



## Corvallis Plant Materials Center 2010 Progress Report of Activities September 2010

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Development of vegetative solutions for conservation problems is a primary function of the USDA NRCS Plant Materials (PM) program. The Corvallis Plant Materials Center (PMC) is one of 27 centers nationally and serves western Oregon, western Washington, and northwestern California. The PMC's primary mission is to develop new technology in plant propagation and establishment, seed production, revegetation, restoration, and erosion control, and to test and release as well as increase plant sources for use in riparian areas, wetlands, and uplands. Most of the focus is on native grasses, forbs, and shrubs.

The principal program customers include:

- ✓ NRCS field offices, who in turn serve both rural and urban landowners, farmers, ranchers and other land managers,
- ✓ Public agencies, universities, tribes, and private conservation organizations that utilize technology and plants selected or produced by the program, and
- ✓ Commercial seed producers and nurseries who receive information on production technology as well as seed and plants of selected species for further increase.



*Downyngia elegans* in flower for seed production at the PMC.

### PLANT TECHNOLOGY DEVELOPMENT

The NRCS is a USDA agency with the responsibility of administering technically based conservation programs. Many of these programs, such as CRP, CREP, GRP, WRP, and WHIP, directly involve the use of plant materials and plant technology. For the agency, the primary responsibility for developing plant technology and plant releases or sources lies within the PM program.

- Portions of the plant technology developed are incorporated into the Field Office Technical Guide (FOTG) or supporting handbooks, technical notes, fact sheets, etc, and therefore integrated into conservation practices implemented on public and private lands.

- The National PM program maintains a web site which contains useful information on plant releases as well as progress reports, technical reports and other publications developed by the PM program. The website address is <http://plant-materials.nrcs.usda.gov>
- The PM program supports other NRCS computer applications such as the PLANTS database.
- New plant propagation and seed increase protocols are entered in the Native Plant Network website.
- Other publications appear in conference proceedings, abstracts, trade magazines, and scientific journals.

Technology development at the Corvallis PMC to address priority resource needs involves:

- ✓ determining vegetative propagation, seed germination, production, and establishment methods of plant materials (native forbs, shrubs, and grasses) for rehabilitating, stabilizing or restoring riparian areas, wetlands, uplands, and critical sites, primarily at low elevations;
- ✓ assessing adaptive genetic variation within select plant species through studies (done in collaboration with geneticists) that help ensure adapted populations are used in revegetation, reclamation, and restoration;
- ✓ evaluating progress and monitoring maintenance needs of sites restored or revegetated through direct seeding, planting, and soil bioengineering;
- ✓ investigating adaptive qualities of select grass, forb, and woody species and populations through exposure to environmental variation (differences in soil, climate, water);
- ✓ increasing and testing seed and plant materials for revegetation at low to high elevation areas in National Parks;
- ✓ increasing and determining seed and vegetative propagation methods of native species for the Bureau of Land Management, U.S. Forest Service, U.S. Fish and Wildlife Service, and Federal Highways;

Installing demonstration plantings or studies to illustrate and evaluate the use of native species for cover crops, wildlife and pollinator habitat, low input turf, natural area landscaping, and other ecologically sound uses;

- ✓ Conducting special purpose studies such as the evaluation of certain species with potential for biofuel.

*Overall, 42 new or ongoing studies and associated seed or plant increases were conducted in 2009-10. In terms of production, more than 87,000 container plants, 650 cuttings, 1,700 bulbs, 2,100 pounds of common seed, and 300 pounds of seed of PMC releases were produced this year.*

### Cascade Seeding Trial

The NRCS along with the Bureau of Land Management (BLM) and US Forest Service (USFS) on the west side of Oregon have an interest in developing native plant seed mixes for various erosion control purposes. The objective of this study was to look at different seeding rates of blue wildrye (*Elymus glaucus*) with and without a legume, big deervetch (*Lotus crassifolius*), to determine whether a 30 or 15 pound/acre seeding rate of blue wildrye would perform better and/or prove to be more cost-efficient while still effectively stabilizing disturbed sites. Another objective is to determine whether the addition of a legume improves cover establishment at the study site.



Abandoned BLM logging road used for the seeding trial.

A longer-term goal of this study is to help these agencies determine whether they should improve the availability of legume seed for disturbed sites.

Plant cover establishment in the first growing season (2010) was variable; some areas were bare of any cover while other areas had good cover of blue wildrye and/or big deervetch and other volunteer seedlings. Further years of establishment and monitoring will produce greater insight into seeding recommendations.



Examples of plant cover within a sampling frame.

### Adaptability of 'Tropic Sun' Sunn Hemp

Sunn hemp (*Crotalaria juncea*) is a tropical or sub-tropical plant that has been touted as a good cover crop and green manure crop since the 1930's. Difficulty in acquiring seed and cheap fertilizer costs over the years caused many growers to abandon the use of this legume. Due to rising energy costs and the increased awareness of sustainable agriculture nationwide have renewed the interest in the production of sunn hemp seed.

This continuing study attempts to determine areas of the country with the potential to use sunn hemp for cover and green manure crops. The anticipated use of sunn hemp is for a 30-45 day green manure crop. The species doesn't produce seed through most of the US and is very sensitive to frost and therefore not likely to become weedy.

Results from last year's initial study at the Corvallis PMC were impressive. For 2010 the Corvallis PMC and other PMC's across the US will be evaluating three seeding rates and biomass at 45 and 60 days after planting.



Sunn hemp evaluation plots at the PMC.

### Native Grasses Evaluated for Low Input Turf or Groundcover

Interest continues to grow in the potential use of native cool season grasses for low input turf and ground cover in the Pacific Northwest to reduce water usage, fertilizer needs, and mowing. Nearly all the local native upland species are bunch grasses, so rather than form a uniform sod, they remain somewhat clumpy. To help compensate, high seeding rates (1 to 2 lbs/1000 sq ft) are advocated.

Based on observations by the PMC to date, Roemers fescue (*Festuca roemerii*) and prairie junegrass (*Koeleria macrantha*) are among the most promising species. They tend to stay greener longer into the dry summer and tolerate relatively low mowing without summer irrigation. Another option the Center will investigate beginning this fall is the potential use of sand fescue (*Festuca ammobia*). Found along the Oregon Coast, it spreads slowly from underground stems and may make a tighter turf.



Native grasses are being evaluated for turf near the PMC office.

### Seed Production, Germination and Establishment Studies

The major challenges facing the widespread increase and availability of native grasses and forbs are unknown seed production techniques and inherent low seed yields for many species. To address these bottlenecks, the Center conducts studies and evaluates seed production and establishment methods. Topics include fertilization, post harvest residue management, harvest methods, seed dormancy, processing, and germination, and control of annual grasses and broadleaf weeds. Nineteen species of native grasses are currently being evaluated (see table).

### Effect of Nitrogen Fertilization Timing and Rate on Seed Production of Native Grasses

The rate and timing of nitrogen fertilization can have a major impact on the seed yield of native grasses. Maximizing seed yields is important for commercial viability. To this end, two new experiments were initiated last fall, one with meadow barley (*Hordeum brachyantherum*) and the other with Roemers fescue (*Festuca roemerii*). The experiments compare fall application (20 lbs Nitrogen/ac) alone and in combination with spring applications at different rates (50 vs. 75 lbs Nitrogen/ac) and different times (February vs. March vs. April). Results will be determined this fall.



Nitrogen fertilization study on Roemers fescue seed increase field.

### NATIVE GRASSES UNDER INCREASE OR STUDY

Common Name	Scientific Name	Technology Issues
Lemmon's needlegrass	<i>Achnatherum lemmonii</i>	Harvest methods, stand establishment, seed dormancy
California brome	<i>Bromus carinatus</i>	Volunteer seedlings, production, control
Sitka brome	<i>Bromus sitchensis</i>	Production methods
Columbia brome	<i>Bromus vulgaris</i>	Establishment, stand longevity in full sun
Bluejoint	<i>Calamagrostis canadensis</i>	Seed fill, establishment from seed, stand mgt.
California oatgrass	<i>Danthonia californica</i>	Establishment, seed dormancy, adaptation
Tufted hairgrass	<i>Deschampsia cespitosa</i>	Adaptation (inundation, salinity) ecotypic variation
Slender hairgrass	<i>Deschampsia elongata</i>	Soil moisture management, longevity
Blue wildrye	<i>Elymus glaucus</i>	Seed shattering
Slender wheatgrass	<i>Elymus trachycaulus</i>	Stand longevity, production management
Sand fescue	<i>Festuca ammobia</i>	Seed yield, rust, harvest techniques
California fescue	<i>Festuca californica</i>	Production methods and sensitivity to forms of residue management
Roemer's fescue	<i>Festuca roemerii</i>	Seed fill, longevity, low yields, rust disease
Red fescue	<i>Festuca rubra</i>	Seed yields
Meadow barley	<i>Hordeum brachyantherum</i>	Seed retention, harvest techniques, diseases
Prairie junegrass	<i>Koeleria macrantha</i>	Adaptive genetic variation, turf potential
Foothill needlegrass	<i>Nassella lepida</i>	Seed production technology
Pine bluegrass	<i>Poa secunda (Poa scabrella)</i>	Potential as groundcover and turf
Weak alkaligrass	<i>Torreyochloa pallida</i> var. <i>pauciflora</i>	Stand longevity, soil moisture management, establishment

## Weed Control in Native Grasses and Lupine Grown for Seed

One of the biggest impediments facing the commercialization of native grass and forb seed production is the lack of labeled herbicides for weed control. In November 2007, experiments were initiated to evaluate various herbicides in their ability to control annual bluegrass and other weeds in established stands of blue wildrye and tufted hairgrass grown for seed. Likewise, repeat experiments similar to those planted in fall 2006 were undertaken in 2007 to further confirm the affect of various rates of diuron (coupled with carbon band seeding) on weed control in newly sown stands of blue wildrye, tufted hairgrass and meadow barley. Repeat experiments with Roemer's fescue and lupine were established in the fall of 2008. The work is cooperative with the Oregon State University Crop and Soil Science Department. The goal is to produce data necessary to obtain "special local needs labels" for herbicides useful in native plant seed production, beginning with diuron.



Diuron herbicide trial on Roemers fescue shows differences in control of annual bluegrass. Plots are sown with carbon bands applied over the rows of seed then treated with the herbicide.

### Seed Germination of California Oatgrass

California oatgrass (*Danthonia californica*) is native bunchgrass important for rangeland and wildlife habitat improvement along with restoration of prairies, oak savanna, and transitional wetlands in the Pacific Coast states. However, germination and therefore

establishment requirements remain an issue because of the existence of single or possible double seed dormancy within certain seed lots. Dormancy varies among different populations and even crop years of the same population. To further investigate this phenomenon, a new germination study comprised of four experiments was completed in 2010 using three populations of California oatgrass.

Results showed that dormancy is primarily imposed by the seed coat alone and can be overcome by nicking or scarifying (abrading or eroding) this outer layer (in combination with removal of the hull). However, manual nicking is impractical and mechanical scarification is too injurious. Dilute acid remains a possible treatment, but cold moist conditions (for 90 days) or warm moist conditions (for 30 days in the dark), allows the seed coat to degrade over time and the seed to germinate. Simply fall sowing and over wintering outdoors probably has a similar effect. The embryo itself appears nondormant.



Germination of California oatgrass was highest (95%) when the seed coat was nicked with a scalpel. This indicates seed dormancy is imposed by the seed coat rather than another mechanism.

### PLANT GENETIC STUDIES and RELEASES

Wild populations of plants are collected, propagated, evaluated in a common environment for their differences, and

sometimes selected for their physical attributes, area of adaptation, or potential or proven performance. Material from such studies may be further evaluated in a series of experiments or plantings to determine how capable the species or selections are at addressing conservation needs. Purposeful selection can be important for farm or other pragmatic uses such as erosion control, forage, seed production, windbreaks, or water quality improvement. However, species are not bred, genetic changes are intentionally minimized, and genetic diversity is emphasized when ecological restoration is the primary goal.

Studies may begin with assemblies of numerous wild ecotypes and the establishment of an initial evaluation planting or common garden. After populations are chosen from comparative evaluations, propagation and increase methods are determined and field tests are conducted. The material may then be released and made available to commercial growers. They in turn produce the seed or plants on a much larger scale and make it available for sale to the public for conservation, reclamation, or restoration purposes. Currently, the Corvallis Plant Materials Center maintains and promotes 15 plant cultivar and pre-variety releases.

### **Pre-variety Native Plants to Address Resource Needs**

Commercial sources of genetically appropriate native plants are needed for wetland, upland, and riparian revegetation and other resource conservation and enhancement needs on the basis of ecoregion, seed zone, or Major Land Resource Area (MLRA). The PMC addresses this need by providing pre-variety releases of species from specific areas for use in the same or similar areas. Pre-variety release is a process whereby a plant (individual, population, or group of populations) from a specific location or area is identified and studied (by the PMC), increased (by the PMC or private grower), and certified (by the official seed certification agency in the state it was collected or grown). Pre-variety releases may

be categorized as “source identified”, “selected”, or “tested” material, depending on the degree of testing, selection, or evaluation they undergo.

### **Oceanspray**

Oceanspray (*Holodiscus discolor*) is a native shrub useful for riparian revegetation and wildlife habitat in western Oregon, western Washington, and northwestern California. It is also an important source of pollen and nectar for numerous pollinating insects in summer.

Two pre-variety germplasm releases of this species are targeted for completion within two years. Thanks to Dr. Matt Horning of the US Forest Service in Corvallis, data from the original common garden study was re-analyzed. Based on statistical correlations between plant growth and environmental factors such as collection site elevation and temperature, unique seed zones or genetic regions are suggested for this species. Results were recently published in the journal of Restoration Ecology. The PMC has established isolated seed orchards for selected populations. Seed certification and harvest began in 2007. Material is being distributed to nurseries for commercial increase and sale.



Oceanspray produces an abundance of cream colored flower clusters in June that are important food (nectar, pollen) for numerous pollinator insects.

## Mass Selection of Sand Fescue

Sand fescue (*Festuca ammobia* synonym *Festuca rubra* var. *arenicola*) is native to beach front meadows along the Pacific coastline. It is classified by some as an endemic red fescue. This attractive grass is fine textured, low growing, and green to blue in color with occasional purple tinges. It spreads slowly by short rhizomes and produces an abundance of short stalked seedheads. A source of this species is already being used for low input "native" turf in California. With a similar goal in mind, the PMC began mass selection of a coastal Oregon population for leaf color and freedom from a disease called "leaf rust" (*Puccinea* spp.). Non-manipulated germplasm of sand fescue is also being increased by the PMC for coastal habitat restoration by other agencies. This year three groups or subsets of germplasm were selected based on stem height, rust, and maturity differences. The third cycle of selection will start this fall.



Bluish sand fescue plants in the F2 mass selection plot. Plants that are greener and more prone to leaf rust disease are being rogued out each new generation or selection cycle.

## Prairie Junegrass Common Garden Study

A common garden study was launched with prairie junegrass (*Koeleria macrantha*) in 2007-08 in collaboration with the US Forest Service (USFS), Pacific Northwest Research Station, Corvallis, OR, and the USFS Region 6. Common garden studies involve growing

populations from multiple locations in the same place. Their purpose is to explore genetic variation of adaptive traits within a species and their relationship to source environments. From the data that is collected and analyzed, seed zones and seed transfer guidelines are developed to help ensure adapted populations are used in restoration and revegetation. Secondly, such studies also afford the opportunity to identify, increase, and potentially release pre-varietal germplasm for use in specific seed zones. This improves the possibility that ecologically adapted seed will be commercially available for field office and landowner use.

Found naturally across most of North America, prairie junegrass is useful for revegetation of mined lands, burns, and other disturbed sites, improvement of rangelands, and restoration of prairie, savanna, and chaparral. Seed of this species was collected by the USFS from at least 120 populations (x2 parents per site = 240 families) primarily from Region 6 (Oregon and Washington) but from outlying areas as well. Duplicate common gardens with 10 replications each (using single plant plots) were established at an Oregon State University Experiment Station near Powell Butte, OR, and at the Corvallis Plant Materials Center. The sites were planted in August and October of 2008, respectively. Data was collected in 2009 on phenology (date a certain growth stage is reached), certain leaf and culm (seed stalk) traits, form, above ground biomass, spread, and plant basal width. Additional data will be collected in 2010 and results and seed transfer guidelines will be published thereafter. The work is under the leadership of USFS geneticists.

Traits measured at Corvallis in 2009 were significantly different from traits measured on the same plants and populations at Powell Butte. Plants at Corvallis had wider crowns, larger leaves and later growth stages than plants at Powell Butte. For nearly all traits, variation among populations was much greater when plants were grown at Corvallis even

though variation among individual plants was similar at both sites. Four traits that had large population variation and were correlated with climates at the source locations are crown width, inflorescence number, leaf width, and bloom date. These traits are generally correlated with temperatures, precipitation, and aridity. The general patterns of variation that emerge from across the landscape from this preliminary analysis are largely congruent with large-scale Level III ecoregions, suggesting these regions may be useful for seed zones. Similar data was recollected in 2010 and a final report will be published in 2011 or 2012.



Prairie junegrass common garden study cooperative with the U.S. Forest Service. There are 2400 single plant plots representing a total of 120 populations (240 families).

### Roemer's Fescue

Roemer's fescue (*Festuca roemerii* synonym *Festuca idahoensis* ssp. *roemerii*) is a native fine leaf fescue found exclusively west of the Cascade Mountains in Washington and Oregon as well as northwestern California. It was once a dominant bunchgrass of oak savannas, prairies, and coastal headlands throughout the region. There is considerable interest in this species for ecosystem restoration as well as revegetation, cover, and erosion control. To address the need, a common garden study of Roemer's fescue was conducted between 2003 and 2005 in cooperation with the Institute for Applied Ecology (IAE) in Corvallis, the Bureau of Land Management (BLM), and the US Forest Service (USFS). The study contained 47 populations from the western reaches of Washington, Oregon, and California.



Seed increase of Roemer's fescue that originated from the Oregon Coast. These plants are comparatively more robust than most other populations.

Results of the study were used to delineate five seed zones for Roemer's fescue which largely correlated with Level III ecoregions. A composite or polycross of two to nine populations evaluated in the original study were chosen to represent each seed zone. Four of the polycrosses will become selected class releases for use in plant community and wildlife habitat restoration. A fifth population from the Oregon coast has also been targeted for increase and use in general erosion control. First year seed production for each polycross was modest in 2010, with yields of 37 lbs for the Coast germplasm, 25 lbs for the Willamette Valley germplasm, 8.5 lbs for the Puget germplasm, 5.5 lbs for the Siskiyou germplasm, and 5 lbs for the San Juan germplasm. Actual release and availability on the commercial market are three to four years away.

### PARTNERSHIPS WITH OTHER AGENCIES

#### **Upland Plants and Technology for the National Park Service**

The Native Plant for Parks Program is based on a cooperative agreement between NRCS and the National Park Service (NPS). It began in 1989 to share expertise and develop plant materials for use in park programs. In 2009-10, the PMC collaborated with four National Parks

under five agreements. Propagation, seed technology and increase, and revegetation techniques developed or refined by the PMC in the process benefits all of the PMC's customers interested in native plants for production, restoration, erosion control, wildlife habitat and related conservation efforts. The same holds true for other agencies the PMC works with on native plants.

Lassen Volcanic National Park, located in the SE corner of the PMC service area, is a dry, rugged, high elevation park with unique and diverse flora. Propagation techniques are not known for many plants that occur in the Park. Germination trials were performed in 2010 to determine how to produce plugs of some forbs that are unique to the Park. The results of these trials were implemented in late spring of 2010 to produce over 7500 plants of 20 species. In early September, the PMC delivered these plants to be planted at the new visitors' center. Also, 3000 Jeffery pines were grown and delivered to the north end of the Park to be planted in areas where campgrounds have been removed. The PMC and Lassen Volcanic National Park have interagency agreements that include yearly plant propagation and delivery for the next three years.

Cooperative agreements between Mt. Rainier National Park and the PMC have been on-going since the early 1990's. In 2010, the PMC produced seed of three species of grasses for two separate agreements. Both of these agreements are for roadside reseeding following repaving. The Nisqually Entrance Revegetation project began in 2008 and ended this year. The construction portion of the project is scheduled to be completed in 2011; seed will be stored at the PMC until then. Also ending in 2010 was the seed increase of three grasses for Steven's Canyon Road. This long road traverses the southern end of the Park and contains high and low elevation ecotypes of two of the grasses included in the agreement. These ecotypes are grown in separate fields and are properly isolated from each other to maintain their genetic integrity.

Approximately 550 lbs of seed were produced for these projects in 2010.

Since 2004, the PMC has been working with Olympic National Park which is preparing for the removal of two large dams on the Elwha River. The dams are now scheduled to be removed in 2012. Their elimination is necessary to restore the salmon runs that historically had access to the upper reaches of the River prior to the dams being built. The revegetation plan is in its final stages and it is anticipated that the PMC will produce over 7000 lbs of seed to revegetate the 500 acres of exposed lake beds. Large-scale seed collected resumed this year in preparation for dam removal. PMC staff collected 21lbs of grass seed in July and August. The large grass and forb fields were planted in the fall of 2009 and will be expanded in the fall of 2010. This year, over 1100 lbs of seed was produced for this project.

In 2009, the PMC and San Juan Island National Heritage Preserve began an interagency agreement to produce seed of three native grasses for on-going prairie restoration. PMC staff visited the Park this year to deliver seed as well as survey the restoration sites. The Park plans to restore about a hundred acres over the next six years. Approximately 120lbs of seed was produced this year for this Park.



American Camp Prairie San Juan Island National Heritage Preserve, August 11, 2010.

## **Wetland and Wet Prairie Species for the Bureau of Land Management**

In 2002, the Corvallis Plant Materials Center entered into an agreement with the Eugene District of the Bureau of Land Management (BLM) to perform seed germination trials and conduct small scale increases of native wetland and wet prairie species. The PMC agreed to investigate and document propagation techniques from seed for these species and to evaluate their potential for agronomic seed increase. The agreement has been renewed every year and since its inception, the Center has successfully produced over 120 lbs of 83 species. Most of them have little if any published data on germination or production methods. Improved production techniques, such as planting annuals in fields covered with fabric which facilitates weed control and vacuum harvesting, have been developed for small scale seed increase. In 2010 new establishment techniques were researched for the earliest blooming forbs. Seeds were directly planted into the holes in the weed fabric plots. Greenhouse grown transplants were also transplanted into half of the plot. The direct sown seedlings were hardier; some bloomed earlier and overall were more healthy and adapted to the cool spring weather. The direct sowing technique will be used for these early bloomers.

### **Native Grasses and Forbs for Fire Rehabilitation and Wildlife Habitat in Southern Oregon**

The Roseburg District of the BLM manages the North Bank Habitat Area for the endangered Columbian white-tailed deer (*Odocoileus virginianus* ssp. *leucurus*). The species has only been delisted for Douglas Co., Oregon, and remains listed in other counties of Oregon and Washington along the lower Columbia River. The PMC entered an agreement with the BLM in 2007 to produce seeds of native grasses, legumes, and forbs. In 2010, we evaluated forb fields that had been direct sown the previous fall. Slugs, hard freezes, and

massive weed pressure made it a difficult spring for the lupine (*Lupinus albus*) and buckwheat (*Eriogonum nudum*) seedlings, but with some selective spring weeding the fields appear to be successful. Buckwheat seedlings grew rapidly in the dry hot summer and some flowered in the late summer. Weeds will continue to be an issue in both of these fields. Fields will be weeded intensely in 2011 now that the plants are large and easy to see.

The Medford District of the BLM has partnered with the PMC since 2004. They are often in need of large amounts of seed for revegetation after wildfires. The PMC agreed to work with certain native grasses and forbs that are seldom grown by large-scale seed producers. In 2009, plugs of lupine (*Lupinus adsurgens*) and scurf peas (*Rupertia physoides*) were produced and transplanted into a field covered with weed fabric. These fields flowered this year and over 30 lbs of seed were produced. Older forb fields also produced 50 lbs of seed in 2010. Both BLM contracts are renewed on a yearly basis.

## **SPECIAL PROJECTS and ACTIVITIES**

### **Threatened and Endangered Plant Species**

Limited information is available on the growth, reproductive potential, and increase technology of a number of threatened and endangered plants in the Corvallis PMC's service area. Therefore to aid in their recovery, the Center has been observing and experimenting with the seed production of several species, including Kincaid's lupine (*Lupinus oregonus* var. *kincaidii*) a federally listed threatened species. It is found in the grasslands of the Willamette Valley of Oregon. About 60 lupine plants were transplanted into a mulched field at the PMC in 2007. The plants grew vigorously and some flowered the first year. The plants are now three years old and show no signs of slowing down. Seed is hand collected twice a week during the few weeks of seed maturity between late June and early August. One to two pounds of seed are collected each year from the small number of plants.

Small plots of Willamette Valley Daisy (*Erigeron decumbens*) are also established at the PMC. It is a federally listed endangered species. Considered extinct in 1939, a few populations were found again in the 1990s. This species was probably widespread in the bottomlands of the Willamette Valley but most of the habitat has been converted to agriculture. With less than 30 known populations left and few plants remaining on protected sites, the species needs augmentation. The PMC's two increase plots range in size from 200 to 400 plants and produce between a quarter to half of a pound of seed each. There are approximately 500,000 seeds per pound. These small trials show that seed increase is a viable option for aiding the recovery of both the lupine and daisy.

Nelson's checkermallow (*Sidalcea nelsoniana*), is a threatened species that is a prime candidate for federal delisting. It is presently found on 62 patches within 5 relict population centers in Oregon, and at 2 sites in Washington. This species is very easy to grow, produces lots of viable seed, and is relatively easy to establish on restoration sites. The PMC is partnering with the Institute for Applied Ecology (IAE) in Corvallis, Oregon, and US Fish and Wildlife Service (USFW) to produce seeds and plants of this checkermallow for planting on appropriate sites. IAE staff collected seed from two designated recovery zones. The seed was delivered to the PMC in the fall of 2008 and was used to grow plants to establish two separate seed increase fields in the spring of 2009. The plants were fully mature this year and produced an impressive 180 lbs of seed! The PMC also produced 8000 plugs. The plugs and seed will be planted out on NRCS Wetland Reserve (WRP) sites in 2010 and 2011.

Golden Paintbrush (*Castilleja levisecta*) is considered to be extirpated from Oregon but a few populations still remain in Washington. The PMC is working with IAE and USFW to produce seeds and plants to reintroduce this plant back into Oregon. In the spring of 2010

the PMC produced 5000 plants most of which were planted out in protected sites in the Willamette Valley. The remaining 1800 plants were transplanted into a seed increase field at the PMC. This plant is a hemiparasite and performs better if planted with a host, except in small containers. The paintbrush plants were planted with a sand fescue (*Festuca ammobia*) "buddy" in the seed increase field.



Golden paintbrush seed increase field growing with host sand fescue at the PMC, May 21, 2010.

### **Seed and Plant Propagation for Oregon Silverspot Butterfly Recovery**

The PMC has the opportunity to assist with the recovery of Oregon silverspot butterfly (*Speyeria zerene* spp. *hippolyta*). The species was declared a federally listed threatened species in 1980 and is classified as endangered in Oregon and Washington. It occurs in small, isolated populations on grassland habitats within its range from coastal Washington south to coastal northern California.

In 2005, the PMC and Anne Walker of the US Fish and Wildlife Service (USFW) began a collaborative effort to develop a long-term seed source for habitat restoration. Since then, the PMC has been growing plugs of early blue violet (*Viola adunca*) which is the larval (caterpillar) host plant, as well as producing a couple pounds of violet seed per year. In 2008, larger seed increase fields were established of violets, sand fescue (*Festuca ammobia*), and nectar plants such as pearly everlasting

(*Anaphalis margaritacea*), goldenrod (*Solidago canadensis*), yarrow (*Achillea millefolium*), and pacific aster (*Aster chilensis*).

The violets are a very difficult species to collect seed from and production presents interesting challenges! These low growing plants produce seed all summer long in pods that shatter upon maturity. Plugs were grown and transplanted into a field covered with weed fabric. As seeds began to shatter on to the fabric, wind quickly blew the round seeds off the surface preventing easy collection. A four sided “wind fence” was installed which allowed more of the seed to remain on the fabric. Unfortunately, the wind fence created a protected enclosure for mice to harvest and cache unripe pods. Mouse traps were set over the plot to reduce further losses. Next, as seed accumulated on the fabric, a flock of doves discovered the seeds. Flashy bird tape was hung over the plot to keep the birds out. This resulted in even more birds in the plot! Finally, pieces of bird netting were fastened together and used to enclose the plot. Every gap had to be filled or the doves would find a way in. Once all these problems were finally solved, massive amounts of seed piled up on the fabric and were vacuumed throughout the growing season.

In 2010, the PMC produced 30 lbs of violet seed, 105 lbs of fescue seed, and over 50 lbs of seed of the nectar species. Approximately 4,000 violet plants were also grown for US Fish and Wildlife Service to plant out at restoration sites.



Early blue violet seed increase enclosure.

The seed and plant production is a small part of a larger project focusing on the recovery of the Oregon silverspot butterfly. Butterflies and caterpillars are also raised by the Oregon Zoo and many federal, state, and non-profit entities are all working together to restore sites in the critical habitat area. This effort has become a national model for butterfly conservation.

### **Insect Surveys on Established Native Forb & Shrub Plantings**

In 2007 the USDA-NRCS Corvallis Plant Materials Center, Oregon State University's Integrated Plant Protection Center and the Xerces Society came together to develop and plant a native pollinator/beneficial insect hedgerow and conduct insect surveys on over 20 different native shrub and forbs species located at the PMC. The objective of the project is to gain knowledge of pollinator and beneficial insect associations with native plants of the Pacific Northwest and to publish the results of this information to aid growers and planners in habitat establishment and management using native plants within agroecosystems in the Willamette Valley of Oregon.



Pollinator hedgerow at the Corvallis Plant Materials Center.

Basic knowledge of pollinator & beneficial insect visitation on native plants within the Willamette Valley of Oregon is lacking or very limited. For the past three growing seasons students from Oregon State University have been taking insect surveys on a variety of native plant species at the PMC between the months of April to August. Weekly surveys

were conducted visually, using sweep nets, aspirators, blue vane, beat sheets and pan traps. Flowering dates of the surveyed plants were also recorded throughout the season.

The principle results to date show that over 40 families of insects have been collected on the plant assemblies including 19 species of bees. This is a significant discovery due to the nationwide decline of European honey bee populations and the important role native pollinators can have on crop pollination. Data from 2010 is currently being analyzed.

### **FACILITIES and EQUIPMENT**

In 2010 the Corvallis PMC acquired a cargo container with dehumidification and cooling, making it an ideal seed storage facility for our expanded seed production efforts. A second large shipping container was purchased for general supply storage at the farm.



Large cargo shipping container used for seed storage.

In addition, the Center obtained a laboratory-sized seed thresher and belt thresher on long term loan from the [USDA Agricultural Research Service](#) in Corvallis. The first thresher removes seed from hand harvested plant stalks and seed heads and the second belt thresher hulls seed and removes other appendages attached to the hull.



A belt thresher is the latest addition to our arsenal of seed cleaning equipment. Two rubber belts travel together but at different speeds which gently hulls seed moving in between.

### **TECHNOLOGY TRANSFER**

The PMC conducts and contributes to field days, workshops, and tours, writes and produces publications, and makes presentations in order to train or disseminate technology to NRCS and Soil and Water Conservation District employees, growers, and other agency partners, as well as the general public.

This past year was a record year for PMC presentations and tours. Between October 1, 2009 and September 2010, the PMC jointly conducted a field day (on farmscaping) and a workshop (on plant propagation) and contributed to the OSU Crop and Soil Science Department's Hyslop Field Laboratory Field Day, the Imperiled Butterfly Conservation Workshop, and an NRCS Soil Quality training session. At least 30 additional presentations and/or tours were given by PMC staff during the year, including one at a National and one at International scientific conference. Papers authored and co-authored by staff included a newsletter, three poster papers, an annual technical report, a refereed journal article, an annual report of activities, technical and other research reports, handouts, and progress reports for a total of 25 documents in 2010.

Kathy Pendergrass, Plant Materials Specialist for the Corvallis PMC service area conducted six additional presentations and training sessions on topics such as threatened and endangered species and plant ID. She also completed five technical note documents.

## PMC Field Day 2010 - 2<sup>nd</sup> Annual Farmscaping with Native Plants

In a repeat performance from 2009, The Plant Materials Center at Corvallis and Plant Materials Specialist (Kathy Pendergrass) teamed up with Oregon State University researchers from the Integrated Plant Protection Center, the Xerces Society, native plant and seed retailers, and insect and native plant enthusiasts for a field day at the PMC on June 1<sup>st</sup>, 2010.

Twenty eight farmers, landowners, NRCS field staff, and Soil and Water Conservation District employees spent the afternoon learning about the importance, identification, and habitat needs of beneficial insects and native pollinators by touring and scouting the PMC forb seed increase fields and demonstration hedgerow. Besides the field tour and insect ID, presentations included an introduction to farmscaping with native plants, pollinator hedgerow design, propagation techniques for native plants, nursery and seed stock availability from vendors, and conservation programs for private farms.



Joe Williams (right, PMC Manager) and Gwen Ellen (2<sup>nd</sup> from right, Oregon State University Integrated Plant Protection Center) lead a discussion during the 2010 field day on pollinator habitat and hedgerow plantings at the PMC.

### Woody Plant Propagation Workshop for Farmers

The Corvallis PMC and the Oregon State University Integrated Plant Protection Center's (IPPC), Farmscaping for Beneficial's Project co-sponsored a workshop on woody plant propagation techniques presented by Dale

Darris of the PMC. Twenty five farmers, nursery growers, and SWCD employees attended the successful workshop on February 16, 2010. Also included was information on winter twig ID by Dale and a visit to the PMC woody cutting blocks and pollinator hedgerow with a discussion of pollinators and beneficial insect habitat by Gwen Ellen of the IPPC and Joe Williams of the PMC.



The PMC provided training on woody plant propagation and planting techniques during both a workshop (Feb 2010) and field day (June 2010).

### Imperiled Butterfly Conservation Workshop

The PMC hosted a session of the Imperiled Butterfly Conservation Workshop focusing on our seed and plant production efforts. Workshop attendees included biologists, museum and zoo staff, as well as butterfly enthusiasts. Attendees spent two hours touring the PMC farm learning about the challenges of producing seed and plants of these plants that are critical to the Oregon Silverspot butterfly survival.



Amy Bartow (left) gives a presentation to attendees of the Imperiled Butterfly Conservation Workshop.

## PMC Hosts NRCS National Employee Development Center's (NEDC) Soil Quality Training for Field Office Staff

The PMC hosted a national training course August 10 to 12, 2010, entitled "Soil Quality Assessment and Applications for Field Staff".

Sponsored by the NRCS's NEDC, expert trainers included Mike Sucik, Susan Samson-Liebig, and Henry Ferguson. Joe Williams and Dale Darris from the PMC contributed with an overview of Center operations and background information on farm management practices and field history among other details and logistics for the field portion of the workshop. Lectures and indoor sessions were held at the Hilton Garden Inn in Corvallis, OR. Thirty NRCS and SWCD employees and trainees attended the course.



Mike Sucik (holding shovel) demonstrates the use of soil quality kit to workshop attendees at the Corvallis PMC. Joe Williams and Dale Darris (dark shirts on far left) of the PMC helped host this NRCS national training course on soil quality.

### Major publications in 2010

- "Pacific Plants and Propagules" PMC newsletter. (8 pages)
- Corvallis Plant Materials Center 2010 Technical Report. (241 pages)
- Corvallis Plant Materials Center 2010 Progress Report of Activities (15 pages)
- Technical Note 40 – Supplement A – Introduction to Nelson's Checker-mallow, a Federally-listed Threatened Species: photo guide and key
- Technical Note 40 – Supplement B – Introduction to Bradshaw's lomatium, a Federally-listed Endangered Species: photo guide and key
- Technical Note 40 – Supplement C – Introduction to Cook's lomatium, a Federally-listed Endangered Species: photo guide and key
- Technical Note 40 – Supplement D – Introduction to Kincaid's lupine, a Federally-listed Threatened Species: photo guide and key
- Technical Note 40 – Supplement E – Introduction to Willamette Daisy, a Federally-listed Endangered Species: photo guide and key
- Tolerance of Carbon-Seeded Meadow Barley and Blue Wildrye to Diuron. OSU Seed Production. (2 pages)
- Tolerance of Established Blue Wildrye to Herbicides. OSU Seed Production ( 2 pages)
- Seed Production Research on Native Grasses: examples of diuron herbicide and nitrogen fertilization experiments. (2 pages)
- "Can an Ecoregion Serve as a Seed Transfer Zone? Evidence from a Common Garden Study with Five Native Species." Restoration Ecology (refereed journal). (9 pages)
- Plant Guide: Tufted hairgrass. NRCS Plants Database. (12 pages)
- The Effect of Scarification and Stratification Treatments on the Germination of *Danthonia californica* from Three Populations (poster paper and published conference proceedings- 2 pages)
- Large Scale Species Recovery through Local Farms and the Wetland Reserve Program (poster paper)
- Harvest Methods in Forb Seed Production Fields (poster paper)
- THE 2009 BUREAU OF LAND MANAGEMENT ANNUAL REPORT: *West Eugene Wetlands*
- THE 2009 BUREAU OF LAND MANAGEMENT ANNUAL REPORT: *Medford District*
- THE 2009 BUREAU OF LAND MANAGEMENT ANNUAL REPORT: *Roseburg District*
- THE 2009 LASSEN VOLCANIC NATIONAL PARK ANNUAL REPORT: *Visitors' Center Landscape and Disturbed Lands Project*
- THE 2009 MOUNT RAINIER NATIONAL PARK ANNUAL REPORT: *Steven's Canyon Road Revegetation Project*
- THE 2009 MOUNT RAINIER NATIONAL PARK ANNUAL REPORT: *Nisqually Entrance Revegetation Project*
- THE 2009 OLYMPIC NATIONAL PARK ANNUAL REPORT: *Elwha River Ecosystem and Fisheries Restoration*
- THE 2009 GOLDEN GATE NATIONAL PARK ANNUAL REPORT: *Marin Headlands Revegetation Project*
- THE 2009 SAN JUAN ISLANDS NATIONAL HISTORICAL PARK ANNUAL REPORT: *American Camp Prairie Restoration Project*
- THE 2009 US FISH AND WILDLIFE ANNUAL REPORT: *Willamette Valley Seed Increase Project*
- THE 2009 US FISH AND WILDLIFE ANNUAL REPORT: *Oregon Silverspot Butterfly Seed Increase Project*

- THE 2009 US ARMY/USFWS ANNUAL REPORT:  
*North Coast Oregon Silverspot Butterfly Seed Increase Project*
- THE 2009 UNITED STATES FOREST SERVICE ANNUAL REPORT: *Umatilla District*
- THE 2009 SEED INCREASE OF THREATENED AND ENDANGERED SPECIES ANNUAL REPORT

*Prepared by Dale Darris, Conservation Agronomist, Amy Bartow, Botanist and Production Manager, Joe Williams, PMC Manager, and Kathy Pendergrass, Plant Materials Specialist. All articles and photos are by NRCS and NRCS Plant Materials Center staff.*