

**National Park Service  
Plant Materials  
Year 2003 Annual Report**

**Prepared by**

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Los Lunas Plant Materials Center  
Los Lunas, New Mexico  
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## Grand Canyon National Park

### Background

In July 1990, an agreement was established between the Grand Canyon National Park (GCNP) of the U.S. Department of Interior and the Natural Resources Conservation Service (NRCS) Los Lunas Plant Materials Center (LLPMC) in Los Lunas, New Mexico, for the collection, propagation, and increase of grasses, forbs, shrubs, and trees.

The LLPMC will produce the plant materials for revegetating disturbed sites and for native landscaping projects in the park. This agreement covers both the north and south rim areas of the park. Amendment No. 1 of 1999 and Amendment No. 2 of 2001 provides for seed production of two native species, and for growing transplants of 10 native tree and shrub species. Of the 10 native tree and shrub species, the LLPMC has agreed to deliver 900 transplants to the GCNP at an agreed upon date. All transplants will be grown from seed collected from the indigenous ecotypes at the GCNP.

### Accessions Involved

Table 1 lists the accessions involved in the GCNP project.

**Table 1: Accessions Involved**

Common Name	Scientific Name	Plant Symbol	Accession Number	Vegetation Association
Indian Ricegrass	<i>Oryzopsis hymenoides</i>	ORHY	9062857	122.3233
Squirreltail	<i>Sitanion hystrix</i>	SIHY	9062858	122.3233
Needle and thread	<i>Stipa comata</i>	STCO	9062859	122.3233
Western wheatgrass	<i>Agropyron smithii</i>	AGSM	9062860	122.3233
Muttongrass	<i>Poa fendleriana</i>	POFE	9062861	122.3233
Penstemon (blue)	<i>Penstemon spp.</i>	PE SPP.	9062862	122.3233
Penstemon (red)	<i>Penstemon spp.</i>	PE SPP.	9066054	122.3233
Lupine	<i>Lupinus spp.</i>	LU SPP.	9062863	122.3233
Apacheplume	<i>Fallugia paradoxa</i>	FAPA	9062865	122.3233
Fernbush	<i>Chamaebatiaria millifolium</i>	CHMI	9062866	122.3233
Curl-leaf mountain mahogany	<i>Cercocarpus ledifolius</i>	CELE	9062867	122.3233
Elderberry	<i>Sambucus spp.</i>	SA SPP.	9066047	122.3233
Utah serviceberry	<i>Amelanchier utahensis</i>	AMUT	9062869	122.3233
Wolfberry	<i>Lycium spp.</i>	LY SPP.	9062870	122.3233
Gambels oak	<i>Quercus gambelii</i>	QUGA	9062872	122.3233
Fourwing saltbush	<i>Atriplex canescens</i>	ATCA	9062873	122.4149
Century plant	<i>Agave utahensis</i>	AGUT	9062874	122.4149
Blue grama	<i>Bouteloua gracilis</i>	BOGR	9062875	122.4149
Rabbitbrush	<i>Chrysothamnus nauseosus</i>	CHNA	9062877	122.4149
Cliffrose	<i>Purshia mexicana</i>	COME	9062876	122.4149
Utah juniper	<i>Juniperus osteosperma</i>	JUOS	9066055	122.3233
Pinon pine	<i>Pinus edulis</i>	PIED	9066467	122.3233

**Table 1: Accessions Involved**

Common Name	Scientific Name	Plant Symbol	Accession Number	Vegetation Association
Ponderosa pine	<i>Pinus ponderosa</i>	PIPO	9066466	122.3233
Big sagebrush	<i>Artemisia tridentata</i>	ARTR	9066056	122.3233
Currant	<i>Ribes spp.</i>	RI SPP.	9066057	122.3233
Datil yucca	<i>Yucca baccata</i>	YUBA	9066058	122.3233
Desert barberry	<i>Berberis fremonti</i>	BEFE	9066059	122.3233

## Collection Information

There was no seed collection in 2003.

## Seed Condition Information

See previous Grand Canyon Park reports for information.

## Seed Production Establishment

In October 2003, the LLPMC established an additional 0.90 acre of muttongrass. Using a mechanical transplanter, transplants grown by the LLPMC were planted into Field 25S.

## Seed Production

The following sections describe the seed production and climatological data for 2003.

## Field Management

### Field 20 – 1.0 Acre

9062861 Muttongrass	Date
Fertilization	
350 lbs. Nitrogen	3/12, 4/25, 5/19, 6/24, 7/31, 9/25, 12/30
250 lbs. Phosphorous	1/17, 4/3, 6/24, 7/29, 9/24, 12/30
Irrigation	
3” water application	1/7, 2/12, 3/12, 4/3, 4/21, 4/30, 5/9, 5/21, 6/4, 6/25, 7/15, 8/1, 9/29, 10/15, 12/5
Herbicide Application	
2,4-D	5/30
Pendulum Preemergent	4/11
Cultural Weed Control	
Hand Hoeing	As needed
Mechanical Cultivation	3/26, 7/24
Harvest	
Forage Harvester	5/7

**Field 20 – 0.5 Acre**

<b>9062875 Blue grama</b>	<b>Date</b>
Fertilization Broadcast spreader	
170 lbs. Nitrogen	5/19, 6/2, 6/24, 7/31
130 lbs. Phosphorous	6/24, 7/29, 12/29
Irrigation	
3" water application	4/16, 5/20, 6/4, 6/26, 7/15, 8/11, 10/16,
Herbicide Application	
2,4-D @ 1.5 quart per Acre	7/1
Pendulum Pre-emergent	4/11
Insecticide	
Orthene @ 1.33 pounds per Acre	3 applications
Cultural Weed Control	
Hand Hoeing	As needed
Mechanical Cultivation	7/9
Harvest	
Combine	10/27

**Seed Produced**

Table 2 describes the seed production for the year 2003.

**Table 2: 2003 Seed Production**

<b>Common Name</b>	<b>Scientific Name</b>	<b>Pounds</b>
Blue grama	<i>Bouteloua gracilis</i>	15.44 PLS
Muttongrass	<i>Poa fendleriana</i>	28.37 PLS

\* Seed test results not available

**Climatological Data**

Table 3 describes the climatological data for 2003 at the New Mexico State University Los Lunas Agricultural Science Center.

**Table 3: Climatological Data Year 2003**

<b>Month</b>	<b>Temperatures</b>		<b>Precipitation</b>
	<b>High</b>	<b>Low</b>	
January	61.2	18.0	0.00
February	57.1	23.4	1.18
March	64.2	28.4	0.86
April	75.0	33.8	0.00
May	85.2	45.6	0.12
June	91.5	53.9	0.27

**Table 3: Climatological Data Year 2003**

<b>Month</b>	<b>Temperatures</b>		<b>Precipitation</b>
	<b>High</b>	<b>Low</b>	
July	100.1	62.0	0.25
August	95.3	59.9	1.13
September	87.3	50.3	0.91
October	79.9	40.4	1.28
November	62.1	27.3	0.88
December	57.3	16.6	0.14
<b>Sum</b>	916.2	459.6	<b>Total</b> 7.02
<b>Average</b>	76.4	38.3	<b>Greatest</b> 1.28

## Transplant Production

Table 4 describes the transplant production and delivery for the GCNP for year 2003. The final allotment of containerized plants was delivered to Grand Canyon National Park on August 28, 2003.

**Table 4: 2003 Transplant Production**

<b>Common Name</b>	<b>Treepots Delivered on August 28, 2003</b>
Fourwing Saltbush	54
Rubber Rabbitbrush	22
Utah Serviceberry	54
Coralberry	17
Curl-leaf Mountain Mahogany	91
Fernbush	54
Banana Yucca	27
Mormon Tea	31
New Mexico Locust	85
Fremont's Mahonia	150
<b>Total</b>	<b>585</b>

## Specialized Treatments

See previous Grand Canyon National Park reports for information on specialized treatments.

## Observations

The blue grama and muttongrass fields had vigorous growth during the 2003 growing season. The production of a good, viable seed crop from these fields continues to be the goal of the LLPMC. The use of increased irrigation applications along with higher rates of fertilizer has led to improved amounts of both forage and seed production of both species each year since installing the plantings. Increasing the irrigation applications on the muttongrass has allowed the plants to produce abundant forage and has kept the plants from being damaged during the warmest time of the season. The use of pepperwax on young plants of muttongrass to repel

rabbits has also prevented damage to young tender growth, which has allowed greater forage production and has led to an increase in seedhead production.

All GCNP plantings will continue with the higher rate of fertilization in 2004, including the new field of muttongrass established in 2003. These increased rates will determine if higher seed production can be achieved by adjusting fertilizers. The LLPMC has tested the soil since 2001 in the muttongrass field to determine nutrient needs and to monitor any changes occurring from the addition of fertilizers (see Tables 5, 6, and 7 for soil test results). These tests are meant to provide useful data to continue to increase the yield of the seed from fields of GCNP species.

The blue grama field will continue to have insecticide applications to control insects that can lower seed yields. Also one half of the blue grama field will have the existing stubble burned. Burning existing blue grama foundation seed fields has proven to be an effective tool for increasing seed production.

**Table 5: Soil Test Results for Muttongrass, Field 20**

**Collector: Joe Aragon    Collected on: January 12, 2001    Submitted on: January 16, 2001**

<b>Test Parameter</b>	<b>Units</b>	<b>Test Result</b>	<b>Detection Limit</b>
PH of Soil Saturation Test		7.69	
Elect. Cond. Of Soil Paste Extr.	mmhos/cm	0.44	0.01
Magnesium (for SAR) -	meq/L	0.54	0.01
Calcium (for SAR) -	meq/L	2.68	0.01
Sodium (for SAR) -	meq/L	1.43	0.01
Sodium Adsorption Ratio (SAR)		1.13	0.01
Calculated Exchangeable Na %-ESP		.04	0.1
Organic Matter	percent	0.49	0.01
NO3-N 1:5 (soil:water) extract	ppm	3.6	0.1
Phosphorus (NaHCO3 extracted)	ppm	6.9	0.1
K 1:5 (soil:water) extract	ppm	16	1
Texture of soil by feel		Loamy Sand	

**Table 6: Soil Test Results for Muttongrass, Field 20**

**Collector: Joe Aragon    Collected on: April 15, 2002    Submitted on: April 15, 2002**

<b>Test Parameter</b>	<b>Units</b>	<b>Test Result</b>	<b>Detection Limit</b>
PH of Soil Saturation Test		7.88	
Elect. Cond. Of Soil Paste Extr.	mmhos/cm	0.53	0.01
Magnesium (for SAR) -	meq/L	0.56	0.01
Calcium (for SAR) -	meq/L	3.53	0.01
Sodium (for SAR) -	meq/L	2.25	0.01
Sodium Adsorption Ratio (SAR)		1.57	0.01
Calculated Exchangeable Na %-ESP		1.0	0.1
Organic Matter	percent	0.42	0.01
NO3-N 1:5 (soil:water) extract	ppm	3.1	0.1

Phosphorus (NaHCO <sub>3</sub> extracted)	ppm	16.8	0.1
K 1:5 (soil:water) extract	ppm	8	1
Texture of soil by feel		Loamy Sand	

**Table 7: Standard Soil Test for Muttongrass, Field 20**

**Collector: Danny Goodson Collected on: March 20, 2003 Submitted on: March 21, 2003**

Test Parameter	Units	Test Result	Detection Limit
PH of Soil Saturation Test		8.07	
Elect. Cond. Of Soil Paste Extr.	mmhos/cm	0.62	0.01
Magnesium (for SAR) -	meq/L	0.45	0.01
Calcium (for SAR) -	meg/L	2.00	0.01
Sodium (for SAR) -	meg/L	4.10	0.01
Sodium Adsorption Ratio (SAR)		3.70	0.01
Calculated Exchangeable Na %-ESP		4.0	0.1
Organic Matter	percent	0.41	0.01
NO <sub>3</sub> -N 1:5 (soil:water) extract	ppm	3.3	0.1
Phosphorus (NaHCO <sub>3</sub> extracted)	ppm	12.4	0.1
K 1:5 (soil:water) extract	ppm	20	1
Texture of soil by feel		Sand	
Zinc by DTPA extraction	ppm	0.41	0.02
Manganese by DTPA extraction	ppm	1.33	0.04
Iron by DTPA extraction	ppm	2.16	0.10
Copper by DTPA extraction	ppm	0.87	0.01



Danny Goodson harvesting muttongrass in 2003 at the Los Lunas Plant Materials Center in Los Lunas, New Mexico

## Pipe Spring National Monument

### Background

On September 12, 2002, an agreement was made between Pipe Spring National Monument (PSNM) of the U.S. Department of Interior and the U. S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) of New Mexico. This agreement declares that the USDA NRCS Los Lunas Plant Materials Center (LLPMC) will produce seed for revegetation projects at PSNM in Utah.

### Accessions Involved

Table 1 lists the accessions involved in the 2004 PSNM agreement.

**Table 1: Accessions Involved**

Common Name	Scientific Name	Plant Symbol	Accession Number
Blue grama	<i>Bouteloua gracilis</i>	BOGR	9066558
Galleta	<i>Pleuraphis jamesii</i>	PLJA	9066559
Indian ricegrass	<i>Achnatherum hymenoides</i>	ACHY	9066587

### Collection Information

Blue grama and galleta seed was collected on the PSNM in 2003 and sent to the LLPMC. In 2003, the LLPMC received galleta and Indian ricegrass seed for the purpose of seed production increase. In the future, Indian ricegrass may be added to the agreement as a revegetation species.

### Seed Condition Information

The LLPMC received only small amounts of seed of the species listed in Table 2-1, but it was in good condition. The seed collections were cleaned by the LLPMC and will be used to establish production fields.

### Seed Production Establishment

No seed production fields were established of in 2003.

### Seed Production

Seed production fields were not established, and therefore no seed was harvested. See Table 1-3 for the 2003 climatological data.

### Transplant Production

Transplant production is not part of this agreement.

## Specialized Treatments

In 2003, plug seedlings were grown from galleta and blue grama collections. These plugs were placed in raised beds in the transplant area at the LLPMC. This treatment produced enough transplants to fill a 75 square foot bed of blue grama and a 25 square-foot bed of galleta. The plants were then grown in the beds and allowed to set seed.

## Observations

The blue grama raised bed produced a good amount of seedheads, but almost zero seed fill. The LLPMC will continue to grow the blue grama plants in 2004 in hopes good seed can be harvested. The galleta plants produced no seed.

Seed produced in 2004 from the raised bed plantings will be used to establish plantings of both species. Collections of the galleta seed received in 2003 will be used to propagate plugs in an attempt to establish small field plantings in 2004.

If Indian ricegrass becomes part of the agreement, a small amount of seed will be planted into plug transplant containers to determine whether sufficient after ripening has occurred to allow large-scale propagation.

## Zion National Park

### Background

On September 12, 2002, an agreement to produce seed was made between the National Park Service, Zion National Park (ZNP) of the U.S. Department of Interior, and the Natural Resources Conservation Service (NRCS) New Mexico and the Los Lunas Plant Materials Center (LLPMC), for the collection, propagation and increase of native grass species.

The agreement states that ZNP will use the plant materials produced by the LLPMC to revegetate disturbed areas located on the park. Seed will be collected from the park and sent to the LLPMC for conditioning. The seed will be used to plant increase production fields to complete the agreement.

### Accessions Involved

Table 1 lists the accessions involved in the ZNP project.

**Table 1: Accessions Involved**

Common Name	Scientific Name	Plant Symbol	Accession Number
Sand dropseed	<i>Sporobolus cryptandrus</i>	SPCR	9066527
Indian ricegrass	<i>Acnatherum hymenoides</i>	ACHY	9066528
Big bluestem	<i>Andropogon gerardii</i>	ANGE	9066529
Blue grama	<i>Bouteloua gracilis</i>	BOGR	9066530
Muttongrass	<i>Poa fendleriana</i>	POFE	9066531
Bottlebrush squirreltail	<i>Elymus elymoides</i>	ELEL5	9066532

### Collection Information

In 2003, seed of the species listed in Table 1 was collected by ZNP employees and sent to the LLPMC for conditioning.

### Seed Condition Information

The seed condition appeared to be fair to poor after cleaning. During the seed cleaning process, a difference was discovered in the type of bluestem seeds. It was unclear if the bluestem collected at ZNP was actually big bluestem (See the sections *Specialized Treatments* and *Observations*).

### Seed Production Establishment

In June 2003, the LLPMC established 0.25 acres of a bluestem species and 0.16 acres of big bluestem. Using a mechanical transplanter, transplants grown by the LLPMC were planted into field 25S and 21S respectively.

## Seed Production

### Field Maintenance

#### Field 21S – 0.25 Acre

##### 9066543 Cane Bluestem

##### Date

Fertilization

40 lbs Phosphorous

12/29

Irrigation

3" water application

6/18, 6/23, 6/27, 7/3, 7/10, 7/17, 7/29, 8/15, 8/25, 10/17

Cultural Weed Control

Hand Hoeing

As needed

Mechanical Cultivation

7/8, 7/25

Harvest

Flail-Vac

#### Field 25S – 0.06 Acre

##### 9066529 Big Bluestem

##### Date

Irrigation

3" water application

6/19, 6/23, 6/27, 7/3, 7/11, 7/17, 7/29, 8/15, 8/27, 9/29, 10/15, 10/31

Cultural Weed Control

Hand Hoeing

As needed

Mechanical Cultivation

7/9, 7/25

### Climatological Data

See Table 3 for 2003 climatological data at the LLPMC in Los Lunas, New Mexico.

### Transplant Production

Transplants are not part of this agreement.

### Specialized Treatments

Grasses from ZNP were sown into plug-flats in the spring of 2003; the species collected at the park were labeled as big bluestem, big galleta, and Indian ricegrass. Results from the seeding were as follows:

- The big galleta yielded only a handful of seedlings.
- The indian ricegrass yielded insufficient seedling numbers for field plantings and were instead planted in 10 cubic inch containers.
- Some collections of the bluestems yielded little if any seedlings. The seed and seedling appearance of several bluestem collections were quite distinctive and were separated into two groups.
- These two groups will be planted as separate field plantings at the LLPMC.

## Observations

One group of bluestem seedlings was planted into field 21S on 6/18/2003. The other group of bluestem seedlings was transplanted into field 25S on 6/19/2003. After seedhead emergence the group planted on 6/18/2003 was identified as being cane bluestem. The second group of bluestem planted on 6/19/2003 had a mixture of what appeared to be three separate species. This second group had big, sand, and yellow bluestem identified in the planting. Yellow bluestem is a non-native species and was rogued out of the planting.

The cane bluestem produced enough mature seed to allow a harvest. There should be a sufficient amount of seed to start a large production field in 2004. A decision by ZNP is needed to add cane bluestem to the species list in Table 1.

The bluestem mixture field did not yield any mature seed. A determination by ZNP will be needed before seed can be harvested from this field.

The containerized indian ricegrass yielded limited seed amounts in 2003. In 2004 seed of the indian ricegrass previously collected by the Park will be planted in plugs. This seeding will evaluate if after ripening has improved germination of the ricegrass. Plug seedling propagation will be attempted from 2003 seed collections of muttongrass, galleta and bottlebrush squirreltail.