

PLANT MATERIALS PROJECT SUMMARY REPORTS

from the Natural Resources Conservation Service to the National Park Service

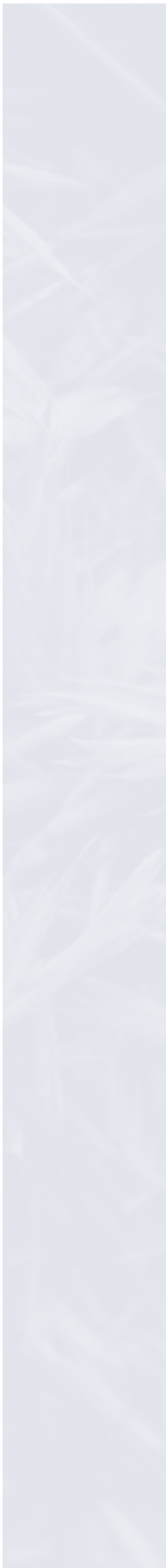
FY 2014





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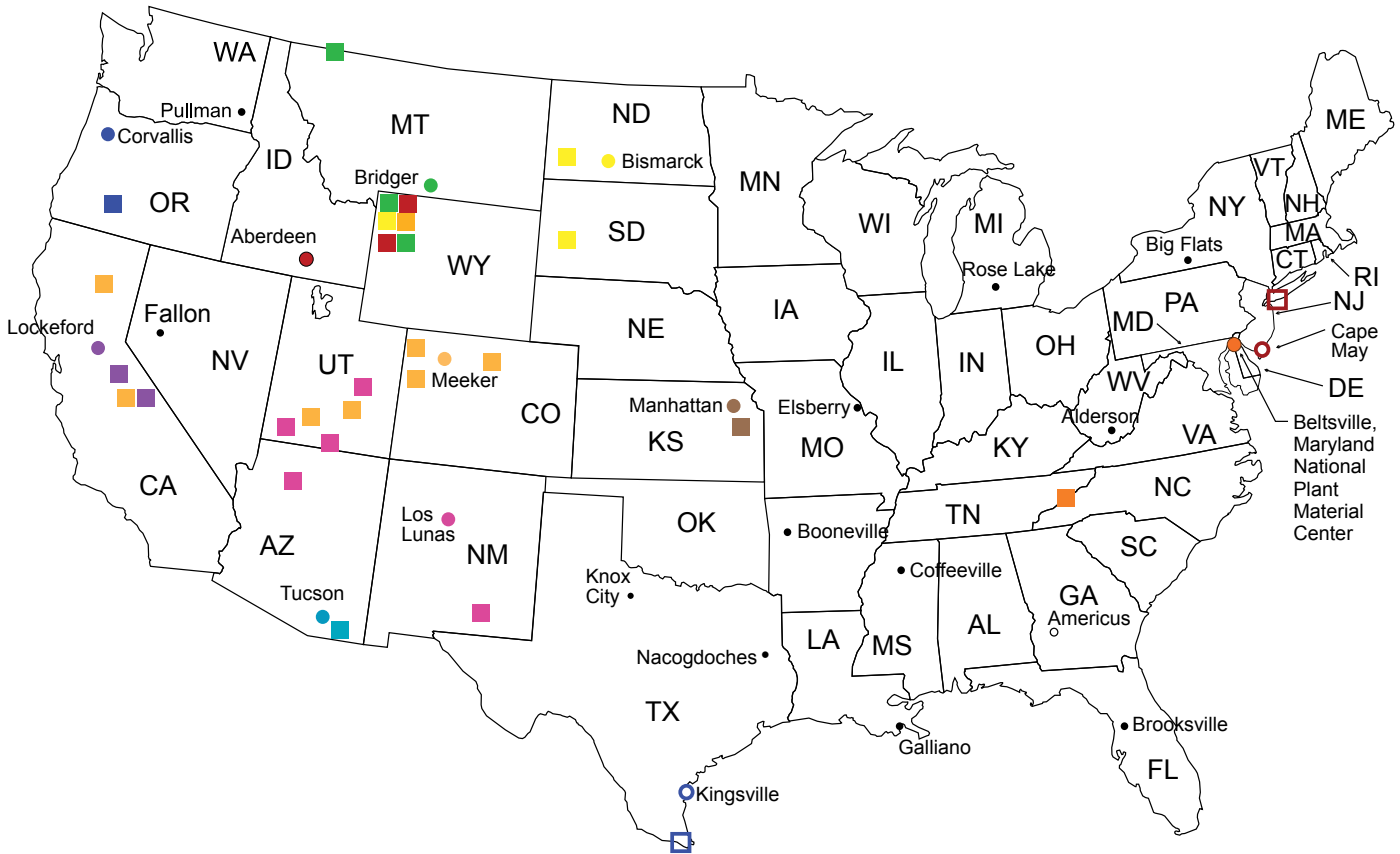
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ACRONYMS

BPMC	Bridger Plant Materials Center
CPMC	Cape May Plant Materials Center
FHP	Foothills Parkway
GATE	Gateway National Recreation Area
GLAC	Glacier National Park
ID/IQ	Indefinite Delivery / Indefinite Quantity
LLPMC	Los Lunas Plant Materials Center
LPMC	Lockeford California Plant Materials Center
NPMC	Norman A. Berg National Plant Materials Center
NPS	National Park Service
NRCS	Natural Resources Conservation Service
PLS	Pure Live Seed
PMC	Plant Materials Center
UCEPC	Upper Colorado Environmental Plant Center
USDA	US Department of Agriculture
USDI	US Department of the Interior



NPS/NRCS Interagency Plant Materials Centers



Plant Materials Center	In cooperation with these National Park Units
Aberdeen, ID ●	Grand Teton, Yellowstone
Beltsville, MD ●	Great Smoky Mountains
Bismarck, ND ●	Grand Teton, Theodore Roosevelt, Mount Rushmore
Bridger, MT ●	Glacier, Grand Teton, Yellowstone
Cape May, NJ ○	Gateway
Corvallis, OR ●	Crater Lake
Kingsville, TX ○	Palo Alto
Lockeford, CA ●	Sequoia, Yosemite
Los Lunas, NM ●	Arches & Canyonlands, Carlsbad Caverns, Glen Canyon, Grand Canyon, Zion
Meeker, CO ●	Bryce Canyon, Capitol Reef, Colorado National Monument, Dinosaur, Lassen Volcano, Rocky Mountain, Yellowstone, Yosemite
Tucson, AZ ●	Coronado

INTRODUCTION

This is the 2014 Natural Resources Conservation Service (NRCS) Plant Materials Center's (PMC) annual summary report on all interagency agreements between the National Park Service (NPS) and NRCS. These projects relate to development of native plant materials for revegetation of park roads and other restoration projects. The National Park Service and the NRCS 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 the 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 US Department of Agriculture (USDA) NRCS state offices.

Additional printed copies or electronic versions of this report may be requested from

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FISCAL YEAR 2014 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 10 national parks in addition to those with interagency agreements.
- The NRCS national technical advisor provided assistance to 25 national parks and associated staff.

Development and Administration of Interagency Agreements

- Twelve new agreements, two new task orders, and eight modifications to agreements were developed this year.
- A total of 41 interagency agreements were administered and coordinated.
- There were 37 active projects at 28 national park units that cooperated with 10 NRCS plant materials centers, and 1 conservation district plant materials center.

Native Seed and Plant Production

- 28 national parks
- 3,419 lbs of seed
- 94,361 container plants
- more than 200 different native species grown

Park-Collected Native Seed Processed

- 6 national parks
- more than 1,120 lbs of seed
- more than 220 different species

Interagency Agreements and Task Orders Reviewed

Arches and Canyonlands National Parks	Grand Teton National Park
Badlands National Park	Great Smoky Mountains National Park
Bryce Canyon National Park	Mount Rainier National Park
Carlsbad Caverns National Park	Mount Rushmore National Park
Colorado National Monument	Palo Alto National Historical Park
Coronado National Memorial	Rocky Mountain National Park
Crater Lake National Park	Theodore Roosevelt National Park
Dinosaur National Monument	Sequoia and Kings Canyon National Parks
Gateway National Recreation Area	Tallgrass Prairie National Preserve
Glacier National Park	Yellowstone National Park
Glen Canyon National Recreation Area	Zion National Park
Grand Canyon National Park	

Cooperating NRCS Plant Centers:

Aberdeen, Idaho

Bismarck, North Dakota

Bridger, Montana

Beltsville, Maryland

Cape May, New Jersey

Corvallis, Oregon

Kingsville, Texas

Los Lunas, New Mexico

Lockeford, California

Tucson, Arizona

Cooperating Conservation 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 and plant monitoring). Links to the NRCS Plant Materials Program, NRCS Electronic Field Office Technical Guide, and plant propagation protocols websites were provided at training sessions and conferences and as requested.
- Provided seed collection training with more than 30 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 225 copies of the fiscal year 2013 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 was made between the US Department of the Interior (USDI), NPS Arches and Canyonlands National Parks and the USDA-NRCS Los Lunas Plant Materials Center (LLPMC) for the collection and propagation of native seed for the increase of native grass species production at the LLPMC for identified project areas in these two national parks. Populations of Indian ricegrass (*Achnatherum hymenoides*) were identified and collected by the park staff and sent to the LLPMC for conditioning and for future seed production. The following table shows a complete list of the accessions specified in this agreement and the seed produced by the LLPMC.

As a result of a discussion with the Arches and Canyonlands Group in 2013, 0.50 acres of the Arches National Park Indian ricegrass in Field 26N at the LLPMC was removed. This field was destroyed after the presence of an unknown Indian ricegrass established itself in the seed production field. The seed harvested in 2013 from Fields 27N and 26N were harvested together, causing all seed from Arches National Park to be contaminated.

Due to the high amount of dormant seed (commonly associated with Indian ricegrass, especially in the first year after harvest and the limited amount of the seed received from Arches and Canyonlands), plant establishment was lower than normal in the Indian ricegrass fields. This caused a significant increase in maintenance of the seed production fields, especially during the growing season.

In December 2014, a teleconference was held between Christine Taliga, NRCS NPS liaison; Cheryl Decker, Arches and Canyonlands National Park; Robin Gregory, NPS Denver Service Center; Bernadette Cooney, LLPMC manager; and David Dreesen, agronomist/horticulturist from the LLPMC to discuss what should be done with the Indian ricegrass fields established at the LLPMC. It was decided that only the production field of the Needles collection of Indian ricegrass will be expanded in 2015. Seed grown in the Indian ricegrass production field will be used to increase the field size from 0.09 acre to 0.50 acre in 2015.

Accomplishments. The table on the following page lists the amount of acreage specified in the agreement, the amount of seed received, and seed produced in 2014.



Arches National Park									
Scientific Name	Common Name	Accession Number	Park Location	Agreement Acreage	2014 Acreage	Harvest Year	Pounds Cleaned (bulk)	Pure Live Seed (PLS) on Inventory	Test Date
<i>Achnatherum hymenoides</i>	Indian ricegrass	9066888	N/A	1.00	0.50	2010 2013 2014	0.20 1.28 7.00		
Canyonlands National Park									
Scientific Name	Common Name	Accession Number	Park Location	Agreement Acreage	2014 Acreage	Harvest Year	Pounds Cleaned (bulk)	PLS on Inventory	Test Date
<i>Achnatherum hymenoides</i>	Indian ricegrass	9066907	Island in the Sky	0.50	0.26	2013 2014	0.90 12.00	9.80	12/2/2014
<i>Achnatherum hymenoides</i>	Indian ricegrass	9066908	Needles	0.50	0.09	2010 2012 2013 2014	0.10 0.30 0.38 2.90		
<i>Achnatherum hymenoides</i>	Indian ricegrass	9066887	Island in the Sky and Needles mix						



Canyonlands National Park
 Indian ricegrass (*Achnatherum hymenoides*, 9066908), May 2014

Bryce Canyon National Park, Utah

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

Introduction. Indefinite Delivery / Indefinite Quantity (ID/IQ) Contract No. AG-8B05-C-12-0002 was initiated June 26, 2012. Task Order No. P12PD12573 identified UCEPC to manage native seed production of two 0.50-acre fields; Indian ricegrass, (*Achnatherum hymenoides*), and nodding brome grass (*Bromus anomalus*) for Bryce Canyon National Park. This task order will remain in effect until December 31, 2015.

Accomplishments. Due to the decrease in seed production from *Bromus anomalus* in 2012 and 2013, UCEPC planted a new 0.70-acre field in August 2013 using a rate of 30 seeds per linear foot. A nice stand ensued and seed was harvested on August 7, 2014. Due to rain causing wet field conditions, there was more seed shatter than is typically planned for. However, production was still up compared to the last two years. In 2014, the new field produced a bulk weight of 86 lbs. Total germination was lower than expected at 60%, but the Pure Live Seed (PLS) percentage was still the highest of the past four years.

The 0.50-acre field of *Achnatherum hymenoides* continued to produce well in 2014. On July 7, 2014, there were 24 lbs of seed harvested. The overall seed maturity did not appear uniform in the field before harvest, but results show very high total germination compared to previous years at 87%. Overall, both species performed well in 2014. The table below shows information for the last four years of production for these two species.



Scientific Name	Harvest Year	Field Size (acres)	Bulk Weight	PLS %	PLS Lbss	Test Date
<i>Bromus anomalus</i>	2011	0.50	191.0 lbs	31.36	59.9 lbs	1/30/12
<i>Bromus anomalus</i>	2012	0.50	3.5 lbs	36.01	1.26 lbs	1/22/13
<i>Bromus anomalus</i>	2013	0.50	28.0 lbs	50.77	14.22 lbs	3/7/14
<i>Bromus anomalus</i>	2014	0.70	86.0 lbs	59.44	51.12 lbs	2/26/15
<i>Achnatherum hymenoides</i>	2012	0.50	98.0 grams	N/A	N/A	Replanted
<i>Achnatherum hymenoides</i>	2013	0.50	19.5 lbs	36.38	7.09 lbs	3/7/14
<i>Achnatherum hymenoides</i>	2014	0.50	24.0 lbs	86.74	20.82 lbs	2/26/15

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



Bryce Canyon National Park,
Achnatherum hymenoides, July 2014



Bryce Canyon National Park,
Bromus anomalus, July 2014



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 USDA-NRCS Los Lunas Plant Materials Center and the Carlsbad Caverns National Park for the collection, propagation, and the increase of native grass species. A new agreement was made in 2010 that provided for the propagation of transplants and seed increase by the LLPMC for park native grass species.

The park seed has been stored at the LLPMC since 2012 when the agreement expired.

Carlsbad Caverns National Park				
Scientific Name	Common Name	Accession	PLS on Inventory (lbs)	Test Date
<i>Bouteloua gracilis</i>	blue grama	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
<i>Leptochloa dubia</i>	green sprangletop	9066658	27.40	1/25/11
			14.38	12/07/11
<i>Setaria vulpiseta</i>	plains bristlegrass	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
<i>Aristida purpurea</i>	purple threeawn	9066607	7.90	4/23/08
			3.04	6/11/10
			0.54	5/18/10
			3.36	1/06/12
<i>Bouteloua curtipendula</i>	sideoats grama	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	1/25/11
			0.74	1/03/12
			3.00 (bulk)	No test*
			1.02 (bulk)	No test*
			0.40 (bulk)	No test*

*Seed was not sent for testing due to an insufficient amount of seed, or the seed on hand was from the park collections and not from harvest at the LLPMC.

Colorado National Monument, Colorado

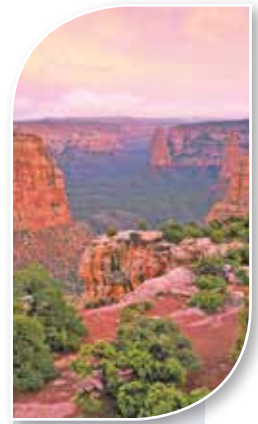
Prepared by: **Meeker, Colorado, Upper Colorado Environmental Plant Center**

Introduction. This report covers activities that have been conducted by UCEPC for Colorado National Monument through an ID/IQ Contract AG-8B05-C-12-0002, Task Order P12PD12930, signed July 11, 2012. This contract was amended on July 19, 2013, to produce seed of one species (Indian ricegrass) through 2015. This agreement will remain in effect until December 31, 2015. A second task order (P14PD03601) was signed September 17, 2014, and calls for the production of two additional species—Sandberg bluegrass through 2018 and Utah sweetvetch through 2016.

Accomplishments. On May 29, 2014, Steve Parr with UCEPC, provided a day of seed collection training to Colorado National Monument staff in order for them to confidently collect seed of targeted production species. Some seed collection locations had been identified by NPS employees prior to the day of collection training and reassurance of species identification, collection methods, and procedures were reviewed. For the most efficient collection of native products, it was emphasized how important it is to get populations identified early and monitor the maturation of the seed, collect the seed, dry the seed down, and ship it for cleaning, testing, and planting.

Seed was collected by NPS staff, dried, and sent to UCEPC for cleaning. A total of 83 grams of Utah sweetvetch and 3.4 lbs of Sandberg bluegrass were cleaned and will be planted in the spring of 2015.

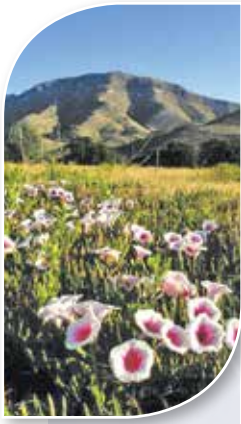
Technology Development. There are no new technological advancements to report for this project at this time.



*Photo credit:
Rob Kurtzman*



The 2015 field crew includes Ross Adams, Jessica McCulloch, Molly Murphy, and Amy Birtwistle.
Photo credit: Molly Murphy (including watermark background image).



Coronado National Memorial, Arizona

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

Introduction. An agreement was initiated July 17, 2009, for the propagation of 5,000 containerized plants of Palmer's agave (*Agave palmeri*). Tucson plant materials personnel delivered a total of 5,100 Palmer's agave to park personnel by August 2012. A modification to this agreement was finalized in August 2013 requiring the production of an additional 1,300 containerized Palmer's agave.

Accomplishments. Plant production was initiated in August 2013. Seeds collected at the Memorial were pre-soaked in water for 12 hours, drained, and placed in trays containing a mixture of peat moss and perlite. Trays were placed in the greenhouse for maintenance. Emerging seedlings were planted into 3"x5" Zipset Plant Band containers during the winter of 2013. In March 2014, the agave were moved to the Tucson Plant Materials Center Tucson Plant Materials Center lathhouse for hardening off. On June 19, 2014, 1,600 containerized agave were delivered to Coronado National Memorial fulfilling the amendment and finalizing the agreement.



Coronado National Memorial, *Agave palmeri*, June 18, 2014

Dinosaur National Monument, Colorado and Utah

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

Introduction. UCEPC and the National Park Service entered into and signed an ID/IQ Contract AG-87B05-C-12-0002 in March 2013. Task Order P13PD02856, also known as Wetland Mitigation for Streambank Stabilization, Dinosaur National Monument, identifies the scope of work to be performed by UCEPC. An existing overlook area in the park has been identified as a mitigation site for floodplain restoration. Native, local-ecotype, riparian plant materials with genetic origins were collected by UCEPC from this vicinity of the park and grown off-site as vegetation propagules for two growing seasons. A total of 100 local ecotype plants were to be delivered to the park by December 31, 2014, for restoring the road turnout area to native vegetation. The following is a list of plant species UCEPC targeted for propagation by means of cuttings, division, or transplants.



Dinosaur National Monument	
Scientific Name	Common Name
<i>Cornus sericia</i>	redosier dogwood
<i>Crataegus</i> spp.	hawthorn
<i>Prunus virginiana</i>	chokecherry
<i>Populus</i> spp.	cottonwood
<i>Rhus trilobata</i>	three-leaf sumac
<i>Ribes</i> spp.	golden current
<i>Rosa woodsii</i>	Woods' rose
<i>Shepherdia argentea</i>	silver buffaloberry
<i>Symphoricarpos occidentalis</i>	snowberry

Accomplishments. UCEPC staff collected well over 250 materials of six species from the two sites where road construction was to occur. Collection was completed on May 14, 2013, and the materials were maintained at UCEPC through the growing season of 2014. On November 7, 2014 there were 102 materials planted at the mitigation site.

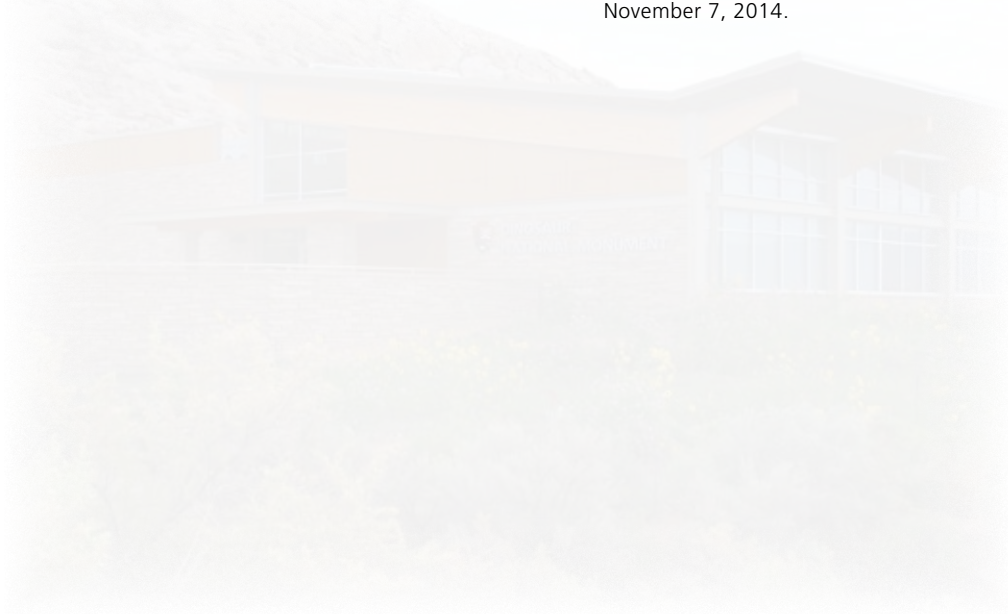
Because of the narrow time frame, seed collection from the shrubs in the fall of 2013 would not allow the propagation of the native material to be of adequate size for out-planting the next year. So vegetation propagation and wildling salvage seemed to be the most reasonable methods to obtain well-rooted stock of adequate size to plant in the disturbed sites, and that is what was done. UCEPC targeted a minimum of 10 materials of each of six species for installation and to maintain diversity in the planting. Targets were reached on five materials, but hawthorn proved to be a difficult product to maintain from wildling harvesting. Hawthorn has a large, horizontal root that does not fit into typical nursery containers. Chokecherry was the only material that was leafed out at the time of collection, and it too, was difficult to maintain healthy plants collected via wildling harvesting.

The following table provides information from an inventory completed on November 6, 2014. It includes the species, collection location, count for installation, and container size.

Dinosaur National Monument			Container Size			
Scientific Name	Common Name	Qty	Mini-Tree	Tall One	1 Gallon	Collection Site
<i>Cornus sericia</i>	redosier dogwood	10		8	2	Deer Park/LSO
<i>Crataegus</i> spp.	hawthorn	9	1	8		Deer Park/LSO
<i>Prunus virginiana</i>	chokecherry	11	3	6	2	Cross Mtn.
<i>Populus</i> spp.	cottonwood					
<i>Rhus trilobata</i>	three-leaf sumac	13	1	7	5	Cross Mtn.
<i>Ribes aureum</i>	golden current	16	2	12	2	Cross Mtn.
<i>Rosa woodsii</i>	Woods' rose	12	2	4	6	Cross Mtn.
<i>Shepherdia argentea</i>	silver buffaloberry	15	2	10	3	Cross Mtn.
<i>Symphoricarpos occidentalis</i>	snowberry	16	2	10	4	Deer Park/ LSO



UCEPC preparing to plant wildlings for Dinosaur National Monument, November 7, 2014.



Glacier National Park, Montana

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

Introduction. The Bridger Plant Materials Center (BPMC) has maintained a cooperative agreement with Glacier National Park (GLAC) since fiscal year (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 2014, 101 seed lots representing 54 species were delivered to GLAC or used for BPMC seed increase. Total weight of seed delivered was 11.26 lbs (5.11 kilograms). Seed distribution included 19 grasses (12 species), 41 forbs (27 species), and 41 woody plants (15 species). In addition, containers of the following species were shipped to the park in 2014: 42 *Acer glabrum* (9081615-LM-L), 41 *Acer glabrum* (9088296 SM-L), 200 *Symphyotrichum laeve* var. *geyeri* (9078464-MG), 5 *Pseudotsuga menziesii* (9087727-LM), and 350 *Eurybia conspicua* (9088061-SM-L). A total of 59 wildland seed collections were processed at the BPMC and are reported in the GLAC 2014 Annual Technical Report.

A new increase field of *Eurybia conspicua* (9087433-LM-L) was installed using containerized seedlings spaced 1 foot apart in four rows in Field 4 at the BPMC (0.03 acres). In addition, seeds of *Bromus carinatus* (9087612-LM-M) were directly sown into two rows in Field 5 in 2014 (0.03 acres).

GLAC seed increase fields as of December 31, 2014, appear in table 1. Container plants sown and held in cold storage at the BPMC as of December 2014, are listed in table 2. Container plants mailed to GLAC in April and September 2014, respectively, are listed in table 3.



Table 1. Glacier National Park Seed Production Fields at BPMC, December 2014

Glacier National Park										
Scientific Name	Common Name	BPMC Accession Number	GLAC Lot ID	GLAC Site	BPMC Field	Date Sown	Field Size	Bulk Harvest	PLS	PLS Seed
			#		#		acres	kg	%	kg
<i>Bromus carinatus</i>	California brome	9087612	11-080	Lake McDonald - Medium	5	5/5/14	0.03	New		
<i>Bromus vulgaris</i>	Columbia brome	9088297	11-136	Many Glacier	4	6/20/13	0.06	0.907	88.61	0.804
<i>Carex microptera</i>	small wing sedge	9087799	08-028	Lake McDonald	4	6/7/11	0.03	0.455	76.24	0.347
<i>Elymus glaucus</i>	blue wildrye	9075846	11-031	Saint Mary - Low	4	6/20/13	0.06	0.503	97.02	0.488
<i>Eurybia conspicua</i>	eastern showy aster	9087433	04-247	Lake McDonald - Fish Creek	4	7/1/14	0.03	New		
<i>Eurybia conspicua</i>	eastern showy aster	9088061	09-295	Saint Mary - Low	5	6/20/13	0.05	0.173		
<i>Phleum alpinum</i>	alpine timothy	9054559	10-363	Logan Pass	2	8/3/12	0.03	0.155	86.01	0.376
<i>Poa alpina</i>	alpine bluegrass	9054561	1993	Logan Pass	2	8/13/12	0.03	0.437		
<i>Symphyotrichum laeve</i> var. <i>geyeri</i>	Geyer's aster	9078605	11-149	Lake McDonald	4	8/15/12	0.04	0.097		
<i>Symphyotrichum laeve</i> var. <i>geyeri</i>	Geyer's aster	9078464	10-197	Many Glacier - Low	5	6/20/13	0.05	7.51	77.89	5.849

Glacier National Park										
Scientific Name	Common Name	BPMC Accession Number	GLAC Lot ID	GLAC Site	BPMC Field	Date Sown	Field Size	Bulk Harvest	PLS	PLS Seed
			#		#		acres	kg	%	kg
<i>Trisetum spicatum</i>	spike trisetum	9081997	12-081	Saint Mary - Low	4	6/20/13	0.06	0.019		

Table 2. Glacier National Park Container Plants Sown and Held in Cold Storage at BPMC, December 31, 2014

Glacier National Park							
Scientific Name	Common Name	BPMC Accession Number	GNP Lot ID	GNP Site	Date Sown	Units	Size Container
			#			#	cubic inches
<i>Arctostaphylos uva-ursi</i>	kinnikinnick or bearberry	9078619	08-154	Lake McDonald	10/14/14	600	7

Table 3. Container Plants Mailed to Glacier National Park, 2014

Glacier National Park							
Scientific Name	Common Name	BPMC Accession Number	GLAC Lot ID	GLAC Site	Date Sown	Units	Size Container
			#			#	cubic inches
<i>Acer glabrum</i>	Rocky Mountain maple	9081615	12-086	Lake McDonald - Low	2/5/13	42	7
<i>Acer glabrum</i>	Rocky Mountain maple	9088296	12-090	Saint Mary - Low	2/5/13	41	7
<i>Eurybia conspicua</i>	eastern showy aster	9088061	09-295 and 10-343	Saint Mary - Low	2/5/13	350	7
<i>Pseudotsuga menziesii</i>	Douglas-fir	9087727	08-166	Lake McDonald	2/19/13	5	7
<i>Symphotrichum laeve</i> var. <i>geyeri</i>	Geyer's aster	9078464	10-197	Many Glacier	2/5/13	200	7

Technology Development and Assistance. Due to the limited seed production from *Trisetum spicatum* (9081997-SM), *Phleum alpinum* (9054559-LP), *Eurybia conspicua* (9088061-SM-L), and *Symphotrichum laeve* (9078605-LM), these lots were not submitted for seed analysis. The remaining 2014 seed increase was sampled and sent to the Montana State Seed Testing Laboratory, MSU-Bozeman, for germination and purity analysis including *Bromus vulgaris* (9088297-MG), *Carex microptera* (9087799-LM), *Elymus glaucus* (9075846), *Poa alpina* (9054561-LP), and *Symphotrichum laeve* var. *geyeri* (9078464-MG-L) (see table 4). Laboratory results from these five seed lots are included in the "Trials Conducted" section of the GLAC 2014 Annual Technical Report.



Glacier National Park *Eurybia conspicua* 9087433, June 2014



Glacier National Park *Carex microptera*
9087799, June 2014



Glen Canyon National Recreation Area, Utah

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

Introduction. In 2013, an agreement was made between the National Park Service, Glen Canyon National Recreation Area and the USDA-NRCS LLPMC for the collection and propagation of native seed for identified project areas at the park. The park staff collected seed from identified populations of native grass and shrub and tree species and sent the seed to the LLPMC. The seed was then conditioned and used for seed increase plantings or for the production of transplants at the LLPMC.



Glen Canyon National Park
Aristida purpurea, accession
9067016, June 2014

Glen Canyon National Recreation Area Seed and Transplant Production										
Scientific Name	Common Name	Accession Number	Amount of Seed Received in 2012	Acreage Agreement	2014 Ac.	Lbs Cleaned	PLS lbs on Inventory	Test Date	Transplant Agreement Request	No. of Transplants Produced in 2014
Grasses										
<i>Aristida purpurea</i>	purple threeawn	9067016	4.86 grams	0.25	0.25	1.6	1.14	2/24/15	N/A	N/A
Shrubs and Trees*										
<i>Pluchea sericea</i>	arrowweed**	9067027	18.2 grams	N/A	N/A	N/A	N/A	N/A	0	35
<i>Gutierrezia sarothrae</i>	broom snakeweed	9067023	16.8 grams	N/A	N/A	N/A	N/A	N/A	500	550
<i>Eriogonum corymbosum</i>	buckwheat	9067021	17.6 grams	N/A	N/A	N/A	N/A	N/A	750	50
<i>Artiplex canescens</i>	fourwing saltbush	9067020	96.3 grams	N/A	N/A	N/A	N/A	N/A	1,000	1,500
<i>Populus fremonti</i>	Fremont cottonwood	9067025	not weighed	N/A	N/A	N/A	N/A	N/A	50	45
<i>Salix gooddingii</i>	Goodding's willow	9067026	not weighed	N/A	N/A	N/A	N/A	N/A	100	110
<i>Ericamer</i> var.	rabbitbrush***	9067024	16.4 grams	N/A	N/A	N/A	N/A	N/A	750	740
<i>Baccharis</i> spp.	seepwillow	9067022	5.18 grams	N/A	N/A	N/A	N/A	N/A	50	90
<i>Atriplex confertifolia</i>	shadscale	9067019	274 grams	N/A	N/A	N/A	N/A	N/A		

*All of the shrubs and trees were propagated in the nursery for transplant production, and therefore field acreage was not a requirement.

** The arrowweed (*Pluchea sericea*) was started in the spring of 2013 due to the uncertainty of being able to meet the salix and populus agreement amounts.

*** The rabbitbrush seed appeared to contain four different species. One of the species appeared to be *Ericameria nauseosa* and another one appeared to be *Isocoma*. The other two species could not be identified by seed alone.

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 USDA-NRCS LLPMC to collect, propagate, and increase native grasses, forbs, shrubs, and trees for the purpose of revegetating disturbed areas and native landscaping projects in Grand Canyon National Park. This agreement includes both the north and south rim areas of the park.

Accomplishments. In 2014 the LLPMC accomplished the following activities:

- Indian ricegrass – Harvested seed from the 0.14-acre Indian ricegrass production field.
- Muttongrass – Harvested seed from the muttongrass production fields.
- To improve the seed production of muttongrass, a split application of gypsum (CaSO_4) was applied in 2013 and 2014. Because calcium deficiency can suppress seed development, the application of CaSO_4 may lead to an increased harvest.
- Needle and thread – Harvested seed from the 0.5-acres needle and thread production fields.
- Spike muhly – Harvested seed from the 1.0-acre spike muhly production field.

Technology Development.

- **Indian ricegrass** – Due to the high rate of dormant seed commonly associated with Indian ricegrass, especially in the first year after harvest, and the limited amount of the seed the LLPMC received from the park, plant establishment in the Indian ricegrass field was very low. This again required an increase in maintenance for this seed production field since seeding occurred in 2012 (see the following photograph). The low stand percentage in the production field meant extra herbicide applications and increased weeding throughout the 2014 growing season. Spot spraying of herbicide and hand weeding and cultivation was needed, on average, every two weeks during the 2014 growing season. The treatments for this field were possibly twice as much as needed for a normal, fully established seed production field at the LLPMC. It is noted that an increase in plant density in the seed field has occurred since the original 2012 seeding. This is likely due to the shattering of seed from the 2013 crop and the germination of that seed in the spring of 2014.
- **Muttongrass** – As previously stated in prior Grand Canyon National Park reports, the LLPMC has evaluated new techniques to increase seed production for muttongrass. Increased irrigation and the addition of gypsum fertilizer to the muttongrass field did increase the seed production. The muttongrass from the park does not perform well on the soils at the LLPMC, and the life span for seed production is, at best, three years. After that, seed production decreases dramatically and the mortality rate is high. This requires continuing evaluation of the need to re-establish new fields of the muttongrass to meet the acreage stated in the park agreement, which increases the cost for production of this species. To maintain the agreement acreage, a new field of muttongrass would have to be established in 2015.
- **Needle and thread** – Needle and thread seed has been difficult to harvest using traditional combine and flail-vac harvesters. Seed production looked good in the field and the vacuum harvest system did an excellent job of harvesting a high percentage of the mature seed. In 2014, the LLPMC used new technology to help in the harvest of needle and thread seed from the Grand Canyon National Park production field.





Grand Canyon National Park, *Hesperostipa comata*, accession 9066797, June 2014

Grand Canyon National Park muttongrass seed production field 33N



Grand Teton National Park, Wyoming

Prepared by: **Aberdeen, 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. Fields of Idaho fescue (*Festuca idahonensis*) and bluebunch wheatgrass (*Pseudoroegneria spicata*) were planted in May 2008. Seed from the bluebunch wheatgrass fields was harvested in 2009 and 2010, and the field was then discontinued in late 2010 because of poor seed yield. The original Idaho fescue field was harvested from 2009 to 2014. In 2010, a second field of mountain brome was planted for seed harvests in 2011 and 2012. A new Idaho fescue field (1.0 acre) was established in 2012 for seed production in 2013 through 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. The first table below lists the species grown and seed harvests through 2014. The second table below shows information from seed shipments and current inventory. To date, PMC has delivered 7,668 lbs of seed to the park in this project.



Seed Yield (Lbs Bulk)											
Common Name	Field	Acres	Year Installed	2007	2008	2009	2010	2011	2012	2013	2014
Mt. brome	2W	1.0	2006	172	176						
Mt. brome	P7W	2.5	2010					2294	2286		
Blue wildrye	P7	2.7	2006	1052	417						
Blue wildrye	27E	1.0	2006	1031	429	520					
ID Fescue	21W	0.3	2008			11	109	95	72	97	24
ID Fescue	P7E	1.0	2012							82	500
Sandberg bluegrass	13	0.25	2006	13	16	7					
Blue bunch wheatgrass	21	1.0	2008			0.5	3				

Lbs Shipped									Current Inventory	
Common Name	Field	2008	2009	2010	2011	2012	2013	2014	Lbs PLS	Test Date
Mt. brome	2W	150	198						0	
Mt. brome	P7W				2289		1084		1000	2/1/13
Blue wildrye	P7		232		116		416	708	0	
Blue wildrye	27E	50	50	319	605		1045		0	
ID Fescue	21W			11	109		166	82	84	1/23/14
ID Fescue	P7E								475	1/23/15
Sandberg bluegrass	13		15		20				0	
Bluebunch wheatgrass	21				3				0	

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

Introduction. On June 1, 2010, the Natural Resources Conservation Service, Plant Materials Center, Bismarck, North Dakota, entered into an interagency agreement with the National Park Service, Grand Teton National Park to grow and produce seed of bluebunch wheatgrass (*Pseudoroegneria spicata*), slender wheatgrass (*Elymus trachycaulus*), and mountain brome grass (*Bromus marginatus*) for use in revegetating Kelly Hay Fields. Fields were established at the PMC in 2010 with seed originating from the park. The original contract period was 2010 through 2012. The contract was extended for 2013 and 2014. At this time, it was agreed to grow the slender wheatgrass and mountain brome grass and discontinue growing the bluebunch wheatgrass due to poor performance at this location. Seed harvested from these fields will be distributed to the park for reclamation activities. The contract expired on December 31, 2014.

Targeted Species and Goaled Seed Amounts

Accession Number	Scientific Name	Common Name	Seed Amount (PLS lbs/year)
9094353	<i>Elymus trachycaulus</i>	slender wheatgrass	720
9094354	<i>Bromus marginatus</i>	mountain brome grass	520

Accomplishments. Seed production was good for both slender wheatgrass and mountain brome grass. There was no evidence of smut in the mountain brome grass field. The fields were direct combined and dried prior to cleaning. The mountain brome grass and slender wheatgrass seed was tested at the North Dakota State Seed Department.

Seed from the 2011, 2012, and 2013 seed lots were distributed to the park on September 15, 2014. The following seed amounts were shipped: 1,939 PLS lbs slender wheatgrass; 1,219 PLS lbs mountain brome grass; and 0.27 lbs bluebunch wheatgrass.

Common Name	Date Planted	Seeding Rate (lbs PLS/acre)	Field Size (acre)	2014 Seed Production (lbs PLS)	2014 Seed Harvest Date	Seed Test Date	Seed Distribution to Park in 2014 (lbs PLS)	Inventory Remaining as of 5/1/2015 (lbs PLS)
Slender wheatgrass	5/26/10	5.5	1.0	266	7/30	4/6/15	1,939	266
Mountain brome grass	5/26/10	10.0	1.0	295	7/29	5/11/15	1,219	295
Bluebunch wheatgrass	Field removed		0	0	0	0	0.27	0

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



Cleaned seed of
Mountain Bromegrass,
Bromus marginatus

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

Introduction. In 2011, the Bridger Plant Materials Center entered into a multi-year 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 1.0 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 2015.

Accomplishments. A total of six seed production fields of four species (five seed sources) from Grand Teton were maintained at the BPMC in 2014. The *Poa secunda* 9088212 planted in Field 11 in 2011 failed to establish and was removed in late 2012. An additional 1.0-acre of *Poa secunda* 9090925 was planted in 2012 and produced well in 2014. Total bulk seed production in 2014 by species also appears in the table below, and total bulk seed on hand appears below.

Bulk Seed Increase Data of Grand Teton National Park Seed Lots, 2014

Grand Teton National Park								
Scientific Name	Common Name	Accession Number	Date Sown	No. of Rows	Area Planted	Location	2014 Bulk Seed Produced	2014 Production PLS
					acres		kg	lbs
<i>Festuca idahoensis</i>	Idaho fescue	9088206	8/11/2011	40	1.0	Field 12	135.2	289
<i>Pseudoroegneria spicata</i>	bluebunch wheatgrass	9088209	8/11/2011	32	0.65	Field 12	pending	pending
<i>Poa secunda</i>	Sandberg bluegrass	9088212	8/11/2011	24&28	1.3	2 sites Field 12	34.5	68.8
<i>Bromus marginatus</i>	mountain brome	9088217	8/11/2011	40	1.0	Field 12	92.5	179.2
<i>Poa secunda</i>	Sandberg bluegrass	9090925	4/24/2012	20	1.0	Field 20	27.2	44

Bulk Seed On Hand for Grand Teton National Park, 2014

Grand Teton National Park							
Scientific Name	Common Name	Accession Number	Seed Lot ID	Area Planted	2014	4/13/15	4/13/15
					Bulk Seed Produced	Total Bulk On Hand	Total Bulk On Hand
				acres	Lbs	Lbs	kg
<i>Festuca idahoensis</i>	Idaho fescue	9088206	SCO-14-GTF12	1.0	298	298	135.2
<i>Pseudoroegneria spicata</i>	bluebunch wheatgrass	9088209	SCO-14-GTF12	0.65	—	—	pending
<i>Pseudoroegneria spicata</i>	bluebunch wheatgrass	9088209	SCO-12-GTFLD12	—	—	6	2.7
<i>Poa secunda</i>	Sandberg bluegrass	9088212	SCO-14-GTF12POA	1.3	76	76	34.5
<i>Bromus marginatus</i>	mountain brome	9088217	SCO-14-GTF12BR	1.0	204	204	92.5
<i>Poa secunda</i>	Sandberg bluegrass	9090925	SCO-14-GTF20	1.0	60	60	27.2

All Grand Teton seed increase fields produced some seed in 2014. Bulk seed production of each seed source was greater in 2014 than 2013. Smut was again evident in the *Bromus marginatus* 9088217 field, and volunteer seedlings of several nontarget species recorded in the original wildland collections, especially slender wheatgrass *Elymus trachycaulus*, continued to increase in several fields.

Technology Development. Adjustments to the screen fanning mill were trialed in 2014 in order to improve separation of nontarget and target species. Reduction in shaker speed of the Super 47B large mill resulted in significantly improved removal of undesirable species. Quinclorac herbicide was also trialed in fall 2014 for improved broadleaf weed control in 2015.



Grand Teton National Park, *Festuca idahoensis*, accession 9088206, July 2014



Grand Teton National Park, *Poa secunda*, accession 9088212, July 2014



Palo Alto Battlefield National Historical Park, Texas

Prepared by: Kingsville, Texas, E. "Kika" de la Garza Plant Materials Center

Introduction. Palo Alto Battlefield National Historical Park is an approximately 3,400-acre national park system unit near the mouth of the Rio Grande River. The first major battle of the war between Mexico and the United States was fought here in 1846. The National Park Service has enlisted NRCS E. "Kika" de la Garza Plant Materials Center to assist in the restoration of the core battlefield at the park (Interagency Agreement 67-7442-14-203). The Plant Materials Center (PMC) will assist in delivery of 40,000 gulf cordgrass transplants to the park in year one, 60,000 in year two, and 60,000 in year three. Seed harvested from gulf cordgrass plants at the PMC and from the park will be cleaned, stored, and tested. Any seed remaining after meeting the needs to produce the PMC required transplants will be used for direct seeding experiments.

Accomplishments. Seed harvested from an increase block in August 2013 received a germination test in April 2014. This seed had a 69% germination rate under 12 hours of light with 30 degrees Celsius (°C) and 12 hours of dark with 20°C conditions. This seed (180 grams) along with a small amount of seed harvested from the park (15 grams) in 2013 was used as the source material in producing 49,100 transplants. The seed was given to a plant contractor (Peterson Brothers, Inc. of San Antonio) who used it to produce the transplants.

Plants were picked-up in San Antonio by PMC personnel the last week in July. Plants were held for a day at the PMC and then delivered to the park in Brownsville by the PMC. A total of 45,000 plants were delivered to the park and 4,100 plants were retained by the PMC and transplanted at the PMC to initiate a third seed increase field.

Seed was harvested by the PMC from a seed increase field in Block I, the first week in September.

Seed harvested from Block I, as well as seed harvested from the park in 2014, was germination tested in both November and December 2014. The seed tested in November was done with 12 hours of light at 30°C and 12 hours of dark at 16°C. The seed from the PMC had a 7% germination rate; the seed from the park had a 49% rate.

Technology Development. The contract nursery (Peterson Brothers, Inc.) produced very nice, healthy transplants. The gulf cordgrass seed germinated quickly and the plants grew fast with a large root mass. Transplants have to be received and field planted within six weeks after delivering the seed to the contract grower if the grower uses the cheaper 105 liner at \$0.08/plant. Gulf cordgrass is better seeded initially in a large container, which gives a longer window of delivery but the costs for a 2" by 2" by 2 ¼" plant will be \$0.19/plant. Nursery plants should be maintained by using a slow-release fertilizer and continually trimming the plants. When gulf cordgrass reaches about 15" to 18" of top growth, they should be clipped back to a 9" height. After about 6–8 weeks, the plants should be pulled out of the water troughs and only top watered. This hardens the plants off for field conditions and it ensures the plants do not rot because of too much moisture. You should have a good estimate of the gulf cordgrass plant growth by now to be able to minimize the time the plants are at the nursery before getting them field planted. The longer you have them growing in the nursery the greater your chances of something going wrong.

It appears that during field planting you were able to plant at roughly 133 plants per man-day. We have averaged about 200 plants per man-day at the PMC. With time, you will improve on the planting rate but this will give you a good figure for estimating field labor needs. For example, if you had planted all 40,000 plants, it would have taken your crew at least 33 days to get them all planted.

You might save on labor time and cost by not watering your field plantings. We have planted in the fall and never watered with probably a 75% survival rate. I think if you were planting in the spring the watering might be more crucial. Soil moisture monitoring might give us a better handle on when and when not to bother watering.

When drill seeding there are two points to remember—you do not want to plant too deep and you want good seed-to-soil contact. The soil has to be dry, especially heavy clay soils. We want it thoroughly dry 1–2 inches deep otherwise it sticks to the drill and plugs the openings. We are looking at some version of no-till. If you can not burn the residue off, then you want to plant directly into the standing grass. You don't want to mow prior to planting. All this does is put so much residue on the ground that the drill just rides up onto the residue and leaves the seed on top. After you finish seeding you can mow because this will provide a mulch and reduce shading of the seedlings. Our small, portable drill has four seed units that have depth bands for control. The units are approximately 11 inches apart. You can control density by adjusting the seeding rate of the drill and by adding a filler such as sand or cat litter. You can also regulate it by how many seed units you use. You can always use the hydraulics to lift it so it does not plant.



Plant delivery of Gulf cordgrass



Gulf cordgrass germination tests



Rocky Mountain National Park, Colorado

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

Introduction. UCEPC and Rocky Mountain National Park initiated an ID/IQ Contract AG-8B05-C-12-0002, Task Order P14PD01642, Bear Lake Road Revegetation, Phase II on July 28, 2014. This agreement involves seed production of two grasses for revegetation of the Bear Lake Road Project for a single year. Additionally, this task order calls for five PLS lbs of mountain muhly and 140 PLS lbs of wooly brome to be produced and delivered to Rocky Mountain National Park to fulfill the terms of the agreement.

Accomplishments. This year, both products yielded well and the target quantities of seed were met as identified in the Task Order. Two additional species were produced in anticipation of the likely use of the germplasm in the future, either by Rocky Mountain National Park or some other public entity for public benefit. This germplasm, if shared among parties, will be proportionately allocated as determined by separate agreements between the parties and UCEPC. One large seed shipment exceeding 1,600 lbs was delivered to Rocky Mountain National Park on July 22, 2014, of previously produced material.

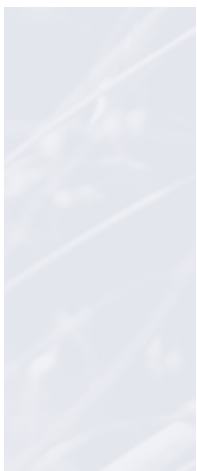
Seed production was reasonably good for bottlebrush squirreltail, Canada wildrye, mountain muhly, and wooly brome. However, bottlebrush squirreltail and Canada wildrye were not under contract.

Common Name	Date	Clean Seed	PLS	Test Date	Process	Acreage
Mountain muhly						
Field Establishment	5/28/03		59.00 g		Planet Junior	0.50
Harvest	10/06/14	7.7 lbs	5.0* lbs	3/6/15	Swather	0.50
Wooly brome						
Field Establishment	8/10/12	Direct seeded 7 lbs			Planet Junior	2.50
Harvest	8/15/14	177 lbs	140*lbs	3/2/15	Combine	1.0

*Contracted amount of seed

The table above provides a complete recap of the activities conducted by UCEPC in 2014. The agreement is complete and this is the final report for the Bear Lake Road Project. The 2014 produced seed is on inventory at UCEPC.

Technology Development. Standard seed production practices were conducted in 2014.



Rocky Mountain,
Bromus lanatipes
June 2014

Yellowstone National Park, Wyoming

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

Introduction. In 2008, the Natural Resources Conservation Service, Plant Materials Center (PMC), Aberdeen, Idaho, entered into an interagency agreement with the National Park Service, 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. The needle-and-thread was harvested as hay mulch and baled for transport in 2010 through 2012. Seed was harvested from the Sandberg bluegrass field in 2010 through 2013, and bluebunch wheatgrass field in 2011 to 2013. New, 2.5-acre seed fields of Sandberg bluegrass and bluebunch wheatgrass were planted in May 2013 to produce seed in 2014 and 2015. 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.

Accomplishments. In 2011, we shipped 2,520 lbs of needle-and-thread in nine bales (approximately 280 lbs/bale). In 2012, we shipped 2,400 lbs in 10 bales (240 lbs/bale). Literature suggests that needle-and-thread produces an estimated 150 lbs PLS/acre seed under irrigation. With one irrigated acre in production, one can estimate approximately 16 lbs of seed per bale. To date, PMC has shipped 449 lbs of processed seed to the park from this project.

Seed Yield (Lbs Bulk)								
Common Name	Field	Acres	Year Installed	2010	2011	2012	2013	2014
Sandberg bluegrass	2	1.0	2009	81	153		93	
Sandberg bluegrass	P2E	2.5	2013					405
Bluebunch wheatgrass	410W	1.0	2009		107	125	117	
Bluebunch wheatgrass	P2W	2.5	2013					250
Needle-and-thread	410E	1.0	2009		150*	150*		

*Estimated seed yield based on literature

Common Name	Field	Lbs Shipped				Current Inventory	
		2011	2012	2013	2014	Lbs PLS	Test Date
Sandberg bluegrass	2			265	0	17	5/13/2014
Sandberg bluegrass	P2E				0	253	2/2/2015
Bluebunch wheatgrass	410W			184	0	29	2/29/2012
Bluebunch wheatgrass	P2W					190	1/23/2015
Needle-and-thread	410E	2520*	2400*			0	

*Needle-and-thread shipped in bales



Yellowstone National Park, bluebunch wheatgrass at Aberdeen PMC, 2015



Yellowstone National Park, Sandberg bluegrass at Aberdeen PMC, 2014



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

Introduction. The Bridger Plant Materials Center has maintained cooperative agreements with Yellowstone National Park since 1986. These agreements facilitate the collection, increase, and reestablishment of indigenous plant materials, and the development of revegetation technologies for restoring disturbances resulting from road construction and other improvement projects within park boundaries. Yellowstone National Park forecasts future road construction projects with adequate lead time for indigenous seed and/or plant collection and production efforts to begin three years in advance of project initiation. Wildland seed collections are collected by park staff, dried, and delivered to the BPMC for processing, w, and entry into a database.

Accomplishments. In 2014, five allocations of 124 seed lots were distributed to the park or the BPMC (used to plant seed increase fields) totaling 182 lbs. The distribution included 61 grass lots (12 species) totaling 167 lbs and 63 forb lots (27 species) totaling 15 lbs. The 79 wildland seed collections yielded a total of 96 lbs, including 80 lbs from 46 grasses (19 species) and 16 lbs from 33 forbs (20 species).

Seed increase fields of five grass accessions (four species) were harvested on 1.5 acres, resulting in more than 396 lbs of bulk seed produced. Three seed increase blocks (1.0 acre) were maintained but not harvested due to poor seedhead development. Two new seed increase fields (1.2 acres) were planted on July 31, 2015. Seed increase blocks of four grasses (0.94 acres) were removed due to natural decline in production. Currently, there are 2.8 acres of seven grass accessions (five species) planted to seed increase blocks at the BPMC. The wildland seed and increase inventory contains seed collections dating from 2005 to 2014. The 2009 seed lots of slender wheatgrass and the 2007 seed lots of mountain brome were returned to the park. Additionally, all seed lots from 2004 were distributed back to the park.

Yellowstone National Park Seed Increase, Bridger, Montana, 2014

Yellowstone National Park							
Scientific Name	Common Name	Accession Number	POMS Lot Number	Harvest Date	Field Size	Quantity of Bulk Clean Seed	PLS Seed
					acres	Lbs	Lbs
<i>Bromus marginatus</i>	mountain brome	9088024	SCO-14-YNP-17	7/01/14	0.33	111	98.5
<i>Bromus marginatus</i>	mountain brome	9088025	SCO-14-YNP-140	7/01/14	0.14	34	30.6
<i>Elymus trachycaulus</i>	slender wheatgrass	9081525	SCO-14-YNP-41	7/16/14	0.80	130	128.5
<i>Festuca idahoensis</i>	Idaho fescue	9081537	SCO-14-YNP-86	7/06/14	0.33	90	86.1
<i>Leymus cinereus</i>	basin wildrye	9081887	SCO-14-YNP-45	8/06/14	0.33	31	23.5

Technology Development. Some technology development related to park studies is reported in the Gardiner Basin Summary Report. Additionally, adjustments to the screen fanning mill were trialed in 2014 to improve separation of nontarget and target species. Reduction in shaker speed of the Super 47B large mill resulted in significantly improved removal of undesirable species. Quinclorac herbicide was also trialed in fall 2014 in seed increase fields for improved broadleaf weed control in 2015.



Elymus trachycaulus, accession 9081525, July 16, 2014



Leymus cinereus, accession 9081887, August 6, 2014

Gardiner Basin

Introduction. The Bridger Plant Materials Center has maintained a cooperative agreement with Yellowstone National Park Gardiner Basin since FY 2008. This agreement facilitates the collection, increase, and reestablishment of indigenous plant materials and the development of revegetation technologies for the restoration of native perennial grasses where desert alysium (desert madwort, *Alyssum desertorum*) dominates in fields of the northern boundary. Yellowstone National Park forecasts future restoration projects with adequate lead time for indigenous seed and/or plant collection and production efforts to begin three years in advance of project initiation.

Accomplishments. Seed increase fields of three grasses were harvested from 2.2 acres, resulting in approximately 858 lbs of bulk seed production in 2014. Seed harvests were processed and purity and germination determined for each lot and PLS calculated. Seed fields were maintained for final harvest in 2015.

Gardiner Basin Seed Increase at the Bridger PMC, 2014

Yellowstone National Park Gardiner Basin							
Scientific Name	Common Name	Accession Number	POMS Lot Number	Bulk Seed	Pure-Live-Seed	PLS	PLS
				Lbs	%	Lbs	kg
<i>Elymus trachycaulus</i>	slender wheatgrass	9081525	SCO-14-YNP-41	389	98.85	384.5	174.4
<i>Poa secunda</i>	Sandberg bluegrass	9090791	SCO-14-YNP-64	397	pending	pending	pending
<i>Pseudoroegneria spicata</i>	bluebunch wheatgrass	9087860	SCO-14-YNP-148	72	79.71	57.4	26.0

Technology Development. Monitoring and evaluation continued on the Comparative Evaluation Planting, which tests the growth and establishment of five indigenous versus five plant materials selections at the Cinnabar Site and BPMC. In the park, no seeded target species were present due to the negative impact of desert alysium *Alyssum desertorum*. At the BPMC, where desert alysium is not present, statistical analysis revealed there were no significant differences between park germplasm and cultivar germplasm of the same species in density or biomass production, except for Sandberg bluegrass. High Plains Sandberg bluegrass (plant materials selection) established at four plants per linear foot, statistically greater than the 2.3 plants per foot of 9087868 (in-park). Three species of improved materials produced more average biomass when compared to the same species of in-park materials including “Pryor” slender wheatgrass, “Lodorm” green needlegrass, and High Plains Germplasm Sandberg bluegrass, but again, these differences were not statistically significant. The in-park accession of bluebunch wheatgrass out-performed

“Goldar” in all mean performance measures, but the differences were not statistically significant. Similarly, the in-park Indian ricegrass out-performed “Rimrock” in mean density and mean biomass production, but not statically so.



Pseudoroegneria spicata, accession 9087860, June 25, 2014



Poa secunda, accession 9090791, June 25, 2014

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

Introduction. This report covers activities that have been conducted by UCEPC for Yellowstone National Park through an ID/IQ Contract AG-8B05-C-12-0002, Task Order P12PD12993. The task order calls for UCEPC to produce seed for a single grass species (bluebunch wheatgrass). UCEPC is to produce approximately 240 lbs PLS for the park from a 1.0-acre field. This agreement will remain in effect until April 30, 2016.

Accomplishments. Plant vigor and seed yield were not very good for the source of Yellowstone bluebunch in 2014. The field looks like it needs to be re-established as the vigor was not good at any time in 2014. The production reflects the observations, as only 30 clean lbs of seed were produced.

No seed was shipped to the park in 2014. The seed on inventory is the seed produced in 2013 and 2014.

Common Name	Year	Planted	Acreage	Harvest Date	Clean Pounds	Test Date	PLS
Bluebunch	2010	Aug. 18	1.0	NA			
	2011		1.0	7/19/11	10	1/6/12	5.79
	2012	Nov. 5	1.0 (blanks)	6/26/12	122	1/22/13	56.55
	2013		1.0	7/8/13	118	3/7/14	80.63
	2014		1.0	7/8/14	30	3/2/15	16.17

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

Zion National Park, Utah

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

Introduction. In June 2009, an agreement was made between the USDA-NRCS Los Lunas Plant Materials Center (LLPMC) and Zion National Park to propagate 800 PLS lbs of bottlebrush squirreltail (*Elymus elymoides*) and 200 PLS/lbs of Indian ricegrass (*Achnatherum hymenoides*) to revegetate disturbed areas in the park. The seed of these two species was collected by the park staff and sent to the LLPMC for conditioning. After conditioning, the seed was used to establish seed production fields according to the agreement. The park seed has been stored at the LLPMC since 2013 when the agreement expired.



Zion National Park Pure Live Seed on Inventory in 2014				
Scientific Name	Common Name	Accession	Pure Live Seed on Inventory (lbs)	Test Date
<i>Elymus elymoides</i>	bottlebrush squirreltail	9066532	2.65	8/20/09
			13.74	9/17/10
			0.47	8/27/07
			14.35	8/06/05
			12.54	8//08/11
			13.83	8/08/11
			45.90	1/17/13
<i>Bothriochloa barbinodis</i>	cane bluestem	9066543	0.60 (bulk)	No test*
			1.36	1/21/05
			2.19	1/17/06
			1.58	3/09/07
			0.20 (bulk)	No test*
<i>Pleuraphis jamesii</i>	galleta	9066586	1.51	1/08/07
			0.58 (bulk)	No test*
			0.46 (bulk)	No test ¹
<i>Achnatherum hymenoides</i>	Indian ricegrass	9066528	15.48	10/16/06
			44.12	4/28/08
			26.57	10/31/08
			33.06	11/11/09
			22.74	12/14/10
			27.87	11/30/11
			49.97	2/19/13
<i>Poa fendleriana</i>	muttongrass	9066531	4.55	5/30/08
			0.70	11/20/08
			1.84 (bulk)	No test*
<i>Andropogon halii</i>	sand bluestem	9066529	2.73 (bulk)	No test*
			2.80	3/20/06
			8.89	3/21/07
			3.26	6/14/10
			9.84	7/07/10
			19.48	4/19/10

*Seed was not sent for testing due to an insufficient amount of seed, or the seed on hand was from the park collections and not from harvest at the LLPMC.



MIDWEST REGION

Mount Rushmore National Memorial, South Dakota

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

Introduction. On August 30, 2013, the USDA NRCS, Plant Materials Center, Bismarck, North Dakota, entered into an interagency agreement with the US Department of the Interior, National Park Service, Mount Rushmore National Memorial. The agreement period is from August 30, 2013 to September 30, 2017. The PMC agrees to increase seed for use in rehabilitation of social trails at Mount Rushmore National Memorial. Seed will be collected by NPS staff of germplasm from populations as closely related as possible, both genetically and ecologically, to park populations. NRCS will clean, test, and seed this material to seed production fields on the NRCS Bismarck PMC. The seed harvested from these fields will be cleaned, tested, and distributed to the park for reclamation projects. The following species and amounts have been agreed upon by both parties.



Scientific Name	Common Name	Acres of Seed Production	Seed Amount (PLS lbs/year)
<i>Andropogon gerardii</i>	big bluestem	0.80	80
<i>Schizachyrium scoparium</i>	little bluestem	0.80	80

Accomplishments. Seed was collected during the fall of 2013 by park employees. The seed was picked up by the PMC staff on March 19, 2014, and brought to the PMC. The seed was initially weighed, cleaned and accessioned. The clean seed was analyzed for germination and purity at the North Dakota State Seed Department laboratory. On May 27, 2014, 0.80-acre fields of big bluestem and little bluestem were planted in panel A-4 at the PMC. The fields were irrigated and broadleaf weeds were controlled in 2014. The big bluestem field established very well while the little bluestem was slow to establish. The little bluestem field will be observed in the spring of 2015 to determine if the stand is acceptable.

2013 Seed Collected by Park Staff Used to Establish Production Fields at PMC

Scientific Name	Common Name	Accession Number	Collection Date	Quantity of Material Received	Quantity of Clean Seed
<i>Andropogon gerardii</i>	big bluestem	9094438	Fall 2013	13.5 lbs	4.1 lbs PLS
<i>Schizachyrium scoparium</i>	little bluestem	9094437	Fall 2013	6.5 lbs	1.6 lbs PLS

Technology Development. All seed harvesting and cleaning protocols have been recorded and are available from the PMC.



Mount Rushmore National Memorial, native harvest of big bluestem prior to cleaning



Mount Rushmore National Memorial, little bluestem native collection prior to cleaning



Theodore Roosevelt National Park, North Dakota

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

Introduction. The Bismarck Plant Materials Center entered into a cooperative agreement 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 the National Park Service, Theodore Roosevelt National Park of the and the Natural Resources Conservation Service. The agreement expired on March 15, 2015. 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 goal seed amounts have been met. The seed produced at the PMC will be distributed to the park for revegetation projects.

Targeted Species and Goaled Seed Amounts for Contract Period 2007–2014

Scientific Name	Common name	Accession Number	PLS lbs
<i>Pascopyrum smithii</i>	western wheatgrass	9092172	550
<i>Elymus trachycaulus</i>	slender wheatgrass	9092175	260
<i>Nassella viridula</i>	green needlegrass	9092171	240
<i>Bouteloua curtipendula</i>	sideoats grama	9092174	220
<i>Bouteloua gracilis</i>	blue grama	9092173	54
<i>Koeleria macrantha</i>	prairie junegrass	9092176	29

Accomplishments. Three seed production fields were managed and maintained using herbicides and hand roguing for weed control. The fields were not irrigated in 2014. All fields produced seed and were harvested by straight combining. Seed was cleaned at the PMC and tested for purity and germination by the North Dakota State Seed Department laboratory. Seed was distributed to the park on July 23, 2014.

Seed Production and Distribution

Common Name	Date Planted	Field Size	2014 Seed Production (PLS lbs)	2014 Seed Harvest Date	Seed Test Date	Seed Distribution to Park in 2014 (PLS lbs)	Inventory Remaining as of 5/1/215 (PLS lbs)
Green needlegrass	Field removed	0	NA	NA	NA	340	0
Western wheatgrass	2008	0.57	113	8/14/14	2/6/15	243	113
Slender wheatgrass	Field removed	0	NA	NA	NA	576	266
Blue grama	2012	0.3	30	9/12/14	5/1/15	218	30
Sideoats grama	2012	0.3	117	9/4/14	4/29/15	194	120
Prairie junegrass	Field removed	0	NA	NA	NA	5.3	4

Seed from a previous agreement with Little Bighorn National Battlefield was also distributed to the park for their use on July 23, 2014. The species and amounts distributed from the national battlefield were 8 PLS lbs blue grama, 111 PLS lbs sideoats grama, 104 PLS lbs bluebunch wheatgrass and 268 PLS lbs green needlegrass.

Technology Development. All seed harvesting and cleaning protocols have been recorded and are available from the PMC.





PACIFIC WEST REGION

Crater Lake National Park, Oregon

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

Introduction. The Corvallis Plant Materials Center entered into an agreement with Crater Lake National Park in 2014 to evaluate, test, and propagate native plant materials for revegetation purposes (East and West Rim Drives Rehabilitation Project). It was agreed that the PMC would clean, visually analyze for viability, and store approximately 50 accessions of wild collected seed lots as well as perform germination trials and develop propagation protocols for rare species and ultimately produce 25,000 container plants to be planted in the park. A more detailed production list will be determined by PMC and park staff as restoration plans are finalized. Under the agreement, the PMC will also provide on-site consultation and training. Activities in 2014 included inspection and cleaning of provided seed, set up and maintenance of germination trials, and a site visit/consultation by PMC staff members Tyler Ross and Amy Bartow in mid-July.

Accomplishments. The East and West Rim Drives Rehabilitation Project encompasses five separate seed collection zones. Seed that was collected in 2013 and 2014 was delivered to the PMC and cleaned by PMC staff. The tables below list the amount of cleaned seed in storage.

Current Seed in Storage at the Corvallis PMC

Northeast East Rim Drive			
Scientific Name	Accession	Year Collected	Weight
<i>Achnatherum occidentale</i>	9109231	2013, 2014	17.64g
<i>Boechera horizontalis</i>	9109236	2013, 2014	0.33g
<i>Bromus carinatus</i>	9109238	2013, 2014	45.52g
<i>Carex halliana</i>	9109260	2014	150.95g
<i>Elymus elymoides</i> ssp. <i>elymoides</i>	9109246	2013, 2014	161.90g
<i>Ericameria nauseosa</i>	9109282	2014	6.51g
<i>Lupinus lepidus</i> var. <i>lobbii</i>	9109270	2014	5.39g
<i>Phacelia hastata</i> ssp. <i>compacta</i>	9109252	2013, 2014	6.45g
Northwest East Rim Drive			
Scientific Name	Accession	Year Collected	Weight
<i>Aconogonon davisiae</i> var. <i>davisiae</i>	9109267	2014	14.69g
<i>Carex breweri</i>	9109240	2013, 2014	26.94g
<i>Castilleja arachnoidea</i>	9109242	2013, 2014	4.80g
<i>Elymus elymoides</i> ssp. <i>elymoides</i>	9109261	2014	125.15g
<i>Eriogonum pyrolifolium</i> var. <i>coryphaeum</i>	9109258	2014	1.47g
<i>Juncus parryi</i>	9109266	2014	14.74g
<i>Luetkea pectinata</i>	9109249	2013, 2014	37.97g
<i>Lupinus lepidus</i> var. <i>lobbii</i>	9109262	2014	37.80g



North West Rim Drive			
Scientific Name	Accession	Year Collected	Weight
<i>Achnatherum occidentale</i>	9109230	2013, 2014	50.91g
<i>Aconogonon davisiae</i> var. <i>davisiae</i>	9109232	2013, 2014	31.00g
<i>Arnica viscosa</i>	9109234	2013	0.16g
<i>Carex breweri</i>	9109239	2013, 2014	76.13g
<i>Elymus elymoides</i> ssp. <i>elymoides</i>	9109245	2013, 2014	330.00g
<i>Ericameria greenei</i>	9109283	2014	0.61g
<i>Eriogonum marifolium</i> var. <i>marifolium</i>	9109259	2014	37.00g
<i>Eriogonum pyrolifolium</i> var. <i>coryphaeum</i>	9109269	2014	2.43g
<i>Penstemon davidsonii</i> var. <i>davidsonii</i>	9109251	2013, 2014	18.22g
<i>Phlox diffusa</i>	9109268	2014	3.26g
Central West Rim Drive			
Scientific Name	Accession	Year Collected	Weight
<i>Achnatherum occidentale</i>	9109229	2013, 2014	52.48g
<i>Aconogonon davisiae</i> var. <i>davisiae</i>	9109263	2014	4.88g
<i>Anemone occidentalis</i>	9109233	2013	35.59g
<i>Boechera horizontalis</i>	9109235	2013	2.36g
<i>Castilleja applegatei</i>	9109272	2014	0.24g
<i>Elymus elymoides</i> ssp. <i>elymoides</i>	9109244	2013, 2014	191.15g
<i>Ericameria greenei</i>	9109286	2014	0.14g
<i>Eriogonum marifolium</i> var. <i>marifolium</i>	9109248	2014	94.31g
<i>Eriogonum pyrolifolium</i> var. <i>coryphaeum</i>	9109273	2014	0.09g
<i>Penstemon davidsonii</i> var. <i>davidsonii</i>	9109250	2013, 2014	18.75g
<i>Phlox diffusa</i>	9109253	2014	2.02g
South West Rim Drive			
Scientific Name	Accession	Year Collected	Weight
<i>Achnatherum occidentale</i>	9109228	2013, 2014	76.14g
<i>Bromus carinatus</i>	9109237	2013, 2014	743.00g
<i>Carex halliana</i>	9109257	2014	169.97g
<i>Carex pachycarpa</i>	9109241	2013, 2014	502.83g
<i>Elymus elymoides</i> ssp. <i>elymoides</i>	9109243	2013, 2014	387.50g
<i>Ericameria greenei</i>	9109247	2014	23.84g
<i>Eriogonum marifolium</i> var. <i>marifolium</i>	9109265	2014	44.98g
<i>Holodiscus microphyllus</i> var. <i>glabrescens</i>	9109264	2014	5.94g
<i>Lupinus andersonii</i>	9109271	2014	5.79g
<i>Phlox diffusa</i>	9109274	2014	3.86g

Technology Development. Crater Lake staff delivered 2013 and 2014 wild collected seed of 24 different species to the PMC in 2014. It was noted that many species had very poor seed quality. Many seed lots contained a high percentage of unfilled seeds. The *Carex halliana*, *Phacelia hastata*, and *Eriogonum pyrolifolium* seeds exhibited signs of seed predation. These problems will be discussed with park staff to encourage better monitoring in the field while the collections are taking place.

Thirteen of the species had never been propagated before at the PMC. Informal germination trials were designed and set up for these species based on previous experience with similar species. Seeds were counted out in 50 seed sets and placed in plastic germination boxes on moistened germination paper. Two boxes for each treatment were either placed in a warm growth chamber set at 80 degrees Fahrenheit (°F) days and 64°F nights, in a walk-in cooler set at a constant 34°F, or remained at room temperature in the PMC laboratory. After six weeks, 90 days or 120 days in the cooler, the boxes were removed and placed either in the warm growth chamber or on the counter in the PMC lab. The *Penstemon davidsonii* seeds were also subjected to an additional warm treatment for two weeks prior to being placed in the cooler. All of the *Lupinus lepidus* seeds were scarified prior to being placed in germination boxes by rubbing the seeds on sandpaper.

Germination trials for the 13 species are currently ongoing. Therefore, results at this time are incomplete. Preliminary findings are as follows: The *Boechera horizontalis* seeds had a high percentage of germination (98%) in the warm growth chamber after six weeks of cold, moist stratification. The *Luetkea pectinata* seeds showed no signs of seed dormancy and germinated readily in warm temperatures. Scarified *Lupinus lepidus* seeds had high percentages of germination (96%–100%) without cold stratification in both the warm treatments and cooler room temperature treatments. *Eriogonum pyrolifolium* seeds had 83% germination in the warm growth chamber after 90 days of cold, moist stratification.



Crater Lake rockcress
(*Boechera horizontalis*)
9109235,
December 30, 2014

Mountain
buckwheat
(*Eriogonum
pyrolifolium*)
9109269,
December 30, 2014





Lassen Volcanic National Park, California

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

Introduction. An ID/IQ contract between Lassen Volcanic National Park and UCEPC was generated in 2012. LAVO-53237, Base ID/IQ Contract AG-8B05-C-12-0002, Task Order P12PD11296 identified in the scope of work that UCEPC would establish a seed production field of western needlegrass (*Achnatherum occidentale*). The seed source was provided by park staff from collections made in the park. The agreement targeted a quantity of 30 lbs of pure live seed (PLS). This task order remains in effect until December 31, 2014.

Accomplishments. Due to the mixed results of the previous plantings, plugs of *Achnatherum occidentale* were grown in the greenhouse in 2012 and 1,000 plugs were planted by hand in 2013. In 2014, about half of the field showed good vigor while the other half did not. There appeared to be many areas where the plants did not persist. On July 1, 2014, seed was mechanically harvested and stored for winter cleaning.

The field was not irrigated following harvest; however, at the end of July, rains came to the area and it was observed that most of the grasses had bolted up new seedheads. After further investigation, much of the seed seemed to be mature. On August 6, a second harvest was completed on the field by hand and was combined with the first harvest for cleaning. Total weight for both harvests was 1.4 lbs. Refer to the table below.

Lassen Volcanic National Park				
Scientific Name	Common Name	Year	Field Size (acres)	Quantity of Cleaned Seed
<i>Achnatherum occidentale</i>	western needlegrass	2013	0.4	34 grams
<i>Achnatherum occidentale</i>	western needlegrass	2014	0.4	1.4 lbs

Harvest amounts have been well below targeted levels. As a result, there have been no germination / purity tests completed on either lots harvested. It was concluded that this species was not progressing as desired in this environment and the field was plowed on October 21, 2014.

Technology Development. The first harvest conducted by UCEPC in 2014 used a tow-behind swather with the header set just low enough to cut seed stalks but not low enough to cut very much of the foliar vegetation. Seed heads were collected with a tarp that was fastened behind the conditioners. The seed was then cured and dislodged from the stems. This method, along with timely rain, increased the amount of seed that was harvested from this species in one season.

Sequoia and Kings Canyon National Parks, California

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

Introduction. The agreement between the Lockeford California Plant Materials Center (LPMC) with Sequoia and Kings Canyon National Parks ran from 2011 through 2014. The agreement was to produce seed of two grasses, California brome (*Bromus carinatus*) and blue wild rye (*Elymus glaucus*) and one forb species, miniature lupine (*Lupinus bicolor*). In addition, seed of 18 additional species was delivered for cleaning and storage.

Accomplishments. Seed of all three species were provided by the parks and cleaned at LPMC prior to planting. All three species (California brome, blue wildrye, and miniature lupine) were direct seeded during the fall of 2011. The grass species (California brome and blue wildrye) are perennial grasses and were harvested during 2012 and 2013. The severe drought, with no rainfall during the fall of 2013 and winter 2014, contributed to no grass seed was produced in 2014. The amounts of harvested seed obtained are shown in the table below. Seed of miniature lupine: 0.1 acres was planted in fall 2013 from seed harvested in 2012 using weed mat established on 0.1 acres and irrigated during a dry fall with sprinkler irrigation. Seed germination was good through the weed mat. Seed lots of 12 species were cleaned at the LPMC during 2013 and an additional six species during 2014 and are being maintained in storage.



Seed Harvested at the Lockeford Plant Materials Center

Scientific Name	Area (acres)	Seed bulk (lbs)	PLS (lbs)	Date tested	Seed bulk (lbs)	PLS (lbs)	Date tested	Seed bulk (lbs)	PLS (lbs)	Date tested
			2012			2013			2014	
<i>Bromus carinatus</i>	0.25	11.00			6	5.64	4/13/14			
<i>Elymus glaucus</i>	0.25	4.25	1.97	3/26/14	2.5	2.0	4/13/14			
<i>Lupinus bicolor</i>	0.25	8.00	4.9	8/7/12	5.3	2.8	10/11/14			
<i>Lupinus bicolor</i>	0.1							49	35.36	9/25/14

Technology Development. Lupinus seeds shatter at maturity and so weed mat is a good option for harvesting the seeds. A previous planting of lupines at the LPMC for seed production failed due to a wilt pathogen that expressed at bloom and seed production. Seeds were pre-treated with fungicides prior to planting to provide a broad-spectrum antifungal activity for the seeds and the germination plants. This was effective.



Sequoia and Kings Canyon National Parks, *Lupinus bicolor*, accession 9105998, April 20, 2014



Sequoia and Kings Canyon National Parks, *Lupinus bicolor*, accession 9105998, June 2, 2014



Yosemite National Park, California

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

Introduction. In 2013, the Lockeford California Plant Materials Center entered into an agreement with Yosemite National Park to produce seed of western needlegrass (*Achnatherum occidentale*) for restoration of native vegetation along Tioga Pass. Under the original contract, there was a specification for planting 1.0 acre for seed production. This needed to be amended because there was insufficient seed and a low rate of germination precluding plug plant production

The contract was amended for the production of a propagation protocol for western needlegrass and seed production of two additional species: blue wildrye (*Elymus glaucus*) and naked buckwheat (*Eriogonum nudum*) with seed provided by the park. Seed of these species will be harvested and the agreement will run through 2015.

A further amendment in the fall of 2014 required seed production of *Elymus elymoides*, squirreltail, on a 1.0-acre area.

Accomplishments. Seed of blue wildrye (*Elymus glaucus*) provided by the park was planted in December 2013 by direct seeding 0.25 acre. These plants germinated well under sprinkler irrigation and grew well into the summer of 2014. An additional five flats were planted in the greenhouse in case the direct seeding failed—these were transplanted next to the direct-seeded plants in February 2014.

Seed of *Eriogonum nudum* was stratified under cool moist conditions for two weeks and planted in February 2014 into one 200-foot bed. Irrigation was applied through drip line and the plants established well. During the summer, some mortality occurred with 40% of the plants dying in July and August with sudden wilt symptoms. Samples were taken showing necrotic areas on the main tap roots and this was shown to be caused by a fungal pathogen, *Macrophomina phaseolina* (charcoal rot). This pathogen thrives on hot and dry conditions and especially when plants are stressed. *Er. nudum* appears to be highly susceptible to this pathogen. A small amount of seed was harvested from these plantings, although the original plan was to delay harvest until 2015. This seed was then used for planting into a 0.10-acre of weed mat in November 2014. There was 148 g seed remaining. Squirreltail obtained from Meeker was planted into 1.0 acre of the PMC in October 2014, irrigation was applied, and germination occurred.

Technology Development. *Achnatherum occidentale* seed (99 g) collected by the National Park Service in 2013 was provided to the LPMC. In addition, the LPMC had additional seed of *A. occidentale* collected at the park in 2012 and stored at the LPMC. Both of these seed lots were used for germination studies and kept separate during trials. In these studies the initial 1% germination in both old and new seed lots was increased to 16% using a smoke water treatment on the seeds.



Yosemite National Park,
Elymus glaucus, March 19, 2014



Yosemite National Park, *Eriogonum nudum* accession 9107575,
August 13 2014

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

Introduction. Yosemite National Park awarded UCEPC the ID/IQ Contract AG-8B05-C-12-0002, Task Order P13PD00746 on July 24, 2013. The project, Rehabilitate Disturbed Areas along Tioga Road Phase I, requires revegetation with native seed indigenous to Yosemite National Park. The task order identifies UCEPC to propagate, establish and maximize seed production from two 0.50-acre fields of native grass, *Bromus carinatus* and *Elymus elymoides*. The seed source was provided by collections made from park staff. This contract shall remain in effect until August 31, 2015.

Accomplishments. UCEPC produced seed of Yosemite sources of *Bromus carinatus* and *Elymus elymoides* in 2014. Seed harvest information is provided in the table below.

Scientific Name	Planting Date	Harvest Date	Field Size	Clean Seed	PLS lbs	Date Tested
<i>Bromus carinatus</i>	7/26/13	7/11/14	0.50 acre	65 lbs	30.48	3/2/15
<i>Elymus elymoides</i>	8/1/13	7/21/14	0.50 acre	7 lbs	Shipped without test	

A request to produce additional seed of bottlebrush squirreltail was made by Yosemite for 2015. However, the window for planting a crop in 2014 and harvesting a seed crop the next year had already passed by the time the request was made. As a result, arrangements were made for Lockeford, California, to produce the seed for Yosemite for 2015. UCEPC cleaned the harvested crop of bottlebrush as the first seed lot cleaned for the year and it was shipped in its entirety to Lockeford on September 26, 2014. No seed test was conducted on the seed.

Unless the contract is amended or extended, it is completed as it now stands with the exception of shipping the California brome seed to the park.



Yosemite National Park,
Elymus elymoides June 2014,
in Meeker, Colorado

Yosemite National Park,
Bromus carinatus July 2014, in
Meeker, Colorado





NORTHEAST REGION

Gateway National Recreation Area, New York

Prepared by: Cape May, New Jersey Plant Materials Center

Introduction. In late October 2012, the coastline of Gateway National Recreation Area (GATE), which encompasses the Sandy Hook unit (New Jersey) and two units (Miller Field, Great Kills Park) on the southern side of Staten Island, New York were dramatically affected by Superstorm Sandy. The natural ecosystems and some infrastructure were heavily damaged by the storm. In response to this need, the National Park Service regional office in Boston contacted USDA-NRCS headquarters to request assistance of the Cape May Plant Materials Center (CPMC) with providing plant materials for revegetating the damaged dunes and shorelines. The CPMC and the NPS GATE have a nearly 25-year relationship centered on plant materials for the restoration of dunes, marshes, and natural areas in the various park units. In addition, the center has maintained some of the park's NPS germplasm of coastal plant materials in seed storage since the inception of this cooperative working relationship.

However, the most immediate need was to provide American beachgrass (*Ammophila breviligulata*) for initial stabilization of the dunes. We established a new, larger beachgrass production field from a small block of plants collected the previous year from the Plumb Beach unit in the park.

This contract provides for production of GATE primarily of American beachgrass, and two coastal shrubs, bayberry (*Morella pensylvanica*) and beachplum (*Prunus maritima*). The project is anticipated to go through 2015.

Accomplishments. An interagency agreement with NPS GATE germplasm was signed in July 2013 to provide up to 280,000 dormant bare root stems of American beachgrass and 1,500 bare root and/or containerized shrubs within the next two years. In addition, wild collections of targeted coastal plant materials and technical assistance through FY 2015 (September 2015) will be accomplished. The table below shows the plants distributed through 2014.

Distributions			
Scientific Name	Amount	Units	Date
<i>*Ammophila breviligulata</i> (Gateway germplasm)	8,400	culms	11/7/13
	6,800	culms	11/12/13
	4,000	culms	3/31/14
	21,200	culms	4/21/14
TOTAL	40,592	culms	
Scientific Name	Amount	Units	Date
<i>Distichlis spicata</i>	100	plugs	6/23/14
	650	plugs	8/25/14
	650	plugs	9/2/14
TOTAL	1,400	plugs	
TOTAL <i>Hibiscus moscheutos</i>	7	2g pots	8/11/14
<i>*Morella pensylvanica</i>	32	tree pots	6/16/14
	48	tree pots	6/23/14
	16	tree pots	7/14/14
TOTAL	96	tree pots	



Distributions			
Scientific Name	Amount	Units	Date
TOTAL <i>Opuntia humifusa</i>	16	plugs	8/11/14
<i>Panicum amarum</i> var. <i>amarulum</i>	96	plugs	6/23/14
	192	plugs	7/14/14
	360	plugs	8/11/14
TOTAL	648	plugs	
<i>Panicum virgatum</i>	96	plugs	7/14/14
	197	plugs	7/21/14
TOTAL	293	plugs	
<i>*Prunus maritima</i>	192	tree pots	6/9/14
	160	tree pots	6/16/14
	96	tree pots	6/23/14
	153	tree pots	6/30/14
	80	tree pots	7/14/14
TOTAL	681	tree pots	
TOTAL <i>Schizachyrium littorale</i>	168	quart pots	8/4/14
*Highlighted = contracted species			
Available			
Scientific Name	Amount	Units	
<i>Panicum virgatum</i>	21	lbs of seed	
<i>Opuntia humifusa</i>	300	plugs	
<i>Strophostyles helvola</i>	0.66	lbs of seed	

Future plans are to provide the grower industry with appropriate germplasm to be used to contract grow coastal plant materials for long term needs within the park.

Technology Development. The most immediate need of GATE was to have local genetic material of coastal plants for stabilizing dune systems. However, the CPMC will also be developing new seeding technology for adding plant diversity to the dunes within the park. Specifically, GATE is interested in providing for more pollinator habitat on the dune systems by adding additional forbs and legumes to the dune plantings. This will require using seed lots in cold storage as well as making additional wild collections of target species.

Some additional technologies include:

- Comparing the variability of beachgrass genetics within the Park (Sandy Hook vs. Plumb Beach) and the commercially available and widely planted Cape variety.
- Determining the viability of GATE NPS seed that has been held in cold storage for up to 25 years.



Diverse planting of mixed grasses and shrubs



One of the recently planted shrubs, Cape May PMC



Gateway beachgrass production at Miller Field on Staten Island



SOUTHEAST REGION

Great Smoky Mountains National Park, Tennessee

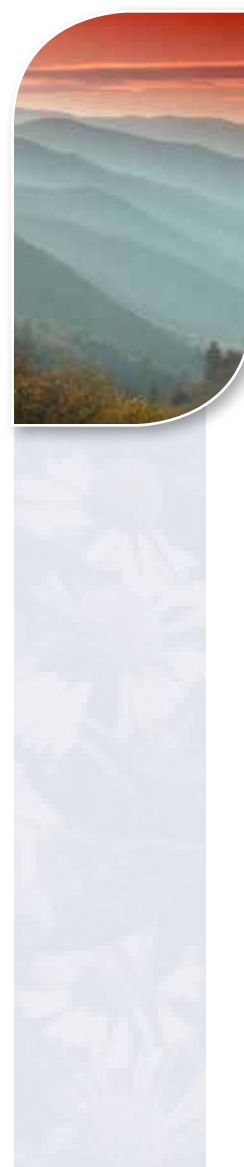
Prepared by: **Beltsville, Maryland, Norman A. Berg National Plant Materials Center**

Introduction. The current interagency agreement between Great Smoky Mountains National Park and the Norman A. Berg National Plant Materials Center (NPMC) was signed December 2013 for FY 2014 and is funded annually. The park and Foothills Parkway (FHP) need to preserve their native plant resources and revegetate park lands. The National Park Service requires that restoration of native plants use germplasm from populations closely genetically related to park populations. The park has harvested seed from native populations and the NPMC provides the expertise and equipment needed to clean, process, and store seed. Seed was harvested and cleaned through FY 2014, and in mid-April 2015 the NPMC distributed all remaining seed to the park. The Tennessee Stream Mitigation Program is working with the park to restore 5,000 feet of Chilogate Creek. This seed is for renovating damaged streambanks and reestablish the original riparian wetland habitat (rare within the park). The area includes critical wetland habitat for a state listed plant, Tennessee pondweed (*Potamogeton tennesseensis*), which is found near the Chilogate Creek confluence with Chilowee Lake. The project will be completed in April 2015.

Accomplishments. This is the fourth and final report for the 2011 to 15 contract periods. The Cades Cove increase fields harvest resulted in over 280 lbs of bulk grass, legumes, and wildflower seed. The following table lists the 11 different seed lots. Due to unforeseeable circumstances, hiring additional seasonal staff was not possible in 2013. The 2013 and 2014 harvests (totaling 980 lbs bulk) were combined (saving considerable time and effort) and cleaned in 2014. The cleaned, processed, and tested seed yielded 313 lbs PLS.

The NPMC distributed seven different shipments of seed totaling 1162 lbs (PLS). This seed was used by the park for two major projects, the Foothills Parkway and Chilogate Creek Stream.

The FHP is a 71-mile parkway that will eventually connect change to US Highway 129 in the west with Interstate 40 in the east. In June 2013, a bridge in the “missing link” section was completed. The Foothills Parkway section from Walland to Wears Valley, Tennessee, is expected to open in 2016.



Scientific Name	Common Name	Harvest year	Bulk Amount (lbs)	PLS (lbs)	Seed Test Date	Source
<i>Andropogon gerardii</i>	big bluestem	2013 & 2014	251	39.0	08/2014	Cades Cove
<i>Andropogon glomeratus</i>	bushy bluestem	2013 & 2014	8.3	0.3	*	Cades Cove
<i>Helianthus angustifolius</i>	swamp sunflower	2013 & 2014	21	1.5	08/2014	Cades Cove
<i>Lespedeza capitata</i>	roundheaded lespedeza	2013 & 2014	14.5	1.1	08/2014	Cades Cove
<i>Monarda fistulosa</i>	wild Bergamont	2013 & 2014	37.8	2.8	08/2014	Cades Cove
<i>Pycnanthemum muticum</i>	mountain mint	2013 & 2014	30.9	2.0	08/2014	Cades Cove
<i>Parthenium integrifolium</i>	wild quinine	2013 & 2014	18.1	2.7	08/2014	Cades Cove
<i>Saccharum giganteum</i>	beard grass	2013 & 2014	117.5	27.7	08/2014	Cades Cove
<i>Schizachyrium scoparium</i>	little bluestem	2013 & 2014	183	81.4	08/2014	Cades Cove
<i>Senna marilandica</i>	Maryland senna	2013 & 2014	14.3	3.9	08/2014	Cades Cove
<i>Sorghastrum nutans</i>	Indiangrass	2013 & 2014	286.9	151.4	08/2014	Cades Cove
TOTALS			983.8	313.9		

* Lot with too little seed for testing.



Swamp sunflower seed increase field in Cades Cove at Great Smokey Mountains National Park



Seed mixture being hydro seeded onto the Foothills Parkway.



Heavy equipment stage near Chilogate stream



Cades Cove at Great Smokey Mountains National Park restored meadow with Indiangrass and other forbs.

ABOUT THIS DOCUMENT

Visit the Plant Materials Program Website (<http://Plant-Materials.nrcs.usda.gov>) and the PLANTS website (<http://plants.usda.gov>).

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