SEED CONDITIONING AND PLANT PROPAGATION OF GRAND TETON NATIONAL PARK NATIVE PLANT MATERIALS[1]

by

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Abstract. Located on a mesa, southeast of Meeker, Colorado, is the Upper Colorado Environmental Plant Center. Owned and operated by the White River and Douglas Creek Soil Conservation Districts, the Plant Center is recognized as a scientific and educational organization. In 1988, the Plant Center entered into an interagency agreement with the National Park Service through the U.S.D.A., Soil Conservation Service, to provide native plants and seed to Grand Teton National Park, Teton, Wyoming, for its revegetation needs. Colorado State University, Fort Collins, Colorado, was contracted to collect seed in Grand Teton National Park and deliver it to the Plant Center. Seed conditioning was completed at the Plant Center. The majority of seed testing for germination and purity was conducted at the Colorado Seed Laboratory, Colorado State University, Fort Collins, Colorado. The 1988 agreement requests the Plant Center to provide Grand Teton National Park with three thousand transplants in one-gallon containers and one thousand three hundred and eighty PLS pounds of seed by 1992. Transplants include *Artemisia tridentata, Artemisia arbuscula,* and *Purshia tridentata.* Seed increases include *Bromus carinatus, Agropyron trachycaulum, Agropyron spicatum,* and on an experimental basis, *Melica spectabilis.* Seedlings for transplants were initiated in the greenhouse and in field plantings. Seed increase fields for *Bromus carinatus, Agropyron trachycaulum, Agropyron spicatum,* and *Melica spectabilis* were also established. Irrigation, weed control, insects, and disease have been monitored throughout the propagation and establishment of the transplants and seed increase fields. On August 28, 1990 the Plant Center provided Grand Teton National Park with its first shipment of *Bromus carinatus* and *Agropyron trachycaulum* seed. Currently, one thousand eight hundred and ninety-three transplants are in one-gallon containers and are scheduled to be delivered in the spring of 1991. Propagation of the remaining one thousand five hundred transplants will begin in the fall of 1990. *Melica spectabilis* will not be harvested in 1990 due to low seedling survival and plant vigor. Seed increase fields of *Bromus carinatus, Agropyron trachycaulum,* and *Agropyron spicatum* will be harvested in 1991.

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Introduction

The Upper Colorado Environmental Plant Center, UCEPC is located on a mesa 5 1/2 miles southeast of Meeker, Colorado on 269 acres. The UCEPC is approximately 330 miles southeast of Grand Teton National Park at an elevation of 6500 feet, and an average growing season of 90 days. The UCEPC, which is owned and operated by the White River and Douglas Creek Soil Conservation Districts, has been recognized since its establishment in 1975 as a leading scientific and educational organization in the plant materials field.

In 1988 the National Park Service, Soil Conservation Service and the UCEPC entered into an agreement to provide needed native plant materials for revegetation projects scheduled for Grand Teton National Park. The interagency agreement called for the UCEPC to grow indigenous plant materials from Grand Teton National Park. Seed and transplants of the collected plant species were to be provided to the Park Service between the fall of 1991 and 1992.

The species in the interagency agreement included: *Bromus carinatus, Agropyron trachycaulum, Agropyron spicatum, Artemisia tridentata, Artemisia arbuscula, Purshia tridentata* and on an experimental basis only, *Melica spectabilis.*

Seed Collection and Conditioning

As per the agreement, seed from the selected species was to be made available to the UCEPC for increase purposes. The seed was collected on a contractual basis for the Park Service from Teton National Park by Colorado State University, Fort Collins, Colorado. In 1988 seed of six of the seven species was delivered to the UCEPC from collections made on the Park by CSU collectors. No collection of the *Agropyron spicatum* was made during the 1988 season.

Table 1. Collections from Grand Teton National Park in 1988 by Colorado State University

Genus & Species	Year Collected	Bulk Wt Rc'd (lb)	Cleaned Wt (lb)	PLS* %	PLS (lb)
Artemisia tridentata	1988	15.72	0.42	15.59	0.06
Artemisia arbuscula	1988	1.60	0.03	4.08	0.001
Purshia tridentata	1988	5.00	3.00	88.37	2.65
Bromus carinatus	1988	57.25	47.00	81.99	38.53
Agropyron trachycaulum	1988	26.00	13.50	81.83	11.05
Melica spectabilis	1988	0.76	0.26	-	-

*Pure live seed

Seed conditioning of the 1988 collected species was done by the UCEPC using various types of seed cleaning equipment during the fall and winter of 1988. After cleaning, seed samples were sent by the UCEPC to the Colorado Seed Laboratory, located at Colorado State University in Fort Collins, Colorado. Tests were run on the purity and germination of the samples. These tests would allow the UCEPC to determine if an acceptable amount of live seed was available to start propagation of the species.

Table 2. Seed Test Results 1988 Collections from Grand Teton National Park

Genus & Species	Year Collected	Purity %	Germination %	PLS %
Artemisia tridentata	1988	70.88	22.00	15.59
Artemisia arbuscula	1988	7.31	56.00	4.08
Purshia tridentata	1988	99.29	89.00	88.37
Bromus carinatus	1988	97.61	84.00	81.99
Agropyron trachycaulum	1988	90.92	90.00	81.83

*Pure live seed

The 1988 Agreement requested the UCEPC produce three thousand, one gallon containerized transplants and one thousand three hundred and eighty pounds of pure live seed by 1992. Transplants to be grown included the shrub species *Artemisia tridentata*, *Artemisia arbuscula* and *Purshia tridentata*. Seed to be produced would be of the three grass species, *Bromus carinatus*, *Agropyron trachycaulum* and *Agropyron spicatum*. No seed of the *Agropyron spicatum* had been collected in 1988 and because of the low amount of viable seed in the *Artemisia arbuscula* collection this species would have to be recollected in 1989.

Table 3. Collections from Grand Teton National Park in 1989 by Colorado State University

Genus & Species	Year Collected	Bulk Wt Rc'd (lb)	Cleaned Wt (lb)	PLS* %	PLS (lb)
Artemisia tridentata	1989	43.80	3.58	68.16	2.44
Artemisia arbuscula	1989	19.06	0.16	-	-
Purshia tridentata	1989	2.02	0.16	-	-
Agropyron spicatum	1989	14.96	1.95	80.24	1.56

*Pure live seed

Table 4. Seed Test Results 1989 Collections from Grand Teton National Park

Genus & Species	Year Collected	Purity %	Germination %	PLS %
Artemisia tridentata	1989	96.00	71.00	68.16
Artemisia spicatum	1989	95.52	84.00	80.24

Seed Increase Production

Seed production fields were established in 1989 of *Bromus carinatus* and *Agropyron trachycaulum* from the 1988 collections made at Grand Teton National Park. The *Bromus carinatus* was seeded at a rate of 40 seeds per linear foot, while the *Agropyron trachycaulum* was planted using 20 seeds per linear foot in rows on three foot centers. Fields of the two grass species were flood irrigated, and both received mechanical cultivation between rows to control weeds and off types. Hand roguing of weeds and off types in the row reduced competition to the young seedlings. No seed production was noted for the fields of grass species in 1989.

In 1990 the two fields of *Bromus carinatus* and *Agropyron trachycaulum* were irrigated to provide maximum seed production. Hand roguing and mechanical cultivation removed weeds and off types from the planting and monitoring of the fields kept track of any insect or disease problems. It was noted after seed head development in the *Bromus carinatus* that head smut had developed in the planting.

Seed from the two increase fields was harvested in 1990 using a combine. The harvest combine had to be carefully cleaned after harvest of the *Bromus* because of the head smut contamination. The following is harvest data for the two grass species in 1990:

Genus & Species	Date Established	Acres	Harvest Date	PLS Lb/AC
Bromus carinatus	4/25/89	3.18	6/28/90 & 7/02/90	233.07
Agropyron trachycaulum	4/21/89	1.88	7/18/90 & 7/23/90	438.20

After harvest the two production fields were irrigated for the remainder of the growing season and each field received 30 pounds of nitrogen per acre in a fall application.

Seed was shipped from the UCEPC of the *Bromus carinatus* and *Agropyron trachycaulum* to Grand Teton National Park in September 1990. This shipment of seed came after a supplemental agreement was signed by the UCEPC with the Park Service and Soil Conservation Service in 1990 to supply an additional nine hundred and ninety pounds of these two species. The *Bromus* seed was treated with a fungicide to control the head smut. This was done in case the head smut on the *Bromus* did not originate in the Park and could cause an infestation to the native *Bromus*.

Transplant Production

Transplants of *Artemisia tridentata, Artemisia arbuscula* and *Purshia tridentata* in one gallon containers were to be produced by the UCEPC for shipment to the Park by 1991. Several methods have been tried by the UCEPC to achieve the numbers needed in the Agreement.

Table 5. Treatments and Results - Shrub Species Transplant Production Trials.

1.	Direct seeding to field - using various planting dates			
	a.	January 1989	Artr-	61 percent germination
			Arar-	< 10 percent germination
		October 1988	Putr-	20 percent germination
	b.	February 1990	Artr-	< 2 percent germination
			Arar-	0 percent germination
			Putr-	1 percent germination
2.	Germinator and sand stratification			
	a.	August 1988	Putr-	< 5 percent germination

The direct seeded treatment of January 1989 provided seedlings which were transplanted from the soil into tubepacks and three inch plastic pots. These were placed in the greenhouse to provide an optimum growth environment. After sufficient growth of these plants had occurred they were transplanted into the desired one gallon pots.

The sand stratification did not produce an adequate germination of the Purshia over the direct seeded method and is not recommended. Direct seeding of the three species seems to depend on time of planting and in 1990 a trial will be installed to look at a late fall seeding of the shrubs.

The UCEPC has one thousand eight hundred and ninety three transplants in one gallon containers scheduled for delivery to the Park in 1991. Continued trials on the shrub species to increase seedling production and improve transplant vigor will be used by the UCEPC to deliver the remaining one thousand five hundred to Grand Teton National Park by 1992.

Experimental Species

The experimental work with *Melica spectabilis* has not been successful after seeding trials at the UCEPC. Two years after a direct seeding on the UCEPC survival of less than two percent has been documented for the planting. Vigor is poor and survival of the planting into 1991 is doubtful. Due to work on higher priority species and other Park Service agreements being undertaken by the UCEPC, *Melica spectabilis* will not be considered for further evaluation.