CRATER LAKE NATIONAL PARK
Highway 62 Revegetation Project

FY 2004 Annual Report
Prepared by Amy Bartow

NATURAL RESOURCES CONSERVATION SERVICE
CORVALLIS PLANT MATERIALS CENTER
CORVALLIS, OREGON

INTRODUCTION- The Corvallis Plant Materials Center (PMC) entered into a new agreement with Crater Lake National Park in 2003 to provide native plant materials for the ecological restoration of the Highway 62 construction area. It was agreed that the PMC would propagate a minimum of 9150 plants of nine herbaceous species (two grasses, four sedges, one rush, one legume, and two forbs) as well as produce 180 lbs of seed of two grass species for delivery in 2004.

ACCOMPLISHMENTS- Activities in 2004 included, expanding and maintaining two grass seed production fields, harvesting seed production fields, continued germination research on new species, containerized plant production, and delivery of plant materials. Seed increase fields of California brome and blue wildrye were expanded via carbon banding on October 22, 2003. These fields produced 160 lbs and 29 lbs of cleaned seed, respectively. Seed was not delivered to the park in 2004 and will remain in seed storage facilities at the PMC until requested by the park. Plant production was very successful; 10,417 plants were delivered to the park, exceeding contract goals.

TECHNOLOGY DEVELOPMENTS- Seed stratification/germination trials were performed on five species that have not been previously produced for the Park. Initial trials with these species indicated that some form of pretreatment may be needed to overcome seed dormancy. Cold-moist stratification trials were set up in the fall of 2003. Howell's pioneer rockcress, western mountain aster, manyrib sedge, and Parry's rush were all found to need at least 5 weeks of cold-moist stratification to break seed dormancy.

THE 2004 CRATER LAKE NATIONAL PARK ANNUAL REPORT:
Highway 62 Revegetation Project

CORVALLIS PLANT MATERIALS CENTER
NATURAL RESOURCES CONSERVATION SERVICE
CORVALLIS, OREGON
Amy Bartow

December 2, 2004

I. Brief Background of Project

The Corvallis Plant Materials Center (PMC) entered into a new agreement with Crater Lake National Park in 2003 to provide native plant materials for the ecological restoration of the Highway 62 construction area. It was agreed that the PMC would propagate a minimum of 9150 plants of nine herbaceous species as well as produce 180 lb (PLS) of two grass species.

Activities in 2004 included cleaning of native seed collected by NPS staff, expansion, maintenance and harvest of two grass seed production fields, containerized stock production, and delivery of plant materials.

Figure 1. Two-year old blue wildrye field, Corvallis PMC, June 28, 2004.

II. Accessions Involved

Accessions included for Highway 62 are listed in Table 1. This table also displays activities performed by PMC staff in 2003. All seeds were collected in the area of the "switchbacks" on Highway 62 except where noted.

Table 1. Accessions involved for Highway 62 cooperative agreement with Corvallis Plant Materials Center in 2004.

Scientific Name	Common Name	Symbol	Accession #	2004 Activity[2]
Achnatherum occidentale	western needlegrass	ACOC3	9079285	Pxn Dlv
Arabis platysperma	Howell's pioneer rockcress	ARPLH2	9079278	Trl Pxn Dlv
Aster occidentalis	western mountain aster	ASOC	9079306	Trl Pxn Dlv
Carex halliana	Hall's sedge	CAHA2	9079280	Pxn Dlv
Carex multicostata	manyrib sedge	CAMU6	9079282	Trl Pxn Dlv
Carex multicostata	manyrib sedge	CAMU6	9079277[1]	Trl Pxn Dlv
Carex pachystachya	thick-headed sedge	CAPA14	9079279	Pxn Dlv
Bromus carinatus	California brome	BRCA5	9079270	Sfp
Elymus elymoides	bottlebrush squirreltail	ELEL5	9079283	Pxn Dlv
Elymus glaucus	blue wildrye	ELGL	9079271	Sfp
Juncus parryi	Parry's rush	JUPA	9079284	Trl Pxn Dlv
Lupinus andersoni	Anderson's lupine	LUAN2	9079307	Trl Pxn Dlv

1- collected near Whitehorse Creek curve

2- germ=germination research was final; sfp=seed production

III. Experimental Propagation

Experimental propagation was performed on five species that have not been previously produced for the Park. Some initial trials with ARPLH2, ASOC, CAMU (both accessions), and JUPA seeds indicated that some form of pretreatment may be needed to overcome seed dormancy. Cold-moist stratification trials were set up in the fall of 2003. These trials were set up as production trials rather than a formal laboratory germination evaluation since the intent is to produce vigorous seedlings under normal greenhouse propagation conditions. Seeds of each species were sown into Ray Leach stubby cone-tainers filled with moistened media (Sunshine #1 a special peat-based soil-less mix). Seeds were lightly covered with fine vermiculite, and the flats were placed in polyethylene bags and moved into the walk-in cooler (36-38^{o} F). Trays of cone-tainers were removed at intervals of 5, 10, and 16 weeks if needed.

CAMU – (Switchbacks) – Trays removed at 5 weeks resulted in good emergence after two weeks. Seedlings were vigorous and germination was estimated at 80%. No significant differences in emergence or seedling vigor were noted between 5, 10 or 16 week-stratified seeds. No germinants were observed in control flats.

CAMU – (Whitehorse creek curve) – After 5 weeks of cold-moist stratification, trays were removed. Seedlings began to emerge after 18 days. Most exhibited low vigor and

many were chlorotic. Germination was estimated at 40%. Trays removed at 10 and 16 weeks had slightly decreased germination (38%, 32% respectively), and similar weak and chlorotic seedlings. No germinants were observed in control flats.

ARPL – Within one week of being removed from a 5-week cold-moist stratification, seedlings emerged. They exhibited excellent vigor and germination was estimated at 96%. No significant difference in emergence or seedling vigor were noted between 5, 10 or 16 week stratified seeds. Approximately, 2% germination was observed in control flats (after 4 weeks) and seedlings were less vigorous than stratified ones.

JUPA – After 5 weeks of cold-moist stratification, trays were removed. Within a week, excellent germination and seedling vigor was observed. Actual germination is difficult to determine, due to tiny, uncountable seed, but estimated at >80%. No significant differences in emergence or seedling vigor were noted between 5, 10 or 16 week stratified seeds. No germinants were observed in control flats.

ASOC – Within one week of being removed from a 5-week cold-moist stratification, seedlings emerged. They exhibited excellent vigor and germination was estimated at 96%. No significant difference in emergence or seedling vigor was noted between 5, 10 or 16 week stratified seeds. No germinants were observed in control flats.

IV. Field Seed Increase

Seed increase fields of California brome and blue wildrye were expanded on October 22, 2003. Seed provided by the Park was cleaned by PMC staff and combined with seed produced by PMC in 2003. Both fields had been sprayed with Roundup one week prior to seeding. A carbon bander was used to seed additional rows of ELGL and BRCA5. Approximate bulk pounds per acre were 7 and 10 for the ELGL and BRCA5, respectively. The entire field was then treated with Diuron to prevent weeds from germinating. Seedlings were emerging in both fields within two weeks of being sown. Plants grew vigorously and flowered well in the late spring.

Table 2. Seed Increase Field Establishment for Hwy 62 Revegetation Project at Corvallis Plant Materials Center in 2004.

Species/ Ac	Seeding Rate	Method	Weed Control
BRCA .3 acre 128 180' rows	10 (bulk)lbs/acre	Carbon banded	Diuron application following carbon banding
ELGL .17 acre 35 180' rows	7 (bulk)lbs/acre	Seeded with single-row Plantet Jr. seeder, carbon banded using a backpack sprayer	Diuron application following carbon banding

Figure 2. Harvesting a blue wildrye field at the Corvallis Plant Materials Center, June 29, 2004.

2004 Field Seed Production Notes:

Both grass species received three applications of Tilt and Bravo fungicides in April/early May for rust control. Both fields were fertilized in October 2002 with 25lbs/ac nitrogen (N), and in February with 50 lbs/ac N plus 15 lbs/ac sulfur (S). Weed control within the plots was mainly performed by hand-hoeing and rouging. Roundup was used on the field borders. Grass fields were mowed, and the residue was baled as necessary following seed harvest.

Table 3. Seed Harvested for Hwy 62 Revegetation Project at Corvallis Plant Materials Center in 2004.

Species	Area Harvested	Date(s)	Method	Yield	Comments
BRCA5	.008 acre	16-Jun	Hand	40	Excellent stand, high vigor
	.292 acre	17-Jun	Swathed	120	
ELGL	.17 acre	29-Jun	Hand	29	Excellent stand, high vigor

G1 sections (seeded in the fall of 2002) of both BRCA and ELGL fields flowered and set seed earlier than the G2 sections (seeded fall of 03). These fields were harvested by hand on June 16 and June 29 respectively. The remaining BRCA stand was swathed on June 17 and combined on July 2. The rest of ELGL stand was hand harvested on July 7. The BRCA and ELGL fields produced 160 and 29 bulk pounds, respectively. Purity and TZ

tests performed by the OSU seed lab showed purity of 99.64% for the BRCA and 99.87% for the ELGL and TZ of 91% and 93%. Pure live seed amounts are calculated as 145lbs and 27lbs.

V. Container Plant Production.

In the winter of 2003, seeds of each species were sown into Ray Leach stubby cone-tainers filled with moistened media (Sunshine #1 a special peat-based soil-less mix) and lightly covered with fine vermiculite. Seeded flats that required cold-moist stratification to break seed dormancy were placed in polyethylene bags and moved into the walk-in cooler (36-38^{o} F).

Table 4. Propagation Techniques for Plant Production for the Hwy 62 Revegetation Project at Corvallis Plant Materials Center in 2004.

Scientific Name	Amount Used	# of Plants produced	Pre-treatments
Achnatherum occidentale	1g	81	approximately 17 weeks of cold-moist stratification resulted in excellent germination (95%).
Arabis platysperma	<1g	98	approximately 5 weeks of cold-moist stratification resulted in excellent germination (95%). Seedlings flowered in cones.
Aster occidentalis	<1g	98	approximately 5 weeks of cold-moist stratification resulted in excellent germination (95%). Seedlings flowered in cones.
Carex halliana	10g	35	used dehulled seed, 25 weeks of cold-moist stratification resulted in poor germ (0.05%). Seed quality was questionable.
Carex multicostata (switchbacks)	7g	1517	approximately 5 weeks of cold-moist stratification resulted in good germination (80%). Seedlings flowered in cones.
Carex multicostata (Whitehorse Creek)	23g	2758	approximately 5 weeks of cold-moist stratification resulted in low germination (30%); seedlings flowered in cones
Carex pachystachya	12g	2092	approximately 5 weeks of cold-moist stratification resulted in excellent germination (90%); seedlings flowered in cones
Elymus elymoides	20g	1620	no pretreatment, excellent germination

Table 4 (Con't). Propagation Techniques for Plant Production for the Hwy 62 Revegetation Project at Corvallis Plant Materials Center in 2004.

Scientific Name	Amount Used	# of Plants produced	Pre-treatments
Juncus parryi	2g	2104	approximately 5 weeks of cold-moist stratification resulted in excellent germination (95%); seedlings flowered in cones
Lupinus andersonii	5g	14	Seed was hand scarified, low germ (15%), slow establishment

VI. Delivery of Plant Materials.

All plants were delivered to the park on September 20, 2004. Restoration site was not ready for planting so, plants were removed from their cone-tainers and "heeled" in to a protected site where they can be irrigated and cared for. In the spring, plants will be monitored for survival and additional plants may be requested by the park.

Seed that was produced in 2003 and 2004 will be held at the PMC seed storage facilities until requested by the park in the fall of 2005.

Table 5. Plants Delivered by PMC staff to Crater Lake National Park on September 20, 2004.

Scientific Name	Symbol	No. produced
Achnatherum occidentale	ACOC3	81 cones
Arabis platysperma	ARPLH2	98 cones
Aster occidentalis	ASOC	98 cones
Carex halliana	CAHA2	35 cones
Carex multicostata	CAMU6	1517 cones
Carex multicostata	CAMU6	2758 cones
Carex pachystachya	CAPA14	2092 cones
Elymus elymoides	ELEL5	1620 cones
Juncus parryi	JUPA	2104 cones
Lupinus andersoni	LUAN2	14 cones
	total	10417cones