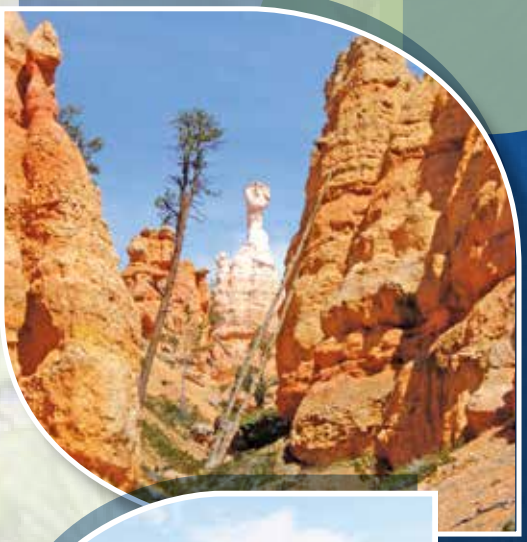
PLANT MATERIALS PROJECT SUMMARY REPORTS

from the Natural Resources Conservation Service to the National Park Service

FY 2012



U.S. DEPARTMENT OF THE INTERIOR • U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES, CONSERVATION SERVICE • NATIONAL PARK SERVICE

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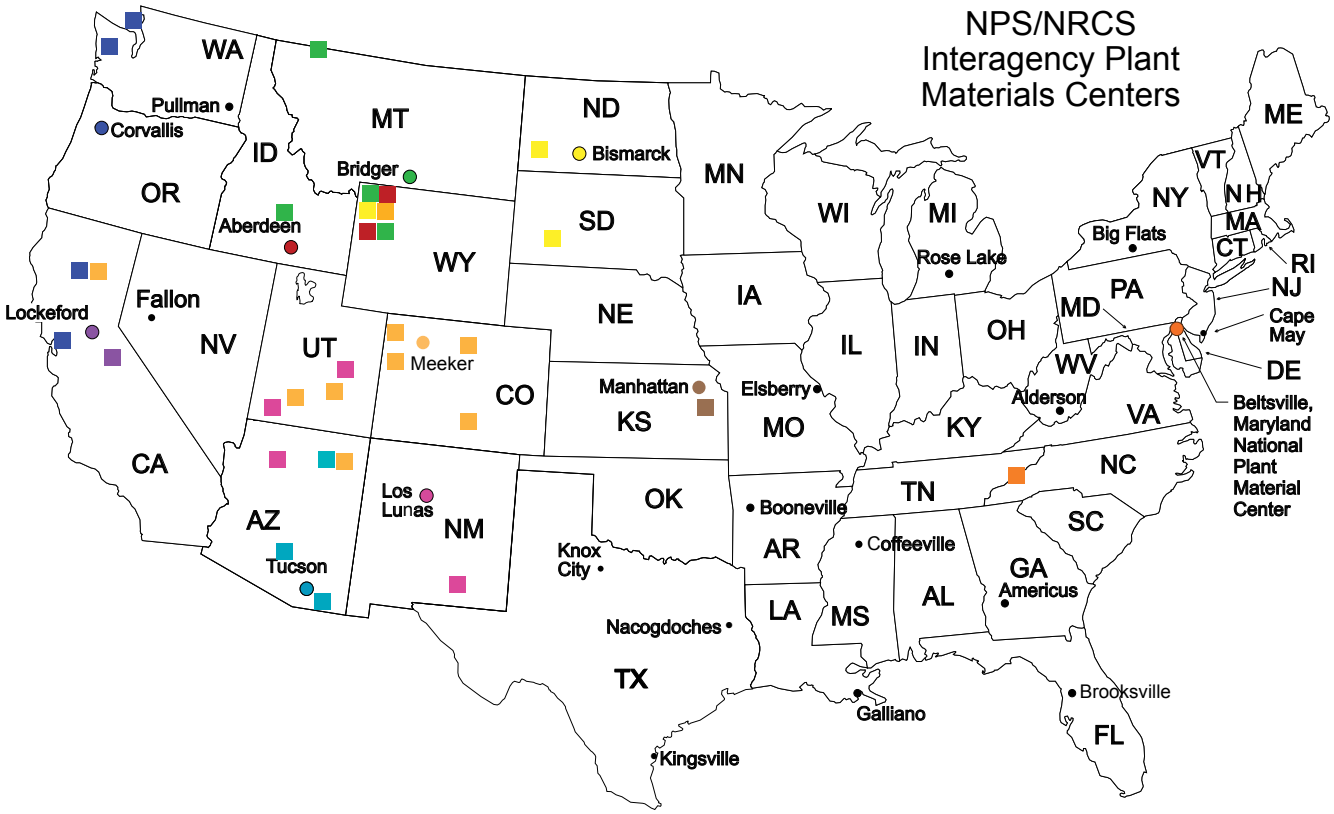


Plant Materials Center	In cooperation with these National Parks
Aberdeen, ID	Grand Teton, Yellowstone
Beltsville, MD	Great Smoky Mountains
Bismarck, ND	Badlands, Theodore Roosevelt, Grand Teton
Bridger, MT	Glacier, Yellowstone, Craters of the Moon, Grand Teton
Corvallis, OR	Lassen Volcanic, Olympic, San Juan Island, Golden Gate
Lockeford, CA	Sequoia
Los Lunas, NM	Carlsbad Caverns, Grand Canyon, Zion, SE Utah Group (Arches & Canyonlands)
Meeker, CO	Bryce Canyon, Canyon de Chelly, Dinosaur, Great Sand Dunes, Rocky Mountain, Yellowstone, Capitol Reef, Colorado National Monument, Lassen Volcano.
Tucson, AZ	Canyon de Chelly, Coronado, Saguaro
Manhattan, KS	Tallgrass Prairie

INTRODUCTION

This is the 2012 Natural Resources Conservation Service (NRCS) Plant Materials Center's (PMC) annual summary report on all interagency agreements between the National Park Service (NPS) and the Natural Resources Conservation Service. These projects relate to development of native plant materials for revegetation of park roads and other restoration projects. The National Park Service and the Natural Resources Conservation Service have been cooperating in testing and increasing native plant materials through a memorandum of understanding using interagency agreements since 1989.

The cooperating NRCS Plant Materials Centers and the Upper Colorado Environmental Plant Center (UCEPC) have prepared a park summary report for each of their projects. This summary report is a culmination of all of these individual reports. This summary report is made available by request and is sent to all national parks with current plant materials projects, associated park resource managers, respective plant materials centers, and U.S. Department of Agriculture (USDA) NRCS state offices.

Additional printed copies or electronic versions of this report may be requested from Christine Taliga, NPS National Technical Advisor, Denver Service Center-Transportation, 12795 West Alameda Parkway, Room 252, Lakewood, CO 80228; by E-mail: Christine_taliga@partner.nps.gov; or call 303-969-2349.

If you have questions or comments to improve the use and distribution of this report, please contact Christine Taliga, acting NPS National Technical Advisor at 303-969-2349 or Robin Gregory, Revegetation Technical Specialist at 303-969-2456.

FISCAL YEAR 2012 PROGRAM SUMMARY

Technical Assistance

- The NRCS national technical advisor provided assistance to landscape architects, project specialists, and project managers at the NPS Denver Service Center relative to revegetation project needs with 13 national parks in addition to those with interagency agreements.
- The NRCS national technical advisor provided assistance to 26 different national parks and associated staff.

Development and Administration of Interagency Agreements

- Five new agreements and six amendments to agreements were developed this year.
- A total of 41 active interagency agreements were administered and coordinated.
- There were 32 active projects at 27 national park units that cooperated with 10 NRCS plant materials centers, and 1 conservation district plant materials center.

Native Seed and Plant Production

- 27 national parks
- 13,716 pounds of seed
- 62,729 container plants
- More than 160 different native species grown

Park Collected Native Seed Processed

- 5 national parks
- More than 800 pounds of seed
- More than 120 different species

Interagency Agreements Reviewed

- Arches and Canyonlands, Badlands National Park, Canyon De Chelly, Colorado National Monument, Coronado National Monument, Dinosaur National Monument, Glacier National Park, Grand Canyon National Park, Grand Teton National Park, Great Smokey Mountain National Park, Rocky Mountain National Park, Theodore Roosevelt National Park, Sequoia and Kings Canyon National Park, Tallgrass Prairie National Preserve, Yellowstone National Park, Zion National Park.
- Cooperating NRCS Plant Centers: Aberdeen, Idaho; Bismarck, North Dakota; Bridger, Montana;, Beltsville, Maryland; Corvallis, Oregon; East Lansing, Michigan; Los Lunas, New Mexico; Lockeford, California; Manhattan, Kansas; Tucson, Arizona.
- Cooperating District Plant Center: Meeker, Colorado.

Technology Transfer and Research

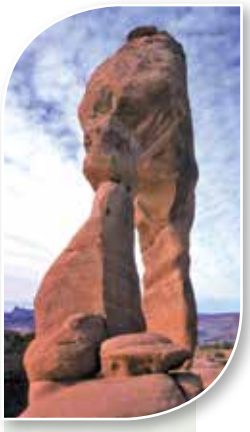
Information provided includes basic Federal Lands Highway Program guidelines, examples of revegetation specifications, tools (seed collection techniques, seed storage, plant salvage, propagation, cost estimates, monitoring, etc.). Links to the NRCS Plant Materials Program, NRCS Electronic Field Office Technical Guide, and plant propagation protocols websites were provide at training sessions and as requested.

Seed collection training workshops were provided to more than 35 NPS staff personnel, in five national parks.

The NRCS national technical advisor and program staff prepared and distributed to cooperating park / plant material centers and to key NPS and NRCS personnel 275 copies of the fiscal year 2012 (FY 2012) annual interagency summary report.

INTERMOUNTAIN REGION

Arches and Canyonlands National Parks, Utah



Prepared by: **Los Lunas, New Mexico, USDA NRCS Plant Materials Center**

Introduction. On August 27, 2010, an agreement between the NPS Southeast Utah Group (Arches and Canyonlands national parks) and the NRCS Los Lunas Plant Materials Center was made for the collection of native seed, the propagation of those seeds, and the increase of native grass species at the Los Lunas PMC. The agreement states that the National Park Service will use the seed produced by the Los Lunas PMC for identified project areas in the two national parks. Populations of Indian ricegrass (*Achnatherum hymenoides*) were identified and collected by the park staff and then sent to the Los Lunas PMC for conditioning and to be used for future seed production.

The following tables show a complete list of the accessions involved in this agreement and the seed received by the Los Lunas PMC:

Arches and Canyonlands National Parks Accessions

Arches National Park Accessions			
Common Name	**Scientific Name**	**Plant Symbol**	**Accession Number**
Indian ricegrass	*Achnatherum hymenoides*	ACHY	9066888

Canyonlands National Park Accessions				
Common Name	**Park Location**	**Scientific Name**	**Plant Symbol**	**Accession Number**
Indian ricegrass	Island in the Sky	*Achnatherum hymenoides*	ACHY	9066907
Indian ricegrass	Needles	*Achnatherum hymenoides*	ACHY	9066908
Indian ricegrass	Island in the Sky and Needles mix	*Achnatherum hymenoides*	ACHY	9066887

2012 Accomplishments. On January 4 and 6, 2012, the Indian ricegrass seed received from both Arches and Canyonlands nationals parks was planted by direct seeding into production fields at the Los Lunas PMC. The following table shows the agreement acreage and the actual amount of acreage that was established in 2012:

Arches and Canyonlands National Park Seed Production Fields at the Los Lunas PMC

Arches National Park			
Common Name	**Scientific Name**	**Agreement Acreage**	**2012 Acreage**
Indian ricegrass	*Achnatherum hymenoides*	1.00	1.00

Canyonlands National Park				
Common Name	**Park Location**	**Scientific Name**	**Agreement Acreage**	**2012 Acreage**
Indian ricegrass	Island in the Sky	*Achnatherum hymenoides*	0.50	0.26
Indian ricegrass	Needles	*Achnatherum hymenoides*	0.50	0.09

The direct seeding of Indian ricegrass was moderately successful for both Canyonlands accessions, averaging approximately 30% stand establishment in their respective production fields The Arches planting averaged 70% stand establishment on only about half of the planted acreage. The remaining half of the Arches planting had less than a 20% stand establishment in 2012. The low stand establishment of the Indian ricegrass fields is a result of the high dormancy found in this particular species. It may take up to three years for seed to break dormancy and germinate after the direct seeding of the Arches and Canyonlands fields. The following table of testing results with seed previously collected at Canyonlands and Arches shows this dormancy and low seed germination. Scarification, cold stratification, and other after-ripening techniques to induce germination had little or no effect on the seed received by the Los Lunas PMC. The direct seeding of the Indian ricegrass was determined by the Los Lunas PMC to be a viable solution for establishing the seed fields.

Seed Test Results for Original Seed Lots Prior to 2012

Seed Test Lab Results for...	Canyonlands Mixed Seed Lot	Arches Original Large Seed Lot
Purity	96.73	97.06
Germination	2%	0%
Dormant	56%	71%
Total Value	58%	71%
Tetrazolium Test (TZ)	56%	71%

Seed will be harvested from the established Indian ricegrass fields in 2013, and this seed will be used to complete the amount of acreage specified in the agreement. It should be noted the seed previously collected at Canyonlands National Park and Arches National Park prior to 2012 is available and also could be used to establish seed production fields. One of the seed lots from Canyonlands has two sites mixed together, but both this lot and one from Arches have a substantial amount of seed.

Canyonlands National Park 'Island in the Sky' Indian ricegrass seed production field F33N.

Bryce Canyon National Park, Utah

Prepared by: **Meeker, Colorado, Upper Colorado Environmental Plant Center**

Introduction. Indefinite Delivery/Indefinite Quantity (IDIQ) Contract No. AG-8B05-C-12-0002 was initiated June 26, 2012. Task Order No. P12PD12573 identified the Upper Colorado Environmental Plant Center to manage native seed production of two 0.5-acre fields previously established for Bryce Canyon National Park (BRCA), producing Indian ricegrass (*Achnatherum hymenoides*) and nodding brome grass (*Bromus anomalus*). This task order will remain in effect until December 31, 2015.

Accomplishments. The 0.5 acre of nodding brome has been in production since 2009. The table below provides information for the last two years of production. The field receives a fertilizer application of 30-10-5-5, at 35 gallons per acre. An herbicide treatment of Buctril; 2,4-D; and methylated seed oil is applied in the spring to help control broad leaf weeds. Milestone is applied as a spot spray treatment targeting Canada thistle.

In 2011, the Upper Colorado Environmental Plant Center received three collections of Indian ricegrass seed from Bryce Canyon National Park for the establishment of the 0.5-acre field. The collections produced 620 grams of cleaned seed. In October 2011 UCEPC staff seeded a 0.5-acre field with 557 grams from the collection. Due to severe winter weather conditions, establishment was poor. Two hand collections were made from plants that had survived and the field was inner-seeded October 4, 2012.

The table below provides information on the Bryce Canyon inventory and produced materials.

Species	Lot #	Field Size	Bulk lbs	PLS %	PLS lbs	Date Tested
BRAN	2011	0.5 acres	191	31.36	**59.9**	1/30/12
BRAN	2012	0.5 acres	3.5	36.01	**1.26**	1/22/13
ELTR	2004	1.3 acres	7.5	58	**4.35**	9/1/04
ELTR	2005	2.5 acres	9	61.81	**5.56**	3/1/06
ELTR	2007	2.5 acres	499	74.16	**370**	2/8/08
ELTR	2008	2.5 acres	137.5	61.18	**84.12**	2/19/09
ACHY	2012	0.5 acres	98 grams	UA	**UA**	Re-planted

** Several BRCA collections <25 grams remain on inventory*
Indian ricegrass, rabbitbrush, squirreltail, black sage and Stipa comata.

Bryce Canyon National Park requested two shipments of seed in 2012 for restoration projects of disturbed areas within the park. A delivery of 53.2 pounds of *Elymus trachycaulus* was made March 20, to Laura Schrage, BRCA Natural Resource Specialist. In November, another 217 pounds of *Elymus trachycaulus* and 162 pounds of *Bromus anomalus* went to Katie Johnson, BRCA Natural Resource Specialist.

Technology Development. Standard cultural practices, harvest, and cleaning protocols were used to produce seed of *Achnatherum hymenoides* and *Bromus anomalus*.

It has been observed that the *Bromus anomalus* laboratory reports continue to return with low germination percentages. Alternative chemical applications were applied but no change was noted. The Upper Colorado Environmental Plant Center is investigating the seed cleaning techniques for *Bromus anomalus*. Possible damage to the seed is occurring during the awn removal process. The field's age may also play a role in the low germination as well. The plant center plans to reestablish a portion of the nodding brome field.

Nodding brome production field at Meeker, Colorado.

Canyon de Chelly National Monument, Arizona

Prepared by: **Meeker, Colorado, Upper Colorado Environmental Plant Center**

Revegetation of Route 10 and South Rim Road. IDIQ Contract AG-8B05-C-12-0002, Task Order P12PD11781 was awarded to Upper Colorado Environmental Plant Center on June 11, 2012. The IDIQ contract replaced Requisition Reference No. R739010032 and IA No-1211-08-003. The scope of work states that the plant center will maximize native grass seed production from two fields: Indian ricegrass (*Achnatherum hymenoides*) and western wheatgrass (*Pascopyrum smithii*). Both fields have been previously established at the plant center from seed stock collected at the monument. The IDIQ contract was complete December 31, 2012. Seed is available for shipment upon the request of Canyon de Chelly National Monument.

Accomplishments. The 1.73-acre field of Indian ricegrass was reduced to 0.86 acres. The 1.27-acre field of western wheatgrass was reduced to 0.63 acres. Both fields produced seed in the 2012 season. Seed inventory for Canyon de Chelly is listed in the table below. Additional seed from both fields is available by negotiation if desired.

Two lots of seed were shipped to Arthur Benally at Canyon de Chelly in March 2012: 10 pounds of 2011 Indian ricegrass and 9.5 pounds of 2010 western wheatgrass.

Seed available at the Upper Colorado Environmental Plant Center for Canyon de Chelly National Monument

Species Symbol	Harvest Year	Field Size	Amount Cleaned Seed (Bulk)	PLS %	Amount PLS on Hand	Date Tested
ACHY	2010	1.73 acres	41 lbs	8.43	3 lbs	12/9/2010
ACHY	2011	"	133 lbs	53.91	71.7 lbs	10/28/2011
ACHY	2012	0.86 acres	74 lbs	49.24	36.4 lbs	1/22/2013
PASM	2010	1.27 acres	311.5 lbs	77.55	241.6 lbs	1/10/2011
PASM	2011	"	611 lbs	61.85	378 lbs	2/17/2012
PASM	2012	0.63 acres	19 lbs	65.22	12.39 lbs	1/28/2013

Technology Development. Cultural practices, harvest, and cleaning protocols were used to handle the western wheatgrass and Indian ricegrass seed. Seed lab results are available upon request. This will be the final report for Canyon de Chelly National Monument.

Canyon de Chelly National Monument western wheatgrass, July 2012.

Prepared by: Tucson, Arizona, USDA NRCS Plant Materials Center

Introduction. This project involves the production of 145 pounds of *Sporobolus airoides* and 140 pounds of *Aristida purpurea*. Seed produced will be used for revegetation of disturbed areas in Canyon de Chelly National Park. The original agreement (IA No.: 1211-08-002) was signed November 14, 2007, with the project ending September 30, 2010. In September 2010, an amendment was signed that extended this agreement until December 31, 2012, to allow for additional seed collection and production time.

Accomplishments. In June 2008, 0.36 acres were planted to *Sporobolus airoides* using seed collected by park personnel in 2006. Harvest totals for years 2008–2012 are shown in the table below.

Sporobolus airoides harvest totals 2008–2012

	2008	2009		2010		2011		2012
Bulk lbs.	15.00	29.30	19.25	10.84	5.96	31.88	2.44	11.50
0.2386 in	5.06	20.87	12.46	9.38	1.38	21.13	0.37	0.41
Germination %	84	74	58	83	50	79	79	70
Purity %	99.20	84.47	99.4	94.57	23.23	90.58	90.58	91.86
Test date	3/19/2012	3/19/2012	3/16/2012	3/19/2012	3/19/2012	3/19/2012	3/19/2012	3/28/2013
PLS %	83.33	62.51	57.65	78.49	11.62	71.56	71.56	64.30
PLS lbs.	4.22	13.05	7.18	07.36	0.16	15.12	0.26	0.26

In March 2010, approximately 3,700 *Aristida purpurea* plants were started from seed received at the center in 2009. In June 2010, these plants were used to establish a 0.54-acre seed production field. Harvest totals for years 2010–2012 are shown in the next table. The total pounds of seed produced in support of this agreement are 126 bulk pounds of *Sporobolus airoides* and 225 bulk pounds of *Aristida purpurea*.

Aristida purpurea harvest totals 2010–2012

	2010		2011				2012			
Bulk lbs.	11.00	11.82	62.94	29.13	21.12	11.75	15.20	14.31	18.00	30.00
Cleaned lbs.	10.58		20.35	20.55	5	0.5	9.63	13.00	14.25	27.00
Germination %	86		75	75	75	75	39	33	39	22
Purity %	88.73		88.68	88.68	88.68	88.68	28.37	18.77	19.50	20.34
Test date	3/13/2012		3/13/2012	3/13/2012	3/13/2012	3/13/2012	3/27/2013	3/27/2013	3/27/2013	3/27/2013
PLS %	76.31		66.51	66.51	66.51	66.51	11.06	6.19	7.61	4.47
PLS lbs.	8.07		13.53	13.67	3.33	0.33	1.07	0.81	1.08	1.21

Technology Development. The center purchased a high-capacity Westrup Brush Machine that was installed and used to clean the 2012 *Aristida purpurea* harvests. Seed processed through this machine was significantly easier to handle, store, and clean further when necessary than was seed processed with other methods. In 2012, it was decided that seed processed with the Westrup Brush Machine would not receive further cleaning treatments as the resulting bare caryopsis of *Aristida purpurea* is too fragile for the needs of the park.

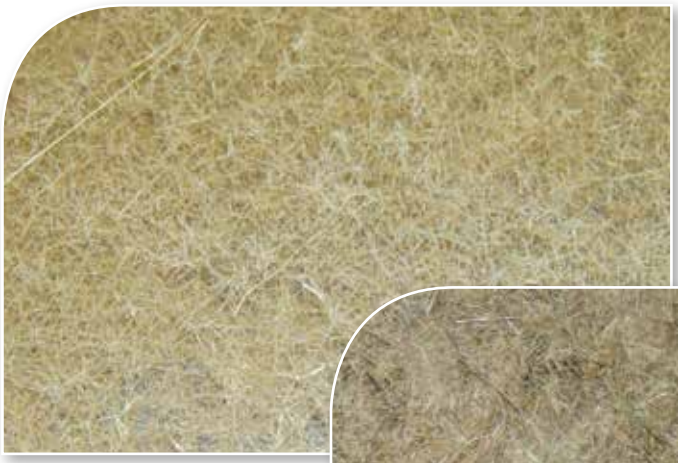


Figure 1: *Freshly harvested* Aristida purpurea

Figure 2: Aristida purpurea *cleaned with the Westrup Brush Machine.*

Capitol Reef National Park, Utah

Prepared by: **Meeker, Colorado, Upper Colorado Environmental Plant Center**

Introduction. This report is in reference to NPS IA 1211-11-02, NRCS 67-8B05-A-11-07. Project Title: Scenic Drive Rehabilitation. This agreement was signed in December 2010. The agreement identified the Upper Colorado Environmental Plant Center for the propagation of seed of selected species required by the National Park Service for this project. From the selected species list, 6000 grasses, 1200 forbs, 400 shrubs, and a mixture of 100 plants (7700 total) were to be delivered to Capitol Reef National Park (CARE) in 2012. Capitol Reef collected germplasm from plant populations within the park and sent the seed to the plant center for production.

Accomplishments. The species with ample seed amounts were tested for germination and planted in specified containers. *Achnatherum hymenoides, Stipa comata, Penstemon utahensis, Eriogonum corymbosum,* and *Atriplex confertifolia* were placed in cold storage to achieve the stratification periods necessary for germination. Additional seed of *Atriplex confertifolia, Penstemon utahensis,* and *Sphaeralcea parvifolia* were directly planted into Field No. 2 as a natural method of cold stratification. The remaining species were planted in January and grown out in the greenhouse. Two additional collections, *Atriplex confertifolia* and *Atriplex conescens*, were made by CARE staff and sent to the plant center in January. Cleaned seed quantities were 155 grams of Atriplex confertifolia and 59 grams of *Atriplex conescens*. On May 7, 2012, UCEPC staff delivered 8,814 plants to Capitol Reef. Wildlands, Inc. began revegetation work the following day. CARE volunteers (aka "The Restoration Mavens") provided irrigation to the plants through September. Below is the list of species delivered to Capitol Reef.

Species	4 Cu In	10 Cu In	D-40's	Mini Tree Pot	3x3x6	3x3x9
ACHY	366				6	5
PLJA	904				4	
HECO	253					2
ELEL	974				22	
PEUT		16				
ENNU		396	5			
CRFL5	106	4				
CHVI		112	22			
CIUN		265				13
FAPA			11			
PUME	218	4				
HYRIF		45	23			
TECA2			1			
ERCO		688	2			
GASP		180	2			1
SPPA2		6	29	1		
SPAI	2705					
ATCO			8			
BOGR2	464					
PSSP		97	25			
ARPU9	726			25		5
STPI		53	14			
YUHA		7	12			

The Upper Colorado Environmental Plant Center has several species still in production for Capitol Reef that will be available in 2013. The contract has been completed and this will be the final report.

Technology Development. *Eriogonum corymbosum* seed that was left in cold moist stratification since December 2011 was allowed to germinate in the greenhouse January 22, 2013. It appears the lengthy stratification period has done no damage to the germination process.

Unfortunately, bare soil conditions and heavy winds the winter of 2011–2012 were not conducive to germination and establishment of *Atriplex confertifolia*, *Penstemon utahensis*, or *Sphaeralcea parvifolia* that were direct seeded as a field planting. All delivered material was produced in the greenhouse.

Delivery to Capitol Reef National Park 5/7/2012.

"Restoration Mavens"
courtesy of Sandy Borthwick at Capitol Reef.

Carlsbad Caverns National Park, New Mexico

Prepared by: **Los Lunas, New Mexico, USDA NRCS Plant Materials Center**

Introduction. On August 23, 2004, an agreement was made between the Los Lunas Plant Materials Center and Carlsbad Caverns National Park for the collection, propagation, and the increase of native grass species. A new agreement began in 2010 that provides for the propagation of transplants and seed increase by the Los Lumas PMC for Carlsbad Caverns native grass species. There was no seed production in 2012, and all Carlsbad Caverns fields have been removed after discussion with the park and NPS/NRCS liaison.

The following table shows a complete list of the accessions involved in the Carlsbad Caverns National Park agreement:

Carlsbad Caverns National Park Accessions

Common Name	Scientific Name	Plant Symbol	Accession Number
blue grama	*Bouteloua gracilis*	BOGR	9066604
curlyleaf muhly	*Muhlenbergia setifolia*	MUSE	9066608
green sprangletop	*Leptochloa dubia*	LEDU	9066658
plains bristlegrass	*Setaria vulpiseta*	SEVU2	9066606
purple threeawn	*Aristida purpurea*	ARPU9	9066607
sideoats grama	*Bouteloua curtipendula*	BOCU	9066605

2012 Accomplishments. The following tables describe the Carlsbad Caverns seed shipped to the National Park Service from the Los Lunas PMC in 2012 and the Pure Live Seed (PLS) on inventory.

Seed Shipment to Carlsbad Caverns by the Los Lunas PMC

Common Name	Scientific Name	Accession	PLS lbs. shipped
blue grama	*Bouteloua gracilis*	9066604	3.50
green sprangletop	*Leptochloa dubia*	9066658	30.60
plains bristlegrass	*Setaria vulpiseta*	9066606	57.40
purple threeawn	*Aristida purpurea*	9066607	12.00
sideoats grama	*Bouteloua curtipendula*	9066605	22.50

Carlsbad Caverns Seed Shipment to Guadalupe Mountains National Park by the Los Lunas PMC

Common Name	Scientific Name	Accession	PLS lbs. shipped
green sprangletop	*Leptochloa dubia*	9066658	168.50
plains bristlegrass	*Setaria vulpiseta*	9066606	17.00
sideoats grama	*Bouteloua curtipendula*	9066605	50.00

Carlsbad Caverns Seed Shipment to Capulin Volcano National Monument by the Los Lunas PMC

Common Name	Scientific Name	Accession	PLS lbs. shipped
blue grama	*Bouteloua gracilis*	9066604	25.00
purple threeawn	*Aristida purpurea*	9066607	12.00
sideoats grama	*Bouteloua curtipendula*	9066605	50.00

Carlsbad Caverns Pure Live Seed on Inventory at the Los Lunas PMC

Common Name	Scientific Name	Accession	Pure Live Seed on Inventory (lbs.)	Test Date
blue grama	*Bouteloua gracilis*	9066604	13.85	1/24/07
			8.12	1/09/08
			2.79	6/17/10
			2.59	12/01/09
			8.60	12/15/11
green sprangletop	*Leptochloa dubia*	9066658	27.40	1/25/11
			14.38	12/07/11
plains bristlegrass	*Setaria vulpiseta*	9066606	17.37	5/15/08
			71.99	7/13/10
			24.04	2/12/10
			14.53	12/08/10
			46.03	1/03/12
purple threeawn	*Aristida purpurea*	9066607	7.90	4/23/08
			3.04	6/11/10
			0.54	5/18/10
			3.36	1/06/12
sideoats grama	*Bouteloua curtipendula*	9066605	41.29	1/19/06
			36.34	1/23/07
			17.14	3/10/08
			40.08	6/29/10
			13.54	12/23/09
			9.72	12/15/10
			0.74	1/03/12
			3.00 (bulk)	No test*
			1.02 (bulk)	No test*
			0.40 (bulk)	No test*

**Seed not sent for testing due to an insufficient amount of seed or seed was from the collections made at Carlsbad Caverns National Park.*

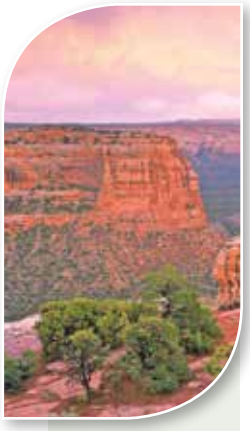


Photo credit: Rob Kurtzman

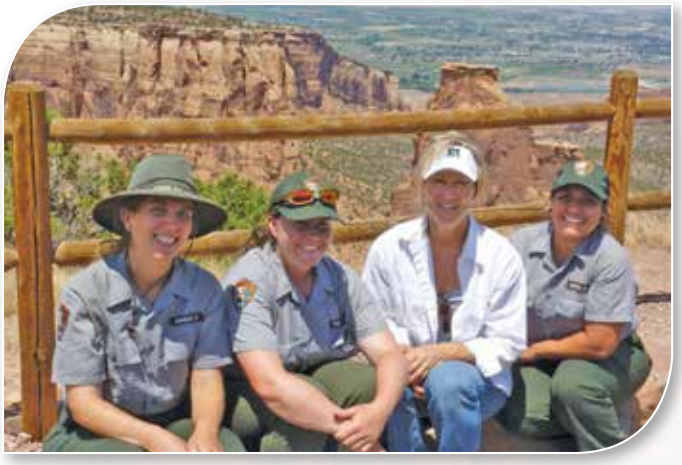
Colorado National Monument, Colorado

Prepared by: **Meeker, Colorado, Upper Colorado Environmental Plant Center**

Introduction. This report covers activities that have been conducted by Upper Colorado Environmental Plant Center for Colorado National Monument (COLM) through an IDIQ Contract AG-8B05-C-12-0002, Task Order P12PD12930 signed July 11, 2012. The task order calls for the plant center to produce seed of two species, Indian ricegrass and Sandberg's bluegrass, through December 2015. The plant center is to obtain seed from Colorado National Monument collections in order to establish two 0.33-acre fields in 2013. If adequate seed is collected, field sizes for both species will be increased to 0.5 acre. This agreement will remain in effect until December 31, 2015.

Accomplishments. On July 20, 2012, Terri Blanke and Steve Parr with the Upper Colorado Environmental Plant Center provided seed collection training to COLM staff in order for them to confidently collect seed of targeted production species. However, prior to the training, COLM staff had collected 18 grams of Indian ricegrass. During the training, no seed was found remaining on plants of Indian ricegrass or Sandberg's bluegrass. It was explained that both species are early maturing, so it is important to get populations identified early in the spring of 2013, collect the seed, and send it to the plant center for cleaning, testing, and planting. The plant center sent approximately 28 pounds of mixed native seed for experimental plantings within Colorado National Monument for use on heavy traffic areas.

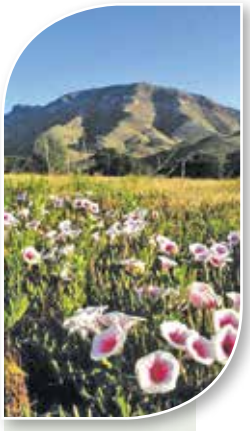
Technology Development. There are no new technological advancements to report for this project at this time.



Terri Blanke and seed collection crew.

Coronado National Memorial, Arizona

Prepared by: **Tuscon, Arizona, USDA NRCS Plant Materials Center**



Introduction. This agreement (IA 1211-09-005) was initiated July 17, 2009 and is expected to be completed by September 30, 2013. The Tucson Plant Materials Center will propagate a total of 5000 containerized plants of agave (*Agave palmeri*) during the course of the contract. Approximately 1500–2000 plants will be delivered to Coronado National Memorial each year in order to meet the amount stipulated in the agreement. The agave plants will be out-planted in an area disturbed during the construction of the border fence along the Arizona–Mexico border. At present, there is limited information available on growth protocols for this species. Therefore, the Tucson PMC has initiated studies on optimal propagation techniques.

Accomplishments. Seed collected at Coronado National Memorial in October 2008 was cleaned with a South Dakota seed blower and production of plants was initiated in July 2009. The first batch of seeds was pre-soaked in water for 12 hours, drained and then placed in the greenhouse at 70°F to germinate. Germination took place over 7–14 days with excellent results. Approximately 1700 seedlings were transplanted into 3-inch by 5-inch Zipset Plant Band containers (45 cubic inches in volume) during the first production year, 2010. The procedure was repeated for production years 2011 and 2012. See the table below for the total number of plants delivered each year. The final delivery was completed on August 9, 2012. The Tucson PMC delivered a total of 5100 containerized agave plants to Coronado National Memorial. Therefore, the production requirements of this agreement have been completed.

Total number of plants delivered to Coronado National Memorial

Delivery Date	Number of Plants	Container size (inches)	Average Rosette Diameter (inches)
July 16, 2010	1600	3X 5	2.5-3.5
August 9, 2011	1900	3 X 5	2.5-3.5
August 9,2012	1600	3 X 5	2.5-3.5
Total Delivered	**5100**		

Technology Development. Limited information is available in the literature regarding *Agave palmeri* culture under nursery conditions. The Tucson PMC initiated observational trials and a growth rate study to investigate the cultural requirements for this plant. The following are some of the observations recorded during the first, second, and third year of the grow-out.

Growing media—A mixture of peat moss and perlite at a 1:2 ratio provided the best results for drainage and growth. A mixture of 3:1:1 of shredded bark, sand, and peat moss did not work as well as the 1:2 ratio of peat moss and perlite. A mixture of medium-texture field soil, peat moss, and perlite (1:1:1) did not provide adequate drainage.

Irrigation frequency—Ten minute irrigation frequencies of three days, two days, and one day per week were compared to determine the optimum watering frequency for growth. Additional watering days per week did not improve growth rates but did result in a fungus gnat infestation in the greenhouse. An irrigation frequency of one 10-minute watering per day per week provided sufficient water for plant growth and reduced the fungus gnat infestation.

Fertilization—Plants were fertilized approximately once per month with 200 parts per million of 20-20-20 Peters Professional® Water Soluble Fertilizer.

Growth Rate Study—A greenhouse/shade house growth rate study was initiated soon after the agave plants were transplanted into individual containers. Observations and data collected indicated that *Agave palmeri* has an increased growth rate in the summer months when temperatures are above 900F. Agave palmeri grows faster in its second year and doubles its root mass (see pictures below). Plants initiated production of pups and increased the number of leaves from 6 the first year to 14 at the end of the second year. The average rosette diameter at the end of two years was about 3.3 inches.

Twelve two-year old plants that were grown in 3-inch by 5-inch containers were transplanted into one-gallon containers on April 29, 2011. They were evaluated January 30, 2013 (20 months after transplanted into 1-gallon containers and 3 years and 5 months after they were initially transplanted). The agaves averaged 8.6 inches in rosette diameter, 2.1 inches collar stem diameter, and 20 leaves per plant. Below are pictures of the results.

Figure 1: *A one-year-old agave plant in 2010.*

Figure 2: *A two-year-old agave plant in 2011.*

Figure 3: *One-gallon, three-year agave plants.*

Figure 4: *Agave rosette diameter.*

Figure 5: *Agave rosette height.*

Figure 6: *Agave roots and pups.*

Dinosaur National Monument, Utah

Prepared by: **Meeker, Colorado, Upper Colorado Environmental Plant Center**

Introduction. This report covers the activities conducted by Upper Colorado Environmental Plant Center for Dinosaur National Monument in 2012. Presently, there is no agreement between Dinosaur and the plant center.

Accomplishments. The Upper Colorado Environmental Plant Center delivered approximately 1.75 tons of straw mulch (70 bales) to Dinosaur's new visitor center along with 43.8 pounds of seed of five species on May 24, 2012 (see Distribution and Delivery Record.)

Technology Development. Seeding rates, irrigation, fertilization, harvest, and cleaning records can be provided upon request. The table below identifies production of basin wildrye, which was not under contract this year. However, the seed is available for purchase if Dinosaur is so inclined.

A listing of seed from Dinosaur by species and year of harvest stored at the Upper Colorado Environmental Plant Center

Species	Year	Bulk	PLS
Basin wildrye	2012 Not under contract	27.0 lb	Not tested

Basin wildrye in production at Meeker, Colorado.

Glacier National Park, Montana

Prepared by: **Bridger, Montana, USDA NRCS Plant Materials Center**

Introduction. The Bridger Plant Materials Center has maintained a cooperative agreement with Glacier National Park since FY 1986. This agreement facilitates the collection, increase, and establishment of indigenous plant materials, and the development of technologies for the restoration of disturbances resulting from road construction and other projects within park boundaries.

Accomplishments. In 2012, 52 seed lots representing 41 species were delivered to Glacier National Park or used for Bridger PMC seed increase. Total weight of seed delivered was 0.260 kilograms (0.57 pounds). Seed distribution included 5 grasses (4 species), 35 forbs (29 species), and 12 woody plants (8 species). A total of 231 wildland seed collections were processed at the Bridger PMC and are reported in the 2012 Glacier Annual Technical Report.

The existing *Symphyotrichum laeve* increase, planted in 1998 and 2004 in Field 4, was sprayed with glyphosate and then cultivated two weeks later to remove the stand. It had become weed-infested and nonproductive. In addition, the two *Elymus trachycaulus* stands in Fields 5 and 13 were also removed after the 2012 seed harvest. These stands, however, were terminated due to the large amount of seed on hand, rather than a result of weed infestation or age.

Instead of attempting to establish new seed increase plantings with very small wildland seed collections, 600 plugs each of *Phleum pratense* L. and *Poa alpina* were grown from seed in the Bridger PMC greenhouse. They were then transplanted into Field 2 on August 3 and on August 13, respectively. Prior to planting, 50 pounds of nitrogen was broadcast over the planting area. Even though daytime temperatures were fairly high, flood irrigation kept the plugs turgid with little to no desiccation or loss of the plugs. In addition, cooler "Indian summer" temperatures prevailed well into November, which aided root system development prior to entering the dormant season. This same planting method was successfully used to establish 900 plugs of *Symphyotrichum laeve* in Field 4, which were planted on August 15. This practice appears to be highly successful for establishing small-seeded species and when the available seed collection is very small.

On September 11, 50 pounds of nitrogen was broadcast on the *Eurybia conspicua* in Field 4. The stand was then roto-tilled, which reduced the planting to one-foot wide strips of vegetation with two-foot, cultivatable alleys between adjacent rows. It is hoped that the practice will invigorate the old, sodbound stand and thereby increase seed production in 2013.

Active and new seed production fields as of December 2012 are listed in the table below. Field seed increase at the plant materials center is reported in the Glacier Park 2012 Annual Technical Report as well as below.

Glacier Park seed production fields at the Bridger PMC, December 2012

Genus and Species	Accession Number	Site	Field	Date Field Planted	Field Size	2012 Harvest
					acres	*kg*
Carex microptera	9087799	LM	4	6/7/2011	0.03	0.018
Elymus trachycaulus	9087790	SM	13	8/19/2010	Removed Fall 2012	43.09
Elymus trachycaulus	9088099	LM	5	8/17/2010	Removed Fall 2012	8.16
Eurybia conspicua	9087433	LM	4	6/21/2005	0.05	0.156
Phleum alpinum1	9054559	LP	2	8/03/2012	0.03	New
Poa alpina2	9054561	LP	2	8/13/2012	0.03	New
Symphyotrichum laeve3	9078605	LM	4	8/15/2012	0.04	New

1. From 2009 lot, 600 plugs; 2. From 2001 Bridger PMC seed increase, 600 plugs; 3. From 2011 lot, 900 plugs.

The container plants sown and held in cold storage at the Bridger PMC, December 2012, are listed in this next table.

Container plants sown and held in cold storage at the Bridger PMC, December 2012

Species	Glacier Lot Number	Accession Number	Collection Location	Date Sown	Number of Units	Size Container
						cubic inches
Arctostaphylos uva-ursi	08-124	9078618	MG	10/26/2012	900	7
Mahonia repens	10-146	9081475	LM	10/26/2012	600	7

There were no container/potted plants delivered to Glacier National Park in 2012.

Technology Development and Assistance. All 2011 and 2012 field increase seed lots greater than one kilogram in size were sent to the Montana Seed Lab, MSU-Bozeman, for analysis. Data includes germination, purity, and inert matter. Those seed lots used for field increase at the Bridger PMC were also sent in for seed analysis or a tetrazolium test (TZ). Results from these 11 tests are included in the Glacier Park 2012 Annual Technical Report.

Great Sand Dunes National Park and Preserve, Colorado

Prepared by: **Meeker, Colorado, Upper Colorado Environmental Plant Center**

Introduction. A plant materials agreement between Great Sand Dunes National Park and Preserve, the Natural Resource Conservation Service, and the Upper Colorado Environmental Plant Center expired in September 2011. Most produced seed remains on inventory.

Accomplishments. Indian ricegrass was harvested during the summer of 2012, but was not under contract. The seed is available to Great Sand Dunes through negotiations.

Great Sand Dunes seed inventory on hand at the Upper Colorado Environmental Plant Center

Species	Harvest Year	Field Size	Amount Cleaned Seed (Bulk)	PLS %	Amount PLS on Hand	Date Tested
						cubic inches
ACHY	2012	0.5	13.0 lb	Not Tested	NA	NA

Technology Development. Standard cultural practices, harvest, and cleaning protocols were used to produce seed of Indian ricegrass.

Indian ricegrass in production at Meeker, Colorado.

Grand Canyon National Park, Arizona

Prepared by: **Los Lunas, New Mexico, USDA NRCS Plant Materials Center**

Introduction. In July 1990, the National Park Service made an agreement with the Los Lunas Plant Materials Center to collect, propagate, and increase native grasses, forbs, shrubs, and trees. This agreement states that the Los Lunas PMC will produce the plant materials for the purpose of revegetating disturbed areas and native landscaping projects in Grand Canyon National Park, which includes both the north and south rim areas of the park.

Date	Species	Action	Status
2006	bottlebrush squirretail	Added to agreement	Inactive
2007	sideoats grama	Added to agreement	Inactive
2009	blue grama spike muhly	Added new accession to the agreement Added to the agreement	Active
2010	Indian ricegrass needle and thread woody and herbaceous species	Added to the agreement Added to the agreement Added to the agreement	Active

The following table shows the complete list of the Grand Canyon National Park plant species accessions.

Common Name	Scientific Name	Plant Symbol	Accession Number
Grasses			
blue grama	*Bouteloua gracilis*	BOGR	9062875
blue grama	*Bouteloua gracilis*	BOGR	9066803
bottlebrush squirreltail	*Elymus elymoides*	ELEL5	9066659
bottlebrush squirreltail	*Elymus elymoides*	ELEL5	9062858
Indian ricegrass	*Achnatherum hymenoides*	ACHY	9062857
Indian ricegrass	*Achnatherum hymenoides*	ACHY	9066904
muttongrass	*Poa fendleriana*	POFE	9062861
needle and thread	*Hesperostipa comata*	HECO	9062859
needle and thread	*Hesperostipa comata*	HECO	9066797
sideoats grama	*Bouteloua curtipendula*	BOCU	9066732
spike muhly	*Muhlenbergia wrightii*	MUWR	9066802
western wheatgrass	*Pascopyrum smithii*	PASM	9062860
Trees and Shrubs			
Apache plume	*Fallugia paradoxa*	FAPA	9062865
big sagebrush	*Artemisia tridentata*	ARTR	9066056
century plant	*Agave utahensis*	AGUT	9062874
cliffrose	*Purshia mexicana*	COME	9062876
curl-leaf mountain mahogany	*Cercocarpus ledifolius*	CELE	9062867
currant	*Ribes* spp.	RI SPP.	9066057

Common Name	Scientific Name	Plant Symbol	Accession Number
Datil yucca	*Yucca baccata*	YUBA	9066058
desert barberry	*Berberis fremontii*	BEFE	9066059
elderberry	*Sambucus* spp.	SA SPP.	9066047
Trees and Shrubs (continued)			
fernbush	*Chamaebatiaria millefollium*	CHMI	9062866
fourwing saltbush	*Atriplex canescens*	ATCA	9062873
Gambel oak	*Quercus gambelii*	QUGA	9062872
lupine	*Lupinus* spp.	LU SPP.	9062863
penstemon (blue)	*Penstemon* spp.	PE SPP.	9062862
penstemon (red)	*Penstemon* spp.	PE SPP.	9066054
pinyon (twoneedle) pine	*Pinus edulis*	PIED	9066467
ponderosa pine	*Pinus ponderosa*	PIPO	9066466
rabbitbrush	*Chrysothamnus nauseosus*	CHNA	9062877
Utah juniper	*Juniperus osteosperma*	JUOS	9066055
Utah serviceberry	*Amelanchier utahensis*	AMUT	9062869
wolfberry	*Lycium* spp.	LY SPP.	9062870

2012 Accomplishments. In 2012, the Los Lunas PMC performed the following activities:

- **Muttongrass** – Grew plug transplants from seed harvested from the seed production fields at the Los Lunas PMC. These transplants were used to establish an additional 0.50 acre production field. To improve seed production of the muttongrass, a split application of 100 pounds/acre of gypsum (CaSO4) was applied in 2012. The first application was completed during the early growth period. The second application was done in December 2012 while the plants were dormant; the gypsum was placed in a band approximately 2 inches below the soil surface next to the plants. Calcium deficiency can suppress seed development, and the application of CaSO4 could provide increased harvest of this species.
- **Needle and thread** – Grew plug transplants from seed harvested from the seed production field of 0.9 acres at the Los Lunas PMC. These transplants were used to establish a 0.24-acre seed production field.
- **Indian ricegrass** – A 0.14-acre Indian ricegrass production field was established by direct seeding in January 2012 from Grand Canyon National Park seed received by the Los Lunas PMC in 2011.
- **Deliveries** – The Los Lunas PMC delivered a total of 29,114 transplants to Grand Canyon National Park on June 12, July 25, and August 28, 2012.

The following tables describe the seed production fields established at the Los Lunas PMC, the amount of seed production, seed and transplant deliveries, and the amount of Pure Live Seed currently in our inventory.

2012 Established Grand Canyon National Park Production Fields at the Los Lunas PMC

Common Name	Scientific Name	Agreement Acreage	2012 Acreage
blue grama	*Bouteloua gracilis*	2.00	2.60
bottlebrush squirreltail	*Elymus elymoides*	0.50	0.00*
Indian ricegrass	*Achnatherum hymenoides*	0.50	0.14
muttongrass	*Poa fendleriana*	1.00	2.63
needle and thread	*Hesperostipa comata*	0.50	0.33
sideoats grama	*Bouteloua curtipendula*	0.50	0.00*
spike muhly	*Muhlenbergia wrightii*	0.50	0.70

**The bottlebrush squirreltail and sideoats grama fields were removed prior to 2011 as per agreement with Grand Canyon National Park.*

2012 Seed Production for Grand Canyon National Park

Common Name	Scientific Name	Pounds Cleaned (Bulk)
blue grama	*Bouteloua gracilis*	72.42
muttongrass	*Poa fendleriana*	111.75
spike muhly	*Muhlenbergia wrightii*	1.50
needle and thread	*Hesperostipa comata*	4.70
Indian ricegrass	*Achnatherum hymenoides*	No harvest

2012 Transplant Delivery to Grand Canyon National Park by the Los Lunas PMC

Common Name	Scientific Name	Accession	Container Size*	Amount Delivered
sideoats grama	*Bouteloua curtipendula*	9066732	SC10	3,234
pinyon pine	*Pinus edulis*	9066765	D25	268
needle and thread	*Hesperostipa comata*	9066797	D25 and SC10	93
fernbush	*Chamaebatiaria millefollium*	9066903	D25	400
Utah serviceberry	*Amelanchier utahensis*	9066912	D25	21
threeawn spp.	*Aristida* spp.	9066913	SC10	165
big sagebrush	*Artemisia tridentata*	9066914	D25	850
Fremont's mahonia	*Mahonia fremontii*	9066915	D25	680
rose heath	*Chaetopappa ericoides*	9066916	SC10	21
Mormon tea	*Ephedra viridis*	9066917	D25	390
James' buckwheat	*Eriogonum jamesii*	9066918	D25	539
rubber rabbitbrush	*Ericameria nauseosa*	9066919	SC10 and D25	1,477
Arizona spinyaster	*Escobaria vivipara var. arizonica*	9066920	SC10 and D25	447
Gray aster	*Eurybia glauca*	9066921	D25	1,100
threadleaf snakeweed	*Gutierrezia microcephala*	9066922	D25 and SC10	40
false goldenaster	*Heterotheca villosa*	9066923	SC10	1,460

Common Name	Scientific Name	Accession	Container Size*	Amount Delivered
fineleaf hymenopappus	*Hymenopappus filifolius*	9066924	SC10	98
threadleaf ragwort	*Senecio flaccidus*	9066926	D25	343
threenerve goldenrod	*Solidago velutina*	9066927	SC10	947
globemallow	*Sphaeralcea ambigua*	9066928	SC10	2,708
sand dropseed	Sporobolus cryptandrus	9066929	SC10 and PC4	7,986
MacDougal verbena	Verbena macdougalii	9066930	D25	1,317
banana yucca	Yucca baccata	9066931	D25	186

**SC10 = Super Cell 10-cubic-inch; D25 = Dee Pot 25-cubic-inch; PC4 = Pine Cell 4-cubic-inch*

Grand Canyon National Park Pure Live Seed on Inventory at the Los Lunas PMC

Common Name	Scientific Name	Accession	Pure Live Seed On Inventory (lbs.)	Test Date
blue grama	*Bouteloua gracilis*	9062875	2.07	11/17/2009
			14.96	12/6/2010
			4.23	11/17/2011
			28.93	2/13/2013
blue grama	*Bouteloua gracilis*	9066803	8.43	1/28/2011
			4.38	12/15/2011
			23.66	2/13/2013
muttongrass	*Poa fendleriana*	9062861	2.00	9/17/2010
			0.14	3/13/2012
			66.86	12/21/2012
sideoats grama	*Bouteloua curtipendula*	9066732	0.50	12/04/09
spike muhly	*Muhlenbergia wrightii*	9066802	9.31	1/25/2011
			12.29	1/24/2012
			0.40	2/15/2013
needle and thread	*Hesperostipa comata*	9066655	3.97	3/28/2013

Grand Canyon National Park spike muhly seed production field 21S.

June 2012 – Transplant delivery to Grand Canyon National Park.

Grand Canyon National Park muttongrass seed production field 35S.

Grand Teton National Park, Wyoming

Prepared by: **Aberdeen, Idaho, USDA NRCS Plant Materials Center**

Introduction. The Aberdeen Plant Materials Center entered into an interagency agreement with Grand Teton National Park in 2006 to produce seed of four native grasses for use in revegetation of disturbed areas following road construction. Seed fields of slender wheatgrass (*Elymus trachycaulus*), Sandberg bluegrass (*Poa secunda*), blue wildrye (*Elymus glaucus*), and mountain brome (*Bromus marginatus*) were planted in 2006, and seed was harvested in 2007 and 2008. New fields of Idaho fescue (*Festuca idahonensis*) and bluebunch wheatgrass (*Pseudoroegneria spicata*) were planted in May 2008. Seed from these fields was harvested in 2009 and 2010. The bluebunch wheatgrass field was removed in late 2010 because of poor seed yield. In 2010, a new field of mountain brome was planted for seed production in 2011 and 2012. The mountain brome field was removed after harvest in 2012. The Idaho fescue field was also harvested in 2011 and 2012 and a new Idaho fescue field (one acre) was established in 2012 for seed production in 2013–2014.

Accomplishments. Seed fields are sprinkler irrigated to supplement natural precipitation to approximate 18 to 20 inches of total annual moisture. Weeds were controlled during the growing season. No seed was requested for delivery in 2012. The following table lists species grown for Grand Teton, field acreage, current seed inventory, and seed test date.

Species	Harvest Year	Field Size (ac)	Inventory PLS Pounds	Pounds Shipped 2012	Seed Test Date
mountain brome	2012	2.5	1802	0	2/1/13
Idaho fescue	2012	0.3	60	0	2/5/13
mountain brome	2011	2.5	66	0	9/19/11
Idaho fescue	2011	0.3	83	0	2/22/12
Idaho fescue	2010	0.3	0	0	3/21/11
bluebunch wheatgrass	2010	0.17	0	0	3/21/11
slender wheatgrass	2009	1.0	503	0	5/17/10
slender wheatgrass	2008	1.0	498	0	4/14/09
slender wheatgrass	2007	1.0	0	0	3/20/08
Sandberg bluegrass	2007	0.25	0	0	3/19/09
Sandberg bluegrass	2009	0.25	0	0	6/4/10
blue wildrye	2008	2.7	389	0	4/22/09
blue wildrye	2007	2.7	599	0	3/10/08

Grand Teton National Park new Idaho fescue seed increase field at Aberdeen PMC, September 2012.

Grand Teton National Park mountain brome seed drying in shop at Aberdeen PMC, July 2011.

Prepared by: **Bismarck, North Dakota, USDA NRCS Plant Materials Center**

Introduction. On June 1, 2010, the Bismarck PMC entered into an interagency agreement with the Grand Teton National Park to grow and produce seed of bluebunch wheatgrass *(Pseudoroegneria spicata)*, slender wheatgrass (*Elymus trachycaulus)*, and mountain brome *(Bromus marginatus)* for use in revegetating Kelly Hay Fields. Fields were established at the plant materials center in 2010 with seed originating from the park. Seed harvested from these fields in 2011 and 2012 will be distributed to the park for reclamation activities. Extension of the agreement for FY 2013 is pending and awaiting signatures.

Targeted species and goaled seed amounts

Species	Common Name	PLS Pounds
Pseudoroegneria spicata	bluebunch wheatgrass	100
Elymus trachycaulus	slender wheatgrass	600
Bromus marginatus	mountain brome	400

Accomplishments. Growing conditions were fair in 2012. Precipitation was limited throughout the growing season. No irrigation water was applied in 2012. The slender wheatgrass field produced above-average seed yields. The mountain brome favored the drier, less humid conditions of 2012. Seed production of the mountain brome field was excellent and smut was minimal compared to 2011. The bluebunch wheatgrass field continued to have poor vigor and poor seed production and was not harvested in 2012. The bluebunch wheatgrass field will be discontinued in 2013. The Bismarck PMC was given a small amount of prairie junegrass seed originating from the park. The plant materials center will seed a single rod row to evaluate seed production. If seed production is successful the prairie junegrass could be a substitution for the bluebunch wheatgrass in future years. Mountain brome and slender wheatgrass seed was cleaned at the Bismarck PMC and tested at the North Dakota State Seed Department. No seed was distributed to the park in 2012.

Accession Number	Species	Seeding Date	Seeding Rate PLS (lb/acre)	Field Size (acres)
9094354	mountain brome	5/26/2010	10	1.0
9094353	slender wheatgrass	5/26/2010	5.5	1.0
9094352	bluebunch wheatgrass	6/26/2010	9.5	0.5

Seed production and distribution

Accession Number	Species	Date Planted	Field Size (ac)	Seed Production (PLS lbs)			2012 Seed Harvest Date	Seed Distribution to Park in 2012 (PLS lbs)	Inventory Remaining as of 2/15/2013 (PLS lbs)
				2010	2011	2012			
9094352	bluebunch wheatgrass	6/2/2010	0.50	no harvest	0.27	0.00	none	0.00	0.27
9094353	slender wheatgrass	5/26/2010	1.00	no harvest	570.30	825.00	7/3/2012	0.00	1395.30
9094354	mountain brome	5/26/2010	1.00	no harvest	19.20	792.00	7/2/2012	0.00	811.20

Technology Development. Combine settings, seed cleaning procedures, and seed tests have been documented and are available from the Bismarck PMC.

2012 slender wheatgrass harvest.

Prepared by: **Bridger, Montana, USDA NRCS Plant Materials Center**

Restoration of the Kelly Hay Fields

Introduction. In 2011, the Bridger PMC entered into a multiyear cooperative agreement with Grand Teton National Park for seed increase of four native grass species including Idaho fescue *(Festuca idahoensis)*, bluebunch wheatgrass *(Pseudoroegneria spicata)*, Sandberg bluegrass *(Poa secunda)*, and mountain brome *(Bromus marginatus)*. Seed increase of each species was goaled for 1 acre, although bluebunch wheatgrass had only enough seeds for a 0.65-acre field based on the production requirement of 25 PLS seeds per foot of row. Additionally, because of high seed dormancy in Sandberg bluegrass, three seed increase fields of this species were sown in 2011, and another field sown in spring 2012. Project completion is anticipated in 2014.

Accomplishments. A total of seven seed production fields of four species from Grand Teton were planted and/or maintained at the Bridger PMC in 2012 (see table below). Of the six separate seed increase fields of four species planted in 2011, five were maintained in 2012. The *Poa secunda* 9088212 planted in Field 11 failed to establish and was removed in late 2012. Seedling emergence of the other fields rated from excellent to fair by fall. On April 24, 2012, a field of *Poa secunda* 9090925 was planted in Field 20 totaling 1.0 acres. Emergence of this accession was very low in 2012. Total bulk seed production in 2012 by species also appears in the table.

Seed increase data of Grand Teton National Park seed lots, 2012

Species	Accession	Date	No. of	Area		2012 Bulk Seed	Total Seed
Symbol	Number	Sown	Rows	Planted	Location	Produced	On-Hand
				acres		*kg*	*kg*
FEID	9088206	8/11/2011	40	1.00	Field 12	0.186	0/0.186
PSSPS	9088209	8/11/2011	32	0.65	Field 12	4.76	0/4.76
POSE	9088212	8/11/2011	24&28	1.30	2 sites Field 12	0	1.043/0
POSE	9088212	11/17/2011	20	0.50	Field 11	0	Same as above
BRMA4	9088217	8/11/2011	40	1.00	Field 12	215.45	1.45/215.45
POSE	9090925	4/24/2012	20	1.00	Field 20	new	0.339/0

Extreme drought and heat in 2012 impacted all seed crops at Bridger, including Grand Teton increase. The only species producing anticipated amounts of seed was *Bromus marginatus*. All *Poa secunda* accessions failed to produce any measurable seed in 2012.

Technology Development. Field sowing of seed increase crops at the Bridger PMC has historically been in late winter or late fall (dormant planting). Midsummer planting of grass seed production crops is a relatively new technique at the plant materials center, with promising results to date. Midsummer sowing allows control of aggressive early-season weeds prior to planting of the target crop, which results in reduced competition for water and nutrients during the growing season. Although establishment of some summer 2011-planted fields was successful in 2012, seed production of many species suffered from the drought and heat.

Harvesting seed increase field.

Rocky Mountain National Park, Colorado

Prepared by: **Meeker, Colorado, Upper Colorado Environmental Plant Center**

Introduction. The Upper Colorado Environmental Plant Center and Rocky Mountain National Park initiated an IDIQ Contract AG-8B05-C-12-0002, Task Order P12D11994, Bear Lake Road Revegetation, on August 10, 2012. This agreement combined two previously separate production agreements and modified the acreage, species, and years for production. This agreement involves seed production of three forbs and six grasses for revegetation of the Bear Lake Road Project for two years, with the reduction of two fields in 2013.

Accomplishments. This year, eight of nine target production materials were harvested for use in the revegetation of the Bear Lake Road Project. The product that did not produce seed was planted in August 2012. The five established grasses produced 1280 clean pounds of seed.

Two large seed shipments were received by the park in 2012. The first was delivered on August 22 by Pat Davey, NRCS Revegetation Technical Advisor to the National Park Service, and accounted for 393.3 pounds and 11 species. The second shipment was delivered by the plant center's Terri Blanke on September 9. Seven species weighing 3,374.7 pounds were unloaded at the greenhouse in the park.

Seed production was excellent for bottlebrush squirreltail and Canada wildrye, but disappointing for most species. The year was the second driest on record at the plant center, so most crops did not do well.

Species	Date	Clean Seed	PLS	Test Date	Process	Acreage
Mountain muhly						
Field Establishment:	5/28/03		59.00 g		Planet Junior	0.50 acres
Harvest:	9/11/12	4 lb	2.22 lb	12/20/12	Swather	
Shipment:	8/22/12	82 lb				
Needle and thread						
Field Establishment:	9/4/03	600 transplants			Transplanter	0.07 acres
	9/14/04	4000 transplants			Transplanter	0.20 acres
	6/30/05	5500 transplants			Transplanter	0.30 acres
Harvest:	6/18/12	5.4 lb	1.8 lb		Flail Vac	
Shipment:	8/22/12	55.6 lb				
Prairie Junegrass						
Field Establishment:	5/29/03	28 g			Planet Junior	0.20 acres
	9/15/04	4000 transplants			Transplanter	0.20 acres
Harvest:	7/5/12	1.5 lb	1.01 lb	1/4/13	Combine	
Shipment:	8/22/12	41.8 lb				
Purple locoweed						
Field Establishment:	5/28/03	203 g			Planet Junior	0.50 acres
Harvest:	7/3/12	488 g	No test		Hand clipped	
Shipment:	8/22/12	47.3 lb				
Rose pussytoes						

Species	Date	Clean Seed	PLS	Test Date	Process	Acreage
Field Establishment:	5/18/09	550 Transplanted plugs				0.10 acres
Harvest:	6/4/12	36 g	No test		Hand clipped	
Shipment:	8/22/12	0.4 lb				
Bottlebrush squirreltail						
Field Establishment:	6/23-24/09	7500 Transplanted plugs				2.75 acres
Harvest:	8/4-6/12	592 lb	538 lb		Combine	
Shipment:	9/9/12	1944 lb				
Canada wildrye						
Field Establishment:	8/2/11	Direct seeded 4.25 lb				3.00 acres
Harvest:	8/9/12	677 lb	459 lb		Combine	
Shipment:	9/9/12	1093.5 lb				
Louisiana sage						
Field Establishment:	7/4/11	300 Transplanted plugs				0.05 acres
Harvest:	9/13/12	4.6 lb	3.38 lb	1/4/13	Hand clipped	
Wooly brome						
Field Establishment:	8/10/12	Direct seeded 7 lb			Planet Junior	2.50 acres

The table above provides a complete recap of the activities conducted by the Upper Colorado Environmental Plant Center in 2012.

Technology Development. Standard seed production practices were conducted in 2012.

Rocky Mountain bottlebrush squirreltail, in production at Meeker, Colorado.

Saguaro National Park, Arizona

Prepared by: **Tuscon, Arizona, USDA NRCS Plant Materials Center**

Introduction. This project originally involved the establishment of 0.5 acres of *Aristida purpurea* and 0.25 acres of *Abutilon incanum*. In May 2012, the agreement was amended to remove the production requirement of *Abutilon incanum* due to insufficient viable seed. Seed harvested from the *Aristida purpurea* field will be used in revegetation projects within Saguaro National Park. The final signature on the amendment was in May 2012 with the agreement continuing until September 30, 2015.

Accomplishments. Tucson PMC personnel received the *Aristida purpurea* seed for this project in March 2011. There were 35 individual *Aristida purpurea* collections with varying collection years (1999–2010). The total seed received was 519 grams. Approximately 1900 plugs of *Aristida purpurea* were started in July of 2011 using 26 of the individual seed collections. A 0.5-acre field of *Aristida purpurea* was established in September 2011. Individual collections were planted into known distinct locations within the field. Field observations in late 2011 indicated that collections 825 and 865, both collected in 2002, were heartier with more vegetative production than the other collections. The remaining accessions died in the field during the winter of 2011.

In late April 2012, additional plugs of *Aristida purpurea* were planted and grown for reestablishment of the field. The majority of the seed used for the replant were the accessions 825 and 865. Planting of additional plugs using additional accessions continued through July to ensure adequate plants were available for full reestablishment of the production field. The field was replanted in September 2012. Harvests of the field are expected in early 2013.

A portion of the aristida purpurea *plugs grown for field reestablishment, July 2012.*

Aristida purpurea *field freshly planted, September 2012.*

Yellowstone National Park, Wyoming

Prepared by: **Aberdeen, Idaho, USDA NRCS Plant Materials Center**

Introduction. In 2008, the Aberdeen PMC entered into an interagency agreement with Yellowstone National Park to produce seed of Sandberg bluegrass (*Poa secunda*), bluebunch wheatgrass (*Pseudoroegneria spicata*), and needle and thread (*Hesperostipa comata* ssp. *comata*) for use on restoration sites at the park. Seed was harvested from these fields in 2011 and 2012 and will be harvested again in 2013 (with the exception of needle and thread, which was removed after harvest in 2012) after which the agreement is scheduled to terminate.

Accomplishments. The seed fields were planted in spring 2009. Sandberg bluegrass was planted in field 2E at the PMC Home Farm and the bluebunch wheatgrass and needle and thread were planted in field 410E at the University of Idaho Brewington Farm. Each seed increase block is approximately one acre. Soils at the PMC Home Farm are Declo silt loam with pH of 7.4 to 8.4. Soils at the Brewington Farm are also classified as Declo loam but these soils have a high percentage of sand. Average annual precipitation is 9.39 inches and seed fields are sprinkler irrigated to supplement natural precipitation to approximate 18 to 20 inches total annual precipitation. Establishment of the seed production fields was rated fair to good. The following table lists all species grown for Yellowstone, field acreage, current seed inventory, and hay mulch/seed shipped during 2012.

Species	Harvest Year	Field Size (ac)	Inventory PLS Pounds	Pounds Shipped 2012	Seed Test Date
Sandberg bluegrass	2012	1.0	46	0	2/25/13
Sandberg bluegrass	2011	1.0	115	0	2/22/12
Sandberg bluegrass	2010	1.0	58	0	3/28/11
Bluebunch wheatgrass	2012	1.0	110	0	2/5/13
Bluebunch wheatgrass	2011	1.0	89	0	2/29/12
needle and thread (hay)	2012	1.0		2400	N/A

Yellowstone National Park Sandberg bluegrass seed production field at Aberdeen PMC, May 2012.

Yellowstone National Park bluebunch wheatgrass seed production field at Aberdeen PMC, July 2012.

Prepared by: **Bridger, Montana, USDA NRCS Plant Materials Center**

Gardiner Basin

Introduction. Effective in FY 2009, a new Yellowstone National Park agreement was developed to address issues associated with enhancing critical wildlife habitat along the northern boundary in the Gardiner Basin. The four-year project facilitates seed production of three native grasses at the Bridger PMC, along with establishment and evaluation of restoration test plots on a small portion of the land formerly used for agricultural production and acquired by Yellowstone in the 1930s. Points of interest include effectiveness of various weed control methods, seeding techniques, and plant performance.

Accomplishments. There are currently 127 pounds of grass seed on inventory at the Bridger PMC for the Northern Boundary Project. This consists of 50 pounds wildland-collected seed from the Carbella site (14 lots of 5 species) and 77 pounds produced at the Bridger PMC (10 lots of 2 species). On August 14 and 21, 2012, seed increase fields of bluebunch wheatgrass, Sandberg bluegrass, and slender wheatgrass were established at the Bridger PMC. Existing stands of bluebunch wheatgrass and needle and thread yielded 4 and 0.7 bulk pounds of seed, respectively. The needle and thread field was removed due to natural decline in production.

Technology Development. In April 2012, Dr. Bill Hamilton continued his efforts sampling soil and inventorying their microbes in different Yellowstone National Park plant communities. He also conducted frequency plant counts at the Cinnabar and Reese Creek planting sites. At Cinnabar, seven of eight grass species were encountered more frequently in nontreated than in treated plots. The top performers were bluebunch wheatgrass, slender wheatgrass, needle and thread, and basin wildrye. There were slightly more prairie Junegrass seedlings in treated compared to nontreated plots. In contrast, desert alyssum was as frequent in nontreated as in treated plots. In nontreated plots, needle and thread occurred five times more frequently than desert alyssum. In treated plots, Indian ricegrass had the lowest frequency when compared to desert alyssum. At Reese Creek, six of eight grass species were encountered more frequently in nontreated than in treated plots. The top performers were bluebunch wheatgrass, slender wheatgrass, needle and thread, basin wildrye, and Sandberg bluegrass. There were slightly more prairie Junegrass seedlings and twice as many Indian ricegrass seedlings in treated compared to nontreated plots. Desert alyssum was as frequent in nontreated as in treated plots. In nontreated plots, slender wheatgrass occurred twice as often as desert alyssum. In treated plots, green needlegrass had the lowest frequency when compared to desert alyssum.

On May 7, the Bridger PMC conducted a preliminary evaluation on both test sites when the native grass seedlings were very small, difficult to properly identify, and establishment was low. Overall, bluebunch wheatgrass had more growth than the other seven entries, except where it was less established in the treated plots at Cinnabar. In general, seedlings were slightly more developed in both treatments at Reese Creek than at Cinnabar.

On July 31, a final evaluation was conducted on both test sites. At Cinnabar, stem counts of needle and thread, bluebunch wheatgrass, and slender wheatgrass were slightly higher in nontreated plots than treated plots. The remaining seeded entries were negligent to absent. The burn treatment was nearly 100% effective in reducing the density of desert alyssum as compared to densities outside the burn. At Reese Creek, overall stem counts were very low but densities were greater in nontreated than treated plots. Needle and thread, bluebunch wheatgrass, and slender wheatgrass were most prevalent, while the remaining entries were negligent to absent. The burn treatment was not as effective in controlling desert alyssum as compared to Cinnabar. In the seed-hay mulch treatment, needle and thread emergence was very low and only slightly higher than at Cinnabar, and no bluebunch wheatgrass plants were found. The study plots will again be evaluated in 2013.

NPS and NRCS partners at the Cinnabar study plots in Yellowstone's Gardiner Basin.

Six-week-old seedlings of Sandberg bluegrass (Poa secunda) *growing at the Bridger PMC.*

Development of plant materials for revegetation of disturbed areas related to Federal Land Highway Program projects.

Introduction. The agreements facilitate the collection, increase, and reestablishment of indigenous plant materials for restoration of disturbances resulting from road construction and other improvement projects within park boundaries. The Bridger PMC has maintained cooperative agreements with Yellowstone National Park since FY 1986. In 2012, 13 allocations of 171 seed and/or vegetative lots were distributed to the park or the Bridger PMC (used to plant seed increase fields). The distribution included 93 grass lots (20 species), 76 forb lots (26 species), 1 shrub, and 1 lot of 1,551 lodgepole pine seedlings.

Accomplishments. Yellowstone National Park can forecast future road construction projects with enough lead time to allow seed and/or plant collection and production efforts to begin three years in advance of each project. Wildland seed collections are made by Yellowstone and PMC crews, dried, and either delivered to the Bridger PMC or picked up by Bridger PMC personnel. In 2012, 59 wildland collections produced a total of 26 pounds of seed, including 20 pounds from 29 grasses (14 species), 5.4 pounds from 29 forbs (19 species), and 2 grams from a shrub.

In 2012, seed increase fields of 10 grass accessions (8 species) was harvested at the BPMC on 2.7 acres, resulting in more than 88 pounds of seed production (see table below). Seed increase blocks of 7 grasses on 2.05 acres were removed due to natural decline in production. Currently there are 4.87 acres of 11 grass accessions (8 species) planted to seed increase blocks at the Bridger PMC. The wildland seed and increase inventory contains seed dated from 2003 to 2012. The 2007 seed lots of slender wheatgrass and the 2005 seed lots of mountain brome were returned to Yellowstone in 2012. Additionally, all seed lots from 2002 were distributed back to the park.

Technology Development. All plant materials collections are assigned accession numbers and inventoried in a database. The lot identification numbers have been upgraded to include identification by individual construction projects.

The 2012 Yellowstone National Park Seed Increase at the Bridger PMC

Genus and Species	Accession	POMS Lot Number	Harvest Date	Amount (kg)	% Pure Live Seed
Bromus marginatus	9088025	SCO-12-YNP-140	6/26 & 6/28	16.783	95.15
Elymus glaucus	9088030	SCO-12-YNP-17	6/28-7/05	4.536	96.07
Festuca idahoensis	9081537	SCO-12-YNP-86	6/26 & 6/28	8.165	93.78
F. idahoensis	9081882	SCO-12-YNP-143	6/25	4.990	86.52
No tests were conducted on the following small seed lots:					
Deschampsia cespitosa	9076227	SCO-12-YNP-128	7/05	0.794	-
Hesperostipa comata	9081502	SCO-12-YNP-57	6/26	0.316	-
Leymus cinereus	9081887	SCO-12-YNP-45	7/25	0.293	-
Nassella viridula	9081773	SCO-12-YNP-43	6/26	0.397	-
Pseudoroegneria spicata	9081759	SCO-12-YNP-140	7/05-7/09	1.724	-
P. spicata	9087860	SCO-12-YNP-148	7/05-7/09	1.814	-

Seed production field of Yellowstone's Idaho fescue Festuca idahoensis *at the bridger PMC.*

Collecting seed of slender wheatgrass Elymus trachycaulus *in the wilds of Yellowstone National Park.*

Prepared by: **Meeker, Colorado, Upper Colorado Environmental Plant Center**

Introduction. This report covers activities that have been conducted by Upper Colorado Environmental Plant Center for Yellowstone National Park through an IDIQ Contract AG-8B05-C-12-0002, Task Order P12PD12993. The task order calls for the plant center to produce seed for a single grass species, bluebunch wheatgrass. The plant center is to produce approximately 240 pounds Pure Live Seed for Yellowstone from a one-acre field. This agreement will remain in effect until April 30, 2016.

Accomplishments. After an establishment year in 2011, abnormal weather took a toll on all plantings and production fields the winter of 2011–2012. The winter was open with little to no snow cover and winds were unusually strong and persistent. A portion of the field was lost to soil drifting, as were a number of fields. Despite the weather, the field of Yellowstone bluebunch still yielded 122 pounds of clean seed, but only 56.5 PLS pounds. The Upper Colorado Environmental Plant Center reseeded each area that was lost to extreme climatic conditions to ensure a full stand for future production years. The plant center will produce bluebunch through 2015 to obtain the targeted quantity of seed.

On October 11, 2012, a joint Yellowstone/PMC meeting was held in Gardiner, Montana, to review accomplishments of past projects and view new projects as well as to identify the capabilities of the Plant Materials Centers to provide native seed stock for restoration work in Yellowstone. Planned projects were discussed as well as updates on projects which were recently started.

Species	Year	Planted	Acreage	Harvest Date	Clean Pounds	Test Date	PLS
Bluebunch	2010	Aug. 18	1.0	NA			
	2012	Nov. 5	1.0 (blanks)	6/26	122	1/22/13	56.55

Technology Development. Standard planting, cultural practices, harvest, and cleaning protocols have been used to produce bluebunch wheatgrass.

Yellowstone bluebunch wheatgrass in production at Meeker, Colorado.

Zion National Park, Utah

Prepared by: **Los Lunas, New Mexico, USDA NRCS Plant Materials Center**

Introduction. In June 2009, an agreement was made between Los Lunas Plant Materials Center and Zion National Park to propagate 800 PLS pounds of bottlebrush squirreltail (*Elymus elymoides*) and 200 PLS pounds of Indian ricegrass (*Achnatherum hymenoides*).

The agreement states that Zion will use this seed to revegetate disturbed areas at the park. The seed of these two species was collected by the park staff and sent to the Los Lunas PMC for conditioning; it then was used to establish seed production fields according to the agreement.

The following table shows a complete list of the accessions involved in the Zion agreement:

Zion National Park Accessions

Common Name	Scientific Name	Plant Symbol	Accession Number
bottlebrush squirreltail	*Elymus elymoides*	ELEL5	9066532
Indian ricegrass	*Achnatherum hymenoides*	ACHY	9066528

2012 Accomplishments. See the following four tables for the established Zion National Park seed production fields at the Los Lunas PMC, the amount of seed delivered to Zion, the amount of seed production, and Pure Live Seed on inventory for Zion:

2012 Established Zion National Park Production Fields at the Los Lunas PMC

Common Name	Scientific Name	Agreement Acreage	2012 Acreage
bottlebrush squirreltail	*Elymus elymoides*	1.50	1.00
Indian ricegrass	*Achnatherum hymenoides*	0.50	0.42*

Only 0.42 acres of Indian ricegrass was established due to the amount of seed originally received from Zion National Park.

2012 Seed Delivered to Zion National Park by the Los Lunas PMC

Common Name	Scientific Name	Pure Live Seed Pounds Delivered
Indian ricegrass	*Achnatherum hymenoides*	50.0 Lot# SFP-08-F35NZ10

2012 Zion National Park Seed Production at the Los Lunas PMC

Common name	Scientific name	Pounds Cleaned (Bulk)
bottlebrush squirreltail	*Elymus elymoides*	76.10
Indian ricegrass	*Achnatherum hymenoides*	56.00

Zion National Park Pure Live Seed on Inventory at the Los Lunas PMC

Common Name	Scientific name	Accession	Pure Live Seed on Inventory (lbs)	Test Date
bottlebrush squirreltail	*Elymus elymoides*	9066532	2.65 13.74 0.47 14.35 12.54 13.83 46.57	8/20/09 9/17/10 8/27/07 8/06/05 8//08/11 8/08/11 1/17/13
cane bluestem	*Bothriochloa barbinodis*	9066543	0.60 (bulk) 1.36 2.19 1.58 0.20 (bulk)	No test* 1/21/05 1/17/06 3/09/07 No test*
galleta	*Pleuraphis jamesii*	9066586	1.51 0.58 (bulk) 0.46 (bulk)	1/08/07 No test* No test*
Indian ricegrass	*Achnatherum hymenoides*	9066528	15.48 44.12 26.57 33.06 22.74 27.87 49.97	10/16/06 4/28/08 10/31/08 11/11/09 12/14/10 11/30/11 2/19/13
muttongrass	*Poa fendleriana*	9066531	4.55 0.70 1.84 (bulk)	5/30/08 11/20/08 No test*
sand bluestem	*Andropogon halii*	9066529	2.73 (bulk) 2.80 8.89 3.26 9.84 19.48	No test* 3/20/06 3/21/07 6/14/10 7/07/10 4/19/10

**Seed was not sent for testing due to an insufficient amount of seed or seed was from the collections made at Zion National Park.*

Bottlebrush squirreltail seed production field 19.

Indian ricegrass seed production field 35N.

MIDWEST REGION

Apostle Islands National Lakeshore, Wisconsin

Prepared by: **East Lansing, Michigan, USDA NRCS Plant Materials Center**

Introduction. The Apostle Islands National Lakeshore entered into an interagency agreement with the Natural Resources Conservation Service to propagate plants of beachgrass (*Ammophila breviligulata*) (AMBR), crinkled hairgrass (*Deschampsia flexuosa*) (DEFL), Canada mayflower (*Maianthemum canadense*) MACA4), juniper (*Juniperus communis*) (JUCO6), evening primrose (*Oenothera oakesiana*) (OEOA), and common milkweed (*Asclepias syriaca*) (ASSY). During the summer and autumn of 2011 NPS staff collected seeds or vegetative material from each species and sent them to the Rose Lake Plant Materials Center. The plant materials center developed propagation protocols, propagated each species, and delivered those plants to the National Park Service as agreed upon in the interagency agreement.

Accomplishments. The following is a summary of the plants propagated and delivered to Apostle Islands National Lakeshore in 2012.

Species (Code)	Plants Delivered to Apostle Islands National Lakeshore
AMBR	1810
DEFL	8820
JUCO6*	260
MACA4*	400
OEOA	2690
ASSY	2350

**JUCO6 and MACA4 were collected in 2010 and propagated in 2011. Plants were kept at the plant materials center and delivered in 2012.*

Technology Development. The Rose Lake PMC has worked with Apostle Islands National Lakeshore since 2000 to develop propagation protocols for 30 plant species that are native to the park. In 2012 the plant materials center published a document detailing the propagation protocols for those species titled "Propagation Protocols – Plants Produced for Apostle Islands National Lakeshore." The document is available through the Plant Materials Program website.

In addition to the plant propagation completed in 2012, Apostle Islands National Lakeshore provided common juniper berries for the Rose Lake PMC in 2011. Juniper berries contain two or three seeds each. Berries are hard and the pulp has a sticky texture that makes seed separation difficult. Popular literature suggests submerging berries in a lye solution will improve ease of seed separation.

An experiment was conducted to determine the effect separating seeds from the berries has on germination compared to propagation using the whole berry. Whole berries were planted with or without a 16-week cold stratification. Separated seeds were also planted with or without a 16-week cold stratification. No emergence was noted in 2012. This is a common observation for common juniper. Pots were allowed to overwinter in 2012–2013 and germination will be evaluated in the spring of 2013.

Delivery of plants to Apostle Islands in May 2012.

NPS volunteers preparing to establish plants on one of the islands.

Badlands National Park, South Dakota

Bismarck, North Dakota, USDA NRCS Plant Materials Center

Introduction. The National Park Service has a need to preserve the native plant resources and revegetate disturbed park lands. The agency requires native plant restoration to be accomplished using germplasm from populations as closely related genetically and ecologically as possible to the park populations. Quantities of native seed are needed to revegetate areas disturbed by construction activities for the proposed road rehabilitation project. The National Park Service has requested assistance from the Bismarck PMC. The Bismarck PMC has agreed to increase seed of five selected grass species collected at Badlands National Park. Technical assistance for planting, growing, and cleaning of seed will also be provided to the park. The original interagency agreement was signed in May 2007 and expired in 2010. The agreement was amended extending the contract for 2011. A new agreement has been signed for FY 2012 and FY 2013.

Targeted species and goaled seed amounts

Species	Common Name	PLS Pounds
Nassella viridula	green needlegrass	100
Pascopyrum smithii	western wheatgrass	200
Bouteloua gracilis	blue grama	20
Sporobolus cryptandrus	sand dropseed	10

Accomplishments. Slender wheatgrass seed production goals were met prior to 2012. The field was removed in 2012. Green needlegrass and western wheatgrass fields remained unchanged in size and location. The blue grama field was increased from 0.04 acre to 0.3 acre and the sand dropseed field was increased from 0.03 acre to 0.10 acre using seed from prior years' plant materials center field harvests. Growing conditions in 2012 were fair for warm-season and cool-season grass seed production. All fields, except western wheatgrass, produced seed and were harvested by straight combining. The 2012 field extensions of blue grama and sand dropseed were part of the harvest. As western wheatgrass had poor seed production in 2012, establishment of a new field needs consideration if there is a need for future seed production. Seed was cleaned at the plant materials center and tested for purity and germination by the North Dakota State Seed Department. Seed distribution in 2012 to Badlands National Park was 626.5 pounds.

Seed production and distribution

Accession Number	Species	Date Planted	Field Size (ac)	2013 Seed Production (PLS lbs)	2012 Seed Harvest Date	Seed Distribution to Park in 2012 (PLS lbs)	Inventory Remaining as of 2/15/2013 (PLS lbs)
9092167	Green needlegrass	11/30/07	0.41	39.8	06/25/12	90.32	387.00
9092165	Western wheatgrass	05/06/08	1.50	no harvest	no harvest	250.32	98.18
9092166	Slender wheatgrass	05/06/08	field removed	field removed	field removed	277.30	569.54
9092168	Blue grama	06/10/08	0.30	19.6	08/22/12	4.29	24.91
9092169	Sand dropseed	05/22/08	0.10	14.9	07/16/12	4.28	18.5

A new field of blue grama was planted in may 2012. Seed was produced and harvested the first year.

New sand dropseed field seeded may 2012.

Theodore Roosevelt National Park, North Dakota

Prepared by: **Bismarck, North Dakota, USDA NRCS Plant Materials Center**

Introduction. The Bismarck PMC entered into a cooperative agreement in May 2007 to provide seed and technical information needed for revegetation of areas disturbed by construction activities in the North Unit Scenic Route 10 of the Theodore Roosevelt National Park in western North Dakota. The agreement is between Theodore Roosevelt National Park and the USDA Natural Resources Conservation Service. The original agreement was effective from FY 2007 through FY 2010. A new agreement was later signed and in effect for FY 2011 and expired in FY 2012. A new agreement is presently being developed for FY 2013. The Bismarck PMC originally agreed to produce native grass seed of six species collected in the park by park personnel and PMC staff. The new agreement terminates the production of slender/thickspike wheatgrass and green needlegrass because goaled seed amounts were met. The seed produced at the plant materials center will be distributed to the park for revegetation projects.

Targeted species and goaled seed amounts

Species	Common Name	PLS Pounds
Pascopyrum smithii	western wheatgrass	100
Elymus trachycaulus	slender wheatgrass	80
Nassella viridula	green needlegrass	70
Bouteloua curtipendula	sideoats grama	10
Bouteloua gracilis	blue grama	2
Koeleria macrantha	prairie junegrass	2

Accomplishments. Four seed production fields were managed and maintained using herbicides and hand roguing for weed control. The fields were not irrigated in 2012. All fields produced seed and were harvested by straight combining. To increase available seed amounts, three field acreages were increased in 2012. The sideoats grama field was increased from 0.03 acre to 0.3 acre. The blue grama field was increased from 0.02 acre to 0.3 acre and the prairie junegrass field was increased from 0.02 acre to 0.2 acre. The new fields of sideoats grama and blue grama produced seed and were harvested in 2012. Seed used for establishing the new fields came from the harvest of original park fields grown at the plant materials center. The western wheatgrass field was maintained at 0.57 acre. The green needlegrass and slender/thickspike wheatgrass fields were taken out of production in 2012. Seed was cleaned at the plant materials center and tested for purity and germination by the North Dakota State Seed Department. Seed distribution to the park in 2012 was 372.5 PLS pounds.

Seed production and distribution

Accession Number	Species	Date Planted	Field Size (ac)	2013 Seed Production (PLS lbs)	2012 Seed Harvest Date	Seed Distribution to Park in 2012 (PLS lbs)	Inventory Remaining as of 2/15/2013 (PLS lbs)
9092171	Green needlegrass	11/30/07	0.00	field removed	none	74.75	356.57
9092172	Western wheatgrass	05/01/08	0.57	25.44	07/19/12	165.38	127.23
9092175	Slender wheatgrass	05/01/08	0.00	field removed	none	132.35	587.90
9092173	Blue grama	06/10/08	0.30	29.43	08/22/12	0.00	43.18
9092174	Sideoats grama	06/10/08	0.30	34.55	08/07/12	0.00	49.40
9092176	Prairie junegrass*	05/22/08	0.20	1.06	07/12/12	0.00	8.84

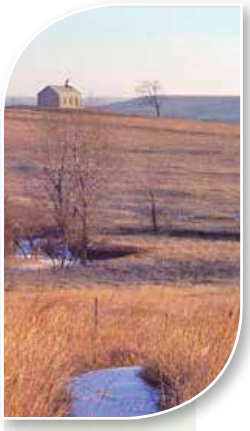
** original field started with 600 plants grown in the greenhouse*

Technology Development. Combine settings, seed cleaning procedures, and seed tests have been documented and are available from the plant materials center.

A new field of sideoats grama was planted in May 2012. Seed was harvested from the field in 2012.

Tallgrass Prairie National Preserve, Kansas

Prepared by: **Manhattan, Kansas, USDA NRCS Plant Materials Center**



Introduction. The National Park Service, in managing the Tallgrass Prairie National Preserve, identified a need to preserve the native plant flora in conjunction with the construction of a new visitor's center. The National Park Service required that the restoration of native plants to the site be accomplished using germplasm from populations as closely related genetically and ecologically as possible to park populations. In 2011, an agreement was made with the Manhattan PMC to propagate plants from seed collected by NPS employees and volunteers, and store the remaining seed.

Accomplishments. NPS employees and volunteers made seed collections of 20 native species found on the Tallgrass Prairie National Preserve in 2010 and 2011. On March 16, 2012, the Manhattan PMC received the collections and began cleaning the seed. Seed units of additional species found in the collections were separated from the collections. Seed quality was poor on many of the collections, 20% of which lacked filled seed units. Seeds from the remaining collections were planted to cone-tainers in the plant materials center's greenhouse. Seedlings were obtained from 94% of the collections but ranged from 1 to 35 seedlings per collection with a success rate of 47%. With the addition of the added species, the plant materials center succeeded in producing 242 plants of 19 species in 21cm cone-tainers and 25cm-deep pots.

Status of Tallgrass Prairie National Preserve seed collections

Alternate No.	Species	Common Name	Collection Date	Quantity of Material Received (g)	Quantity of Clean Seed (g)
NPS-KS-10-001	*Mimosa nuttallii*	catclaw sensitive brair	7/31/2010	39	3.2
NPS-KS-10-002	*Penstemon cobaea*	prairie beardtongue	9/2/2010	15	1.6
NPS-KS-10-004	*Asclepias syriaca*	common milkweed	2010	54	50.8
NPS-KS-10-005	*Baptisia australis*	blue wild indigo	2010	34	28.4
NPS-KS-10-006	*Echinacea angustifolia*	black sampson	2010	116	3.2
NPS-KS-10-010	*Amorpha canescens*	lead plant	2010	41	0 No Fill
NPS-KS-11-001	*Astragalus crassicarpus*	groundplum milkvetch	6/18/2011	11	9.4
NPS-KS-11-002	*Delphinium carolinianum*	prairie larkspur	7/1/2011	0.5	0.4
NPS-KS-11-003	*Asclepias tuberosa*	butterfly milkweed	8/6/2011	3.5	2.9
NPS-KS-11-004	*Liatris aspera*	button blazing star	11/1/2011	13	0.27
NPS-KS-11-005	*Ratibida columnifera*	prairie coneflower	8/4/2011	18.5	0 Immature
NPS-KS-11-006	*Ceanothus americanus*	New Jersey tea	6/4/2011	95	10.9
NPS-KS-11-007	*Silphium laciniatum*	compass plant	9/24/2011	46	12.5
NPS-KS-11-008	*Baptisia bracteata*	cream wild indigo	7/16/2011	2	1.4
NPS-KS-11-009	*Tradescantia ohiensis*	Ohio spiderwort	6/2011	8	7.8
NPS-KS-11-010	*Koeleria macrantha*	June grass	6/18/2011	27	0 Immature
NPS-KS-11-011	*Dalea purpurea*	purple prairie clover	7/16/2011	63	0 No Fill

Alternate No.	Species	Common Name	Collection Date	Quantity of Material Received (g)	Quantity of Clean Seed (g)
NPS-KS-11-012	*Oenothera macrocarpa*	Missouri evening primrose	7/9/2011	9	7.92
NPS-KS-11-013	*Psoralidium tenuiflorum*	wild alfalfa	6/18/2011	70	48.4
NPS-KS-11-014	*Lespedeza capitata*	roundhead lespedeza	11/5/2011	87	2.3
NPS-KS-11-015	*Andropogon gerardii*	big bluestem	NA	NA	NA
NPS-KS-11-016	*Sorghastrum nutans*	Indian grass	NA	NA	NA
NPS-KS-11-017	*Panicum virgatum*	switchgrass	NA	NA	NA
NPS-KS-11-018	*Bouteloua curtipendula*	sideoats grama	NA	NA	NA
NPS-KS-11-019	*Sporobolus cryptandrus*	sand dropseed	NA	NA	NA

Legend: Alternant No. = Agency-State-Crop Year-Collection Number; NA=Not Available

Status of Tallgrass Prairie National Preserve plant production

Alternate No.	Species	Common Name	Number of Initial Seedlings Produced	Number of Plants Produced
NPS-KS-10-001	*Mimosa nuttallii*	catclaw sensitive brair	20	18
NPS-KS-10-002	*Penstemon cobaea*	prairie beardtongue	2	1
NPS-KS-10-004	*Asclepias syriaca*	common milkweed	24	24
NPS-KS-10-005	*Baptisia australis*	blue wild indigo	19	19
NPS-KS-10-006	*Echinacea angustifolia*	black sampson	20	19
NPS-KS-10-010	*Amorpha canescens*	lead plant	0	0
NPS-KS-11-001	*Astragalus crassicarpus*	groundplum milkvetch	18	18
NPS-KS-11-002	*Delphinium carolinianum*	prairie larkspur	21	0
NPS-KS-11-003	*Asclepias tuberosa*	butterfly milkweed	35	22
NPS-KS-11-004	*Liatris aspera*	button blazing star	10	10
NPS-KS-11-005	*Ratibida columnifera*	prairie coneflower	0	0
NPS-KS-11-006	*Ceanothus americanus*	New Jersey tea	1	1
NPS-KS-11-007	*Silphium laciniatum*	compass plant	12	11
NPS-KS-11-008	*Baptisia bracteata*	cream wild indigo	12	10
NPS-KS-11-009	*Tradescantia ohiensis*	Ohio spiderwort	0	0
NPS-KS-11-010	*Koeleria macrantha*	June grass	0	0
NPS-KS-11-011	*Dalea purpurea*	purple prairie clover	0	0
NPS-KS-11-012	*Oenothera macrocarpa*	Missouri evening primrose	8	8
NPS-KS-11-013	*Psoralidium tenuiflorum*	wild alfalfa	11	8
NPS-KS-11-014	*Lespedeza capitata*	roundhead lespedeza	20	18
NPS-KS-11-015	*Andropogon gerardii*	big bluestem	15	15
NPS-KS-11-016	*Sorghastrum nutans*	Indian grass	19	19
NPS-KS-11-017	*Panicum virgatum*	switchgrass	14	14
NPS-KS-11-018	*Bouteloua curtipendula*	sideoats grama	5	5
NPS-KS-11-019	*Sporobolus cryptandrus*	sand dropseed	2	2

Legend: Alternant No. = Agency-State-Crop Year-Collection Number

Milkweed seedling being produced for the Tallgrass Prairie National Preserve.

PACIFIC WEST REGION

Craters of the Moon National Monument and Preserve, Idaho

Prepared by: **Bridger, Montana, USDA NRCS Plant Materials Center**

Container plants for Craters of the Moon National Monument and Preserve.

Introduction. The Bridger PMC entered into a cooperative agreement with Craters of the Moon National Monument and Preserve in FY 2010. This agreement facilitates the processing, propagation, and establishment of indigenous plant materials and the development of propagation technologies for the restoration of disturbances resulting from road construction and other projects within national monument boundaries.

Accomplishments. In May 2012, all production of mountain big sagebrush (*Artemisia tridentata ssp. Vaseyana*), limber pine (*Pinus flexilis*), antelope bitterbrush (*Purshia tridentate*), and rubber rabbitbrush (*Ericameria nauseosa*), were delivered by Bridger PMC staff to Craters of the Moon. These plants had been held over an additional year at Bridger PMC to accommodate construction delays in the park. The *Artemisia tridentata* and *Ericameria nauseosa* were transplanted to a 50:50 sand:peat mix in 1 gallon pots, whereas the *Purshia tridentata* was transplanted to 40-cubic-inch Dee pots using a similar mix. All *Pinus flexilis*, because of their slow growth, were produced in 10-cubic-inch cone-tainers. The plants were hardened off outdoors for most of the 2011 and early 2012 growing seasons. Target production, number of containers sown, and plants delivered appear in the table on the following page.

Container plants delivered to Craters of the Moon National Monument in 2012

Species	Accession Number	Target Production	Total Number Sown	Stock Age	Number of Plants Delivered	Balance
Artemisia tridentata	9088148	450	800	2-0	462	+12
Artemisia tridentata	9088148	see above	see above	1-0	93	+93
Ericameria nauseosa	9088151	225	400	2-0	345	+120
Pinus flexilis	9088158	275	600	2-0	287	+12
Purshia tridentata	9088160	450	830	2-0	173	-277

In fall 2012, a total of nine wildland seed collections from Craters of the Moon were processed at the Bridger PMC and then returned to the park in October 2012 for use in fall seeding activities (see the next table). Each lot was analyzed at the Montana State University Seed Laboratory for viability. No wildland seed collections from Craters of the Moon currently remain in storage at the Bridger PMC.

Wildland seed collections processed at the Bridger PMC for Craters of the Moon, October 2012

Species	Collection Location	Bulk Clean Seed 2	TZ	Seed Used for TZ
		g	%	*g*
Agropyron spicatum1	Golden Chariot	364	97	-2.00
Poa secunda	Golden Chariot	1,200	96	-1.00
Ericameria nauseosa	Tree Molds, VC, RM Office	169	94	-2.00
Achnatherum thurberianum	Golden Chariot	161	90	-3.00
Elymus elymoides	Golden Chariot	254	99	-2.00
Oryzopsis hymenoides3	Golden Chariot	70	60	-1.00
Pseudoroegneria spicata	Golden Chariot	447	99	-3.00
Phacelia hastata	N End, Golden Ch., backyard	239	98	-1.00
Purshia tridentata	Tree Molds, VC, RM Office	241	7	-6.00

[1]*old nomenclature, now* Pseudoroegneria spicata
[2]*lot weight before removing 200 seeds for TZ testing*
[3]*old nomenclature, now* Achnatherum hymenoides
all lots = "Craters 2012" with A and B for bluebunch wheatgrass collections (AGSP as Lot A)

Golden Gate National Recreation Area, California

Prepared by: **Corvallis, Oregon, USDA NRCS Plant Materials Center**

Photo credit: Robert Campbell

Introduction. In 2009, the Corvallis PMC entered into an agreement with Golden Gate National Recreation Area to provide native plant materials for ecological restoration following road construction in the Marin Headlands. The Corvalllis PMC has agreed to produce 250 pounds of two grasses.

Accomplishments. Activities in 2012 included maintenance and harvest of two grass seed increase fields. The plant materials center met the contract goals for the oatgrass seed in 2012, but production in 2013 is needed to meet goals for the needlegrass. The *Danthonia* field looked great again in 2012, but not as impressive as last year. All *Danthonia* fields on the plant materials center farm were not as vigorous or as tall as they were in 2011. The farm experienced heavy flooding in January and March 2012 and this may have affected the plants, although none of the fields for this project had standing water on them.

Species	Harvest Date	Harvest Method	Field Size (ac)	Yield in 2012	Total Pounds in Storage
Nassella lepida	June 19	seed stripper	0.2	8.5 lbs	12
Danthonia californica	June 28, July 25	seed stripper, swath/combine	0.5	136 lbs	198

Technology Development. Controlling rattail fescue in the needlegrass is difficult because the plants look very similar before they flower. Once the needlegrass is flowering, it is nearly impossible to find the rattail plants even though they can be distinguished from the needlegrass. The entire field was walked each week in order to find the rattail plants as they became identifiable. This greatly reduced the amount of rattail plants in the field.

California oatgrass (Danthonia californica) *seed increase field before flowering at the Corvallis PMC, April 21, 2012.*

Lassen Volcanic National Park, California

Prepared by: **Corvallis, Oregon, USDA NRCS Plant Materials Center**

Introduction. The Corvallis PMC entered into an agreement with Lassen Volcanic National Park in 2009 to provide additional native plant materials for planting around the new visitors' center and in the restoration of historically disturbed lands in the park. This agreement was extended in 2012.

Accomplishments. Activities in 2012 included vegetative propagation of one shrub species and production (by seed) of one tree, one legume, one rush, three grass and one sedge species. Approximately 2,200 plants were produced and delivered to the park this year.

Species	Start Date	Treatment	Number Produced
Arctostaphylos nevadensis	5-Jan	cuttings	328
Carex sp. (dry)	25-Feb	90 day cold	185
Danthonia californica	25-Feb	90 day cold	171
Deschampsia sp.	May 1	Warm GH	587
Luzula comosa	25-Feb	Hot water/outside	181
Panicum acuminatum	May 1	Warm GH	389
Trifolium longipes	25-Feb	90 day cold	272

Technology Development. In previous years, rooted cuttings of manzanita were planted into the plant materials center standard media mix (Sunshine #4 with micronutrients and a balanced slow-release fertilizer). Most plants thrive in this mix, yet PMC staff struggle to keep potted manzanita plants healthy and green during the growing season. This year, the manzanitas were planted into the standard mix without micronutrients or slow release fertilizer. Plants were fertilized every two weeks with a Peter's 20-20-20 solution throughout the growing season. These plants were greener and had a much higher survival rate than plants from previous years. We assume this may have something to do with less nutrient availability as the peat-based media experiences changes in pH.

Prepared by: **Meeker, Colorado, Upper Colorado Environmental Plant Center**

Introduction. An IDIQ Contract between Lassen Volcanic National Park and the Upper Colorado Environmental Plant Center was generated in 2012. LAVO-53237, Base IDIQ Contract AG-8B05-C-12-0002, Task Order P12PD11296 identified in the scope of work that the plant center would establish a grass production field of western needlegrass (*Achnatherum occidentalis*) using the park's native seed. The field would be used to produce 30 pounds of Pure Live Seed. This task order remains in effect until December 31, 2014.

Accomplishments. Three collections of western needlegrass were made by the park. Due to the small quantity and poor germination results of the first collection, it was agreed that the park would recollect seed in 2010 and the plant center would plant in 2011. The one-third-acre field was planted by hand in August by using a Planet Junior seeder. The plant center planted 10 rows at 60 seeds per linear foot based on germination results from previous testing. By mid-September, the field had established and photos were taken. Unfortunately, bare soil conditions and heavy winds the winter of 2011–2012 destroyed nearly all the newly established plants. The plant center chose to start plugs of needlegrass in the greenhouse to supplement the field. On May 24, 2012, 4000 needlegrass plugs were planted using 2009/2010 seed. Jay Johnson and Martin Hutten of Lassen Volcanic made a third collection of needlegrass in July 2012. There were 170 grams of seed cleaned by UCEPC staff. The field was replanted October 5, 2012, using 152 grams of native seed. Irrigation was applied immediately to the field after the replanting and repeated as necessary through the fall.

On April 12, 2012, the plant center shipped 667 pounds of *Bromus carinatus* and *Elymus glaucus* native seed to Lassen Volcanic from inventory produced in a previous agreement. The plant center conducted in-house germination tests on these materials for the park so they could calculate amounts to load into the hydro-mulch mixes. The seed was for restoration areas within the park.

Technology Development. The 12 plants that were transferred from the greenhouse to the new field in August 2011 are thriving. They produced seed as well. From the 4000 plugs that were established in the greenhouse for supplementing the field, only 1600 germinated. The plugs have established a vigorous root system and will be ready for the spring planting in 2013.

Twelve 16-month-old Lassen needlegrass plants.

Needlegrass plugs for 2013 field increase.

Olympic National Park, Washington

Prepared by: **Corvallis, Oregon, USDA NRCS Plant Materials Center**

Introduction. The Corvallis PMC entered into an agreement with Olympic National Park in 2004 to provide native plant materials for the ecological restoration of Lake Mills and Lake Aldwell following the removal of two high head dams on the Elwha River. The plant materials center agreed to produce 4,355 pounds of four grass species, 450 pounds of two sedge species, and 430 pounds of three forb species. The plant materials center completed the requirements of the agreement this year and exceeded production by more than 1,000 pounds!

Accomplishments. Activities in 2012 included maintenance and harvest of seed production fields including two grasses, one forb, and two sedges. More than 2800 pounds of seed were produced for this project in 2012. The majority of the seed produced for this project was delivered to the park in late September. Park staff plan to seed the remaining sites throughout the fall and spring. More than 5,400 pounds of seed was delivered and another 1,500 pounds remain at the plant materials center in the seed storage facilities.

Species	Pounds of Seed Produced in 2012	Total Pounds Delivered Per Species
Bromus spp.	872	2,067
Elymus glaucus	1550	2,797
Carex pachystachya	270	360
Eriophyllum lanatum	88	238
Deschampsia elongata	0	32
Carex deweyana	22	28
Agrostis exarata	0	17
Artemesia suksdorfii	0	1
		5,540

Technology Development. Seed mixes were created to be sown on de-watered areas in the lake beds last fall. These seed mixes were not applied to the sites until March. Corvallis PMC staff visited the park in late September and toured the dam removal sites and evaluated the seed mixes. All of the species in the mixes were present on the site. Plant establishment was very high for all mixes and plant vigor was also high for all species except for *E. lanatum*. It was inspiring to witness how these native species performed in the absence of nonnative weeds.

PMC staff members Amy Bartow and John Knox, with half of the seed that was delivered to the park, September 24, 2012.

The west side of Lake Mills (left of photo) was seeded with mixes in March 2012. The east side (right) was not seeded, leaving the sediments bare throughout the summer. September 24, 2012.

San Juan National Park, Oregon

Prepared by: **Corvallis, Oregon, USDA NRCS Plant Materials Center**

Introduction. The Corvallis PMC entered into a new agreement with San Juan Islands National Historical Park in 2009 to provide native plant materials for the restoration of the American Camp Prairie. It was agreed that the plant materials center would produce a minimum of 900 pounds (PLS) of *Elymus glaucus*, 900 pounds (PLS) of *Bromus sitchensis*, and 440 pounds (PLS) of *Festuca roemerii*. The project was expected to be completed in 2013 but now has been put on hold indefinitely. The Corvallis PMC received no funding for this project in 2012, but continued to maintain and harvest two of the grass fields. The Brome field was not harvested due to weed and smut issues.

Accomplishments. The San Juan Island ecotypes seem to be suffering slightly in the wet spring months at the Corvallis PMC. Plants were reddish and looked sick through most of the spring. It was an unusually wet and cool spring, which didn't help these fields. The Brome field had severe smut issues and was very weedy because the plant materials center did not receive funding; the field was not harvested. The blue wildrye and fescue fields were both relatively weed-free and vigorous. Usually grass seed production fields should be fertilized in late February. In 2012, the fields were fertilized in April. This application seemed well-timed—the fields were slow to grow due to the cool temperatures—so the late application of fertilizer came at a time when they were starting to grow vigorously.

Species	Seed lot	Bulk Weight	PLS Weight	Purity	Germination
Elymus glaucus	SG1-10-SJ607	53 lbs	44 lbs	99.34%	84%
Elymus glaucus	SG2-11-SJ607	202 lbs	181 lbs	99.90%	90%
Elymus glaucus	SG2-12-SJ607	76 lbs			
Bromus sitchensis	SG1-10-SJ606	63 lbs	52 lbs	98.99%	84%
Bromus sitchensis	SG1-11-SJ606	143 lbs	143 lbs	99.10%	98%
Festuca roemerii	SG1-11-SJ605	47 lbs	41 lbs	97.21%	90%
Festuca roemerii	SG1-12-SJ605	60 lbs			

Technology Development. The blue wildrye field did not grow in early spring, but grew fast and flowered moderately as the fields dried out and the temperatures increased. The field matured evenly and the field was directly combined. This technique hadn't been tried before, but seemed moderately effective. It took very little time, but some seed shattered during the combining. Overall, it appeared that less seed was lost with direct combining compared to the more common practice of swathing the green material into windrows, then combining it when dry.

California oatgrass (Danthonia californica) *seed increase field before flowering at the Corvallis PMC, April 21, 2012.*

Sequoia and Kings Canyon National Park, California

Prepared by: **Lockeford, California, USDA NRCS Plant Materials Center**

Introduction. In 2011, the Lockeford Plant Materials Center entered into an agreement with Sequoia and Kings Canyon National Park to produce seed of two grasses—California brome (*Bromus carinatus*), and blue wildrye (*Elymus glaucus*)—and one forb species, miniature lupine (*Lupinus bicolor*). Under the contract there is a specification for delivery of 12 pounds of seed for both grass species and 10 pounds for the miniature lupine, delivered over the period of the contract. In addition, seed of six additional species was delivered for cleaning and storage. The agreement will run through 2014.

The National Park Service requires that restoration of native plants be accomplished using germplasm from populations as closely related genetically and ecologically as possible to park populations. The Lockford PMC was chosen due to its ability to clean, propagate, and produce the desired amounts of high-quality seed within the required time frame. The plant materials center is also able to conduct studies to determine adaptation and cultural requirements for establishment and seed production.

Accomplishments. California brome, blue wildrye, and miniature lupine planted during the fall of 2011 were harvested in 2012. Seed of all three species were provided by the park and cleaned at the plant materials center. For all three species the plant materials center had seed in storage from a previous contract with the park in 2002. Seeds of the lots of California brome and blue wildrye were combined to give enough seed to plant 0.25 acre of each species. Germination and establishment was good. Seed of miniature lupine was planted as separate lots from the 2002- and 2011-collected seed. The stored seed germination was 90%. The 2011-collected seed germination was poor at 20%. California brome and blue wildrye were harvested with a Flailvac, which allowed more than one harvest, while the miniature lupine was initially harvested by hand. Then the plants were swathed and dried prior to cleaning. The amount of harvested seed obtained after cleaning is shown in the table.

After harvest the grasses were mowed and maintained with weed control by cultivation and broadleaf herbicide for harvest in 2013. Seed of miniature lupine, 0.1 acre, was planted in fall 2012 from seed harvested in 2012.

Seed lots of sicklekeel lupine, California melic, one-sided bluegrass, Sierra needlegrass, and squirreltail cleaned during 2011 are being maintained in storage at the plant materials center.

Seed harvested under contract to Sequoia and Kings Canyon National Park during 2012

Code	Common Name	Year of Harvest	Area (acres)	Seed Cleaned (lb)	PLS Amount	Date Tested
BRCAC8	California brome	2012	0.25	11.00		
ELGLG	Blue wildrye	2012	0.25	4.25		
LUBI	Miniature lupine	2012	0.25	8.00	4.87	8/7/2012

Miniature lupine in bloom, April 4, 2012.

Blue wildrye harvest with Flailvac.

SOUTHEAST REGION

Great Smoky Mountains National Park, Tennessee

Prepared by: **Beltsville, Maryland, Norman A. Berg National Plant Materials Center**

Introduction. The current interagency agreement between Great Smoky Mountains National Park and the Norman A. Berg National Plant Materials Center was signed in March 2010, for the fiscal years 2011–2013, and is funded on an annual basis. The park and Foothills Parkway have a need to preserve their native plant resources and revegetate parklands. The National Park Service requires that restoration of native plants be accomplished using germplasm from populations as closely genetically related as possible to park populations. Great Smoky Mountains has harvested seed from indigenous populations but does not have the personnel, expertise, facilities, or equipment needed to clean, process, test, and store the seed. The plant materials center does have the personnel and is equipped to clean, process, and store quantities of seed sufficient to meet NPS needs within the required time frame. Technical expertise as necessary to achieve this goal will be provided by the plant materials center under this agreement.

Accomplishments. *Seed Cleaning*—This is the second report for the 2011–2013 contract periods. The Cades Cove increase fields and Foothills Parkway harvest resulted in more than 801 pounds of bulk grass, legume, wildflower, tree, and shrub seed. The table below lists the 18 different lots of seed cleaned (removed from the fruit for the woody species, de-bearded, and then run through a clipper for the grasses and wildflowers) by plant materials center staff to yield 271 pounds Pure Live Seed (PLS = bulk x purity x viability).

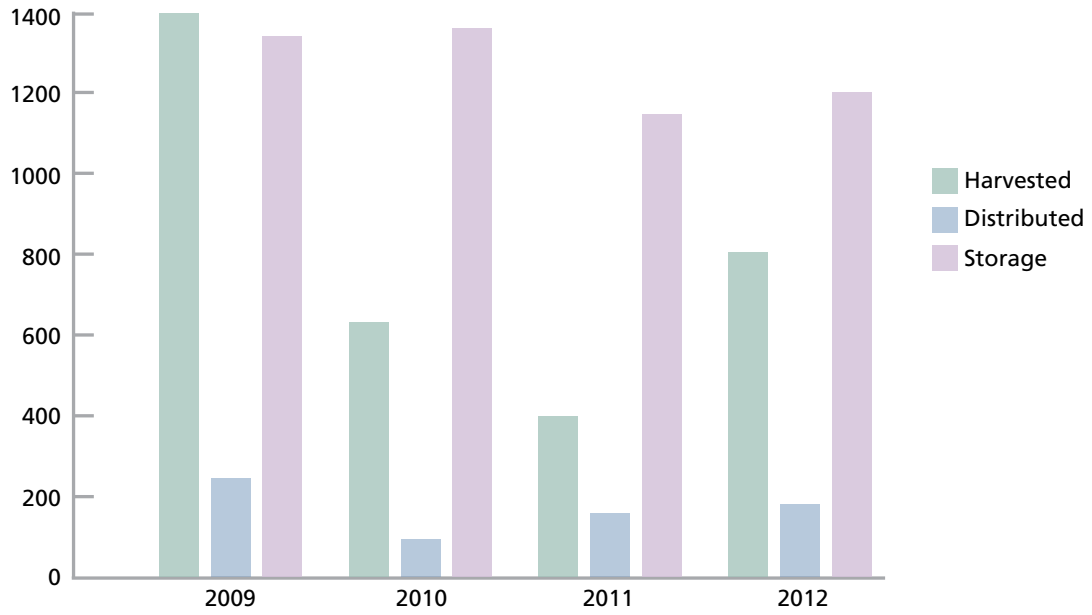
The last section of the table lists three lots in which our efforts resulted in low amounts of PLS. Those lots were cleaned for a second time and samples sent to the Kansas Seed Testing Lab to make sure we are continuing to deliver high quality seed to the park. Seed harvested and cleaned in 2012, by common name (Table provides harvest year, bulk amount, PLS, seed test date, and NPS source)

Common Name	Species Code	Harvest year	Bulk Amount (lbs.)	PLS (lbs./ g.)	Seed Test Date	Source
Cades Cove Increase Fields						
big bluestem	ANGE	2012	102.9	34.4	3-2012	Cades Cove
Virginia wildrye	ELVI3	2012	4.0	3	*	Cades Cove
common sneezeweed	HEAU	2012	.7	0.2	*	Cades Cove
swamp sunflower	HEAN2	2012	10.45	2.2	3-2012	Cades Cove
roundheaded lespedeza	LECA8	2012	11.55	1.85	*	Cades Cove
wild bergamot	MOFI	2012	11.4	.75	*	Cades Cove
beaked panicgrass	PAAN	2012	37.1	18.4	3-2012	Cades Cove
wild quinine	PAIN3	2012	24.3	2	10-2012	Cades Cove
clustered mountainmint	PYMU	2012	8.1	.05	*	Cades Cove
beardgrass	SAGI	2012	7.4	.3	*	Cades Cove
little bluestem	SCSC	2012	83.0	2.2	10-2011	Cades Cove
Maryland senna	SEMA11	2012	12.8	3.5	10-2011	Cades Cove
Indiangrass	SONU2	2012	280.6	53.7	10-2011	Cades Cove
purpletop	TRFL2	2012	206.6	134.8	10-2012	Cades Cove
		Totals	**801.1**	**257.2**		

Common Name	Species Code	Harvest year	Bulk Amount (lbs.)	PLS (lbs./ g.)	Seed Test Date	Source
Foothills Parkway Woody Species						
sumac	RHUS	2012	12.3	9.5		FHP
		Totals	**12.3**	**9.5**		
Re-Cleaned Seeds from 2011						
big bluestem	ANGE	2010	18.8	2.1	*	Cades Cove
little bluestem	SCSC	2010	41.5	2	*	Cades Cove
beardgrass	SAGI	2010	3.5	.6	*	Cades Cove
		Totals	**68.8**	**4.7**		

**Lots with too little seed for testing.*

Distribution—The plant materials center distributed six different shipments of seed totaling 178 pounds (PLS) in 2012. Some uses for this cleaned seed included plug production for the Cades Cove increase fields and revegetation of Foothills Parkway sites. The figure below shows the seed harvest, distribution, and storage trends over a four-year period.



2006–2011 Seed Harvested, Distributed, and Stored.

Virginia Wildrye Increase Field at the Norman A. Berg National Plant Materials Center—In 2010 an attachment to the current agreement was created for the production of 300 pounds of Virginia wildrye (*Elymus virginicus*) seed. This native, perennial, cool season grass germinates quickly, making it a highly used species for slope stability and revegetating disturbed sites throughout the park. Another important benefit of Virginia wildrye seed is that it maintains high viability percentages over a long period (more than 10 years) while in storage. Ideally, native seed mixes contain up to 25% Virginia wildrye for these reasons.

The one-half acre increase field plants (planted spring 2010) are currently well established. Field maintenance during seedling establishment included soil testing, soil amendment application (primarily lime), supplemental watering when necessary, pre-emergent herbicide application, and tillage. After establishment only pre-emergent herbicide application and mowing to limit weed pressure were necessary. The field was harvested for the second time in September 2012. The increase field yielded more than 50 pounds of bulk seed. Subsequent Virginia wildrye harvests will significantly increase as the plants continue growing.

Images from the Foothills Parkway F8E15 project (completed in 2009) show how effective slope stabilization is realized using vegetation. This project is the first project on the east end of the Missing Link Section. The top two images show the slope soon after construction in 2009 and the bottom in 2011.

ABOUT THIS DOCUMENT

Visit the Plant Materials Program Web site (http://Plant-Materials.nrcs.usda.gov) and the PLANTS website (http://plants.usda.gov).

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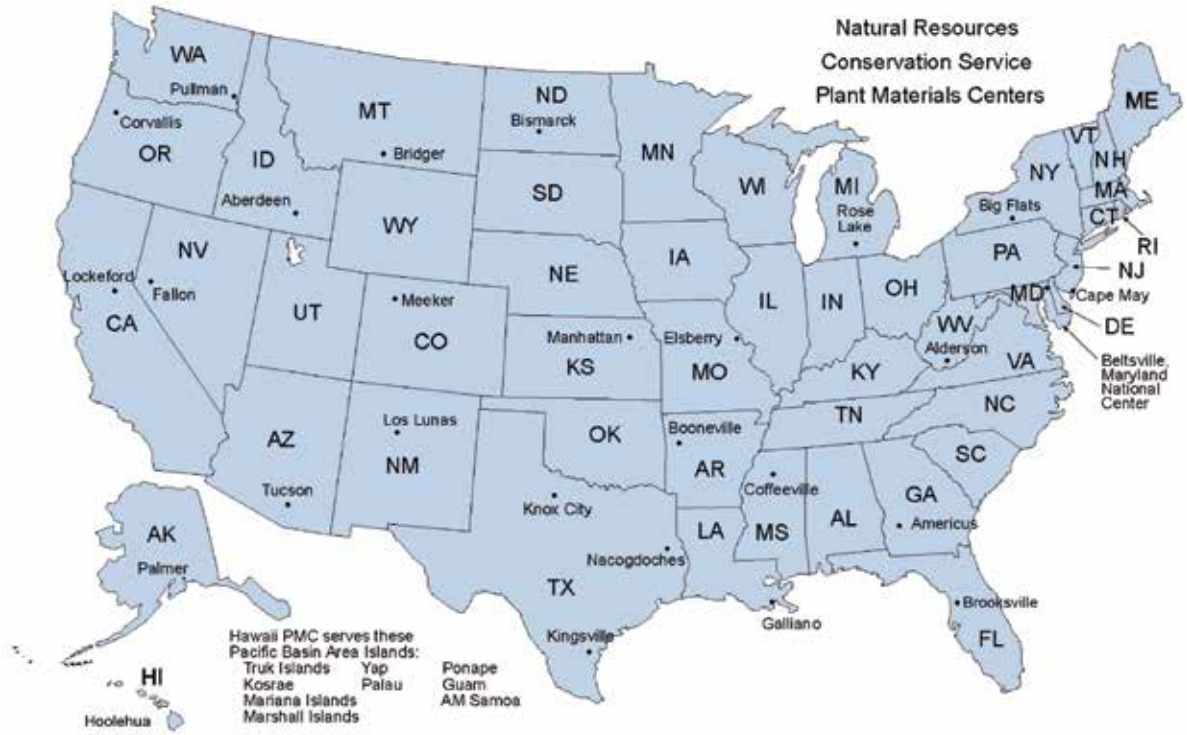
APPENDIX



Plant Materials Centers (PMC)				
Palmer, AK	Alaska PMC	5310 South Bodenburg Spur Road	Palmer, AK 99645	907.745.4469
Tuscon, AZ	Tuscon PMC	3241 North Romero Road	Tuscon, AZ 85705	520.292.2999
Booneville, AR	Booneville PMC	6883 S. State Highway 23	Booneville, AR 72927	479.675.5182
Lockeford, CA	Lockeford PMC	PO Box 68, 21001 N. Elliot Road	Lockeford, CA 95237	209.727.5319
Meeker, CO	Upper CO Environmental Plant Center	5538 RBC #4	Meeker, CO 81641	970.878.5003
Brooksville, FL	Brooksville PMC	14119 Broad Street	Brooksville, FL 34601	352.796.9600
Americus, GA	Jimmy Carter PMC	295 Morris Drive	Americus, GA 31709	229.924.4499
Hoolehua, HI	Hoolehua PMC	PO Box 236	Hoolehua, HI 96729	808.567.6885
Aberdeen, ID	Aberdeen PMC	PO Box 296, 1691A South 2700 West	Aberdeen, ID 83210	208.397.4133
Manhattan, KS	Manhattan PMC	3800 S. 20th Street	Manhattan, KS 66502	785.539.8761
Galliano, LA	Golden Meadows PMC	438 Airport Road	Galliano, LA 70354	985.475.5280
Beltsville, MD	National PMC	Building 509, BARC-East, E. Beaver Dam Road	Beltsville, MS 20705	301.504.8175
East Lansing, MI	Rose Lake PMC	7472 Stoll Road	East Lansing, MI 48823	517.641.6300
Coffeeville, MS	Jamie L. Whitten PMC	2533 County Road 65	Coffeeville, MS 38922	662.675.2588
Elsberry, MO	Elsberry PMC	2803 N. Highway 79	Elsberry, MO 63343	573.898.2012
Bridger, MT	Bridger PMC	98 South River Road	Bridger, MT 59014	406.662.3579
Cape May, NJ	Cape May PMC	1536 Route 9 North	Cape May Court House, NJ 08210	609.465.5901
Los Lunas, NM	Los Lunas PMC	1036 Miller Street, SW	Los Lunas, NM 87031	505.865.4684
Big Flats, NY	Big Flats PMC	3266A State Route 352	Corning, NY 14830	607.562.8404
Bismarck, ND	Bismarck PMC	3308 University Drive	Bismarck, ND 58504	701.250.4330
Fallon, NV	Great Basin PMC	2055 Schurz Highway	Fallon, NV 89406	775.423.7957
Corvallis, OR	Corvallis PMC	3415 NE Granger Avenue	Corvallis, OR 97330	541.757.4812
Nacogdoches, TX	East Texas PMC	6598 FM 2782	Nacogdoches, TX 75962	936.564.4873
Kingsville, TX	Kika De La Garza PMC	3409 North FM 1355	Kingsville, TX 78363	361.595.1313
Knox City, TX	James E. "bud" Smith PMC	3776 Farm Road 1292	Knox City, TX 79529	940.658.3922
Pullman, WA	Pullman OMC	PO Box 646211, WSU	Pullman, WSU 99164	509.335.6892
Alderson, WV	Alderson PMC	PO Box 390, Old Prison Farm	Alderson, WV 24910	304.445.3005

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