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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 (OR) Plant Materials Center (PMC) is one of 26 centers nationally and serves western Oregon, western Washington, and northwestern California. The Corvallis PMC's primary mission is to develop new technology in native plant propagation, establishment, seed production, revegetation, and erosion control, and to test and release new plant sources for use in riparian areas, wetlands, and uplands.



Harvesting seed of California brome with mini-combine

- The principal program customers include:
- ✓ NRCS field offices, who in turn serve both rural and urban land owners and managers,
 - ✓ Public agencies, universities, Tribes, and private conservation organizations that utilize technology and plants selected or produced by the program, and
 - ✓ Commercial seed and plant growers who receive seed and plants of selected species and use PMC information to produce them.

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PLANT EVALUATIONS AND RELEASE

Wild populations of plants are collected, propagated, and selected for their physical attributes, area of adaptation, potential performance, or documented capabilities from a series of evaluations aimed at addressing conservation needs. However, species are not bred or hybridized and genetic changes may be intentionally minimized if ecological restoration is the primary goal.

Studies often begin with large assemblies of 40 or more ecotypes and the establishment of an initial evaluation planting or common garden. After populations are chosen from these 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 to the public for conservation, reclamation, or restoration purposes. Currently the Corvallis Plant Materials Center maintains and promotes 14 plant cultivars and pre-varietal releases.

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Pre-varietal Native Plants to Address Resource Needs

Commercial sources of native plants of “local” genetic origin are needed for wetland, upland, and riparian revegetation and other resource needs on an ecoregion or Major Land Resource Area (MLRA) basis. The PMC addresses this need by providing pre-varietal releases of species from specific areas for use in the same or similar area. Pre-varietal release is a process whereby a plant (individual, group, or whole population) from a specific location is identified (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-varietal releases may be “source identified”, “selected”, or “tested class”, depending on the degree of testing and evaluation they undergo.

Future Plant Releases

A selected class of Sitka alder (*Alnus viridis* ssp. *sinuata*) called Skamania germplasm will be released shortly. Sitka alder (*Alnus viridis* ssp. *sinuata*) is a deciduous shrub native to the Pacific Northwest. It occurs from sea level to timberline in thickets on wet slopes, along mountain streams and pond margins, and as a pioneer plant where seepage or other supplemental water is available.

The Skamania germplasm Sitka alder was selected from a common garden study of 63 Sitka alder accessions collected from western Washington to northwestern California. It was chosen for its rapid growth, stem density, vigor, size, and seed production. Recommended uses include riparian revegetation, streambank stabilization, critical area erosion control, and wildlife habitat planting. It also has the potential for rehabilitation of eroded, low fertility sites and as a companion or nurse shrub in conifer plantations. Sitka alder enhances site productivity by the fixation of atmospheric nitrogen within the roots by bacteria of the *Frankia* genus.

Other pre-varietal releases targeted within several years include five ecotypes of oceanspray (*Holodiscus discolor*) which will be ecoregion specific. Within 10 years additional releases are likely to include several populations of vine maple (*Acer circinatum*) collected from the Corvallis PMC Service area in 1988-89. All three species are important native shrubs for riparian revegetation and wildlife habitat in western Oregon, western Washington, and northwestern California.

Progress Continues on Common Garden Study of Roemers Fescue

Roemers fescue (*Festuca roemerii*) is a native fine leaf fescue found exclusively west of the Cascade Mountains in Washington and Oregon as well as northwestern California. Once a dominant bunchgrass of oak savannas and prairies throughout the coastal region, there is considerable interest in this species for ecosystem restoration as well as revegetation and erosion control. To address the need, a common garden study of Roemers fescue was initiated in 2001 in cooperation with Institute for Applied Ecology in Corvallis, and the Bureau of Land Management. By collecting seed from throughout its geographic range and growing out plants in a common garden, it is possible to identify patterns of genetic variation that correlate to the environment. The study contains 14 populations from Washington, 30 from Oregon, and 3 from California. The results will be used to define seed transfer guidelines or seed transfer zones. Other outcomes may include several selected class releases.



Hand harvest of seed from individuals in the Roemers fescue common garden study

This year (2004) was the first full growing season for the common garden of Roemers fescue. Specimens began to flower as early as March and others continued flowering into June. Seed was harvested from all productive plants. The phenological status of each individual was recorded at weekly intervals throughout the growing season. Crown width, culm length, and culm abundance were also recorded.



Specimens of Roemers fescue show high genetic diversity within and between populations

PLANT TECHNOLOGY and INCREASES

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

- Portions of the plant technology developed by the program are incorporated into the Field Office Technical Guide (FOTG) or supporting handbooks and become standards for conservation practices implemented on public and private lands.
- The National PM program maintains a web site, which contains useful information such as plant fact sheets and guides, publications developed by the PM program, sources of plant materials, and related websites. The website address is <http://Plant-Materials.nrcs.usda.gov>.

- The PM program supports other NRCS computer applications such as the PLANTS database and VEGSPEC.

Current technology studies at the Corvallis PMC to address priority resource needs involve:

- ⇒ determining vegetative propagation, seed production, and establishment methods of plant materials (native forbs, shrubs and grasses) for restoring riparian areas, wetlands, and uplands, primarily at low to mid elevations;
- ⇒ studying and increasing plant materials for use in soil bioengineering;
- ⇒ evaluating progress and monitoring maintenance needs of sites restored or revegetated through direct seeding, planting, and soil bioengineering;
- ⇒ assessing flood inundation tolerance of select native grass, forb, and woody species;
- ⇒ increasing and testing seed and plant materials for revegetation at low to high elevation areas in National Parks;
- ⇒ increasing and determining seed propagation methods of wetland and upland species for the Bureau of Land Management;
- ⇒ installing demonstration plantings to illustrate and promote the use of native species for windbreaks, landscaping, and wildlife; and
- ⇒ conducting special studies and increases on culturally significant plants for Tribes.

Overall, about 40 new or ongoing studies and increases were conducted in 2003-2004. Technology produced by the staff during the 2003 fiscal year included 18 publications and 9 oral presentations. In terms of production, nearly 8,000 plants, several thousand of linear feet of cuttings, live stakes, and whips (branches), and 215 pounds of seed were produced in 2003. Cooperators (partners, other agencies) were provided direct technical assistance 59 times, NRCS field offices were helped 44 times, and the general public was assisted 44 times.

Seed Production, Germination and Establishment Studies Benefit Commercial Growers

The major challenges facing the widespread increase and availability of native grasses and forbs are unknown seed production techniques and low seed yields. To address this bottleneck, the Center conducts studies and demonstrations to evaluate seed production and establishment techniques.

For example, in 2001-02 a study was initiated to investigate the effect of several herbicide treatments on control of annual bluegrass (*Poa annua*) in tufted hairgrass (*Deschampsia caespitosa*), California oatgrass (*Danthonia californica*), meadow barley (*Hordeum brachyantherum*) and American sloughgrass (*Beckmannia syzigachne*). In the spring of 2004, both meadow barley and Roemers fescue plots received thermal and non-thermal post harvest residue treatments to evaluate the effect of burning on seed yield of these species. Results are often species specific.



Post harvest residue management (burned vs. unburned seed increase plots) evaluated for meadow barley

Since 1999-2000, other native grasses have been increased and their seed production or propagation methods evaluated. They include rice cutgrass (*Leersia oryzoides*), Pacific bluejoint (*Calamagrostis canadensis*), and tall mannagrass (*Glyceria elata*) which are wetland or marsh grasses, and Roemers fescue (*Festuca roemerii*), an upland grass. Seed of these species is used for research and can be made available for field scale testing on private

and public lands. Most recently (2002-2004), small fields of pine bluegrass (*Poa scabrella* or *P. secunda*), slender wheatgrass (*Elymus trachycaulus*), Lemmon's needlegrass (*Achnatherum lemmonii*), and annual hairgrass (*Deschampsia danthonioides*) have been added for similar purposes.

In addition to field production, the PMC searches for the best ways to enhance seed germination and improve seed quality. Nearly each year one or more germination studies are conducted either in the PMC lab or in conjunction with the Oregon State University Seed Testing Laboratory. Recent evaluations conducted on seed of rice cutgrass, pine bluegrass, Lemmon's needlegrass, bearded fescue (*Festuca subulata*), Alaska oniongrass (*Melica subulata*), Harford's melic (*Melica harfordii*), and nodding semaphore grass (*Pleuropogon refractus*) demonstrated or confirmed complex dormancy and the need for cold, moist stratification or over wintering periods for germination of their seed. Other native grasses like Prairie junegrass (*Koeleria macrantha*), nodding trisetum (*Trisetum cernuum*), and slender hairgrass (*Deschampsia elongata*) appear to lack any similar requirements for germination.



Establishing new field of blue wildrye using activated charcoal banding (the herbicide diuron is applied after for weed control)

Finally, significant amounts of time and funds have been put into obtaining and evaluating seed harvesting, cleaning and conditioning equipment. A new mini-combine (see photo page 1), windrower with narrow header, and three screen fanning mill were added in 2003-

2004. The goal is to define and perfect production and processing methods for PMC releases and other species in order to maximize seed quality and ease of planting.

PARTNERSHIPS WITH OTHER AGENCIES

Upland Plants and Technology for the National Park Service

Since 1988 the Corvallis Plant Materials Center has developed and implemented numerous cooperative agreements with Olympic National Park, Mount Rainier National Park, and Crater Lake National Park of the National Park Service. These collaborative projects were created to share technical expertise, develop propagation or establishment technology, and produce indigenous plant materials for use in park revegetation programs. Over the past 15 years, the Corvallis PMC has collected, increased, and tested more than 50 native species, grown several hundred pounds of native grass and forb seed, produced thousands of containerized plants, and investigated revegetation techniques onsite (Crater Lake and Mount Rainier). High standards of seed quality and genetic integrity are guaranteed by isolating fields for each species and ecotype. Information on collection, field establishment and management, seed increase and processing for grasses and forbs, propagation and container production of herbaceous and woody species, and results of tests or trials are compiled and published in annual reports and presented at meetings. Many species have recently been added as protocols to the Native Plant Network website (www.nativeplantnetwork.org).

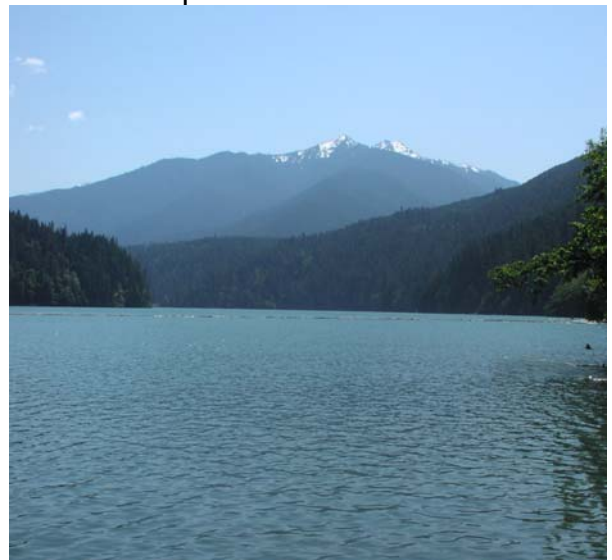
Increases for Crater Lake and Mt. Rainier National Parks

In 2004, The Corvallis PMC entered its second year of an agreement with Crater Lake National Park to produce 10,000 plants and 160 pure live pounds of seed for roadside revegetation along Highway 62. This agreement includes two grasses, three forbs, and five sedges and rushes. Plants will be delivered to the Park in the fall of 2004. New

this year is an agreement with Mount Rainier to produce 100 pure live pounds of seed of three grasses for roadside seeding along SR 123 within the Park. This work will continue through 2005.

Revegetation of Lake Drawdown Slopes and Roadsides within Olympic National Park

Two new agreements with Olympic National Park were signed in 2004. The first is for revegetation of shorelines and exposed lakebed slopes. Two dams on the Elwah River are scheduled to be removed in 2007 in order to restore salmon habitat. This will leave 500 acres of land in need of restoration under what is now Lake Mills and Lake Aldwell. The Park is relying on the Corvallis PMC for about one third of the plant material required for the entire project. The Center has agreed to produce plants and seed of 15 trees and shrubs, 11 forbs, six grasses, and four sedges and rushes. Several of the species needed for this work are forbs that require creative harvesting and handling procedures, such as fireweed (*Epilobium* spp. or *Chamerion* spp.). PMC employees began initial seed collections this summer with the help of numerous volunteers and Park staff. Seed increase fields and cutting blocks for vegetative propagation will be planted this fall. This agreement is scheduled to continue through 2009 when dam removal should be complete.



Lake Mills, Olympic National Park. The lake will be lowered and the Corvallis PMC will supply seed and plants for reveg.

In addition to restoration of the lower Elwah River, a second agreement involves materials for revegetation of the Park's Hurricane Ridge road project. Beginning in 2004 and continuing through 2007, work includes the increase of three native grasses and seven forbs. Collections have already begun. The PMC has agreed to produce 400 pounds of Pure Live Seed (PLS) on the farm and directly collect an additional 3.5 pounds of wild seed for roadside seeding.

Wetland and Wet Prairie Species for the Bureau of Land Management

In 2002, The Corvallis Plant Materials Center (PMC) entered into a new 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. Many of these species have proven difficult to establish in restored wetlands or have very high labor costs associated with collection (as high as \$2000 an ounce!). The PMC agreed to investigate and document propagation techniques from seed for these species and to evaluate their potential for agronomic seed increase. In three years, the Center has successfully propagated over 40 species, most of which have little if any published data on germination or production. New harvesting techniques, such as hand-made seed catchers, have been developed for small scale seed increase. These new techniques have increased yields by 400 percent while cutting collection time in half for difficult species such as slender phlox (*Microsteris gracilis*). Over 5 pounds of seed have been meticulously produced since 2003.

Native Grasses and Legumes for Fire Rehabilitation in Southern Oregon

Another agreement with the BLM began in 2004. Its Medford, Oregon district is regularly in need of native seed for fire rehabilitation projects. The PMC agreed to work with four native grasses that are seldom grown by large-scale seed producers. This spring the staff seeded one acre of grasses and four small

plots of legumes. It also began containerized production of four legumes and two forbs. Both BLM contracts are renewed on a yearly basis.

Common Garden Studies with the US Forest Service and Bureau of Land Management

The PMC has cooperated with David Doede and other staff and volunteers of the US Forest Service (USFS) on two common garden studies. The second also involved the Bureau of Land Management (BLM). The first study (1997-1999) was with broadleaf lupine (*Lupinus latifolius*) and included seed collected from 81 locations on the Mt. Hood National Forest. The PMC propagated all the materials, maintained one of two common garden sites, and participated in data collection. Results are now being published (refer to written technology transfer).

The second study (2000-2002) consisted of a common garden evaluation of big deervetch (*Lotus crassifolius*) comprised of material assembled from 141 locations across two National Forests (Siuslaw and Willamette) as well as BLM lands in western Oregon. All the seedlings were produced at the PMC and staff collected greenhouse data. Plants were then turned over to the USFS for planting, maintenance, and data collection/processing. The purpose of both projects is to evaluate genetic diversity within each species in relation to the environment and use the data to develop preliminary seed zones and seed transfer guidelines for ecological restoration. Broadleaf lupine and big deervetch are important native legumes that help fix nitrogen and act as early successional species on infertile or newly disturbed sites.

SPECIAL ASSISTANCE AND DEMONSTRATIONS

Seed Collection and Production of White Alder (*Alnus rhombifolia*)

In the summer of 2003 the PMC was contacted by Jeff Bash, Council Coordinator for the

Yamhill Basin Watershed Council, based in McMinnville, Oregon. He was interested in collecting seed from locally adapted white alder (*Alnus rhombifolia*) and growing it out for use in basin restoration projects. Jeff had also contacted Brad Withrow-Robinson, Extension Forester at the Yamhill County Extension Office and the Soil and Water Conservation District. Following an initial meeting of the interested parties, we extended the original idea to make the white alder available to others in addition the basin council. The extension agent contacted a forest genetics specialist on campus and we were provided with a seed collection strategy. We identified the Willamette Valley as a suitable collection zone and also determined since white alder occurs only at low elevations in the valley, no separation by elevation was necessary. The collection strategy was to collect from at least 20 parent trees, in 4 to 6 stands scattered throughout the valley (the seed zone). After we all collected the seed from the various sites, it was delivered to the PMC. We cleaned, labeled and stored the seed for future delivery to growers. Brad notified potential growers of the available seed and in the spring of 2004 we provided seed to two commercial growers and the D.L Phipps, Department of Forestry nursery at Elkton for grow out. With this effort, white alder, known to be ecologically appropriate to Willamette Valley riparian corridors, will be available for late winter planting next year.

Clover Ridge Elementary School Native Plant Community Demonstration Garden

Early in 2004 Jean Townes stopped by the PMC requesting information about local native plants and upland prairie plant community structure. Jean was directed to us by Steve Smith, habitat restoration biologist with the local office of the U.S. Fish and Wildlife Service whom she had contacted for assistance. She serves as librarian for the Clover Ridge Elementary School in Albany, Oregon. Early in 2001, she and third grade teacher Chris Gjaltema decided to begin planting a number of native northwest trees to serve as an

outdoor classroom for the students at the school. Following a couple of years of tree planting, they decided to increase the effort and add shrubs, herbaceous perennials and native grasses. They successfully recruited a number of parent volunteers and secured a \$5,000 grant from Linn County. After meeting with Jean and discussing the matrix grasses anchoring our upland prairie communities, the PMC agreed to grow 200 plugs of Roemer's fescue for her. Late in August we delivered the plants and assisted with planting them through the weed control fabric they had installed.



Chris Gjaltema planting plugs of Roemers fescue at Clover Ridge Elementary School

The Roemer's fescue will serve as the matrix species for the upland prairie demonstration garden. As the fescue becomes established we have agreed to provide additional native grasses and herbaceous perennials to fill in the prairie. We will be providing these additional plants and continue to consult on plant community structure, planting technique and maintenance over the next couple of years.

Native Grass and Threatened and Endangered Species Gardens

In 2002 the PMC established a native grass demonstration garden. The garden includes between 26 and 32 species of native upland prairie, woodland, wet prairie, and marsh-bog grasses, organized by habitat type. It is used for training NRCS field office, Soil and Water Conservation District, and other personnel on native grass identification and use. The staff also designed and installed an endangered species garden in 2003 for similar purposes.

The Berry Botanic Garden donated seeds of seven endangered species of the Corvallis PMC service area: Willamette valley daisy (*Erigeron decumbens* var. *decumbens*), Bradshaw's lomatium (*Lomatium bradshawii*), Nelson's checkermallow (*Sidalcea nelsoniana*), Kincaid's lupine (*Lupinus sulphureus* spp. *kincaidii*), peacock larkspur (*Delphinium pavonaceum*), shaggy horkelia (*Horkelia congesta*), and Curtus's aster (*Aster curtus*).

WRITTEN TECHNOLOGY TRANSFER

The PMC regularly produces publications and makes technical and popular presentations in order to disseminate technology to NRCS, SWCD, and other partners, as well as the general public. Papers include technical reports, technical notes, brochures, plant guides, and fact sheets summarizing work and plant releases. Major publications in 2003 were:

- "Propagating and Planting Tule (*Schoenoplectus acutus*) at Johnson Lake: Final Results of Cooperative Work with The Confederated Tribes of the Warm Springs Reservation of Oregon (poster paper and published abstract).
- "Festuca roemerii Common Garden Study" (poster paper and published abstract cooperative with the Institute for Applied Ecology).
- "Geographic Patterns of Genetic Variation and Isozyme Variation in Broadleaf Lupine (*Lupinus latifolius*) on the Mt. Hood National Forest (poster paper and published abstract cooperative with the US Forest Service).
- "Native Plant Propagation, Seed Increase, and Revegetation Efforts: the Role of the Corvallis Plant Materials Center in Western Oregon and Western Washington" (published summary in proceedings and conference presentation).
- "The 2002 Crater Lake National Park Annual Report: Mazama Dorm".
- "The 2002 Bureau of Land Management Annual Report: West Eugene Wetlands".
- In addition to these, the PMC documented the addition of 9 new plant propagation protocols written and entered in the Native Plant Network.

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