Los Lunas
Plant Materials Center
2012 Progress
Report of Activities

National ALMANAC Project at the Los Lunas Plant Materials Center (LLPMC)

The LLPMC is one of six PMCs assisting the Agricultural Research Service in collecting field data on plant growth to be used in their ALMANAC prediction model. This prediction model is designed to evaluate impacts of various management strategies such as grazing management and the impact of invasive species on vegetation factors such as plant cover and nutrient cycling and will become available to all land managers.

In order for this prediction model to perform accurate simulations, data from actual growth measurements of representative vegetation is required. The LLPMC is providing measurement data from 'Vaughn' sideoats and 'Viva' galleta (Figure 1) taken from foundation seed production fields at the LLPMC. Plant cover is being measured bi-monthly on both above and below the canopy using an AccuPark LP-80 PAR Ceptometer (Figure 2) which measures photosynthetically active radiation (PAR). The below the canopy measurement is an objective measurement of cover, and it is directly affected by the width and density of the plants' leaves. The above the canopy measurement is taken for quantifying PAR. Forage yield data is also being measured at this time by the traditional method of clipping and weighing. The reading taken from the ceptometer and the actual forage yield results will be used to validate the ALMANAC model's predictive capability. Additionally, the specific plant parameters derived from the study will be valuable for simulating growth responses of individual plant species and plant functional groups (grasses, forbs, shrubs, legumes) on ecological sites. Using these plant parameters, the ALMANAC model will be useful in interpreting ecological site monitoring and guide adaptive management approaches

For more information about this project, contact Danny Goodson at 505-865-4684 or by e-mail at danny.goodson@nm.usda.gov.

Figure 1. 'Viva' galleta grass – 2012 ALMANAC data collection

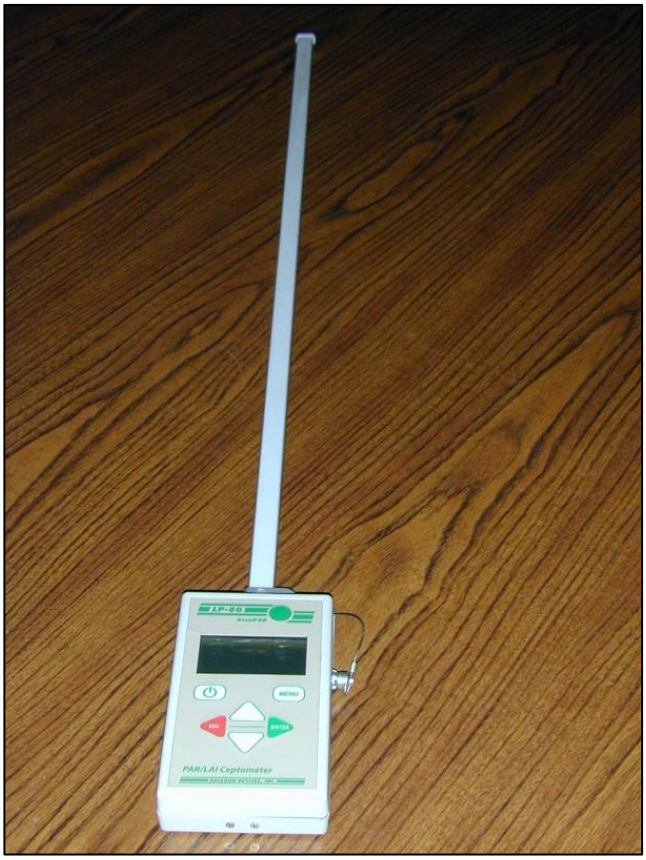

Figure 2. AccuPar LP-80 PAR Ceptometer

Assisting the National Park Service

The LLPMC continued interagency agreements for seed production with the National Park Service (NPS) including: Arches National Park, Canyonlands National Park, Grand Canyon National Park, and Zion National Park. Seed of six native grass species were grown on a total of 9.16 acres and produced 496 PLS (pure live seed) lbs. NPS agreements also include the production of 17,327 transplants of 14 native species. Seed for both seed production fields and transplants were collected onsite at the individual parks by park personnel. The intent is to use these plant materials at the parks to restore severely degraded sites such as roadsides, trails, and abandoned historical mine sites. See Figures 3, 4, and 5.

Figure 3. Grand Canyon blue grama 2012 seed production field

Figure 4. Zion National Park bottlebrush squirreltail 2012 seed production field

Figure 5. 2012 LLPMC transplant delivery to the Grand Canyon National Park

'Windbreaker' Big Sacaton Cultivar Release

Continuation of 'Windbreaker' Marketing, LLPMC's Latest Cultivar Release

Under ideal growing conditions, 'Windbreaker' big sacaton (Figure 6) may grow up to 10 feet with relatively low water use. It can be used as an effective wind-strip which can be a useful tool to control soil erosion during the severe, windy spring weather in the Southwest.

Figure 6. 'Windbreaker' big sacaton (*Sporobolus wrightii*)

Additional attributes of 'Windbreaker' include:

- Quality spring forage for livestock and wildlife
- Cover for wildlife
- Hay mulch for critical area seedings
- An ornamental in xeriscape planting
- Production of biomass for use in construction, fuel, and carbon sequestration

Because of its versatility, 'Windbreaker' is an optimal plant selection for several NRCS conservation practices, and it is continuing to be showcased at conservation meetings to encourage its use in New Mexico. The following marketing presentations were provided in 2012:

Organization	Attendance
• The Western Sustainable Agriculture Research and Education Conference in Santa Fe, NM	40
• City of Grants' Agriculture Day	350
• City of Gallup's Youth Soil and Water Conservation Awareness Days	150
• The New Mexico Association of Conservation Districts Annual Meeting	50
• Valencia County Soil and Water Conservation Annual Meeting	10
• East Torrance Soil and Water Conservation District Annual Meeting	50
• Northeastern New Mexico Prairie Partners Third Annual Meeting	50
• Lava Soil and Water Conservation District Annual Meeting	65
• LLPMC/New Mexico State Agricultural Science Center Annual Field Day	185
Total Number of Attendees:	**950**

These current marketing activities have helped to encourage the production of 'Windbreaker' by three commercial producers:

- Curtis and Curtis, Inc., Clovis, NM (produced seed)
- Browning Seed Company, Plainview, TX (produced seed)
- Revegetation Services, Higley, AZ (produced mulch hay)

'Windbreaker' Plant Spacing Study

An irrigated, non-replicated transplant spacing study was initiated to determine if in-row spacing of plants have an effect on seed production and dry matter yield. A previous (1980's) irrigated Initial Evaluation Planting of big sacaton accessions at the LLPMC displayed reduced height when they were planted on 1-ft. row spacing compared to plants on 3-ft. row spacing (Figure 7). This stunting was possibly caused by competition between plants for nutrients, water, and light, and may also impact seed production. In an effort to determine the optimal in-row spacing, the foundation seed fields of 'Windbreaker' were established using transplants in fields with three different in-row spacings: 1-ft. 2-ft. and 3-ft. Both seed production and dry matter were measured for each field in 2012.

As the in-row spacing increased, seed production also increased. Seed harvest from the 1-ft. and 2-ft. spaced fields were mixed when harvested with the combine because seedhead density was sparse compared to the field with the 3-ft. row spacing. The 1-ft. and 2-ft. spaced fields mixed only produced 32 PLS lbs./acre. The seed harvested from the field with 3-ft. in-row spacing yielded 192 PLS lbs/acre, which was six times the combined weight produced from the other two fields. In addition, dry matter yield also increased with 3-ft. in-row spacing. Dry matter yield for 1-ft., 2-ft., and 3-ft. in-row spacing was respectively 2,201, 3125, and 5776 lbs. The planting with 3-ft. in-row spacing between transplants is currently recommended for production of both 'Windbreaker' seed and hay mulch (Figure 8).

At 3-tons/acre of dry matter, 'Windbreaker' may be a preferred selection for a biomass production species where there is limited water for irrigation. A future biomass study may involve comparing switchgrass (*Panicum virgatum)* to 'Windbreaker' under limited irrigation. With <u>unlimited</u> irrigation, switchgrass has shown to produce 7-tons of dry matter/acre making it the currently preferred species. Perhaps where irrigation is limited, the dry matter production of 'Windbreaker' may be competitive.

Figure 7: 'Windbreaker' 0.5-acre foundation seed field with 3-ft. spacing in September 2012

Figure 8: 'Windbreaker' dry matter plot after clipping July 2012

2012 Activities for BLM New Mexico

Propagation and Installation of a Cottonwood and Willow Pole Production Block

The Bureau of Land Management (BLM) State Office in New Mexico has requested the LLPMC to install a one-acre pole production field to provide cottonwood and willow poles for the BLM Field Offices in the State. Cottonwood and willow seed were collected by BLM field office personnel in 2011 and 2012 from most of the primary watersheds in New Mexico where riparian restoration is planned:

- Northwest NM - San Juan River, La Plata River
- North Central NM – Rio Grande, Santa Fe River
- Southwestern NM – Gila River
- South Central – Tularosa Creek

Approximately 1,200 seedlings from three watersheds were propagated in 2011 and planted into one-half of the acre field in the summer of 2012. Additional seedlings were propagated in 2012 from the three other watersheds for planting in 2013. The BLM will collect seed from the Pecos River watershed in 2013 to provide the final seedling source for installation in 2014.

Treatments to Improve Germiantion of *Arctostaphylos pungens* – Pointleaf Manzanita

Over the years we have conducted numerous experiments on *Arctostaphylos* seed to try to enhance germination. These treatments have included concentrated sulfuric acid scarification, mechanical scarification, exposure to smoke, exposure to water soluble char compounds (charate), and exposure to heat.

The BLM provided *Arctostaphylos pungens*, pointleaf manzanita, seed from the Kasha-Katuwe Tent Rocks National Monument (KKTR) seed to be included in an experiment testing the duration of concentrated sulfuric acid scarification on seed germination. The initial experiment was designed to vary the duration of acid scarification based on seed size. Seed size is a rough approximation of degree of nutlet coalescence; smaller size implies one or a few nutlets per seed unit, whereas larger sizes have more coalesced nutlets. This experiment investigated KKTR germplasm as well as pointleaf manzanita seed from Washington County, Utah. The acid scarification times varied from 120 minutes for the smallest seed units to 150 minutes for the most coalesced nutlets. The seeds were moist stratified at 40° F in a refrigerator for 18 weeks when significant germination was observed in some treatments. The longer acid scarification treatments on the larger seed units had germination percentage of about 15% germinating seed per seed unit. The smallest seed units had much lower germination percentages indicating possible acid destruction of some of the seed.

The final 2012 experiment tested new acid scarification times as well as potential smoke-like cues solely on the Washington County, Utah seed because there was no KKTR seed available. Because it appeared that 120 minutes of acid scarification was damaging the smallest seed in the earlier experiment, the treatment time was reduced to 90 minutes. The largest seed might need longer treatment times, so the scarification time was increased to 175 minutes. Each seed batch was treated for 24 hours to one of the following chemical cues: gibberelic acid (GA_3 at 500 mg/l), 10% Colgin Liquid Smoke Mesquite diluted with tap water, 10% Colgin Liquid Smoke Hickory diluted with tap water, and a control of tap water.

The seeds were moist stratified at 40° F for 12 weeks when significant germination was observed in some of the treatments. The germination percentages for each seed treatment and size are shown in Table 1.

Table 1. Germination percentages of the four seed sizes and four chemical-cue treatments for *Arctostaphylos pungens* – Pointleaf Manzanita seed from Washington County, Utah. Percentages based on germinating seed per seed unit.

Seed Size (mm)	Acid Scarification Duration (min)	Colgin Liquid Smoke Mesquite	Colgin Liquid Smoke Hickory	Gibberelic acid (GA_3)	Tap Water	Mean
2.1 - 2.8	90	20%	32%	20%	13%	21%
2.8 - 3.2	115	33%	37%	33%	9%	28%
3.2 - 4.0	140	21%	29%	33%	0%	21%
> 4.0	175	21%	23%	24%	0%	17%
	Mean	**24%**	**30%**	**27%**	**5%**	

By pooling all seed sizes, the Liquid Smokes and GA_3 improved average germination by 5 to 6 fold relative to the control average germination of 5%. The relative equality of average germination when pooling all chemical treatments from 17% to 28% shows the benefits of varying scarification times by seed size.

Propagation of the Endangered Southwestern Pricklypoppy (Argemone pleiacantha ssp. pinnatisecta) for Out-Planting Experiments in the Lincoln National Forest

The southwestern pricklypoppy, sometimes referred to as the Sacramento prickly poppy, was listed as a federally endangered species in 1989. This subspecies with the accepted nomenclature of *Argemone pleiacantha* ssp. *pinnatisecta* G.B. Ownbey has also been referred to as a separate species using population genetic analysis by other taxonomists as *Argemone pinnatisecta* (G.B. Ownbey) S.D. Cervantes & C.D. Bailey. Its distribution is restricted to 10 canyons on the west slope of the Sacramento Mountains in south central New Mexico. Most of the remaining populations are within the Lincoln National Forest at elevations from 4,200 to 7,100 feet on loose, gravelly, disturbed sites.

The *New Mexico Rare Plant Technical Council* describes the species as a robust, herbaceous perennial, 0.5-1.5 m tall; leaves blue-green, 10-15 cm long, divided, the sinuses broad and square, margins, midribs, and veins armored with stout yellow spines; flowers large and showy; petals 6, white, 3-4 cm long, 8-9 cm wide; stamens numerous, anthers yellow; capsule with many fine spines, none branched; seeds round, black, 2.5 mm in diameter. It flowers from May to August.

The Lincoln National Forest has asked the LLPMC to propagate seedlings for several out-planting experiments to be conducted in 2012 and 2013 as part of their recovery plan for the species. Germination trials indicated some germination of three-year-old seed without any treatment; however, two months of cold stratification improved germination substantially. Scarification treatments were of no benefit.

The seedlings prefer well-aerated media with large pore spaces and cooler growing temperatures. Large transplants grown in 60-cubic-inch containers (2.5” dia. by 14” deep) can easily be produced in one growing season (see Figure 9). The most significant problem encountered in propagating transplants was a foliar disease possibly caused by a species of *Alternaria*. In addition to using a fungicide treatment, spacing plants to improve air circulation and reduce wet leaves allowed the production of transplants with minimal mortality. Initial results from the out-plantings conducted by the Lincoln National Forest indicate the transplants grown in the larger 60-cubic-inch containers survived considerably better than those grown in 10-cubic-inch containers (1.5” dia. by 8” deep).

Figure 9. Pricklypoppy growing at the Los Lunas Plant Materials Center

Soil Health Study at the LLPMC

NRCS cooperators are interested in sustainable farming practices which use cover crops to improve soil health providing increased production of their commodity crops with limited input and possibly increased profits. To date, NRCS field staff do not have the practical information to successfully employ cover crop practices in New Mexico. Such data is currently not available for Southwestern climates and soils. NRCS State and Area Agronomists have teamed up with the LLPMC to develop and implement studies to measure the actual soil health benefits (i.e. improvements in fertility, structure, water holding capacity) from the use of cover crops.

This endeavor began with a series of three meetings in in the winter and spring of 2012 to identify what was needed to improve field support to cooperators. The outcome of these meetings identified nine, prioritized potential studies.

The first study will be to introduce three cover crop treatments in the New Mexico southern high plains. We will evaluate the effect these treatments have on soil health attributes. The treatments were selected by the agronomists based on popularity among their cooperators. The plant materials used for the study include a single species of a grain and a legume, and a mixed species of a legume, a grass, and a forb. Because water is limited and expensive in New Mexico, irrigation treatments will be part of this study. The cover crops will receive an ample irrigation treatment that will be sufficient enough to prevent wilting, and also a deficient irrigation treatment where crops will be allowed to temporarily wilt. These treatments will identify the relative drought tolerance of the selected crops which is very important to New Mexico farmers. The study is scheduled to begin in April 2013.

Bureau of Land Management *"Seeds of Success"* Activities

In 2010, the LLPMC entered into an Interagency Agreement with the Bureau of Land Management (BLM) "*Seeds of Success"* (SOS) Program to establish seed production fields of BLM selected native plant populations at the LLPMC of primarily forbs in an effort to improve the commercial availability of seed adapted to the Colorado Plateau. Under cultivation, some of the selected species are very sensitive to diseases and pests that may reduce both plant survival and seed yield. Alternative methods to improve commercial production of these difficult species are being evaluated at the LLPMC. Also, demonstration plantings employing proven methodologies are also utilized in the evaluating process.

The Colorado Plateau region is situated in the four corners area and includes portions of Arizona, Colorado, New Mexico, and Utah, and it comprises approximately 130,000 square miles. This area is made up of high deserts with scattered high mountain forests. It is unique with its spectacular geology that includes domes, reefs, river narrows, natural bridges, slot canyons and more. Historically this area has been impacted by heavy off-road vehicle use, livestock grazing, mining activities, abandoned farmland, and noxious and invasive weed invasion. Currently there is a limited amount of adapted commercial plant materials available to this region for restoration purposes.

The starting seed collections from the SOS program consisted of approximately 200 bulk seeds. This seed generally requires some type of scarification or stratification process to break dormancy. We typically are able to produce about 25 to 100 transplants from this seed in about 90 days. Once mature, transplants are either planted into raised beds in our plant production area where they are hand watered and closely watched, or "easier-to-grow" species are planted directly into the field where they are then flood irrigated. Seed is harvested from these plantings for two to three years until there has been enough seed produced to establish a one-acre field. See Figures 10 and 11.

Species currently being developed for commercial production include:

Species	**Status**
James galleta (*Pleuraphis jamesii*)	2012 received seed
Evening primrose (*Oenothera pallida*)	800 plants in field production
Scarlet gilia (*Ipomoxis aggregate*)	155 plants in field production
Prairie coneflower (*Ratidbida columnifera*)	One-acre in field production, 300 bulk lbs. of seed available
Small flower globemallow (*Sphaeralcea parvifolia*)	0.5 acres (3, 500 plants) in production

Figure 10. *Ipomopsis aggregata* – scarlet gilia planting in mid-October 2012.

Figure 11. *Sphaeralcea parvifolia* – smallflower globemallow planting on October 15, 2012.

Riparian Restoration Training Workshops

The LLPMC participated in seven riparian restoration workshops in FY-2012 on deep-planting methods involving 356 participants. These workshops included oral presentations and demonstrations of planting equipment at local riparian restoration site, and providing participants training and hands-on experience operating motorized planting equipment (Figure 12). These workshops were hosted by the Colfax Soil and Water Conservation District, Colorado State Parks, Tamarisk Coalition, and the Colorado Watershed Assembly.

Figure 12. Hands-on workshop in Ruidoso, New Mexico

The strategy of the deep-planting methodology is to tap into shallow groundwater of riparian ecosystems. They require minimal or no follow-up irrigation and are very effective for re-establishing riparian vegetation in the Southwest. Planting continues to be necessary due to the loss of the natural hydrologic conditions on many rivers in the Southwest. Without the natural hydrologic conditions (overbank flooding), there is minimal natural recruitment of native riparian shrubs and trees. The benefits provided by established riparian vegetation on the banks and floodplains include: reduction in soil erosion, enhancement of wildlife habitat, creation of buffers, and improvements in recreational opportunities. Vast cleared areas in riparian ecosystems were created from 2002 to 2004, when over 34,000 acres in New Mexico were treated either chemically or mechanically to control salt cedar, Russian olive, Siberian elm, and other non-native phreatophytic vegetation. Additional open areas are now being created by the release of the *Diorhabda spp*. beetle for the biological control of salt cedar which has recently moved into New Mexico from Colorado and Utah where it has been active since 2008.

In the lower elevations in the Southwest where annual precipitation is less than 15 inches, traditional planting methods require frequent irrigation. This is labor intensive and often cost-prohibitive. In response, the LLPMC has developed deep-planting methods (for riparian trees and shrubs) that connect the root systems to the shallow water table and eliminate or reduce the amount of follow-up irrigation. More than 30,000 shrubs or trees have been established over a 30-year period with a 70 percent or better survival rate on most sites.

In Microsoft PowerPoint presentations, planting methods are discussed in detail including some replicated studies that have helped to refine the methodologies. We also presented photos of demonstration plantings of up to 40 acres taken before and after treatments. A hands-on workshop follows that allows the participants to operate unique planting tools that easily drill deep-planting holes at a local riparian restoration site. The specific planting zones for various riparian species are discussed onsite.

The workshops were provided to the following organizations:

Host Organization	**Number of Attendees**	**Location**	**2012 Date**
Colorado Watershed Assembly	170	Avon, CO	10/5–10/6
Colfax Soil and Water Conservation District	70	Avondale, CO	06/20
Tamarisk Coalition	45	Moab, UT	10/11
Colfax Soil and Water Conservation District	40	Granada, CO	06/21
Tamarisk	15	Escalante, UT	10/13
Colorado State Parks	10	Salida, CO	11/2
Total Trained	**350**		

2012 Selected Publications

- Pocket Guide to Beneficial Insects of New Mexico (Miscellaneous Technical Article)
- Pocket Guide to Native Bees of New Mexico (Miscellaneous Technical Article)
- A Screening for Biofuel Feedstock Quality of Perennial Warm-Season Grasses in Semiarid Subtropical Environments (Miscellaneous Technical Article)
- Preliminary Pollinator Plant Recommendations for New Mexico. (Technical Note)
- 'Windbreaker' Cultivar Big Sacaton: A Foundation Class of Certified Seed (Refereed Journal Article)
- Deep-Planting of Longstem Native Riparian Shrubs (Published Abstract)

Publications are available at the following website: http://plant-materials.nrcs.usda.gov/nmpmc/publications.html

Non-Discrimination Policy

The U.S. Department of Agriculture (USDA) prohibits discrimination against its customers, employees and applicants for employment on the bases of race, color, national origin, age, disability, sex, gender identity, religion, reprisal, and where applicable, political beliefs, marital status, familial or parental status, sexual orientation, or all or part of an individual's income is derived from any public assistance program, or protected genetic information in employment or in any program or activity conducted or funded by the Department. (Not all prohibited bases apply to all programs and/or employment activities.)

To File an Employment Compliant

If you wish to file an employment complaint, you must contact your agency's EEO Counselor within 45 days of the date of the alleged discriminatory act, event, or in the case of a personnel action. Additional information can be found online at http://www.ascr.usda.gov/complaint_filing_file.html.

To File a Program Complaint

If you wish to file a Civil Rights program complaint of discrimination, complete the USDA Program Discrimination Complaint Form, found online at http://www.ascr.usda.gov/complaint_filing_cust.html, or at any USDA office, or call (866) 632-9992 to request the form. You may also write a letter containing all of the information requested in the form. Send your completed complaint form or letter to us by mail at U.S. Department of Agriculture, Director, Office of Adjudication, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9419, by fax at (202) 690-7442, or email at program.intake@usda.gov.

Persons with Disabilities

Individuals who are deaf, hard of hearing or have speech disabilities and you wish to file either an EEO or program complaint please contact USDA through the Federal Relay Service at (800) 877-8339 or (800) 845-6136 (in Spanish).

Persons with disabilities, who wish to file a program complaint, please see information above on how to contact us by mail or by email. If you require alternative means of communication for program information (e.g., Braille, large print, audiotape, etc.), please contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

Supplemental Nutrition Assistance Program

For any other information dealing with Supplemental Nutrition Assistance Program (SNAP) issues, persons should either contact the USDA SNAP Hotline Number at (800) 221-5689, which is also in Spanish, or call the State Information/Hotline Numbers.

All Other Inquires

For any other information not pertaining to civil rights, please refer to the listing of the USDA Agencies and Offices.

Explanation. All NRCS staff must be notified of the updated text, which must be used in public notification requirements. In accordance with Departmental Regulation 4300-003, *Equal Opportunity Public Notification Policy*, the appropriate nondiscrimination statement must appear on all USDA/NRCS materials produced by USDA, NRCS, or recipients of USDA or NRCS program assistance for public information, public education, or public distribution including, but not limited to program information, district newsletters, agency letterhead, fact sheets, publications, etc.

If the material is too small to permit the full statement, the material will, at minimum, include the nondiscrimination statement shortened version:

An Equal Opportunity Provider and Employer

Contact. You may access the updated required statement from the NRCS Civil Rights Division Web site at ttp://www.nrcs.usda.gov/wps/portal/nrcs/main/national/about/civilrights/. If you have questions, please contact the Program Compliance Branch, Civil Rights Division, at (301) 504-2181.