are typically planted directly along the shoreline into shallow groundwater.
- Use auger, hammer drill, or other machinery, such as a water jet stinger, to dig hole for planting.
- Depending on your soil type, you may need to plant whips immediately after drilling in order to prevent collapse of the hole.



- As with cottonwood poles, be sure to maintain contact with soil upon planting. According to Wildland Restoration Volunteers, poor soil to stem contact is the main cause of willow whip death.
- Whips should be planted at least 2-3' into the water table (see pg. 7 for diagram). The resulting adventitious roots will then develop in the capillary fringe above this. Leave 1-2 buds above the soil.
 - Ensure there is at least 2' of aerated soil at the time of planting between the soil surface and the top of the groundwater table; if possible planting should be done in the early spring when the water table is at its lowest.
 - The whips need to be planted deep enough that they are not washed away by spring flooding or expelled from the ground during freeze-thaw cycles.
- Do not cut off the top of the whip after planting.
- Ideal density of whip planting depends on the species used. For species that tend to creep, planting 1-3' apart typically suffices, for shrub-type species plantings are typically done 3-8' apart, and tree type species are typically planted 8-16' apart.
- Cage all whip plantings, especially if beaver present.

LONGSTEM POTTED PLANTING

Longstem plantings are rooted materials, typically woody species that can form adventitious roots along their stems once planted. The goal of longstem planting is to place the root balls of plants in contact with the capillary fringe, thereby minimizing the need for supplemental irrigation. Longstems can be planted in a variety of containers; see diagram on page 8 for more explanation.

Planting method

- The best time to plant longstem plants is in the fall, once it has cooled off but before it is frosting regularly (e.g. probably late Sep/early October around the Grand Junction area). Potted plants can be planted when dormant or actively growing, however, if planting is done prior to dormancy plants will be able to put on some root growth before the winter.
- Determining where to plant longstems is completely site dependent and will be driven by where you find water and where soils are conducive for planting (e.g. high soil salinity or coarse materials such as cobble may prevent planting in that area).
- Installation of monitoring wells 1-2 years prior to planting can help to gauge water table depth throughout the year.
- Longstem plants are typically planted so that the bottom of the root ball is just at the top of (but not into) the water table at its low/lowest level for the year (see pages 7 & 8 for diagram). In other words, you will be planting the root ball into the capillary fringe occurring directly above the low/lowest groundwater level depth (e.g. fall/winter groundwater depth).
 - Be sure your plant is long enough to reach the groundwater at your particular site. Leave a foot or so of the plant above the ground; too much biomass above ground increases desiccation.
 - Longstem plants should be planted one per hole.
 - Be sure your plant is long enough to reach the groundwater at your particular site.
- Use long auger (6-8' depending on your site) or other machinery, such as a backhoe, to dig hole for planting. Dig until you find standing water; this way you know you have hit the low water table and that you have 'broken through' any clay lenses in the soil profile or other potential impediments that might prevent the plant roots from accessing water table. You want to create porous soil that allows roots to spread out.
 - Refill the hole to the level of the top of the water table, and then plant longstem root ball here. Do not plant long stem root ball directly into water table.
- All long stem plantings should be accompanied by PVC (or similar material) watering tubes so that for first 1-3 years plantings can be watered as needed in arid environment (e.g. 3 irrigations per year for first two years until roots can fully spread and access capillary fringe).
 - These watering tubes also serve as great markers for finding planted plants again as they can sometimes be difficult to find. A typical watering tube is 1" in diameter, and might be 40" long although this could vary (e.g. buy 10' piece of PVC and cut into lengths). Typically



the watering tube might stick up about 6" above the soil surface when placed with the bottom end at depth in the vicinity of the root ball to ensure water getting directly to the root ball.

- It may be important to cap the watering tubes when not in use in order to minimize root ball dessication and exposure to freezing temperatures, as well as reduce the accumulation of debris and small animals in tube that could prevent water from reaching root ball over time.
- Cage all longstem plantings

DIAGRAMS

Diagram of cottonwood and willow planting depths relative to capillary fringe and high and low water table depths

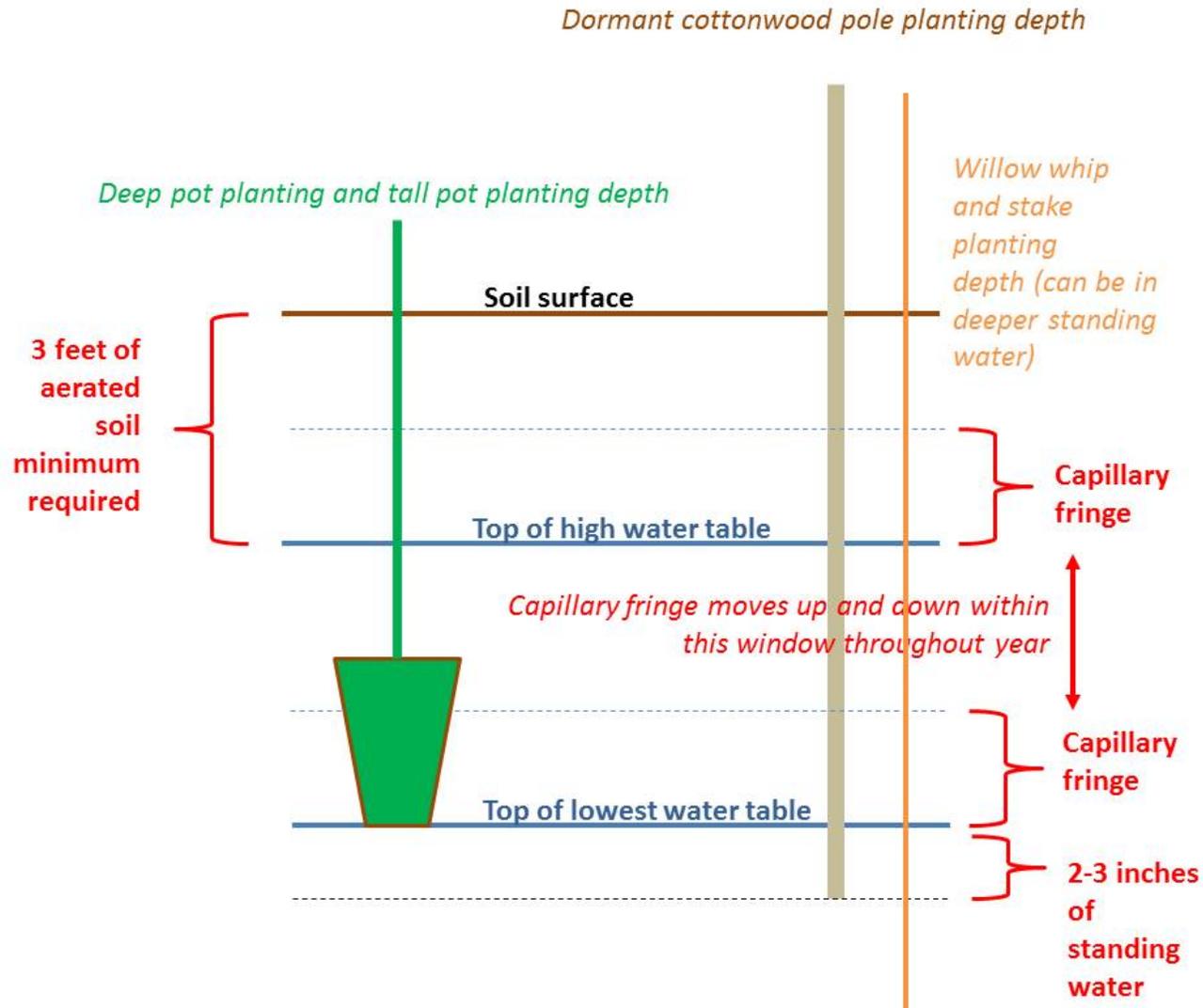
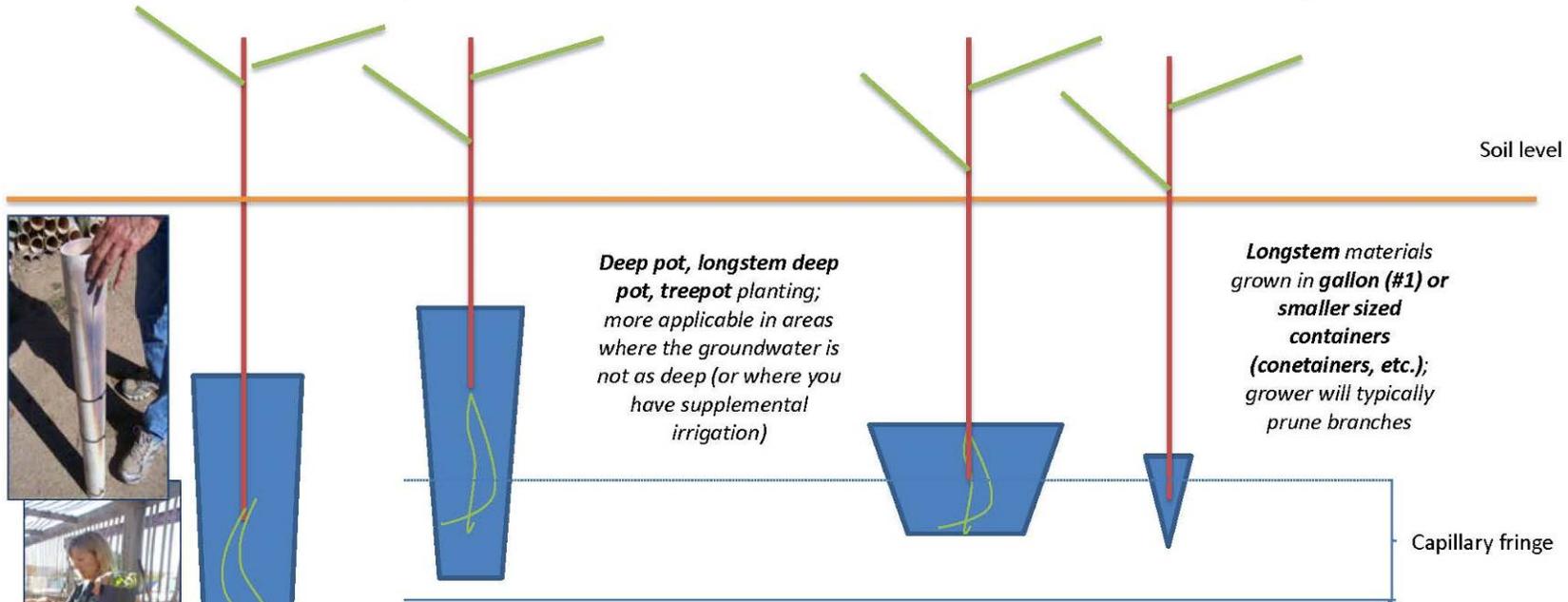


Diagram of longstem products, container sizes, and planting depths



Tallpot/longstem tallpot (note plant just developing in lower picture)

Tallpot, longstem tallpot
 (may be more applicable in Sonoran desert or in areas where the groundwater is very deep)



Deep pot/ longstem deep pot



Example of different container sizes that can be used to produce woody species with longstem properties



Don't see what you're looking for? We can discuss your pot design and size, please call for information.

ADDITIONAL DOCUMENTS

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