

CRATERS OF THE MOON NATIONAL MONUMENT
2005 Annual Report
Prepared by
NATURAL RESOURCES CONSERVATION SERVICE
ABERDEEN, IDAHO PLANT MATERIALS CENTER



INTRODUCTION

In 2004, the Aberdeen Plant Materials Center (PMC) entered into an agreement with Craters of the Moon National Monument and Preserve (CRMO) to produce transplants and/or cleaned seed of thirteen native plant species for use in revegetation of disturbed areas following road construction. The National Park Service requires that restoration of native plants be accomplished using germplasm from populations as closely related genetically and ecologically as possible to park populations. Many of the proposed species are poorly understood or require special attention for adequate germination and survival. The PMC was chosen for its personnel, expertise and equipment to assist in seed collection, cleaning, development of establishment protocols and production of greenhouse propagated materials for transplanting at CRMO.

Two sites are to be revegetated at CRMO. The “Soil Base” site is approximately 28,380 sq. feet (0.65 acres) and is to be reseeded with a grass mix consisting of equal parts of Thurber’s needlegrass (*Achnatherum thurberianum*), Indian ricegrass (*Achnatherum*

hymenoides) and Sandberg bluegrass (*Poa secunda*). The “Cinder Garden” site is approximately 18,780 sq. feet (0.43 acres) and will be seeded with a forb mix consisting of 30 % dwarf buckwheat (*Eriogonum ovalifolium* var. *depressum*), 30 % dusky maiden (*Chaenactis douglasii*), 30 % scorpion weed (*Phacelia hastata*) and 10 % dwarf monkey flower (*Mimulus nanus*). Table 1 lists the seed mixtures that will be broadcast planted. Greenhouse propagated materials will be transplanted into both sites as deemed suitable by the CRMO ecologist.

Table 1. Seed mixes

Site	Species	% mix	Full rate lb/ac (PLS)	Mix rate/0.66 ac. (PLS)	Broadcast rate (2x) PLS
Soil Base Site (28,380 ft ²)	Thurber’s needlegrass	33	6	1.3	2.6
	Indian ricegrass	33	6	1.3	2.6
	Sandberg bluegrass	33	2	0.4	0.8
Mix rate/0.43 ac. (PLS)					
Cinder Garden Site (18,780 ft ²)	Dusky maiden	30	3.18	0.42	0.84
	Dwarf buckwheat	30	0.38	0.05	0.10
	Scorpion weed	30	2.42	0.32	0.64
	Dwarf monkey flower	10	0.11	0.01	0.02

ACCOMPLISHMENTS

Based on the area to be revegetated and number of transplants desired of each species, the PMC estimated amounts of seed required (see Table 2). The PMC then advised CRMO personnel in seed collecting time periods, techniques and storage. During the summer of 2004, CRMO staff hand collected seed for each species at numerous sites throughout the monument with technical assistance from PMC personnel. Seed collections were dried and bagged at CRMO and delivered to the PMC in early fall. Collections were cleaned and processed by PMC staff during the winter of 2004-2005.

CRMO technicians also made opportunistic collections of the following species: Nelson’s needlegrass (*Achnatherum nelsonii*), cushion buckwheat (*Eriogonum ovalifolium* var. *ovalifolium*), western needlegrass (*Achnatherum occidentale*) and fern bush (*Chamaebatiaria millefolium*). Table 3 provides a summary of collections made during 2004 with cleanout information as well as Tetrazolium (TZ) test results for collections sent to the Idaho State Department of Agriculture seed lab.



Figure 1. Antelope bitterbrush seedling.

A portion of the seed was to be planted in 40 cubic inch conetainers at the PMC greenhouse during the winter of 2005; however, because of delays in road construction, transplant propagation was postponed until the winter of 2005-2006.



Figure 2. Limber pine seedling.

During the summer of 2005, technicians from CRMO made further seed collections of antelope bitterbrush, sulphurflower buckwheat, dwarf buckwheat, Indian ricegrass, Sandberg bluegrass, scorpion weed and needlegrass. These materials were then dried, bagged and transported to the PMC. Seed collections were cleaned at the PMC in November of 2005. The 2005 collection of needlegrass could not be identified to a single species and most likely represents a composite of more than one *Achnatherum* species. Table 4 shows collections made during 2005 with cleanout information. Table 5 depicts the optimum times for seed harvest for each species collected, and Table 6 shows actual collecting dates and provides hourly totals for time spent making collections.

As of fall 2005, CRMO had met all seed requirements with the exception of sagebrush and Thurber's needlegrass. Sagebrush has not been collected

during either season and should not be collected until the season before planting due to storage difficulties with the species. Of the 3.8 lbs of required Thurber's needlegrass, a total of 0.5 lb has been collected. However if the other collections of western needlegrass, Nelson's needlegrass and the needlegrass mixture are combined with the Thurber's, then there is a total of 2.62 lb collected leaving 1.18 lb lacking.

In the fall of 2005, the PMC began propagation of limber pine and started stratification of dwarf buckwheat, bitterbrush, and hotrock penstemon. In late November, the PMC was notified that construction was delayed indefinitely. It was agreed at this point that the PMC would postpone further greenhouse propagation and maintain the limber pine seedlings in the PMC greenhouse until late summer 2006 when they would be delivered to CRMO. Some of the seed that had been under stratification when the decision to discontinue propagation was started in the greenhouse to evaluate propagation strategies for future reference.

Table 2. CRMO Seed Requirements and collection yields

Species	Accession #	Transplants	Broadcast Seed (lb PLS)	Total Required Cleaned Seed	Collected Seed (lb)		Total seed (lb)
					2004	2005	
Antelope bitterbrush	9076477	600	n/a	0.31	0.82	19.00	19.82
Rabbitbrush	9076478	300	n/a	0.03	0.22	0.00	0.22
Sagebrush	--	200	n/a	0.04	0.00	0.00	0.00
Limber Pine	9076480	75	n/a	0.68	1.58	0.00	1.58
Sulphurflower buckwheat	9076479/ 9076514	200	n/a	0.02	0.54/ 0.46	0.96	1.96
Hotrock penstemon	9076481	25	n/a	0.003	0.34	0.00	0.34
Dwarf buckwheat	9076482	150	0.2	0.21	0.12	0.03	0.15
Thurber's needlegrass	9076483	200	3.7	3.8	0.5	0.00	0.50
Indian ricegrass	9076484	200	3.7	3.8	1.4	2.60	4.00
Sandberg bluegrass	9076485	200	1.1	1.2	4.68	1.20	5.88
Dusky maiden	9076486	n/a	1.68	1.68	1.84	0.00	1.84
Scorpion weed	9076487	n/a	1.28	1.28	0.7	1.10	1.80
Dwarf monkey flower	9076488	n/a	0.04	0.04	0.11	0.00	0.11

Table 3. 2004 collections and seed cleanout percentages

Common Name	Species	Min. req. seed (lb)	Est. % cleanout	Est. min dry material (lb)	Collected fresh material (lb)	Collected dry material (lb)	% dry matter	Actual clean seed (lb)	Actual % cleanout (seed/dry)	% Viability (TZ test)
Antelope bitterbrush	<i>Purshia tridentata</i>	0.31	55	0.6	8.93	5.1	57	0.82	84	60
Rabbitbrush	<i>Ericameria nauseosa</i>	0.03	95	0.6	3.44	2.2	64	0.22	90	91
Sagebrush	<i>Artemisia tridentata</i> var. <i>vasseyana</i>	0.04	95	0.88	0	0	0	0	0	
Limber Pine	<i>Pinus flexilis</i>	0.68	--	2.7	23.12	13.2	57	1.58	88	73
Sulphurflower buckwheat	<i>Eriogonum umbellatum</i>	0.02	95	0.5	5.4	3.4	63	1.00	71	64
Hotrock penstemon	<i>Penstemon deustus</i> var. <i>deustus</i>	0.003	95	0.06	3.1	2.1	68	0.34	84	96
Dwarf buckwheat	<i>Eriogonum ovalifolium</i> var. <i>depressum</i>	0.21	95	4.14	1.73	0.51	29	0.12	76	68
Thurber's needlegrass	<i>Achnatherum thurberianum</i>	3.8	85	25.04	1.95	1.68	86	0.50	70	94
Indian ricegrass	<i>Achnatherum hymenoides</i>	3.8	85	25.04	29.85	25.1	84	1.40	94	38
Sandberg bluegrass	<i>Poa secunda</i>	1.2	85	8.03	8.9	8.0	90	4.68	42	78
Dusky maiden	<i>Chaenactis douglasii</i>	1.68	95	33.6	20.9	9.1	44	1.84	80	67
Scorpion weed	<i>Phacelia hastata</i>	1.28	95	25.6	25.2	12.1	48	0.70	94	97
Dwarf monkey flower	<i>Mimulus nanus</i>	0.04	95	0.8	4.93	1.60	32	0.11	93	93
Nelson's needlegrass	<i>Achnatherum nelsonii</i>	n/a	n/a	n/a	16.86	11.63	69	0.96	92	85
Cushion buckwheat	<i>Eriogonum ovalifolium</i> var. <i>ovalifolium</i>	n/a	n/a	n/a	4.91	3.27	67	0.36	89	91
Western needlegrass	<i>Achnatherum occidentale</i>	n/a	n/a	n/a	4.21	2.92	69	0.26	91	85
Fern bush	<i>Chamaebatiaria millefolium</i>	n/a	n/a	n/a	2.85	2.23	78	0.88	61	Not tested

Table 4. 2005 collections and seed cleanout percentages

Common Name	Species	Min. req. seed (lb)	Est. % cleanout	Est. min dry material (lb)	Collected dry material (lb)	Actual clean seed (lb)	Actual % cleanout (seed/dry)
Antelope bitterbrush	<i>Purshia tridentata</i>	0.31	55	0.6	41.11	19.00	46
Sulphurflower buckwheat	<i>Eriogonum umbellatum</i>	0.02	95	0.5	4.0	0.96	24
Dwarf buckwheat	<i>Eriogonum ovalifolium</i> var. <i>depressum</i>	0.21	95	4.14	0.4	0.03	8
Indian ricegrass	<i>Achnatherum hymenoides</i>	3.8	85	25.0	11.5	2.60	23
Sandberg bluegrass	<i>Poa secunda</i>	1.2	85	8.0	4.3	1.20	28
Scorpion weed	<i>Phacelia hastata</i>	1.28	95	25.6	11.5	1.11	10
Needlegrass mix	<i>Achnatherum</i> spp.	n/a	n/a	n/a	11.5	0.90	8

Table 5. Duration of seed harvests

Scientific Name	Common Name	June			July			August			September			October		
		Early	Mid	Late	Early	Mid	Late	Early	Mid	Late	Early	Mid	Late	Early	Mid	Late
<i>Achnatherum hymenoides</i>	Indian Ricegrass				■	■	■	■								
<i>Achnatherum nelsonii</i>	Columbia Needlegrass					■	■	■								
<i>Achnatherum occidentale</i>	Western Needlegrass					■	■	■								
<i>Achnatherum thurberianum</i>	Thurber's Needlegrass				■	■										
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>	Mountain Big Sagebrush															
<i>Chaenactis douglasii</i>	Dusky Maiden			■	■	■	■									
<i>Chamaebatiaria millefolium</i>	Fern Bush							■	■							
<i>Ericameria nauseosa</i>	Rubber Rabbitbrush							■	■	■	■	■	■			
<i>Eriogonum ovalifolium</i>	Cushion Buckwheat							■	■	■						
<i>Eriogonum ovalifolium</i> var. <i>depressum</i>	Dwarf Buckwheat		■	■	■	■										
<i>Eriogonum umbellatum</i>	Sulphurflower Buckwheat							■	■	■						
<i>Mimulus nanus</i>	Dwarf Monkeyflower		■	■	■											
<i>Penstemon deustus</i> var. <i>deustus</i>	Hotrock Penstemon							■	■	■	■					
<i>Phacelia hastata</i>	Scorpionweed		■	■	■	■	■									
<i>Pinus flexilis</i>	Limber Pine								■	■						
<i>Poa secunda</i>	Sandberg's Bluegrass		■	■	■											
<i>Purshia tridentata</i>	Antelope Bitterbrush					■	■									

Table 6. Seed collection dates and rates

Species	Collecting dates		Hours collecting		Total seed collected (lb)		Lb seed/hr	
	2004	2005	2004	2005	2004	2005	2004	2005
	Antelope bitterbrush	7/15-7/26	7/25-7/26	11.6	28.0	0.82	19.00	0.07
Rabbitbrush	8/10-8/30	--	1.92	0.0	0.22	0.00	0.11	--
Limber Pine	8/19-8/24	--	3.17		1.58	0.00	0.50	--
Sulphurflower buckwheat	7/21-8/2	7/18-7/30	12.92	5.0	1.00	0.96	0.08	0.19
Hotrock penstemon	7/21	--	6.00	0.0	0.34	0.00	0.06	--
Dwarf buckwheat	6/16-7/13	7/11-7/28	8.17	6.2	0.12	0.03	0.01	0.005
Thurber's needlegrass	7/1-7/28	--	17.0	0.0	0.50	0.00	0.03	--
Indian ricegrass	7/7-8/13	7/6-7/21	57.5	15.1	1.40	2.60	0.02	0.17
Sandberg bluegrass	6/15-7/1	6/30-7/13	29.6	5.6	4.68	1.20	0.16	0.21
Dusky maiden	6/30-7/20	--	27.7	0.0	1.84	0.00	0.07	--
Scorpion weed	6/22-8/11	7/6-7/30	16.8	9.1	0.70	1.10	0.04	0.12
Dwarf monkey flower	6/16-7/28	--	9.5	0.0	0.11	0.00	0.01	--
Nelson's needlegrass	7/16-7/23	--	19.7	0.0	0.96	0.00	0.05	--
Cushion buckwheat	7/23-8/4	--	7.4	0.0	0.36	0.00	0.05	--
Western needlegrass	7/19-7/28	--	6.0	0.0	0.26	0.00	0.04	--
Fern bush	8/11-8/18	--	2.0	0.0	0.88	0.00	0.4	--
Needlegrass mix	--	6/30-7/30	0.0	22.1	0.00	0.90	--	0.04