TECHNICAL NOTES

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PLANT MATERIALS TECHNICAL NOTE NO. 68

GUIDELINES FOR PLANTING DORMANT POLE CUTTINGS IN RIPARIAN AREAS OF THE SOUTHWEST

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The increasing concern to control noxious tree species and revegetate riparian areas along New Mexico's rivers and streams has led to substantial riparian restoration activities during recent years. The lack of flood flows on many of the rivers in the southwest US has disturbed normal ecosystem function and prevented the natural recruitment of native species comprising the gallery forest and its understory vegetation. Planting dormant pole cuttings has proven to be a successful technique for establishing many riparian tree and shrub species. The key advantage of pole planting is that poles are hydrated after planting by the stump end being in contact with ground water and are established through the proliferation of adventitious roots in the capillary fringe above the water table.

Consider the following points when planning a pole planting project:

The following aspects describe important **characteristics of pole cuttings** used in riparian restoration projects:

- Pole cuttings are harvested and planted while **dormant** (early winter to early spring).
- **Branches,** except a few at the top of the cutting, are removed from the pole at harvest making sure to keep the branch collars intact while pruning.
- **Vigorous young poles** with larger diameters establish more readily and successfully than older or skinny poles.
- The stump ends of poles should be placed in water tanks, streams or ditches to keep them **hydrated** between harvest and planting.
- Pole cuttings tolerate being out of water briefly during **transport**; this interval of desiccation should be minimized.
- The **depth of the planting hole** must be sufficient for the stump end of the pole to be in ground water throughout the growing season even if the water table drops. The hole depth and the desired aboveground height of the planted pole will determine the length of pole needed.

- The traditional pole cuttings are **tree-type cottonwoods** (e.g., Rio Grande, plains, Fremont, lanceleaf, narrowleaf) or **willows** (e.g., Gooddings, peachleaf) used to establish the overstory structure of riparian forests.

- A second type of cutting is a **whip** used typically for streambank plantings and include thicket forming coyote willow as well as multi-stem shrub willows (e.g., bluestem, mountain, Bebb's, and arroyo) and red-osier dogwood.

- The third type of pole cuttings include **unconventional species of understory shrubs** including New Mexico olive, false willow, and false indigo. The high success rates of pole plantings with cottonwood and willow species of 80 to 90% can not be expected with these unconventional species. These species can not tolerate long periods of **hydration**; planning will require a minimum delay between harvest and planting to achieve maximum success. Although understory riparian species are somewhat **shade tolerant**, poles of these unconventional species have poor survival if planted in the shade of a gallery forest.

- The use of clonal stock can limit **genetic diversity** and can result in the production of unisexual pole cuttings. Establishing pole production areas using seedlings will assist in maintaining genetic diversity and an appropriate mix of male and female cuttings.

The following **site factors** can significantly influence the survival and growth of pole cuttings planted in riparian areas:

- To determine appropriate species and pole lengths for revegetation, seasonal **measurement of depth to ground water** is highly recommended. Inexpensive shallow monitoring wells will confirm the depth and seasonal fluctuation of the water table. These groundwater depth measurements can help in the selection of appropriate species; for example, shrub willow species in general can tolerate shallower ground water depths (1.5 ft or deeper) than cottonwoods (4 ft or deeper).

- Electroconductivity (EC) measurements greater than 3 to 4 dS/m indicate **excessive salinity** that can restrict the list of species which will thrive. Wolfberry, screwbean mesquite, and fourwing saltbush are some of the woody species that can tolerate these salinity levels; whereas, many of the typical overstory pole cutting species (cottonwoods and willows) and unconventional understory pole species (e.g., NM olive, false willow, false indigo) will not perform well at or above this threshold.

- Soils with high percentages of **cobble** can be impossible to auger; whereas augered holes in **dry sands and gravels** will often collapse before planting. **Fine-textured soils** with high percentages of silt or clay will not permit good aeration at depth which will diminish root development and often survival. Visual observation of soil samples from augered holes should be sufficient to determine if soil texture will be limiting; these samples can also be analyzed for EC to determine if near-surface or subsurface soil salinity is a problem.

- Pole plantings are not appreciably affected by **weed competition** because the poles are not shaded by the canopy of annual weeds, and a stand of weeds will not deplete the soil moisture supply in the capillary fringe.

- Pole planting into **cold soils** of high elevation sites can be problematic because rooting will not occur until soil temperatures moderate in mid-summer. The buried portion of the pole can degrade in the time between the planting of dormant cuttings and when warm subsoils occur.

- High flow events on montane streams, unregulated rivers, and arroyos can easily erode shallowly planted cutting stock. Dormant pole and whip cuttings planted to substantial depths can resist the extractive forces of **flood flows**. Willow whips with their inherent flexibility are more appropriate for higher flow regimes and less stable channel systems.

- Pole cuttings of cottonwood species will usually die when planted in alluvium with less than 3 feet of **aerated soil** above the water table, while shrub willow species are tolerant of shallower ground water conditions. Whether a site is truly a **wet meadow environment** and not appropriate for woody vegetation needs to be evaluated in the planning stage. Shallow depth to ground water, fine-textured organic-rich or anaerobic soils, and low stream gradients are some of the factors consistent with wet meadow environments.

A number of **planting considerations and maintenance** requirements need to be considered in planning riparian restoration utilizing pole cuttings:

- Dormant pole and whip cuttings need to be planted before **budbreak**; therefore, a winter to early spring planting window is required.

- Sites with deep water tables may require long **augers** to reach ground water for pole plantings.

- **Backhoes** are useful for excavating deep planting holes in unconsolidated alluvium which would normally collapse into an augered hole; backhoes have also been used in finer–textured soils if a large area of disturbed soil is acceptable.

- Willow whip cuttings can be effectively planted in most stream bank soils with three foot long, one inch diameter **rotary hammer drill** bits.

- Alluvium rich in cobbles or rocks may require unique planting equipment such as a **"stinger"**, which is a sharpened steel rod attached to a backhoe boom and can punch holes between cobbles for planting poles or whips.

- Willow whips also can be planted using a **water jet** if a water supply is readily available.

- Large planting equipment requires **site access** which can be restricted by ditches, arroyos, levees, soft sand, steep slopes, and cut stumps of invasive woody species.

- Protection from **cattle** will require adequate fencing and periodic monitoring of fence integrity.

- The presence of beaver necessitates five foot high poultry wire **tree guards** around individual pole plants as well as protection of unplanted poles and whips placed in streams or ditches for hydration.

- Controlling infestations of **defoliating insects** may be crucial for pole plantings during the initial growing seasons; cottonwood leaf beetle outbreaks will require control.

The **long-term prospects** of riparian species established by intensive revegetation.

The lack of flood flows has prevented the natural recruitment of native species comprising the gallery forest and its understory vegetation along rivers in the southwest US. Riparian forest communities that have been established through intensive approaches such as pole planting will evolve towards xeric shrublands/grasslands if flooding is not eventually re-established. These non-flooded sites will require perpetual planting and management if the long-term landscape goal is a park-like setting with groves or stands of riparian trees and shrubs.