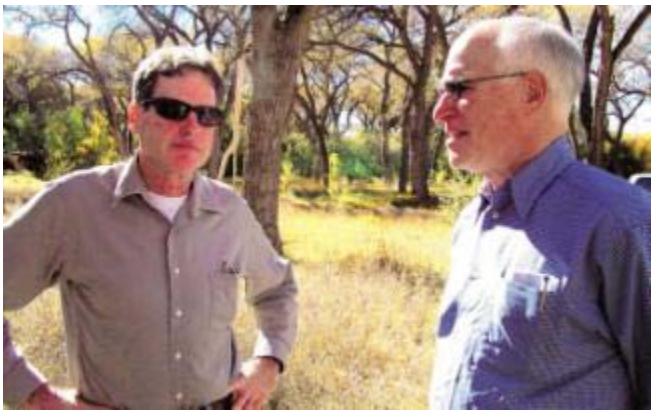
IN THIS REPORT

USDA-NRCS Undersecretary Visits the Los Lunas Plant Materials Center	2
Hydrogel Seeding Study	2
Bioenergy and Sustainable Feedstocks	3
Assisting the National Park Service	3
Assisting with Conservation Concerns	4
Big Sacaton – Biomass Bioenergy Study	4
Youth Soil and Water Conservation Awareness Days	5
Revisiting CSU-10 Indian Ricegrass for Potential Release	5
Partnership with BLM *"Seeds of Success Program"*	6
Riparian Technology Exported to Colorado	7
Pollinator Plant Evaluation	8

Undersecretary Visits the LLPMC

Harris D. Sherman, USDA-NRCS Undersecretary, visited the Los Lunas Plant Materials Center (LLPMC) in October 2010. The LLPMC staff showed him a riparian restoration project in Bosque, New Mexico that the LLPMC has been involved with for the past several years.



Gregory A. Fenchel, Manager, Los Lunas PMC (left) and Harris D. Sherman, USDA-NRCS Undersecretary, visiting a riparian restoration site in Bosque, New Mexico.

The LLPMC has been researching plant materials that are best-suited to particular environments, and they have developed the planting methods used to successfully restore these areas without using supplemental irrigation. Whether in an arid or montane environment, the plants still need enough moisture to become established. The way to provide that moisture is to connect the plant materials to the groundwater. You can get more information on restoring riparian areas and using long-stem transplants and tallpots from the USDA-NRCS Plant Materials Program website.

Dr. David Dreesen demonstrates long-stem transplants with root systems that will be planted to the depth of the water table.

Hydrogel Seeding Study

The Los Lunas Plant Materials Center is testing 'Soil Moist' (a starch polymer) in a seeding study funded by the Bureau of Reclamation's Albuquerque Area Office to determine if this polymer treatment will benefit seedling establishment.

Extensive research has been conducted as early as the 1950's exploring the use of organic polymers for soil property amendments (Azzam, 1980) such as water retention. These compounds are estimated to hold 40 – 800 times their own weight in water. With precise placement of the polymer in the seed furrow, surface moisture retention may be enhanced enough to allow for seedling establishment during the arid periods between rainfall events. In theory, when precipitation hydrates the dry powder polymer material, the seed lying in contact would be able use this moisture. The polymer, Celanese, at the rate of 1/100 in potting soil was able to reduce water use and irrigation frequency of Zinnia plants (Fruta and Autio, 1988). The dry powder of a polyacrylamide has been applied at the rate of 4 lbs. per acre on irrigated cantaloupe fields in Colorado to improve water use efficiency (James Valliant [Colorado State University], personal communication, 2009). The LLPMC used a corn starch polymer hydrogel "Soil Moist" in a replicated 60 entry plant materials study in Estancia, New Mexico at the rate of 10 lbs per acre without a significant effect on seedling survival in 2009. However, seedlings seemed to respond favorably in both growth and establishment to the hydrogel.

Soil moisture is the most critical factor that limits seedling establishment in the arid southwest. Even seedlings of drought tolerant species require moist soil conditions during the three- to four-week period of emergence to establishment. Often if a seedling can establish roots below a 4-inch depth (the zone below rapid soil surface evaporation), the seedling can be considered established. A standard practice in the Southwest is to apply a surface straw-mulching treatment that provides for a moist/cool soil surface microclimate. This reduces soil moisture evaporation, seedling evapotransporation and reduces surface erosion by enhancing water infiltration. However, purchasing the mulch materials and applying the mulch may triple the cost of a seeding when applied at the recommended rate of two tons per acre (the recommended rate required for a single layer of straw to cover the soil surface). Because many of the polymer moisture retention products sell for less than

$7.00 per dry pound, the potential exists to significantly reduce dryland seeding costs with this substitution for hay mulch.

Replicated studies were installed above the active flood plain on the Rio Grande in San Acacia, New Mexico and Bernalillo, New Mexico. These areas receive less than 10 inches of annual precipitation; the planting was completed in the fall of 2010. The herbicides 2,4-D and glyphosate were mixed and applied at a 2% solution rate to control weeds (for example, bindweed, Russian thistle, and kochia) prior to seeding at the San Acacia site. The experimental design at each location was a replicated randomized complete block. The hydrogel was applied as a granular during seeding using the grain box of a No-Till seed drill and dropped through the separating disc with the seed during planting; rates on a per acre basis were 10 lbs, 20 lbs and 30 lbs which doubled and tripled the treatment rates of the 2009 Hydrogel Study in Estancia, New Mexico. Native grass and forb seed was sown through the legume box at the rate of 80 pls per square ft. of a mix that is similar to the plant species and composition of what currently exist on nearby less disturbed sites with Indian ricegrass as the primary species.

By December 2010, there had been no emergence on any of the treatments, possibly due to the drier than normal fall season during this FY-2011 La Nina year in New Mexico.

Sowing native grass seed with a dry granular cornstarch hydrogel on the Rio Grande in Bernalillo, New Mexico – September 2010

Bioenergy and Sustainable Feedstocks

Danny Goodson, Agronomist at the LLPMC, participated in the Soil and Water Conservation Societies workshop entitled *Sustainable Feedstocks for Advanced Biofuels* during September 28-30, 2010. The workshop was devoted to gaining insight from all regions of the United States as to the impacts of meeting the mandates set forth in the Renewable Fuels Standards (RFS2) of the Energy Independence and Security Act of 2007 (EISA). The RFS2 will have a dramatic effect on Agriculture in the United States, and the workshop's participants were given the assignment of outlining what those effects might be in the parts of the country where they work and live. The LLPMC along with several other PMC's are working on various plant species and on new technologies that may play a key role in meeting the RFS2 mandate.

Possible new plant species for bioenergy – sand bluestem

Assisting the National Park Service

In 2010, the LLPMC had nine native grass species in production on a total of 8.71 acres. The seed production fields for the NPS were harvested and seed processing is underway. In 2010, 214.36 lbs. of pure live seed and 7,207 transplants were shipped to the NPS from the LLPMC.

Carlsbad Caverns National Park blue grama field

Pipe Springs National Monument Indian ricegrass field

Assisting with Conservation Concerns

"Plant Materials Release of Big Sacaton"

The LLPMC has been assisting the Natural Resources Conservation Services (NRCS) Field Offices, Resource Conservation and Development Offices, Soil and Water Conservation Districts and other Federal Agencies in finding solutions for many soil and water conservation concerns, including wind and water erosion issues in the LLPMC service area. To address these concerns the LLPMC started testing and evaluating the usefulness of the native warm-season grass species, big sacaton (*Sporobolus wrightii*) in the early 1980's. The species was initially identified as having the potential for use as a warm-season irrigated pasture grass, and early evaluations were made to address that purpose.

In the late 1990's, the LLPMC changed the direction of the evaluation of big sacaton. The LLPMC recognized that big sacaton had a great potential for protecting many land types from wind and water erosion. Big sacaton is a large, native warm-season perennial bunchgrass, and its growth habit makes it an ideal candidate for this use. The LLPMC began to evaluate these attributes in 1999 by establishing a big sacaton windstrip on farmland near Columbus, New Mexico. Since 1999 the LLPMC has established 18 windbreak/windstrip plantings at 13 locations in New Mexico and Arizona to continue the evaluation process of the big sacaton.

In 2011 the LLPMC will be releasing our accession of big sacaton as a NRCS Plant Materials Cultivar. The plant material release should be finalized in 2011 and the LLPMC will have seed available to any commercial growers interested in production of the new release.

2010 Big Sacaton seed production field

Big Sacaton – Biomass Bioenergy Study

In 2010, the LLPMC conducted an advanced evaluation study of big sacaton (*Sporobolus wrightii*) for use as a biomass species. The use of a native grass as a source of bioenergy has been underway even before it was mentioned in a state of the union speech by the President. The native grass mentioned was switchgrass (*Panicum virgatum*) and since then it has become a standard to use when evaluating other plant species. The LLPMC has been evaluating big sacaton for long period of time and it was apparent that this species could be valuable in bioenergy production. In 2009, the LLPMC had established a seed production field planting of big sacaton and in 2010 the planting was used to provide a source for a forage clipping study. Forage was clipped from random plots in the production field from April to September of 2010. The initial forage amounts harvested from the big sacaton look very promising. The biomass study will be continued in 2011 and results will help to determine if big sacaton can be added to the list of native plants used for bioenergy production.

2010 Big sacaton biomass forage clipping study

Youth Soil and Water Conservation Awareness Days

On April 28, 2010, Danny Goodson, Agronomist at the LLPMC, participated in 2010 the Grants Ag Day in Grants, New Mexico. The event is used to provide a venue to present to school children the many facets of Agriculture and how it affects their everyday lives. Danny presented to the elementary school age children from schools in the Grants School District the role of plant materials in agriculture. An exhibit with photographs and live plants from the LLPMC were on display in order to present the role of the LLPMC in providing agriculture with solutions to many conservation issues.

On May 5-6, 2010, Danny Goodson attended the McKinley County Youth Water Awareness Day in Gallup, New Mexico. Danny was invited to present water conservation techniques and technologies through the use of native plants. Children from elementary through high school age attended the two-day event. Danny used an exhibit with photographs of water conservation plantings and technologies along with live native plants to emphasize the need for using native species in reducing the use of water in our daily lives.

Revisiting CSU-10 Indian Ricegrass for Potential Release

There is always continued interest by our seed producers for improvement in seed production in new released plant materials. CSU-10 Indian ricegrass is an experimental synthetic developed by Dr. Robin Cuany, Gary Thor, and Robert Zematra of Colorado State University from 1978 - 1983. CSU-10 is composed of 10 different elite plants from experimental populations originally collected from Colorado, Montana, New Mexico, and North Dakota. An elite 'Paloma' Indian ricegrass plant was also included in this mix. Individual plants were subdivided into eight clonal pieces and planted at gardens at Fort Collins and Meeker, Colorado, and evaluated for seed yield. Thirty-four of the highest yielding plants were selected and evaluated in row-planted seed test in the Piceance Basin of Colorado. These progeny tests were planted in 1979, 1980, 1982 and 1983. As a result, the ten best plants were selected from among the 34 selected parent plants, and each of these ten plants were subdivided into eight clonal pieces for establishment of the breeders block in Fort Collins, Colorado. Bulk seed from the breeder's block (in approximately equal quantities from each of the ten clones) was provided to the LLPMC in 1985, 1986, and 1988 for the purpose of testing and establishing a foundation seed field.

A replicated study evaluating the seed production of both CSU-10 Indian ricegrass and the LLPMC released cultivar, 'Paloma' Indian ricegrass was planted at the LLPMC in the fall of 2009.

The 'Paloma' Indian ricegrass was originally collected in July of 1957 from a population located west of Pueblo, Colorado at an elevation of 5,000 feet and having loam-textured soil. 'Paloma' was selected from a 22-entry dryland variety trial conducted in the late 1960's in Las Cruces, New Mexico and Tucson, Arizona, and it included Indian ricegrass populations from Colorado, New Mexico, and Arizona. 'Paloma' Indian ricegrass was selected for superior seed and forage yield compared to the other populations tested, and it was subsequently released to growers for commercial production in 1974. 'Paloma' Indian ricegrass is still a very popular variety and commonly is used today in seed mixtures for reclamation throughout the Southwest.

CSU-10 and 'Paloma' Indian ricegrass transplants were installed on two, 200- foot rows that were spaced on 38-inch centers. The plots consisted of ten plants spaced on 1-foot centers and replicated 16 times. The experimental design was completely random. In July 2010, the seed from individual plots was hand-harvested from the plants and kept separate. In December 2010, the seed was cleaned using a Clipper Office Seed Cleaner and weighed.

CSU-10 and 'Paloma' Indian ricegrass study (June 2010)

Plant survival for 'Paloma' and CSU-10 Indian ricegrass averaged 92.5 and 93.1 percent respectively. Seed weight per plant for Paloma and CSU-10 averaged 3.4 and 3.9 grams respectively which was not significantly different (.05) even though CSU-10

had an increase in production of 13 percent. This study will continue for at least one additional year. As the plants mature, if the results show that seed production of CSU-10 is significantly greater than 'Paloma', then CSU-10 Indian ricegrass will be released for commercial production.

CSU-10 and 'Paloma' Indian ricegerass study after hand-harvesting seed (June 2010)

Partnership with BLM

"Seeds of Success Program"

A new project was initiated between the Los Lunas Plant Materials Center (LLPMC) and the Bureau of Land Management (BLM) to participate in the "Seeds of Success" program which is an ongoing effort to improve the health and productivity of the public lands, including those recently affected by wildfire. This is a native seed collection effort for eventual establishment of commercial seed production fields, which germplasm will be used for long-term conservation and immediate restoration needs on public lands. Native seed collectors from this program gather between 400 and 600 collections annually.

Our assistance to the "Seeds of Success" program included supervising two of their interns who were collecting seed in the Southern portion of the Colorado Plateau during the spring and summer of 2010. The LLPMC provided a home base for their field collections; the LLPMC staff provided training when they experienced difficulties. Their training also included two separate weeks of a LLPMC person assisting them off-center in their field collection work. They made more than 40 seed collections during 2010.

Other assistance included developing a presentation on *Planting Methods for the Colorado Plateau and Other Arid Areas*, and it was presented at two separate conferences: one at the "Seeds of Success Annual Meeting" in Salt Lake City, Utah (February 2010), and the other one at the "10th Biennial Conference Integrating Science & Management" on the Colorado Plateau in Flagstaff, Arizona (October 2009). Also, a paper with the same title was written and included in the *Biennial Conference of Research on the Colorado Plateau Proceeding Series.*

The seed received from the BLM for establishing production fields included:

- 1.9 g of *Ratibida columnifera* (prairie coneflower) (~2000 seed)
- 0.3 g of *Oenothera pallid* (primrose) (~2000 seed)
- 6.1 g of *Ipomopsis aggregata* (scarlet gilia) (~2000 seed)
- 0.6 g of *Sphaeralcea parvifolia* (scarlet globmallow) (~1000 seed).

In addition, *Rumex hymenosepalus* (wild rhubarb) was collected in May 2010 by the LLPMC and BLM in San Juan County, New Mexico. The germination of these seed was conducted as follows:

- RACO – Seed covered with 2 mm of peat/perlite mix and germinated in warm greenhouse
- RUHY – Seed covered with 4 mm of peat/perlite mix and germinated in warm greenhouse
- OEPA – Sown on surface of peat/perlite mix, moistened, and then cold stratified for six weeks at 3° C
- IPAG – Sown on surface of peat/perlite mix, moistened, and then cold stratified for six weeks at 3° C
- SPPA – Seed scarified with MAT-OSU pneumatic seed scarifier for 10 sec at 20 psi, sown on surface of peat/perlite mix, moistened, and then cold stratified for six weeks at 3° C

The RACO, IPAG, and RUHY germinated well enough to produce sufficient seedlings for field planting. The minimal amount of SPPA seed produced about 80 seedlings which were kept in containers for seed collection during the summer and fall of 2010. Sufficient seed was produced to allow a field planting to be installed in 2011. The OEPA germinated very poorly, using the same conditions we have used for successful germination of other seed lots of OEPA. A handful of seedlings survived and were planted into a raised bed, but only minimal seed was produced which will preclude a field planting in 2011. Lastly, seed of bluebunch wheatgrass *(Pseudoroegneria spicata)* and desert needlegrass *(Achnatherum speciosum)* was collected from San Juan County, in Farmington, New Mexico by the LLPMC. All species and population selection was

approved by the BLM National Program Manager, Chicago Botanical Gardens, and the BLM District Offices in Farmington and Roswell, New Mexico.

Field plantings of prairie cone flower, primrose, wild rhubarb, desert needlegrass and bluebunch wheatgrass for a total of 3.5 acres planted at the LLPMC. Plants were grown from seed and transplanted into the field. The fields were fertilized, irrigated, and weed control was applied. As the fields become mature, they will be harvested for seed. The seed will be cleaned and tested for purity and germination and provided to the BLM for future commercial production.

Wild rhubarb seed ripe and ready to be collected on BLM land near Farmington, New Mexico (June 2010)

Transplanting wild rhubarb seedlings into ½-acre seed production field at the LLPMC (September 2010)

Established BLM wild rhubarb field receiving irrigation at the LLPMC (October 2010)

Combine harvesting prairie coneflower seed at the LLPMC (January 2011)

Riparian Technology Exported to Colorado

Los Lunas Plant Materials Center partnered with the Upper Colorado Environmental Plant Center (Meeker, Colorado) and the Tamarisk Coalition in Grand Junction, Colorado to provide a *Riparian Planting Workshop* to 70 participants in December 2008 and December 2010. These workshops included two classes of 35 students each. Participants included land managers from the National Park Service, Bureau of Land Management, Forest Service, State of Colorado, City of Grand Junction, and private businesses. Staff and students from Mesa State College also attended. Participants of each class spent the morning inside receiving information and engaged in discussion on seeding arid lands and planting trees and shrubs in riparian ecosystems of arid areas without providing irrigation. The afternoon was spent drilling monitoring wells, preparing well casing from PVC pipe, and installing well casing.

Participants also planted trees and 'longstem' shrubs on the flood plain of the Colorado River using a tractor with an 8-foot auger, electric rotary hammer drills, and a portable tripod auger. Participants constructed treeguards and placed them around cottonwoods to protect them from beaver damage. Lastly, a demonstration on how to measure soil samples for Total Dissolved Solids (TDS) using an electro-conductivity meter was done. This is useful because soil salinity often limits plant species diversity in the arid southwest, with many extreme salty sites only allowing for establishment of halophytic species.

Other recent related workshops in Colorado have included two riparian workshops in Pueblo, Colorado (December 2007 and December 2008 at the City of Pueblo Nature Center), Vail Colorado at the Sustaining Colorado Watersheds Annual Meeting (October 2009 at the Vail Cascade Resort), and Grand Junction, Colorado (November 2010 at Mesa College).

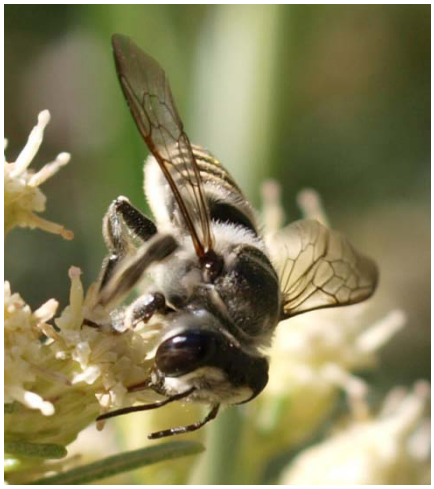
Keith White (standing center) provides instructions on how to plant willow cuttings using an electric rotary hammer drill

Pollinator Plant Evaluation

Decline of honey bee and wild pollinator (i.e., native bee) populations are evident in the U.S. and elsewhere and could affect agricultural crop production as well as natural plant communities. The LLPMC has installed a planting of native Southwestern species including 42 herbaceous perennial species, 23 annual and biennial species, and 30 woody shrub species. This project is being conducted with the collaboration of Dr. Tess Grasswitz, an entomologist at the New Mexico State University Los Lunas Agricultural Science Center. We are evaluating the different species for pollinator use (abundance, diversity and phenology), plant survival, plant vigor, and duration of flowering. Similar plantings have also been installed at a rural high school in Reserve, New Mexico and at the Whitfield Wildlife Conservation Area near Belen, New Mexico.

Observations made during the summer of 2010 indicated that the species (see Table 1: Pollinator Plants at the LLPMC**)** attracted considerable attention from pollinators, including honey bees and native bees (for example, various bumblebees and solitary bees (such as halictids, megachilids and andrenids)). In addition, various species of predatory wasps, beetles, parasitic flies and butterflies were recorded.

Native Bee (Halictidae Family) on *Baccharis emoyri male flowers*



Native Bee (Megachilidae Family) on *Baccharis emoryi male flowers*

Additional species will be planted in 2011 to test more native species and introduced species which might be better adapted to agronomic situations. More intensive pollinator observations and collections will also be conducted in 2011. Two additional demonstration plantings are planned for 2011 that may possibly include plantings at an organic farm and at an NMSU Research Station in northwest New Mexico.

Table 1: Pollinator Plants at the LLPMC

Species	Common Name	Family	Growth Habit
Cleome serrulata	Rocky Mountain beeplant	Capparaceae	Annual
Coreopsis tinctoria	golden tickseed	Asteraceae	Annual
*Cosmos bipinnatus**	garden cosmos	Asteraceae	Annual
Gaillardia pulchella	firewheel	Asteraceae	Annual
Helianthus petiolaris	prairie sunflower	Asteraceae	Annual
Monarda citriodora	lemon beebalm	Lamiaceae	Annual
Thelesperma filifolium	stiff greenthread	Asteraceae	Annual
Rudbeckia hirta	black-eyed Susan	Asteraceae	Annual
Oenothera pallida	pale evening primrose	Onagraceae	Biennial
Achillea millefolium	common yarrow	Asteraceae	Perennial
Coreopsis lanceolata	lanceleaf tickseed	Asteraceae	Perennial
Dalea candida	white prairie clover	Fabaceae	Perennial
Heliomeris multiflora var. multiflora	showy goldeneye	Asteraceae	Perennial
Melampodium leucanthum	plains blackfoot	Asteraceae	Perennial
Ratibida columnifera	upright prairie coneflower	Asteraceae	Perennial
Ratibida columnifera var. pulcherrima	Mexican hat	Asteraceae	Perennial
Symphyotrichum laeve var. geyeri	Geyer's aster	Asteraceae	Perennial
Baccharis emoryi	Emory's baccharis	Asteraceae	Shrub
Chamaebatiaria millefolium	desert sweet	Rosaceae	Shrub
Dalea bicolor var. argyrea	silver prairie clover	Fabaceae	Shrub
Poliomintha incana	frosted mint	Lamiaceae	Shrub
Salix lasiolepis	arroyo willow	Salicaceae	Shrub

*** Introduced species**

NRCS The USDA-Natural Resources Conservation Service is an equal opportunity employer.