The Deep Planting of 'Longstem' Transplants: An Effective and Inexpensive Planting Method for Disturbed Southwestern Riparian Ecosystems

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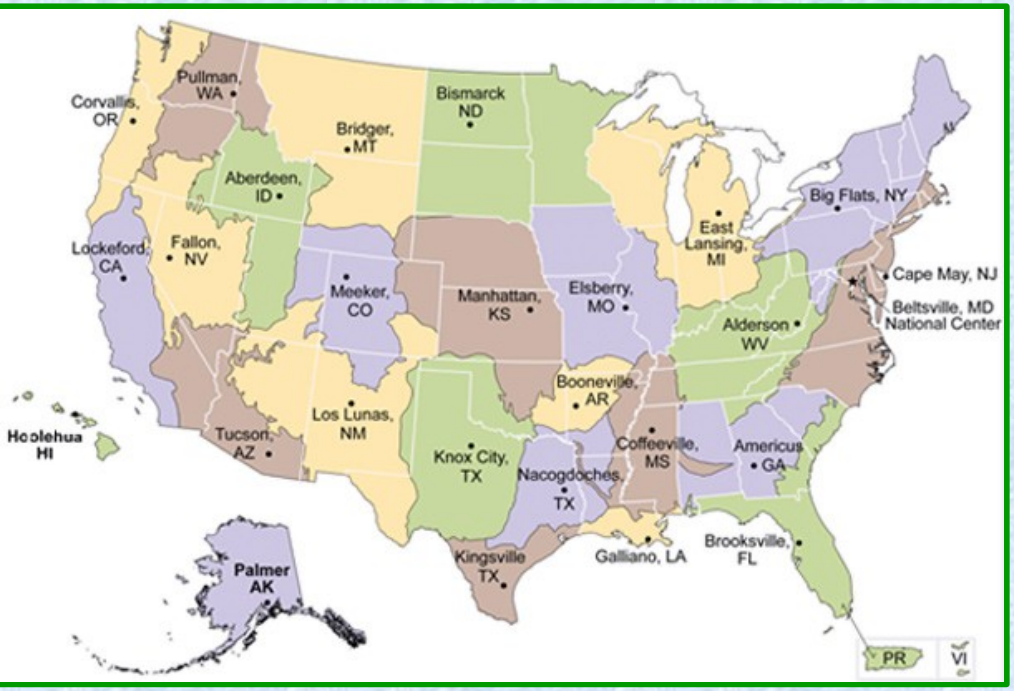
USDA Natural Resources Conservation Service Plant Materials Program



The Plant Materials Program

- Collects, selects, and uses plant breeding strategies to release grasses, legumes, wildflowers, trees and shrubs to commercial producers who sell our products to the public
- Develops technologies for establishing vegetation for the use of plants as a natural way to solve conservation issues with the ultimate goal of re-establishing ecosystem function

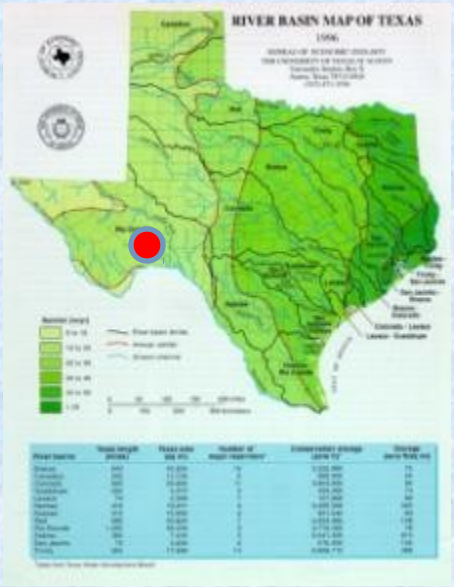
A Reference Site for a Desert Riparian Ecosystem in Lemitar, New Mexico


Same Site Six Years After Planting
Funded by Middle Rio Grande Conservancy District
40 acre site

Biological Control of Saltcedar in the Southwest

Dr. Jack DeLoach (ARS), project leader, with interagency participants

Defoliation of Tamarisk by the beetle (*Diorhabda elongata* or *Diorhabda sublineata*) near Big Springs, TX (2010)



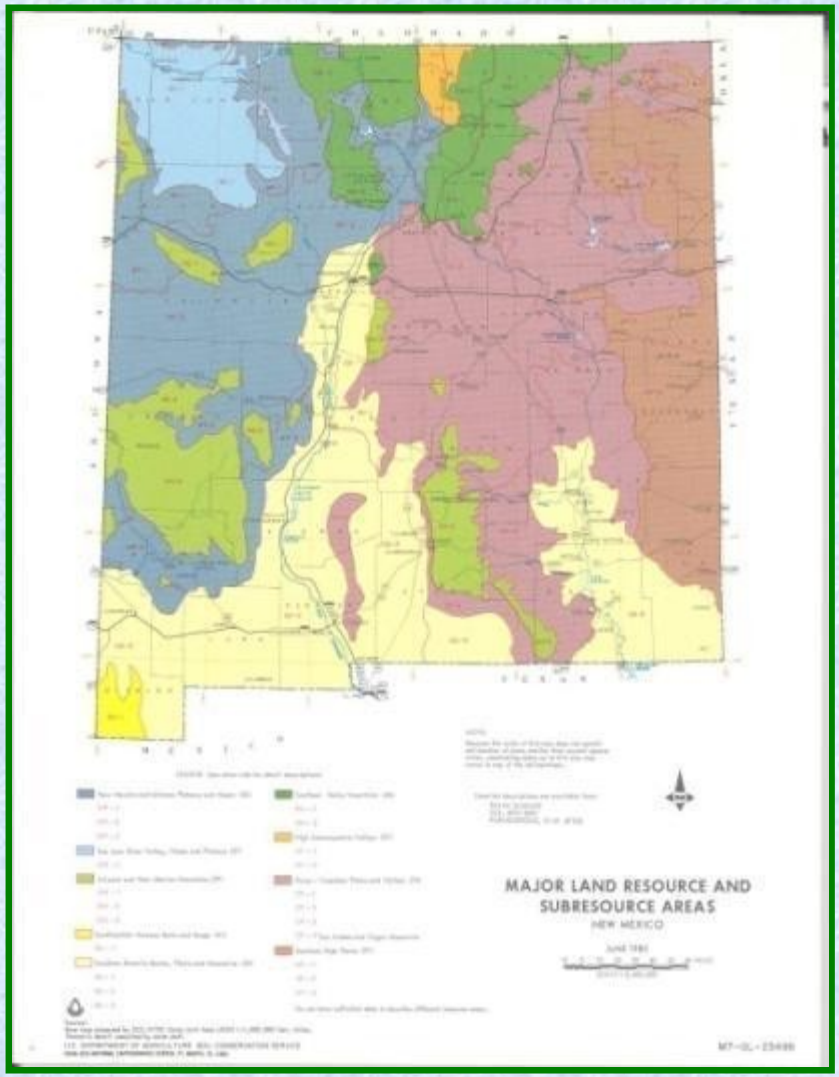
Total Acres Treated in New Mexico for Non-Native Phreatophyte Control (2002-2004)

	Total Acres
Canadian River	4,018
Pecos River	17,054
Lower Rio Grande	9,961
Upper Rio Grande	3,182
Grand Total	**34,115**

Source: New Mexico Department of Agriculture (September 2005)

Most Treated Areas Receive Less Than 15-Inches of Annual Precipitation

- Non-native phreatophyte control is occurring mainly in these major land resource areas (MLRA):
  - MLRA 42 (Southern Desert Basins Plains and Mountains)
  - MLRA 70 (Pecos and Canadian Plains and Valleys).
- MLRA's are geographical areas, usually several thousand acres in extent, that are characterized by a particular pattern of soils, climate, water relations, and land uses.



Source: NRCS (2005)

Attributes of Planting Riparian Vegetation After Clearing

- Accelerate succession to protect river or stream bank from erosion
- Select desirable vegetation instead of allowing perennial or annual weeds to dominate the site
- Enhance wildlife habitat with selected plant species
- Create pristine recreational areas


Cleared area now dominated by Russian knapweed
(*Acroptilon repens*) on the Rio Grande in San Acacia, New Mexico (2010)

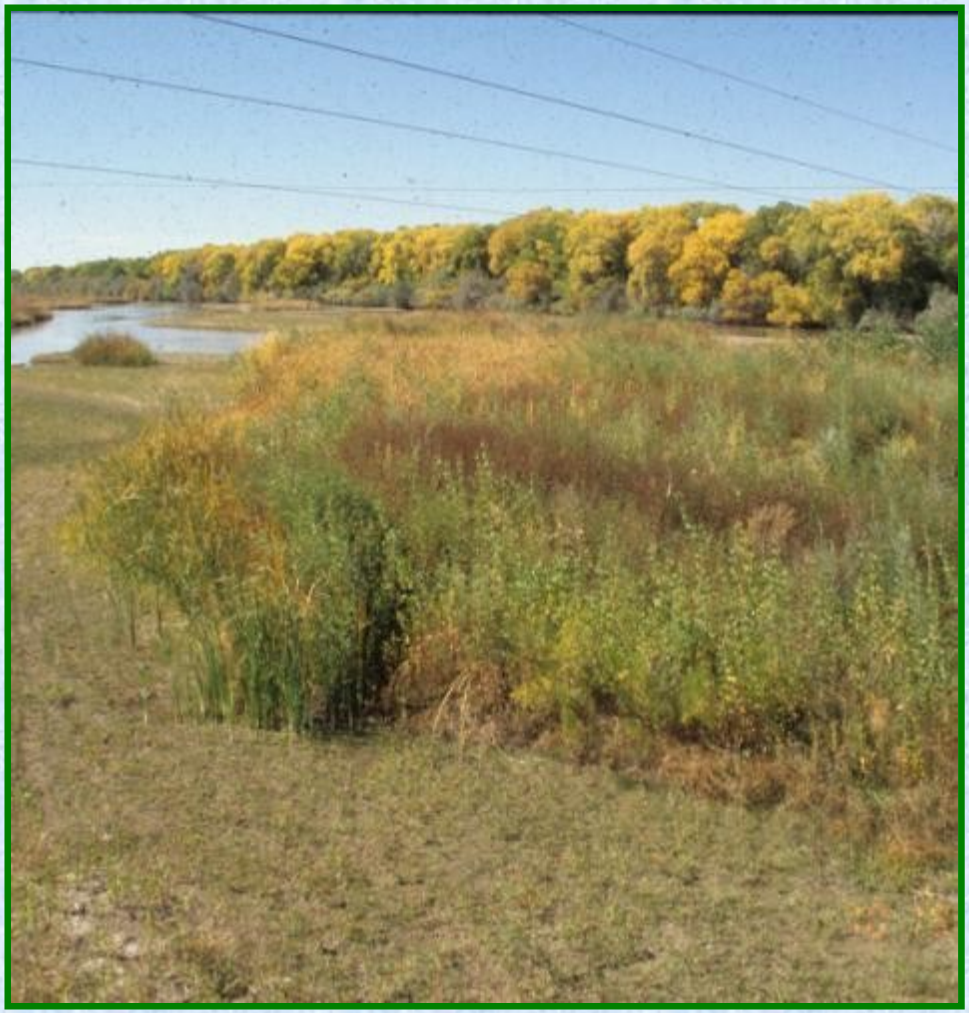
Rebecca Harms and Ron Hiebert (2006) found " that vegetation response to tamarisk removal is often negligible. Land managers should be prepared for persistent impoverished plant communities following tamarisk removal if additional restoration measures are not instigated." Their results are from an on-site review of 33 previously treated areas (from 1 – 11 years) in the Southwest.

Vegetation Response Following Invasive Tamarisk (*Tamarisk* spp.) Removal and Implication for Riparian Restoration.
September 2006. Restoration Ecology Vol. 14, No. 3, pp. 461-472

Over-Bank Flooding Provides Natural Establishment of Native Vegetation

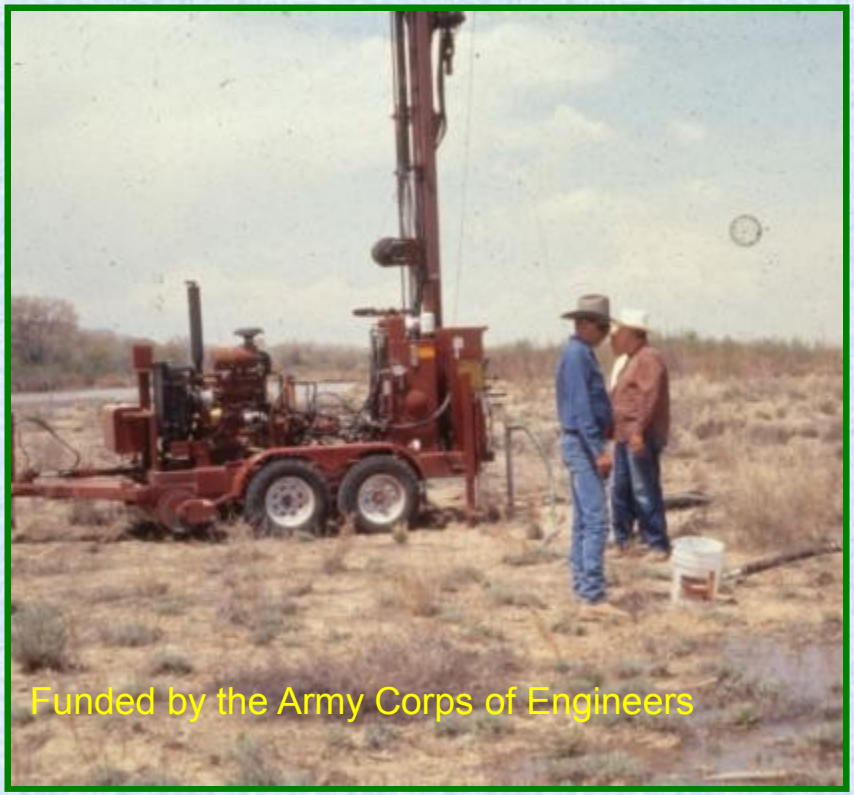
Species includes:

- Cottonwood (*Populus deltoides var wislizeni*) seedlings
- Black willow (*Salix goodingii*) seedlings
- Coyote willow (*Salix exigua*) seedlings



Sandbar on Rio Grande, Los Lunas, NM

Simulating Over-Bank Flooding Using Micro-Sprinklers to Establish a Riparian Plant Community



Drilling a shallow well on the west side of the Rio Grande in Albuquerque, New Mexico.

Same site–More than 12,000 cottonwood seedlings by the fall of the first year.

Same Location

Cottonwood seedlings germinated only in the wet areas.

Same planting by the 5th year. Irrigation was removed after the 2nd year.

Elevation of flood plain reduced to promote seasonal flooding to establish riparian plant species on the Rio Grande in Belen, NM

Middle Rio Grande Conservancy District Project

Bureau of Reclamation Project

Elevation of flood plain reduced to promote seasonal flooding to establish riparian plant species on the Rio Grande in Bernalillo, NM

Water Seepage From Rivers Supports a Ribbon of Trees and Shrubs in the Desert

Methods have been developed for establishing trees and shrubs that require minimal or no irrigation by tapping into this shallow water table.

Middle Rio Grande Reach, New Mexico

Riparian Plant Materials Developed to Plant in Shallow Water Tables (Less Than 8 Feet)

- Cottonwood and willow pole cuttings
- Willow whip cuttings
- Tree and shrub transplants with ‘longstems’

Attributes of Shrubs

- Increases species diversity which improves habitat sustainability
- Improves habitat structure (from 2 tier–4 tier) for wildlife species (i.e. neo-tropical birds)
- Increases browse production for livestock and wildlife
- Increases cover for wildlife
- Increases vegetation density and cover which reduces the potential of surface erosion
- Produces fruit by several species providing food for wildlife
- Tolerates soil salts allowing for establishment of several species where cottonwoods cannot

Species and Ecotype Selection

- Assess nearby proper functioning condition (PFC) riparian areas
- Use local populations of common riparian species from the area
- If not available, purchase plants considering their origin:
  - Eco-region
  - Elevation
  - Environment (montane, desertic, floodplain, arroyo, closed basin-playa)
  - Soil moisture and water table depth
  - Soil texture and salinity

Soil Salinity Tolerance of Common Riparian Woody Species in Colorado

Table 4-1. Soil salinity tolerance of typical woody plants in the Rio Grande Bosque. Information compiled from Scianna 2003, Miyomoto et al 2004, and CSU 2009

Common Name	Scientific Name	Salinity tolerance (dS/m)	Native Status
Fourwing saltbush	*Atriplex canescens*	60	Native
Saltcedar	*Tamarix ramosissima*	10	non-native
Silver buffaloberry	*Shepherdia argentea*	8	Native
Russian olive	*Elaeagnus angustifolium*	8	non-native
Tree of heaven	*Ailanthus altissima*	8	non-native
Honeylocust	*Gleditsia triacanthos*	6-8	Native/non-native
Wolfberry	*Lycium torreyi*	6-8	Native
Black locust	*Robinia pseudoacacia*	6-8	Native/non-native
Skunkbush sumac	*Rhus trilobata*	6-8	Native
New Mexico olive	*Forestiera neomexicana*	6	Native
Baccharis	*Baccharis salicifolia*	6	Native
Rubber rabbitbrush	*Ericameria nauseosa*	6	Native
Siberian elm	*Ulmus pumila*	6	non-native
Big sagebrush	*Artemisia tridentata*	6	Native
Plains cottonwood	*Populus deltoides*	4	Native
Goodings willow	*Salix gooddingii*	4	Native
Northern Catalpa	*Catalpa speciosa*	4	Native/non-native
Coyote willow	*Salix exigua*	4	Native
Golden currant	*Ribes aureum*	4	Native
Wood's rose	*Rosa woodsii*	4	Native

Source: Scanna 2003, Miyomoto et al 2004 and CSU 2009

Traditional Transplants

New Mexico olive grown in 14-inch treepots (2:1 shoot-to-root ratio)

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U.S. Army C

Y--Middle Rio Grande (MRG) Restoration Project, Bernalillo and Sandoval Counties, New Mexico

Solicitation Number: W912PP11R0007
Agency: Department of the Army
Office: U.S. Army Corps of Engineers
Location: USACE District, Albuquerque

3.8.2.1 Watering Plant Material

All planted shrubs (willow baccharis, New Mexico olive, golden currant, sumac, silver buffaloberry, and false indigo bush) shall be watered as follows:

Water for November Planting:
TOTAL OF 18 WATER APPLICATIONS. Watering shall be conducted by using a steel rod hose that can be pushed down into the soil to the level of the root system. Water should then be injected (at a slow rate so that soil or root disturbance does not occur) into the root zone of the plant. The volume of water applied to individual plants at each watering period will be 2-3 gallons. The need for some flexibility in the watering schedule is anticipated, depending upon site conditions (soil texture, depth to groundwater) and seasonal climatic factors (snowmelt runoff volume, precipitation, temperatures). However, the contractor shall assume that the watering schedule listed below will be followed unless advised otherwise by the COTR:

- Immediately after installation (1 watering)
- 1 x per month December through end of March (4 waterings)
- 2 x per month April through end of June (6 waterings)
- 1 x per month July through end of November (5 waterings)
- 1 x per every 6 weeks December through March (3 waterings)

‘Longstem’ Transplants Grown in Treepots and Tallpots (2 – 4 year Stock)

New Mexico olive grown in 2x2 x 14-inch treebands (7:1 shoot-to-root ratio)

New Mexico olive grown in 14-inch treepots (7:1 shoot-to-root ratio)

Skunkbush sumac grown in 30-inch tallpots (3:1 shoot-to-root ratio).

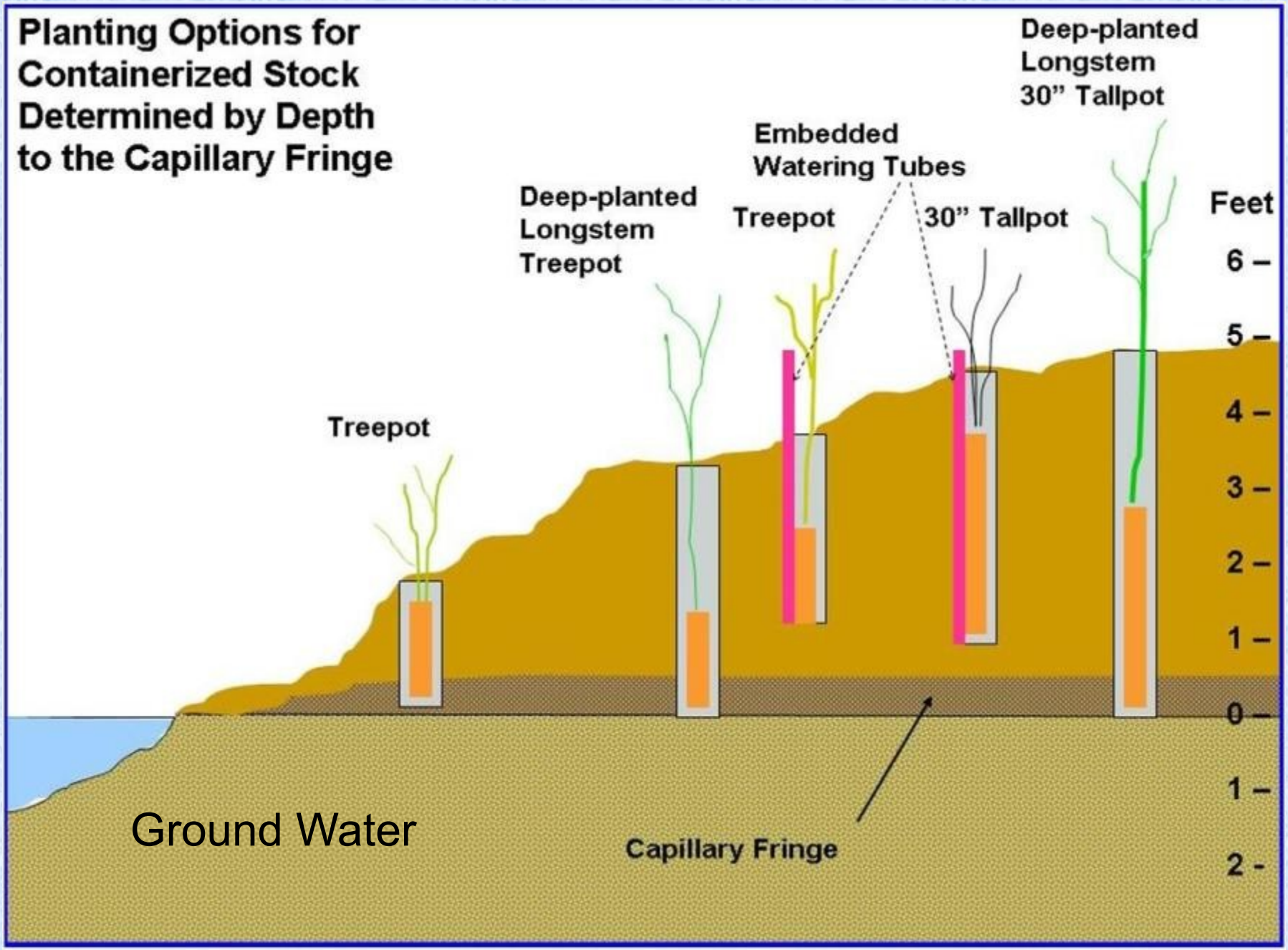
Some Longstem Shrubs Available at the LLPMC

Baccharis emoryii

Forestiera pubescens

Amorpha fruiticosa

Populus deltoides


Planting Options for Containerized Stock Determined by Depth to the Capillary Fringe
Deep-planted Longstem 30" Tallpot
Embedded Watering Tubes
Deep-planted Longstem Treepot
Treepot
30" Tallpot
Feet
6
5
4
3
2
1
0
1
2
Treepot
Ground Water
Capillary Fringe

Best Time to Plant ‘Longstem’ Transplants

~~November~~ – March?

September

Some Planting Equipment

(Google: Soil Power Auger = 1,640,000 results)

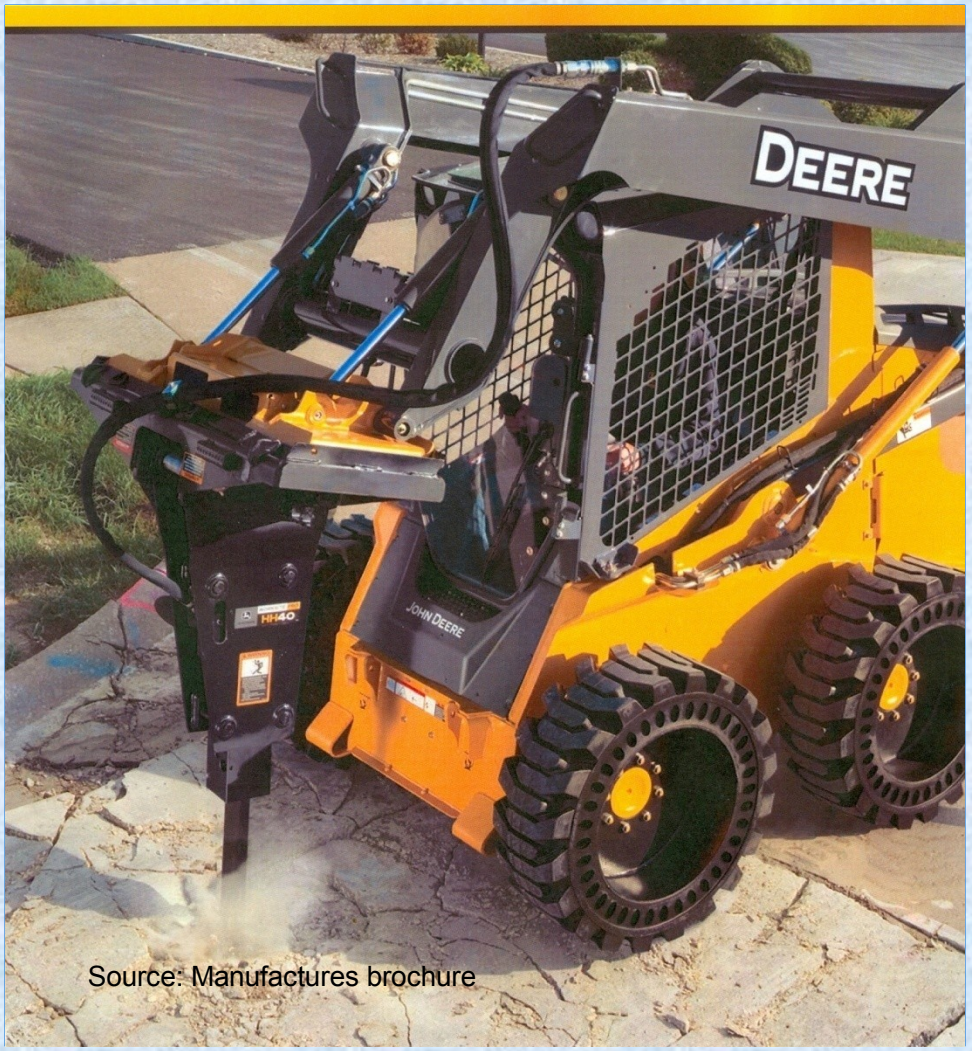
Farm tractor (65hp) and Auger

Stinger bar attached to an excavator.

® Bobcat is a registered trademark of the Bobcat Company – a unit of Ingersoll-Rand

New Equipment for Loose Sand, Gravel, and Cobble

Hydraulic compactor with stinger (3.5-inch diameter) attached to the loader of a 65-hp farm tractor



Source: Manufactures brochure

Hydraulic hammer with chisel mounted on a skid tractor

Burying the Root Crowns of Tallpot Transplants by Planting in Deep Holes to Reach Capillary Water

Annual Precipitation = 7.5 inch

Funded by Bureau of Reclamation


Same Site by the 4th Growing Season
15 acre site

Burying the Root Crowns of Treepot Transplants by Planting in Deep Holes to Reach Capillary Water

On the Rio Grande in Belen, New Mexico (Feb. 2006)

Average Annual Precipitation 7.5 inches

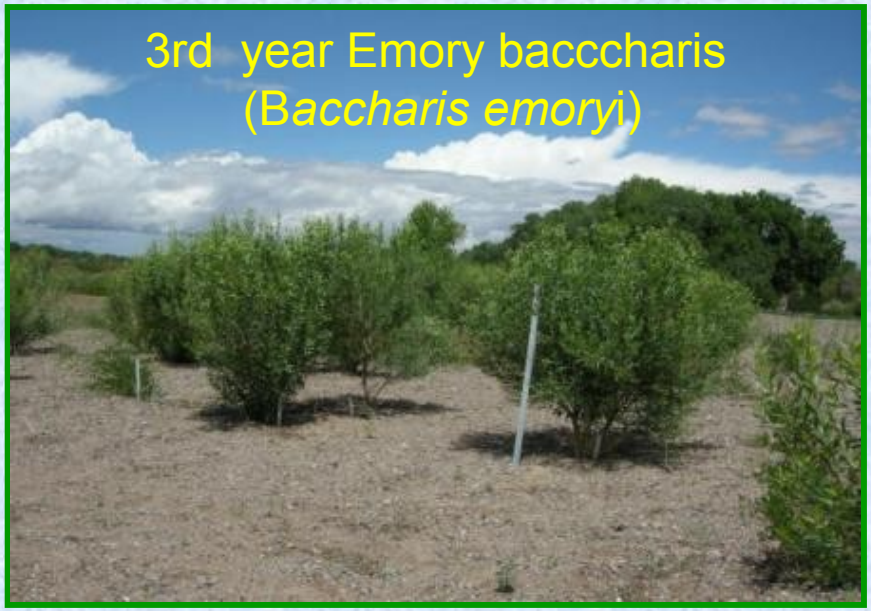
Same Location 2008
3rd growing season

Funded by Valencia SWCD


Same Location After 5 Years
17 acre site

Established Longstem Transplants of Various Shrub Species

Established Longstem Transplants, Continued



Successfully Deep-Planted Shrub Species

Golden currant	*Ribes aureum*
Stretchberry	*Forestiera pubescens*
Netleaf hackberry	*Celtis reticulata*
Boxelder	*Acer negundo*
Skunkbush sumac	*Rhus trilobata*
Silver buffaloberry	*Shepardia argentea*
Wolfberry	*Lycium torreyi*
False indigo	*Amorpha fruiticosa*
Screwbean mesquite	*Prosopis pubescens*
Emory baccharis	*Baccharis emoryii)*
Mountain snowberry	Symphoricarpos oreophilus
Rio Grande cottonwood	*Populus deltoides*
Sandbar (coyote) willow	*Salix exigua*

Adventitious Root Growth on the Main Stem of Buried Plants

Skunkbush sumac after one growing season.

Emory baccharis after one growing season.

False indigo after two growing seasons.

Adventitious Root Growth, Continued

Irrigation of Shrubs During Drought

Shrubs are irrigated monthly if ground capillary water becomes absent

70 to 97 percent

- Sample size of more than 7,000 during a 8-year period

Failures commonly caused by planting:

- *Too shallow (the rootball is not in contact with capillary water)*
- *Too deep (entire rootball is emerged in ground water longer than 40 days)*
- *Into soil salinity above the shrub or tree species tolerance*

COST COMPARISON
Field Planting Traditional Transplants versus 'Longstem' Transplants

Traditional Transplant (2:1 shoot-to-root ratio)
(18 irrigations x $2.00 per irrigation) + $6.00 for a one-gallon traditional 'treepot' + $6.00 for installation = **$48.00/plant**

Or **$48,000 for 1,000** plants installed

'Longstem' Transplant (7:1 shoot-to-root ratio)
$15.00 for a one-gallon 'treepot' 'longstem +
$10.00 for installation = **$25.00/plant**

Or **$25,000 for 1,000** plants installed

Monitor Plantings
Other Hazards That May Impact Survival

Cottonwood leaf beetle
(*Chrysomela scripta* fabricius)

Removal of tree guards

Other Hazards, Continued

Long-term inundation (more than 40 days).

Annual and perennial weed control.

Other Hazards, Continued

Fire

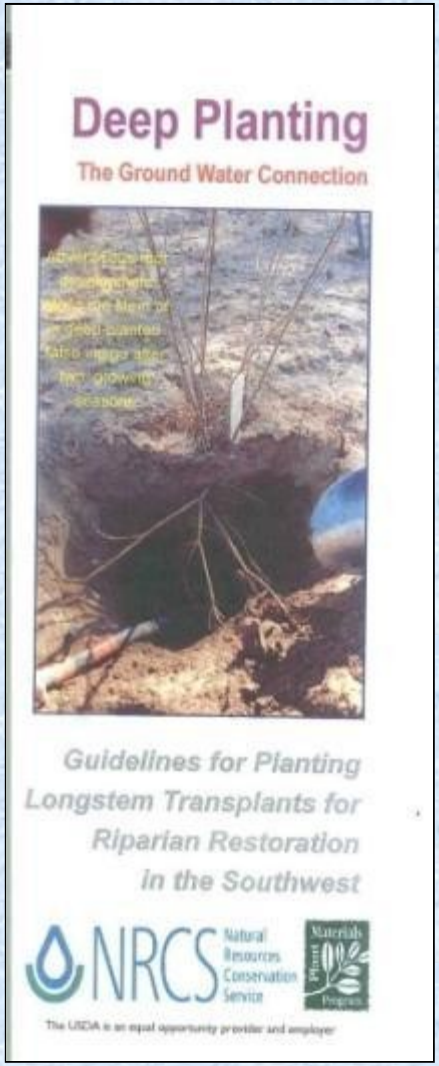
Livestock browsing and trampling

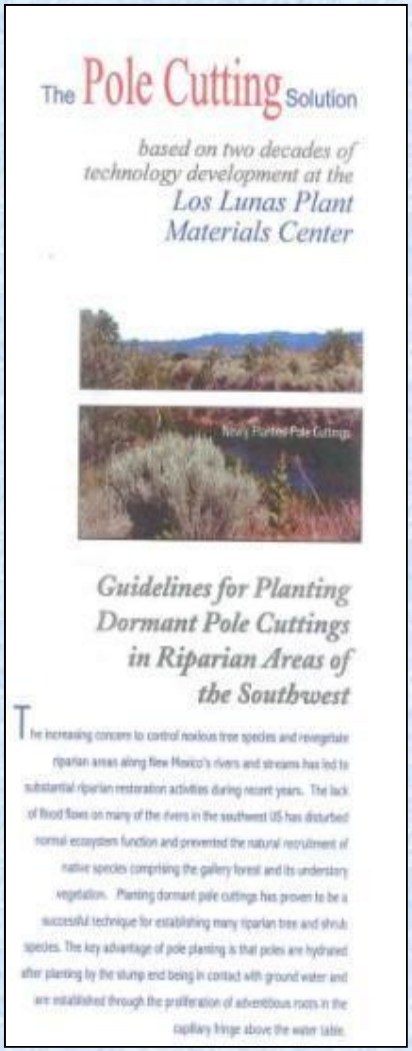
Improper backfilling

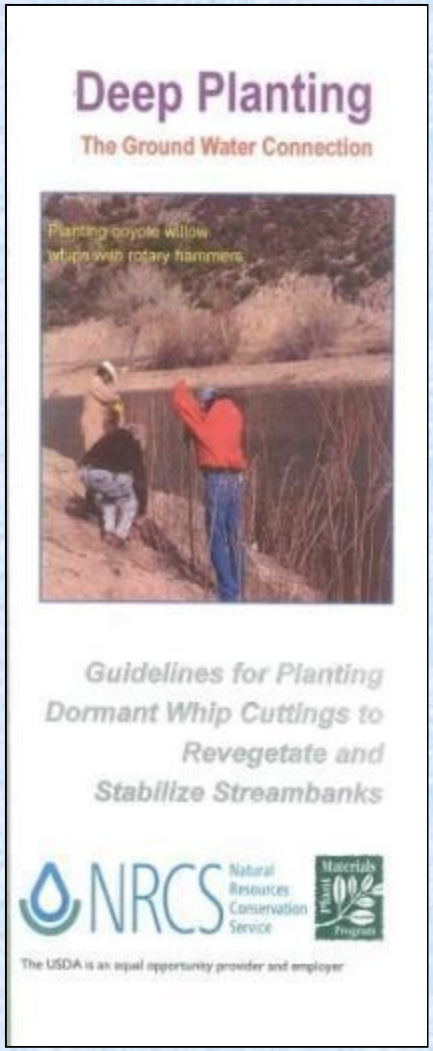
Wildlife browsing

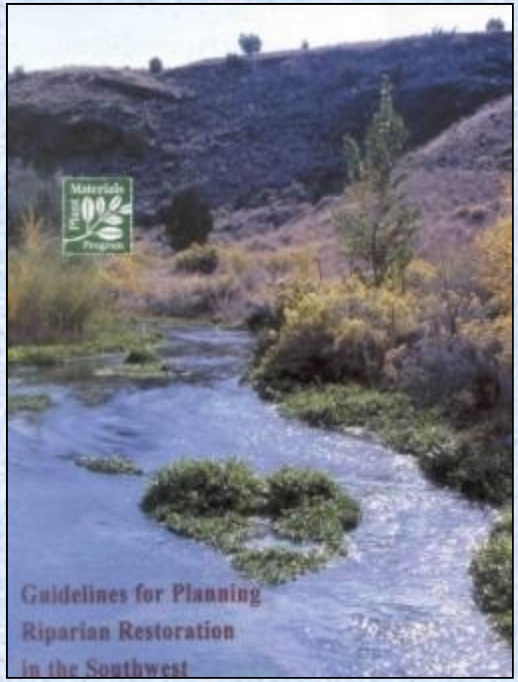
Available Planting Guides

www.nm.nrcs.usda.gov/plants

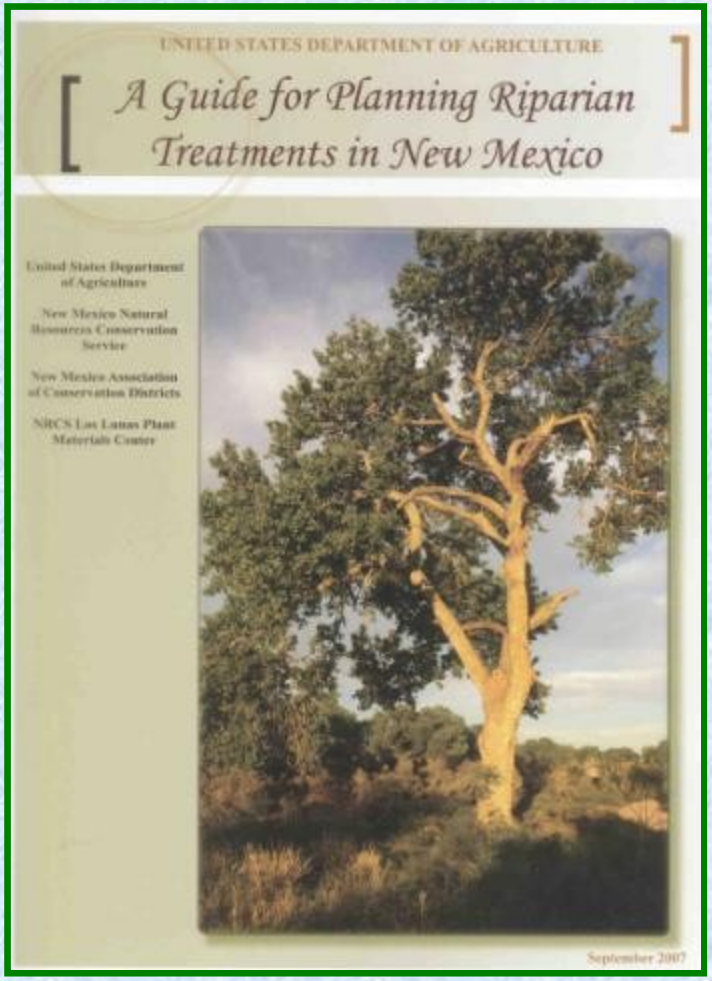








www.nm.nrcs.usda.gov/technical/technotes/bio/riparian.pdf



- Step-by-step guide for obtaining resource information on the riparian site
- An assessment tool to determine the condition of a riparian site
- Treatment considerations and references 40 websites where you can download free“state-of-the-art” New Mexico NRCS endorsed methodologies to improve condition

Thank You

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The Natural Resources Conservation Service provides leadership in a partnership effort to help people conserve, maintain, and improve our natural resources and environment.