

CORVALLIS PLANT MATERIALS CENTER
NATURAL RESOURCES CONSERVATION SERVICE
CORVALLIS, OREGON
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**THE 2006 BUREAU OF LAND MANAGEMENT ANNUAL REPORT:
*WEST EUGENE WETLANDS***

I. Brief background of Project

The Corvallis Plant Materials Center (PMC) entered into an agreement in the spring of 2002 with the Bureau of Land Management (BLM) to perform seed germination trials and seed increase of native wetland and wet prairie species. The West Eugene Wetlands program has been collecting wild seed and sowing it in wetland restoration projects. Some species have been difficult to establish or have very high labor costs associated with hand collection. The PMC agreed to research and document seed propagation techniques for these species and to evaluate their potential for agronomic seed increase.

In 2006, this agreement was renewed with 12 additional species for germination research and seed increase. Germination research continued on two of the species from 2004 that did not germinate or for which germination protocol was questionable. Seed increase was extended on 27 of the species from the 2003 and 2004 contracts. This agreement will be amended and renewed through 2007.



Figure 1. Seed increase plots at the Corvallis Plant Materials Center, May 15, 2006.

Activities in 2006 included cleaning seed provided by BLM, germination trials, establishing and maintaining seed increase plantings, seed harvesting and seed cleaning. Numbers of seeds per pound were also calculated for certain species upon request.

II. Accessions Included in 2006 Agreement

Table 1. Accessions Included in 2006 Agreement with Eugene BLM.

<i>Species</i>	Common name	Symbol	Accession number	Activity in 2006 ¹
<i>Bromus carinatus</i>	California brome	BRCA5	9079373	sfp
<i>Balsamorhiza deltoidea</i>	deltoid balsamroot	BADE2	9079372	cont
<i>Carex feta</i>	greensheath sedge	CAFE4	9079315	sfp
<i>Carex lanuginosa</i>	wooly sedge	CALA30	9079304	cont
<i>Carex tumulicola</i>	splitawn sedge	CATU	9079291	sfp
<i>Carex vesicaria</i>	blister sedge	CAVE	9079316	sfp
<i>Cicendia quadrangularis</i>	Oregon timwort	CIQU3	9079254	sfp
<i>Delphinium menziesii</i>	Menzies' larkspur	DEME	9079374	cont
<i>Deschampsia elongata</i>	slender hairgrass	DEEL	9079375	sfp
<i>Dichanthelium acuminatum</i> <i>var. fasciculatum</i>	western panicgrass	DIACF	9079303	sfp
<i>Downingia elegans</i>	elegant calicoflower	DOEL	9079432	sfp
<i>Downingia yina</i>	Cascade calicoflower	DOYI	9079433	sfp
<i>Eleocharis obtusa</i>	blunt spikerush	ELOB	9079434	sfp, germ
<i>Eleocharis palustris</i>	common spikerush	ELPA	9079435	sfp, germ
<i>Eryngium petiolatum</i>	coyote thistle	ERPE	9079431	sfp, germ
<i>Festuca roemerii</i>	Roemer's fescue	FERO	9079488	sfp
<i>Galium trifidum</i>	threepetal bedstraw	GATR2	9079317	sfp
<i>Gentiana sceptrum</i>	king's scepter gentian	GESC	9079311	sfp
<i>Geranium oreganum</i>	Oregon geranium	GEOR2	9079376	cont
<i>Gnaphalium ebracteata</i>	bractless hedgehyssop	GREB	9079436	sfp
<i>Juncus nevadensis</i>	Sierra rush	JUNE	9079248	sfp
<i>Lasthenia glaberrima</i>	smooth goldfields seaside bird's-foot	LAGL3	9079293	sfp
<i>Lotus formosissimus</i>	trefoil	LOFO2	9079294	cont
<i>Ludwigia palustris</i>	marsh seedbox	LUPA	9079297	sfp
<i>Madia glomerata</i>	mountain tarweed narrowleaf	MAGL	9079437	sfp
<i>Montia linearis</i>	minerslettuce	MOLI4	9079295	sfp
<i>Myosotis laxa</i>	bay forget-me-not	MYLA	9079253	sfp
<i>Myosurus minimus L.</i>	tiny mousetail	MYMI2	9079381	sfp
<i>Navarretia intertexta</i>	needleleaf navarretia	NAIN2	9079378	sfp
<i>Nemophila menziesii</i>	baby blue eyes	NEME	9079379	sfp
<i>Perideridia gairdneri</i>	Gairdner's yampah	PEGA3	9079255	sfp
<i>Perideridia oregana</i>	Oregon yampah	PEOR6	9079256	sfp
<i>Phlox gracilis</i>	slender phlox	PHGR16	9079299	sfp
<i>Pyrrocoma racemosa</i>	clustered goldenweed	PYRA	9079496	cont
<i>Ranunculus alismaefolia</i>	plantainleaf buttercup	RAAL	9079438	cont, germ
<i>Rorippa curvisiliqua</i>	curvepod yellowcress	ROCU	9079257	sfp
<i>Saxifraga oregana</i>	Oregon saxifrage	SAOR2	9079296	sfp

Table 1. Accessions Included in 2006 Agreement with Eugene BLM (cont').

<i>Species</i>	Common name	Symbol	Accession number	Activity in 2006¹
<i>Sidalcea virgata</i>	showy wild hollyhock	SIVI3	9079305	sfp
<i>Veronica peregrina</i>	neckweed	VEPE	9079439	sfp
<i>Veronica scutellata</i>	skullcap speedwell	VESC	9079440	cont
<i>Viola praemorsa</i>	canary violet	VIPR3	9079380	cont

1- sfp= seed increase, cont= container production, germ= germination trials

III. Germination Trials

BLM staff provided seed of 21 species to PMC staff on December 22, 2004. Most seed



lots were cleaned using an air screen machine to increase purity. Seeds were sown directly into stubby containers of moistened Sunshine #1 (a peat-based, soil-less media) amended with micronutrients and a slow-release fertilizer. Three or four flats (294 or 392 cones) of each species were sown. Flats were either placed in a warm greenhouse (70°F day/ 55°F night), an unheated greenhouse (approximately 40°-50° F day and 35°-40° F night), or were covered with a polyethylene bag and placed in a walk-in cooler (34-38°F) for cold-moist stratification.

Figure 2. *Downingia elegans* plants in a seed increase plot at the Corvallis PMC, May 15, 2006.

Table 2. Optimal Germination Treatment per Species From Trials Conducted at Corvallis Plant Materials Center in 2006.

Species	Amt used (g)	Number of cone-tainers produced	Seed lot used	Treatment
<i>Lotus formosissimus</i>	18	300	SNC-05-EB294	12 weeks stratification
<i>Eleocharis obtusa</i>	6	250	SNC-05-EB434	5 weeks stratification
<i>Eleocharis palustris</i>	5	200	SNC-05-EB435	5 weeks stratification
<i>Madia glomerata</i>	3	400	SNC-05-EB437	Heated greenhouse
<i>Myosotis laxa</i>	1	300	SNC-05-EB253	Heated greenhouse
<i>Rorippa curvisiliqua</i>	1	300	SNC-05-EB257	Heated greenhouse

Table 2. Optimal Germination Treatment per Species From Trials Conducted at Corvallis Plant Materials Center in 2006 (cont').

Species	Amt used (g)	Number of cone-tainers produced	Seed lot used	Treatment
<i>Veronica peregrina</i>	1	300	SNC-05-EB439	Heated greenhouse
<i>Veronica scutellata</i>	1	300	SNC-05-EB440	Heated greenhouse
<i>Ranunculus alismaefolia</i>	5	250	SNC-05-EB438	Heated greenhouse (2 months), then cooler 2 weeks
<i>Cicendia quadrangularis</i>	15	500	SCO-05-EB312	Unheated greenhouse
<i>Myosurus minimus</i>	4	400	SNC-04-EB381	Unheated greenhouse
<i>Navarettia intertexta</i>	3	300	SNC-04-EB378	Unheated greenhouse
<i>Galium trifidum</i>	4	300	SNC-05-EB317	Unheated greenhouse
<i>Montia linearis</i>	4	300	SNC-05-EB295	Unheated greenhouse
<i>Nemophila menziesii</i>	6	300	SCO-05-EB379	Unheated greenhouse
<i>Phlox gracilis</i>	10	300	SNC-05-EB299	Unheated greenhouse
<i>Eryngium petiolatum</i>	5	300	SNC-05-EB431	Unheated greenhouse
<i>Downingia elegans</i>	7	400	SNC-05-EB432	Unheated greenhouse
<i>Downingia yina</i>	6	400	SNC-05-EB433	Unheated greenhouse
<i>Gratiola ebracteata</i>	1	400	SNC-05-EB436	Unheated greenhouse
<i>Lasthenia glaberrima</i>	1	300	SNC-05-EB293	Unheated greenhouse

IV. Field Plantings

A *Sidalcea virgata* field planting was established in late spring of 2003. The winter of 2005/2006 was very wet at the PMC farm. Half of the *sidalceas* were under water for a month and 95% of these died. The plants that were not submerged grew normally and flowered in May. No weevils were detected on any of the seedheads. Plants did not seem affected by changes in soil environment due to the plastic woven weed barrier.

Seed was collected weekly from June 28th to July 15th by hand-stripping mature seeds, and also by sweeping up ones that had shattered onto the ground cover. Collections were efficient and relatively little seed was lost. *S. virgata* racemes are less upright than other *sidalceas* which caused the seed to fall directly on the ground cover instead of on the crown of the plant. The ground cover is a considerable aid in seed collection for the species and does not seem to be detrimental to plant growth or development. Ground cover needs to be cut back from the crowns of the *sidalceas* as they expand. Harvested seed was collected in bags and dried in an open greenhouse. It was then placed in a small brush machine containing a scarifier (sandpaper) drum. Seed was further cleaned using an air screen machine.

The *Bromus carinatus* field was harvested by hand on June 18th. Pots of *Deschampsia elongata* were harvested by hand on June 22. Seeds were placed on a tarp in a greenhouse

to dry and were then de-awned or de-bearded using a lab-sized brush machine and cleaned using an air-screen machine.

A new technique was implemented this year for seed production of the annual species. Two 15' X 170' sheets of weed fabric were stapled down onto a field that had been previously sprayed with glyphosate herbicide. Small squares were cut out of the weed fabric in order to transplant the cone-tainer plants. The squares were cut slightly larger than the size of the cones. Once transplanted, plants grew quickly, flowered, and set seed.



Figure 3. *Nemophila menziesii* seed increase plot at the Corvallis PMC, May 15, 2006.

As seed ripened, it shattered onto the weed fabric.

Small, battery-powered hand vacuums were used to collect seed of *Montia linearis*, *Nemophila menziesii*, *Veronica peregrina*, and *Rorippa curvisiliqua*. Twice a week, the weed fabric in the planting would be vacuumed and the material placed in paper bags in a greenhouse.

A large leaf-blower (used in reverse, as a vacuum) was used to harvest the seed of *Myosotis laxa*, *Phlox gracilis*, *Galium trifidum*, and

Lasthenia glaberrima. The *P. gracilis* and *L. glaberrima* plots were vacuumed multiple times. The *M. laxa* and *G. trifidum* plots were each vacuumed only once. The plants in these plots covered the weed fabric completely and held the seeds. The plots were vacuumed only when the plants had stopped producing seed and were then removed. The *M. laxa* seeds seemed to be damaged by the collection bag on the leaf blower. Many seeds lost their hulls and some were broken. This seed was used to grow containers in the fall and no reduction in germination was noticed even though seeds looked a bit ragged.

Some of the plants did not drop their seed. *Navarettia intertexta*, *Downingia elegans*, and *Downingia yina* plants were cut out of the plots after all of the plants had died and were collected in large trash barrels. The plants were then fed into a large brush machine (each species cleaned separately) equipped with a small mesh screen mantle. The brush machine opened the seed pods and separated the seeds from the larger pieces of plant material. The seed was cleaned using an air-screen machine.

The *Madia glomerata* plot was enormous. Plants stood almost 5 feet high and were each about 3 feet in diameter. The plants were cut down in late fall using a sickle-bar mower. All the large material was pitch forked onto a tarp and placed in an open shed to dry. After removing the larger material, the weed fabric was vacuumed using a leaf blower.

The vacuumed seeds and chaff were fed into a large brush machine fitted with a screen mantle with large holes that the seeds could fall through. This separated the large chaff from the seeds. The tarp containing cut *Madia* plants was beat with pitchforks while it was drying. This “hand threshing” was repeated a couple of times over three weeks until the seed was dry and had been released from the plants. The large plant parts were pitch forked off the tarp and the remaining material was then fed into the brush machine. The seed was further cleaned using a brush machine. The seed lot was large enough to be sampled for purity at the Oregon State University Seed Lab. The 16 lb. seed lot was found to be 94.58% pure, with 5.25% inert matter.



Figure 4. *Lasthenia glaberrima* in a seed increase plot at the Corvallis PMC, May 15, 2006.

V. Seed Increase Tubs

Some perennial species were maintained in tubs in the PMC shadehouse. Plants were monitored daily for disease and pests as well as seed maturity. Plantings were watered overhead as needed.

***Carex feta* (CAFE4)**- This tub was established with spring 2004-sown seedlings. In 2006, these plants were hearty and covered with flowering stems. In the fall of 2004, more CAFE plants were transplanted into artificial ponds at the PMC. These plants had a 100% survival rate and produced a moderate amount of seed. Seed heads were clipped just as they turned from green to yellow. Seeds shatter when they still look green and immature. Seed from both tub planting and pond planting were combined.

***Carex tumulticola* (CATU3)**- This tub was established from cone-tainers seeded in 2003 that didn't germinate until spring of 2004. Seed heads were clipped when mature. When over 80% of seedheads were ripe at the same time, the entire tub was cut back and all the clippings were dried in a greenhouse on a tarp. After harvest, they flowered again. Production was moderate.

***Carex vesicaria* (CAVE6)**- Seedlings that were sown in the spring of 2004 were used to establish this tub. Flowering in 2006 was fair, but no seed was produced. If this plot continues to produce very little viable seed, it may be advantageous to re-collect and add more genetic diversity to the existing plot.



Figure 5. *Lotus formosissimus* flowering at the Corvallis PMC, June 26, 2006.

***Dichanthelium acuminatum* (DIAC)**- A tub of plants was established in 2003. It flowered well in the summer of 2006. Seeds were collected by hand. A small plot was also planted into weed fabric. Seed production was good and seeds fell onto the weed fabric as they matured. Weed fabric was vacuumed twice, on July 30 and August 15, with a hand-held vacuum. Seeds collected in the vacuum filter were emptied into collection bags. When flowering had subsided, seed was cleaned with an air-screen machine. This seed collection technique was very effective and efficient.

***Gentiana sceptrum* (GESC)**- This tub was established from seedling sown in winter of 2003. Plants were transplanted into the tub in late summer of 2004. Approximately 10 plants were also transplanted out into a field covered with plastic woven weed barrier. Plants in tubs and in the field both exhibited signs of seed predation. Plants in the tub flowered more, grew taller, and were more vigorous overall. Plants in the field went dormant soon after flowering. Seeds were collected when capsule began to turn papery and tan.

***Juncus nevadensis* (JUNE)**- Plants that were produced by the PMC and the BLM in 2003 were combined and transplanted into a large 5' x 6' tub on April 2, 2004. The plants grew vigorously, but no flowering occurred. Plants were watered heavily throughout the spring of 2006 to encourage flowering. Still, no flowering occurred.

Table 4. Recorded Collection and Cleaning Times for Seed Increase Tubs and Plots.

Species	Symbol	Accession number	Harvest time	Cleaning time	Amount of seed produced
<i>Bromus carinatus</i>	BRCA5	9079373	15 min	15 min	1569 g
<i>Carex feta</i>	CAFE4	9079315	30 min	15 min	131 g
<i>Carex tumulicola</i>	CATU	9079291	15 min	15 min	25 g
<i>Cicendia quadrangularis</i>	CIQU3	9079254	4 hours	15 min	13 g
<i>Delphinium menziesii</i>	DEME	9079374	4 hours	15 min	16 g
<i>Deschampsia elongata</i>	DEEL	9079375	30 min	15 min	73 g
<i>Dichanthelium acuminatum</i> var. <i>Fasciculatum</i>	DIACF	9079303	30 min	30 min	136 g
<i>Downingia elegans</i>	DOEL	9079432	2 hours	3 hours	971 g
<i>Downingia yina</i>	DOYI	9079433	2 hours	3 hours	587 g
<i>Eleocharis obtusa</i>	ELOB	9079434	2 hours	1 hour	22 g
<i>Eryngium petiolatum</i>	ERPE	9079431	30 min	30 min	2 g
<i>Galium trifidum</i>	GATR2	9079317	1 hour	1 hour	2141 g
<i>Gentiana sceptrum</i>	GESC	9079311	45 min	15 min	52 g
<i>Geranium oreganum</i>	GEOR2	9079376	30 min	15 min	4 g
<i>Gratiola ebracteata</i>	GREB	9079436	30 min	15 min	35 g
<i>Lasthenia glaberrima</i>	LAGL3	9079293	4 hours	30 min	639 g
<i>Madia glomerata</i>	MAGL	9079437	2 hours	10 hours	16 lbs
<i>Montia linearis</i>	MOLI4	9079295	2 hours	30 min	195 g
<i>Myosotis laxa</i>	MYLA	9079253	1 hour	30 min	240 g
<i>Myosurus minimus</i> L.	MYMI2	9079381	1 hour	30 min	31 g
<i>Navarretia intertexta</i>	NAIN2	9079378	2 hours	2 hours	1185 g
<i>Nemophila menziesii</i>	NEME	9079379	2 hours	30 min	580 g
<i>Perideridia gairdneri</i>	PEGA3	9079255	30 min	30 min	42 g
<i>Phlox gracilis</i>	PHGR16	9079299	4 hours	1 hour	946 g
<i>Pyrrocoma racemosa</i>	PYRA	9079496	15 min	15 min	2 g
<i>Rorippa curvisiliqua</i>	ROCU	9079257	2 hours	1 hour	1144 g
<i>Saxifraga oregana</i>	SAOR2	9079296	1 hour	30 min	7 g
<i>Sidalcea virgata</i>	SIVI3	9079305	2 hours	30 min	451 g
<i>Veronica peregrina</i>	VEPE	9079439	4 hours	1 hour	373 g

Perideridia oregana (**PEOR6**)- This tub of plants was established in 2003 from plants that were grown in 2002. Plants in this tub did not emerge in 2005.

Perideridia gairdneri (**PEGA3**)- This tub was established in 2003 from plants that were grown in 2002. Entire umbels were cut from the stems when seeds turned greyish brown and felt dry and crumbly. Seeds were left in an open greenhouse to dry, then rubbed in a rubbing trough to break up seeds and stems. Seed was cleaned using an air-screen machine.

Saxifraga oregana (SAOR2)- This tub was established in 2004. Plants flowered in early spring and seeds were collected by hand from March 25 to May 12. Rain was heavy during harvest time for this tub, which decreased yields.

Cicendia quadrangularis (CIQU3)- These tiny plants grew and flowered well in the cone-tainers. Plants sown in mid-December in a warm greenhouse flowered in March and seed collection began in mid-April. Capsules turn bright orange when mature and split slowly from the top, releasing tiny, grey seeds. Mature capsules were cut and placed in seed collection envelopes to dry. Seeds are tiny enough to slip out of paper bags. Capsules can be separated from the seed using handscreens.

Myosurus minimus (MYMI2)- Seeds were sown into cone-tainers in mid-December and placed outside in a shadehouse. They germinated outside within four weeks of sowing and grew slowly throughout the winter. They were brought inside a warm greenhouse in March and began to flower in April. “Mousetails” turn tan as they mature and seeds can be stripped off the “tail”.

Additional 2006 Seed Increase Notes

Some species produced seed while they were in pots. *Delphinium menziesii*, and *Pyrrocoma racemosa* plants were overwintered from 2005 and flowered for the first time in 2006. *Eryngium petiolatum*, *Gratiola ebracteata*, and *Eleocharis obtusa* were new this year and flowered in their cone-tainers. They were too small in the spring to be transplanted out and were cared for through the summer in cone-tainers. Seed was hand harvested as it ripened from the *D. menziesii* and *P. racemosa*. Small battery-powered grass clippers were used to cut *E. petiolatum*, *G. ebracteata*, and *E. obtusa* like a mini-swath. Seeds were dried in small bags in an open greenhouse.

The *Balsamorhiza deltoidea*, *Festuca roemerii*, *Lotus formosissimus*, *Veronica scutellata*, *Ranunculus alismaefolia*, and *Eleocharis palustris* did not produce seed in 2006. These plants are being over-wintered at the PMC and will be planted into seed increase plots in 2007.

The *Ludwigia palustris* and *Viola praemorsa* var. *praemorsa* plants did not survive through the winter of 2005/2006. The *L. palustris* will be re-planted in the spring of 2007. The violet will be discontinued.

VI. Plant Materials Delivery

Seed was requested for delivery in late August in order to be available for fall sowing on restoration sites. Some plantings were still producing seed at this time. Seeds from plantings that had completed seed production for the season were picked up by BLM staff on September 19, 2006. Some of the later ripening seed and some dormant plants were picked up by BLM staff on October 24, 2006. All remaining seed lots are being stored at the PMC seed storage facilities until requested.

Table 5. Seed and plants delivered to BLM staff in the fall of 2006.

<i>Species</i>	Symbol	Accession number	Seed Delivered	Plants Delivered
<i>Bromus carinatus</i>	BRCAS	9079373	1569 g	
<i>Carex tumulicola</i>	CATU	9079291	25 g	
<i>Cicendia quadrangularis</i>	CIQU3	9079254	13 g	
<i>Clarkia amoena</i>	CLAM	9079300	60 g	
<i>Delphinium menziesii</i>	DEME	9079374	16 g	49 corms
<i>Deschampsia elongata</i>	DEEL	9079375	73 g	
<i>Downingia elegans</i>	DOEL	9079432	971 g	
<i>Downingia yina</i>	DOYI	9079433	587 g	
<i>Galium trifidum</i>	GATR2	9079317	2141 g	
<i>Gentiana sceptrum</i>	GESC	9079311	52 g	
<i>Geranium oreganum</i>	GEOR2	9079376	4 g	7 5" pots
<i>Gratiola ebracteata</i>	GREB	9079436	35 g	
<i>Lasthenia glaberrima</i>	LAGL3	9079293	639 g	
<i>Montia linearis</i>	MOLI4	9079295	195 g	
<i>Myosotis laxa</i>	MYLA	9079253	240 g	
<i>Myosurus minimus L.</i>	MYMI2	9079381	31 g	
<i>Navarretia intertexta</i>	NAIN2	9079378	1185 g	
<i>Nemophila menziesii</i>	NEME	9079379	580 g	
<i>Phlox gracilis</i>	PHGR16	9079299	946 g	
<i>Rorippa curvisiliqua</i>	ROCU	9079257	1144 g	
<i>Saxifraga oregana</i>	SAOR2	9079296	7 g	
<i>Sidalcea virgata</i>	SIVI3	9079305	451 g	
<i>Veronica peregrina</i>	VEPE	9079439	373 g	