



Year 2000

Progress Report of Activities

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Los Lunas, New Mexico Plant Materials Center

1036 Miller Street SW, Los Lunas, NM 87031 Tel: (505) 865-4684, FAX (505) 865-5163, Web Site: Plant-Materials.nrcs.usda.gov

Who We Are

The Los Lunas Plant Material Center (LLPMC) is one of 26 Plant Material Centers operated by the USDA Natural Resources Conservation Service (NRCS). Areas served by the LLPMC include New Mexico, Arizona, Colorado, and Utah. The LLPMC is located twenty-five miles south of Albuquerque, New Mexico at Los Lunas, New Mexico, and it is operated in conjunction with the New Mexico State University Agricultural Science Center. The facility is located in the Middle Rio Grande Valley and includes 200 acres of irrigated land.



Plant Materials Center at Los Lunas, New Mexico

What We Do

It is our mission to develop, test and transfer effective, state-of-the-art plant science technology to meet customer and resource needs. The LLPMC targets the following major land resource areas (Ecozones):

- New Mexico and Arizona plateaus and mesas
- New Mexico and Arizona mountains
- San Juan River Valley plateaus and mesas
- Southern desert basin, plains and mountains
- Southern Rock Mountains
- High intermountain valleys
- Pecos–Canadian plains and valleys
- Southern high plains

The LLPMC emphasizes using native plants to solve conservation problems. Environmental conditions including low precipitation, high intensity rainfall, wind, topography, and varied land uses combine to produce a variety of problems needing plant material solutions.

The LLPMC collects superior adapted plants for testing, selecting, and releasing to commercial growers along with production and management technology. Additionally, plant establishment technologies are developed or further refined that require minimal or no irrigation in the arid southwest. The following major objectives are addressed:

- Rangeland Erosion Control
- Cropland Erosion Control
- Water Quality maintenance and Improvement
- Wildlife Habitat Improvement

The articles on the following pages provide a brief summary of Year 2000 accomplishments. For a complete account of all activities, request the Year 2000 Technical Report.

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USDA-NRCS National Goal

A national goal of the USDA NRCS is to restore and enhance wetland ecosystems and fish and wildlife habitat and improve the environmental quality of both rural and urban landscapes. To assist in this effort, the Los Lunas Plant Materials Center (LLPMC) makes available 100 riparian plant material units each year upon request to any NRCS Field Office that would like to do a demonstration riparian planting (such as stream bank stabilization planting) in their district. In general riparian plantings provide a buffer improving water quality, reducing the likelihood of downstream flooding, improving wildlife habitat, shading streams and lakes to reduce water temperatures for fish habitat, and reducing atmospheric carbon dioxide by storing carbon in woody stems, branches and roots.



NRCS Chama Field Office picking up pole cuttings of various species for planting

During the past 15 years, the LLPMC has been testing riparian trees and shrubs for their ability to root from dormant pole cuttings (a rootless stem 10- to 15-feet in length). Through this testing process, we have found that most common riparian woody shrubs in the Middle Rio Grande Valley can be established from vigorous rootless stem cuttings. These stems are planted down to the water table where they grow roots and become established without irrigation. Without irrigation, containerized woody transplants typically die before they have a chance to establish. This is because most of the LLPMC's service areas receive less than 15 inches of moisture annually. Irrigation is expensive and generally is not practical in wild land plantings. The LLPMC has approximately 20 acres of stem cutting riparian plant materials in production that are harvested annually for distribution purposes. We also have encouraged so far, one commercial

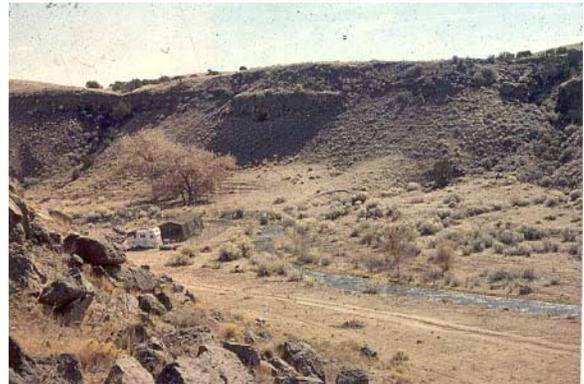
producer who sells rootless stem cuttings of several different species.

In the year 2000, the USDA-NRCS New Mexico Field Offices involved with the LLPMC in riparian plantings include:

- Alamogordo
- Espanola
- Grants
- Carlsbad
- Los Lunas
- Roy
- Chama
- Las Cruces
- Socorro
- Datil
- Mora
- Taos

Other organizations that received riparian plant materials include:

- Army Corps Engineers
- Bosque del Apache Wildlife Refuge
- Bureau of Indian National Affairs
- Bureau of Land Management
- Bureau of Reclamation
- City of Albuquerque Open Space
- Common Ground Earthworks Institute
- NM State Land Office
- Rio Grande Nature Center State Park
- San Juan Pueblo
- US Fish and Wildlife Service



Rio Santa Fe at Cochiti Pueblo, New Mexico Before Treatment (1991)



Same Location on the Rio Santa Fe at Cochiti Pueblo 7 Years After Planting Pole Cuttings

Assistance: Conservation Concerns

The Los Lunas Plant Materials Center (LLPMC) has worked directly with field office conservationists and conservation district members to provide assistance with conservation concerns:

- Wind erosion
- Water erosion
- Increasing available forage on rangeland and/or cropland

Solutions to the concerns have included field windstrips, erosion control, forage production studies, and range seeding demonstrations. Providing assistance for these concerns allows the LLPMC opportunities to test new plant materials and to demonstrate new planting techniques.

Wind erosion is severe in many areas of New Mexico, and damage to seedlings is typical. To help a cooperater near Columbus, New Mexico reduce wind erosion damage, the LLPMC provided the cooperater with seedling transplants of an experimental variety of native grass (Giant Sacaton). We planted them on irrigated cropland, forming a 3000-foot field windstrip. This type of planting is unique because it has underground drip irrigation that supplies water to the plants. If this variety of grass continues to show promise in field plantings, it will be released in the future.



Field Windstrip of Giant Sacaton (October 2000)

Water erosion is also a serious concern in the LLPMC service area. A rancher near House, New Mexico requested assistance from the local NRCS Field Office, and he was referred to the LLPMC. The rancher was experiencing severe water erosion from an arroyo in one his pastures. The result was a cutbank in the arroyo approximately 16-feet high and 800-feet long.

To help solve the water erosion problem, the LLPMC supplied vegetative material to the rancher

along with the equipment to install the materials. The vegetative materials were grown and harvested at the LLPMC and consisted of cottonwood and willow poles, and associated species. These poles (unrooted sapling trees, 12- to 15-feet) were planted by the NRCS, district and local cooperators during a hands-on workshop hosted by the LLPMC. These plant materials were installed to the water table level for rooting, and once they become established, they should provide the protection needed to reduce the water erosion of the cutbank by slowing down the water flow. During follow-up visits to the ranch, we observed that 60% of the planted material is surviving and withstanding heavy flows in the drain from storms in the area.



Installing cottonwood and willow poles for water erosion control during a hands-on workshop hosted by the LLPMC (February 2000)

Rangeland is a primary land resource in the LLPMC service area, and forage production by native rangeland species is crucial for landowners to maintain their livelihood. The NRCS Field Office in Datil, New Mexico requested assistance from the LLPMC to establish rangeland species. To help identify rangeland species and varieties that can increase range productivity, the Sam Ray Ranch (near Quemado, NM) agreed to provide the land needed to establish a demonstration area.

The ranch site is typical of the area, having low production on most of its pastures. The LLPMC provided seed of fourteen different types of native rangeland species and all the necessary equipment (tractor, disc and drill) to install the seed in the demonstration area.

In August of 1999, we drilled the seed into a one-acre plot. Planting at this allows the plants to become established before a killing frost arrives. A

follow-up visit to the site late in the season saw fair to good germination of the plot, but limited rainfall may have prevented the development of a strong root system that the plants will need for the winter.



Quemado Demonstration Area (July 1999)

A second project involved the New Mexico State Agronomist and the NRCS Silver City Field Office response to a request from a local cooperater to determine if the annual grazing forage being used in the local area was the best forage available. Typically the annual grazing forage used in that area (and in many parts of New Mexico) is triticale. Triticale is a cross between wheat and rye and is planted in the fall. It is harvested as a forage crop, and it is either harvested using forage harvesting equipment, such as swathers, balers and forage choppers for use in silage, or by grazing, using livestock. The triticale currently being used there is considered seed-type forage, and the State Agronomist was aware that a forage type of triticale is now available. The landowner agreed to establish a field of the forage type triticale using his growing and grazing regime. The forage triticale will be evaluated against the present seed type.

The LLPMC helped to establish the triticale forage evaluation planting in Silver City, New Mexico. We acquired seed from seed growers in Washington State and Texas. The Texas seed growers forage triticale is in the form of a mix, and contains wheat and oats. Using his own equipment, the landowner installed the seed. The seed will receive the same treatment as the other fields of triticale.

To evaluate the planting, protected plots in the field will be clipped and will coincide with the grazing schedule being used by the landowner. These clippings along, with visual observations of the planting, should provide enough data to determine if

the forage triticale has the potential for providing more forage per acre.



Triticale Evaluation Planting (October 2000)

Restoring High-Elevation Mined Land

There is a significant need for high-elevation revegetation in the southwest, particularly since the recent spring and summer wild fires in the montane forest ecosystems (served by the LLPMC). A recommended seed mix for the rehabilitation of the recent fires at Los Alamos, New Mexico (Cerro Grande) was based on research conducted by the Molycorp Mine. Because the LLPMC's current federal budget is very limited, revegetation projects for high-elevation areas (greater than 8,000 ft.) is considered to be a low priority.

Since 1992, the LLPMC has had a cooperative agreement with the Molycorp Mine at Questa, NM. The LLPMC evaluates plant materials and establishes technologies for revegetating mine overburden piles and tailings disposal areas. From 1965 to 1983, an open-pit mine was in operation at this site that produced over 300 million tons of overburden. The overburden piles were placed on the walls of the Red River Canyon at elevations from 8,000 to 10,000 feet, resulting in very steep overburden slopes. Overburden consists of neutral rock and acid-generating volcanic rock that was mixed during pile construction. This resulted in considerable variability in chemical constituents detrimental to plant growth. The vegetation on undisturbed land surrounding the mine consists of ponderosa pine and mixed conifer forests, as well as mountain shrub communities.

The goal of PMC activities is to determine planting methods and plant species and ecotypes suitable for direct revegetation of the overburden without soil coverings or amendments. The use of ecotypes of

native shrubs and trees from the mine vicinity has been emphasized. We have also investigated the role of fertilization and the importance of container size in survival and growth rate.

The uptake of molybdenum and copper by native grasses, forbs, and shrubs growing in molybdenum tailings and native soils was assessed in an experiment to determine whether animals grazing or browsing on revegetated tailings areas would be at risk of molybdenum toxicity (molybdenosis). The results showed that the overall molybdenum levels and copper to molybdenum ratios do not pose any substantial risk to wildlife. Large differences in molybdenum uptake among ecotypes of the same species indicate that selection or breeding of native species could result in reduced risk of toxicity.



Wild Buckwheat on Neutral Overburden

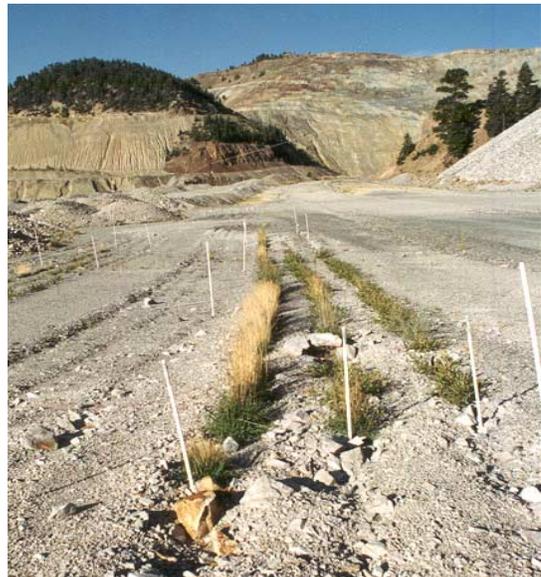
The natural invasion of narrowleaf cottonwood onto the uplands of the mine overburden piles was an unexpected observation because this species is typically a riparian species. A study was conducted to examine the propagation and field performance of a number of narrowleaf cottonwood clones collected from the mine site and vicinity. Substantial differences in survival and vigor among clones were observed one year and three years after planting into mine overburden. For most clones, application of controlled release fertilizer in the planting hole reduced survival but increased vigor. Smaller containerized stock (4 in³) had poorer survival and vigor than larger stock (10 in³).

Difficulties in establishing vegetation on acidic overburden rock compelled an experiment to determine grass species more likely to survive and grow in these overburden materials. A total of 54 grass species and ecotypes, primarily cool-season natives of the western U.S., were grown from

commercially available seed, seed from evaluations at the LLPMC, and seed collected from the vicinity of the Molycorp Mine. Molycorp ecotypes having superior performance in the range of overburden pH (2.7 to 3.7) and electroconductivity (2.0 to 2.6 dS/m) tested included:

- Mountain muhly (2 ecotypes)
- Pine dropseed
- Fescues (3 ecotypes)
- Bluegrass

A number of commercially available grass varieties had good survival and growth rates in the acid substrates: Tufted hairgrass 'Peru Creek', Arizona fescue 'Redondo', Sheep fescues 'Covar' and 'MX-86', Canada bluegrass 'Reubens', Western wheatgrasses 'Arriba', 'Barton', and 'Rosana', and Slender wheatgrass 'San Luis'.



Grass Species Trial at 9,000-Foot

Other native grass species that showed superior survival and growth in these acid rock substrates included: Canada wildrye, Timber oatgrass, Giant sacaton, Inland bluegrass, Needle and thread

The objective of experimental plantings in 1994 and 1995 was to evaluate 41 shrub species or ecotypes to determine which species exhibit superior survival and growth when planted directly into overburden without soil covers or amendments. In these experiments, an application of controlled release fertilizer in the planting hole was compared with a control receiving no fertilizer at planting. All treatments received top-dressed fertilizer in subsequent years. The planting in 1995 exhibited substantially poorer survival with the fertilizer

application than without, but this was not the case with the 1994 planting. The fertilizer application in 1995 planting may have retarded the onset of dormancy in the fall causing appreciable winter mortality. Overall, the plantings which received no initial fertilizer and were not planted in highly acidic overburden had approximately 65% overall survival rate 5 years after installation.

A number of species that would not normally be recommended for high-elevation montane revegetation showed good to excellent survival and growth rates, including Molycorp ecotypes of Apache plume, rabbitbrush, and eriogonum (wild buckwheat) as well as New Mexico olive. A number of other more traditional montane species had superior survival and growth: Molycorp ecotypes of mountain mahogany, little leaf mockorange, rock spirea, skunkbush sumac, Woods rose, cliffbush, and wild raspberry as well as generic ecotypes of New Mexico locust, serviceberry, and silver buffaloberry. Substantial differences in performance for wild rose and rabbitbrush ecotypes implied that seed source at the mine site may be an important factor in revegetation success with certain species.



Planting on Steep Slopes

In 1997, an experimental planting of seedlings comprising 54 native grass species or ecotypes was installed on very steep neutral overburden slopes at an elevation of 8500 feet. Preliminary results indicate superior performance by the following grass genera grown from Molycorp seed collections:

- Bluegrass
- Fescue
- Needlegrass
- Brome

Other species exhibiting good growth and survival rates include Arizona fescue, creeping wildrye,

Canada wildrye, Canada bluegrass, sheep fescue, slender wheatgrass, western wheatgrass, thickspike wheatgrass, streambank wheatgrass, hard fescue, sheepgrass, indian ricegrass, and junegrass.

Narrowleaf Penstemon Released

In August 2000, the Los Lunas Plant Materials Center (LLPMC) released San Juan germplasm narrowleaf penstemon (*Penstemon angustifolius*). Narrowleaf penstemon is a drought tolerant forb, found throughout the western and Great Plains states. It is adapted to sandy mesas and grasslands.

Narrowleaf penstemon is helpful in preventing wind erosion on sandy dunes, plains and grasslands where it establishes. It provides a food source to small birds and mammals and is heavily used by hummingbirds and various insects during flowering. As a drought tolerant forb that also produces beautiful flowers in early spring, it is an ideal plant for xeriscaping.



San Juan Narrowleaf Penstemon

Cane Bluestem Released

A selected release of cane bluestem (*Bothriochloa barbinodis*), referred to as the Grant germplasm cane bluestem, will be released in the year 2001. USDA-NRCS Field Office personnel originally collected the Grant germplasm in 1982 from native stands in New Mexico and Arizona.

Cane bluestem is a large robust warm-season bunch grass with plants reaching heights of 1.5 to 2 m. It appears to be remarkably drought tolerant, and it is well adapted to southwestern rangeland. It has been classified as fair-to-good forage for cattle and wildlife. Under dry land conditions, cane bluestem has produced yields of approximately 4 metric tons/ha annually. When green, the total protein of cane bluestem forage is about 10%; when dormant

forage, protein may drop to 4.5%. When grown under similar conditions, cane bluestem and switchgrass (*Panicum virgatum* L.) compared favorably. However under drought conditions, cane bluestem produced more forage than switchgrass.



Cane Bluestem

Bottlebrush Squirreltail Released

Tusas germplasm bottlebrush squirreltail (*Elymus elymoides*) will be released in 2001 as a selected class of certified seed. In 1983, USDA-NRCS Field Office personnel collected 131 accessions of bottlebrush squirreltail from native stands throughout New Mexico. Eight of these accessions were selected to form the composite known as Tusas germplasm.

Bottlebrush squirreltail is a cool-season, short-lived native perennial bunchgrass, most often characterized as an early seral species. Tusas germplasm obtains a height of approximately 15-20 inches (38-50 cm) and greens up in mid-to-late February when 'Paloma' ricegrass (*Achnatherum hymenoides*) is still dormant.



Bottlebrush Squirreltail

Bottlebrush squirreltail is one of the most fire-resistant bunchgrasses. Its fire tolerance allows it to survive sequential burns, and its self-pollinating mode of reproduction allows it to produce seed despite sparse initial populations. These qualities along with an effective seed dispersal mechanism make it well suited for seeding following wildfire or prescribed burns. It also has the potential for aiding in the reclamation of rangelands dominated by exotic annual weeds. Studies show that bottlebrush squirreltail can compete with exotic annual grasses such as medusahead wildrye (*Taeniatherum caput-medusae*) and cheatgrass (*Bromus tectorum*). The ability to germinate and produce roots at low temperatures allows bottlebrush squirreltail to establish in areas dominated by these types of grasses.

Tallpot Transplants With Hydrogel

A Technique for Revegetating in the Arid Southwest Without Intensive Irrigation

In the arid southwest, irrigation typically is required to establish trees and shrubs that are commonly used for windbreaks, wildlife plantings, and stabilization of critical sites. On remote sites, irrigation can be very expensive or very time consuming when watering individual plants. The Los Lunas Plant Materials Center (LLPMC) has been working on a planting technique that utilizes transplants grown in tallpots (containers longer than 24 inches) coupled with a single application of a cornstarch hydrogel to provide enough moisture for one year.



Native Shrub With 30-inch Rootball Grown in a Tallpot

Perforated irrigation tubes 3-inches in diameter and 40-inches in length and that hold hydrogel are placed in planting holes before backfilling.



Perforated Irrigation Tube That Holds Hydrated Cornstarch Hydrogel

These tubes allow the hydrogel to flow near the bottom of the root-ball to encourage growth of a deeper root system. The hydrogel is sold as a powder to be hydrated. Each powder granule acts as a tiny reservoir, which can absorb water at 200 times its weight. Microbial degradation of the cellulose releases free water to plants that is available through root absorption.

To test this planting system, the LLPMC grew native shrub species of local ecotypes (origins within a 200-mile radius of the planting site) in plastic pipe (30-inches tall and 4 inches in diameter). For moderate to fast growing species, it typically takes approximately 3 years to produce a mature rootball from seed in this type of container. During the Fall of 2000, we planted more than 1,500 transplants of 16 different species at three locations in north central and northwest New Mexico.



A North Central Location Planting Site Where Shrubs Grown In Tallpots Will Receive Hydrogel for Supplemental Moisture

We applied hydrogel to most plants through the irrigation tubes. To measure the effect of the hydrogel, some plants will only receive an annual application of 2.5 gallons of water, the same volume of applied hydrogel. The results will be included in the *2001 Plant Materials Progress Report of Activities*.

Seed Production At The LLPMC

The Los Lunas Plant Materials Center (LLPMC) has released 34 plant material varieties (cultivars) of 25 native plant species. Some of our best known releases include 'Hachita' blue grama, 'Niner' sideoats, 'Salado' alkali sacaton, and 'Viva' galleta. The LLPMC maintains foundation-class seed production fields of the more popular released varieties. For a fee, the PMC provides seed to commercial growers through the New Mexico Crop Improvement Association. Currently, we have 12 production fields of native grass species. We also provide seed to conservation districts, conservationists, scientists, and for demonstration and research projects.

The commercial demand for some varieties of seed far exceeds the LLPMC's ability to produce the foundation seed for it.

During the growing season, we maintain the fields for optimum seed production. Maintenance includes irrigation, fertilization, and weed control in order to produce good viable seed from the plantings. For some types of native species, irrigating may be as limited to one application (3 inches) per growing season, and typically no more than four applications. Fertilizing depends upon the type of species. For optimum seed production to occur, fertilizer applications must be adjusted to the type of species. Fertilizing obtains higher seed production levels, even in native species.



Little Bluestem Seed Production Field (September 2000)

Grass Demonstration Nurseries

The Los Lunas Plant Materials Center (LLPMC) has established nurseries of southwest-adapted released varieties of warm- and cool-season species of native grasses. These nurseries are intended to show the growth characteristics of the different varieties of grasses. The nurseries are also provided for educational purposes. A live, visual aid helps instruction by teachers, professors or other instructors. The nurseries also help to provide information about the different varieties ability to adapt to the local climate at the LLPMC. As new southwest varieties of native grasses are released, they will be added to nurseries.

National Park Service

The Los Lunas Plant Materials Center (LLPMC) has cooperative agreements with the National Park Service, and has assisted the Park Service at several of the national parks in our service area to provide plant materials of local, native ecotypes. These plant materials are used to revegetate disturbed areas (such as roadsides, trails, campgrounds, and other construction areas) to reduce the potential of water and wind erosion. The LLPMC can identify the native species from the parks and collect good quality seed or vegetative cuttings from the site.

In the current agreement, the LLPMC has agreed to produce seed or transplant material for the parks. To product transplants, the LLPMC will plant seed or vegetative cuttings in a greenhouse environment. If seed production is needed, the seedling transplants will be planted into production fields at the LLPMC, and maintained according to their adapted climate. In the year 2000, the LLPMC established 1-acre of two native species using this technique.

When harvesting the seed, some may need to be harvested by hand while others may require only the

use of mechanical equipment, such as combines. Processing seed can be a time consuming task. It can require very specialized equipment (such as gravity tables or disc separators) to extract the mature seed from the harvested materials. Cleaned seed is then stored in a climate-controlled environment until shipment to the park. In the year 2000, the LLPMC shipped 59 pounds of seed of four different types of native species to the Grand Canyon National Park.

Containerized transplants are also produced by the LLPMC for revegetation of areas on the parks. Seed is processed by the LLPMC and grown in containers in the greenhouse. The transplant material may take two to three years to reach the size needed for successful planting. Currently, we have over 8800 plants of nineteen species in production for the Grand Canyon National Park. In the year 2000, the PMC delivered 2230 containerized transplants of 15 native shrub species to the Grand Canyon National Park.

Distribution of Plant Materials In 2000

During the year 2000, the Los Lunas Plant Materials Center (LLPMC) distributed 36, 548 plant materials. Those materials consisted of containerized plants and poles.

Containerized Plant Distribution

33,776 containerized plants of the following sizes were distributed:

10 cubic inch	1 gallon treepot
16 cubic inch	2 gallon treepot
40 cubic inch	30-inch tallpot
80 cubic inch	5 gallon

- The majority of smaller containerized stock (85% of 10 cubic inch and 100% of the 16 cubic inch) was installed at the P&M and Molycorp Mines, both having longstanding agreements with the LLPMC to address revegetation technology.
- More than 2/3 of the 1-gallon treepots were distributed to National Forests and the Grand Canyon National Park.
- The 30-inch tallpots were used exclusively in demonstration plantings for riparian restoration or highway landscaping, and they were installed

by the LLPMC for the New Mexico State Highway and Transportation Department (NMSHTD).

- 845 containers of various sizes were given to NRCS Field Offices and RCD Centers to aid with their projects.
- 458 1-gallon treepots were distributed to the Bureau of Land Management (BLM)
- 365 containers of various sizes were distributed to private landowners and Earth Team projects.

Pole Distribution

2,772 poles (large dormant cuttings) of the following species and sizes were distributed:

Rio Grande Cottonwood	10 – 12 feet
Rio Grande Cottonwood	> 13 feet
Coyote Willow	8 – 10 feet
Goodding's Willow	8 – 10 feet
Gooding's Willow	10 – 12 feet

- Over half of the poles (1,497) were distributed to 10 New Mexico NRCS Field Offices.
- 300 Goodding's willow poles (10 – 12 feet) were installed by the LLPMC for the NMSHTD at Hernandez, New Mexico.
- 125 Rio Grande Cottonwoods (> 13 feet) were installed by the LLPMC for the Army Corps of Engineers at Alamosa, Colorado.

Note: Both the NMSHTD and Army Corp of Engineers installations were done for riparian restoration demonstration projects.

- The remaining poles were distributed to other state and federal agencies, Native American tribes, city parks, and non-profit organizations.

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- Bureau of Reclamation, Upper Colorado Region
- City of Albuquerque
- Department of Army, Albuquerque District, Core of Engineers
- New Mexico Environmental Department, Surface Water Quality Bureau
- New Mexico State Highway and Transportation Department
- Southern Sandoval County Arroyo Flood Control Authority, Rio Rancho
- The Pittsburg & Midway Coal Mining Company, York Canyon Mine Complex
- Unocal, Molycorp, Inc.
- USDA National Forest Service, Apache Sitgreaves National Forest
- USDA National Forest Service, Carson National Forest
- USDA National Forest Service, Cibola National Forest
- USDI, Bureau of Land Management
- USDI, Fish and Wildlife Service
- USDI, National Park Service, Grand Canyon National Park