Watering of planted containerized stock

- With the exception of poles and whips planted into the water table, containerized plants should be watered at the time of installation. Establishment of containerized stock will require a few too many water applications depending on stock size, soil moisture conditions, and watering method.
- Conventional water basins can be used, but high evaporation losses and promotion of weed growth are problems with this irrigation method. Fall planting will reduce these problems for the initial water applications, but the start of watering the following spring will reinstate these concerns.
- For stock sizes with a 1 to 3 foot root-ball length, the use of embedded watering tubes can aid in getting the water around and below the root ball and in recharging deep soil moisture. Watering tubes can be perforated at root ball depth to allow rapid and thorough distribution of water and are typically fabricated from PVC pipe but cardboard mailing tubes or other materials can be used.
- Larger diameter (3" -4 ") embedded watering tubes are helpful if starch based hydrogels are going to be applied. The hydrogel is costly and more difficult to apply than water because of its viscosity, but the slow release of moisture will probably reduce the number of waterings required.
- If water is available from nearby streams, rivers, or ditches, a gasoline-powered pump with long hoses can be used to fill basins or watering tubes. In many circumstances, the long distance between individual plants warrants the use of water tanks and shorter hoses for more efficient labor use.

Protection and maintenance of revegetated sites

- A number of other considerations will require post-planting attention: resprouting of noxious woody species, protection from grazing and browsing animals, and controlling defoliating insects.
- The continued spot spraying of noxious woody sprouts and any other invasive weeds will be required for an indefinite period.
- Protection from cattle will require adequate fencing and periodic monitoring of fence integrity. The presence of beaver necessitates poultry wire tree guards around individual pole plants as well as protection of unplanted poles and whips placed in streams or canals for hydration. Elk-proof fences (e.g., 8 foot tall woven wire) will be required on sizeable montane riparian restoration sites. Small 5 foot high exclosures constructed from rigid welded-rod corral panels placed around individual plants or clumps of plants have proven to provide effective elk protection.
- Controlling defoliating insects is crucial for pole plantings during the initial growing seasons; cottonwood leaf beetle occasionally will require control.

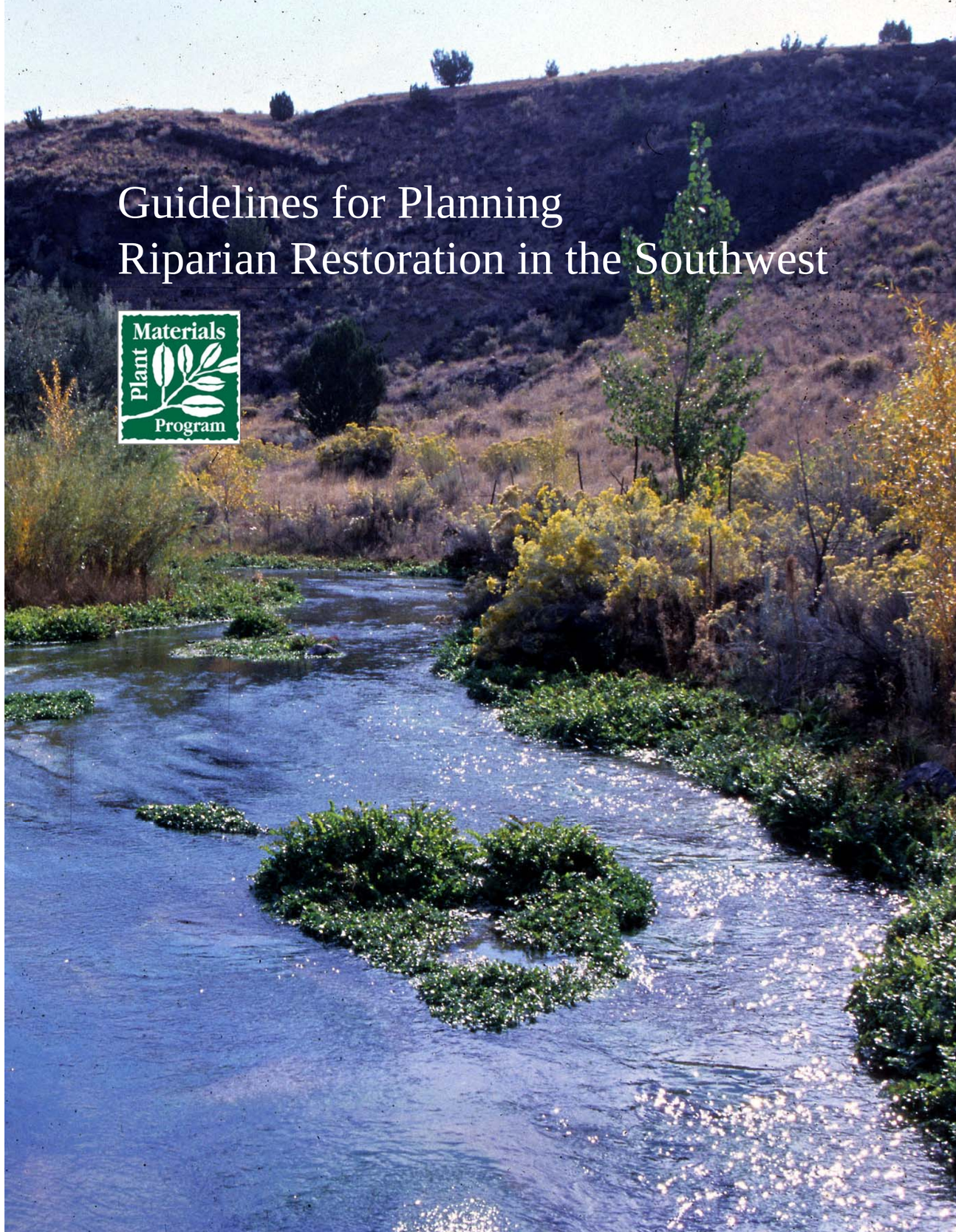
Desired landscape objectives

- On river floodplain sites which no longer experience flooding, the self-perpetuation of cottonwoods and tree willows can not be assumed due to the lack of natural recruitment. Riparian forest communities that have been established through intensive planting approaches will evolve towards xeric shrublands/grasslands if flooding is not re-established. These types of sites will require perpetual planting and management if the landscape goal is a park-like setting with groves or stands of riparian trees.
- Other landscape objectives to be considered include the fuel load that will be acceptable from the re-established plant community and the need for firebreaks and emergency access within the restored area. Wildfire concerns may necessitate a landscape goal more similar to a savannah than of a vast gallery forest.

Project planners must determine the concerns and problems apparent at a particular site and address the appropriate responses to these critical factors. Although there is not a precise recipe that will guarantee success in riparian restoration, understanding site limitations and the potential methods of resolving them is the most important step in the planning process.

For further information contact the Los Lunas Plant Materials Center at (505)865-4684.

NRCS Natural Resources Conservation Service



Guidelines for Planning Riparian Restoration in the Southwest

Los Lunas Plant Materials Center

The increasing efforts to control noxious tree species and revegetate riparian areas require extensive planning to successfully implement site preparation and planting and to maintain these revegetated sites. This restoration guide is intended to address concerns that must be considered when developing riparian restoration projects as well as a number of responses or solutions to these potential problems.

Extreme depth to ground water and severe water table fluctuation

- Measurement of depth to ground water using shallow monitoring wells will confirm the depth and seasonal fluctuation of the water table to help determine appropriate species and the most effective stock type (container depth or pole length) for revegetation.
- Extreme depths to groundwater may indicate the only practical restoration goal is revegetation with xeric shrubs and grasses rather than riparian species.

Revegetation limitations due to soil salinity and/or soil texture extremes

- Fine-texture soils or soils with restrictive layers can limit the selection of species and stock types for revegetation. Soils with high percentages of cobble can make augering impossible; whereas, augered holes in dry sands and gravels will often collapse before planting.
- Visual observation of soil samples from augered holes should be sufficient to determine if soil texture or restrictive soil layers will be limiting.
- Extreme salinity and sodicity of floodplain soils can profoundly influence species suitable for revegetation. Salinity problems (electroconductivity greater than 3 dS/m) can be especially persistent in clay soils where natural leaching of salts is limited.
- Augered soil samples can be analyzed for electroconductivity (EC) to establish if surface or subsurface salinity is a problem. Electromagnetic induction field instrumentation can also be used to rapidly estimate soil salinity for large acreages.

Loss of planting stock from the scouring action of flood flows

- Dormant pole and whip cuttings planted to substantial depths can resist the extractive forces of flood flows compared with shallowly planted containerized and cutting stock. Willow whips with their inherent flexibility are more appropriate for higher flow regimes and less stable channel systems.
- In lower elevation situations where scouring is severe, it is advantageous to plant containerized stock with deep root balls during the fall to provide some root development prior to spring runoff.
- Some riparian species in small containers but with long stems can be buried in deep planting holes for anchorage. Many riparian species should be adapted to this planting method which is comparable to natural burial by sediment deposits.

Eradication of woody invasive species and removal of resulting biomass

- A long-term commitment for spot spraying of resprouts must be part of any control program.
- The dead biomass resulting from herbicide treatment can be burned in slash piles for interspersed noxious woody plants or by crown fires in monoculture stands. The removal of large diameter biomass as firewood and burning of slash is another alternative.
- The mulching of dead biomass is expensive, but the benefits of mulch include limiting wind and water erosion, reducing soil moisture loss to aid reseeding efforts, and enhancing salt leaching by decreasing evaporation and increasing infiltration. A mulch layer will also retard the growth of weeds that commonly occurs after clearing operations.

Woody riparian plant communities versus wet meadow communities

- Due consideration (particularly in montane situations) is required to evaluate whether a site is truly a wet meadow environment and not appropriate for woody vegetation. 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.
- One factor to consider with montane wet meadows is that many of the dominant exotic grasses in these communities have meager soil stabilizing capability.
- On low elevation floodplains, saltgrass meadows are inappropriate for revegetation with woody species because of shallow groundwater as well as generally high levels of soil salinity.

Effect of weed competition on revegetation

- Proliferation of annual weeds can drastically influence reseeding efforts to re-establish native grasses and forbs. The survival and growth of small containerized stock will be severely diminished by competition with large dense weed stands which shade transplants and deplete soil moisture.
- For severe weed infestations on disturbed sites, herbicidal control of weeds for two years before reseeding may be necessary to maximize revegetation potential.
- In some extreme situations, the installation of weed barrier fabrics in V-ditches or basins can be used for planting woody species to reduce weed competition, harvest runoff, and evaporation.

Advance planning for plant materials and stock types

- To achieve a suitably diverse native plant community, growers of native plant materials will need to be identified and contracts will have to be granted well in advance to produce the amount of plant materials required for a large restoration project.
- Those planning revegetation projects need to consider the costs versus benefits of different stock sizes. A primary concern with large stock is the high cost of plant material and installation versus the benefits of lower cost of maintenance (i.e., irrigation) and higher survival rates. The calculation of advantages of large versus small stock will be influenced by the availability and cost of labor and equipment used for planting, irrigation, and maintenance.

Planting methods for riparian sites

- Time of year of installation, planting methods employed, shade from existing overstory trees, and ease of access for heavy equipment can influence the success of a revegetation project.
- At lower elevations, planting containerized woody plants in the fall offers benefits of lower evapotranspiration and of continuing root growth while soil temperatures remain moderate. Dormant pole and whip cuttings need to be planted before budbreak; therefore, a late winter to early spring planting window is required. Reseeding of low elevation floodplain sites should be timed to take advantage of anticipated summer rains.
- The stock type will greatly influence the planting equipment required. Sites with deep water tables may require long augers to access ground water for pole plantings. Willow whip cuttings can be effectively planted in most stream bank soils with three foot long, one inch diameter rotary hammer drill bits. Willow whips can also be planted using a water jet if a water supply is readily available. Whip cuttings of understory species (e.g., NM olive and willow baccharis) do not root well in the shade of mature cottonwood or willow trees; containerized stock is preferred for these situations.
- Large equipment requires site access which can be restricted by ditches, arroyos, levees, soft sand, steep slopes, or cut stumps of invasive species.