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NRCS Natural Resources Conservation Service

Corvallis Plant Materials Center
2002/3 Progress Report of Activities

Plant Materials Program

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Responsibility for the 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 the fields of native plant propagation and establishment, seed production, revegetation, and erosion control, and to test and release plants or sources for restoration of riparian areas, wetlands, and uplands.

One of two Corvallis PMC Greenhouses

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 related affiliations that utilize technology developed by the program, and
- ✓ Commercial seed and plant producers who receive seed and plants of selected species.

WHAT'S NEW IN THIS ISSUE:

PLANT EVALUATIONS AND RELEASE

Plants are collected and/or selected for their physical attributes, area of adaptation, potential performance, or documented capabilities from a series of evaluations aimed at addressing conservation needs. Studies often begin with large assemblies of 40 or more populations (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 then is 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. One good way for the PMC to address this need is to provide 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 amount of testing and evaluation they undergo.

Release of Skamania Germplasm Sitka alder (pre-varietal, selected class)

The PMC is making the final preparations and securing the appropriate signatures for releasing Skamania Germplasm Sitka alder. Sitka alder (*Alnus viridis* ssp. *sinuata*) is a deciduous, sweet-scented shrub, or small tree native to the Pacific Northwest that forms a symbiotic relationship with nitrogen fixing bacteria. It grows from sea level to timberline in thickets on wet slopes, or along mountain streams and pond margins. It is generally a slender shrub, up to 10 feet in height, but may grow to 20 feet tall. It most often appears as a pioneer plant in areas of heavy snow accumulation and where abundant seepage 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 selected for its rapid growth rate, stem density, vigor, size, aesthetic appeal, and abundant seed production. Recommended uses include riparian site revegetation, streambank erosion control, critical area stabilization, 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.

Twig of Sitka alder with leaves, immature female "cones" (green) and male catkins (brown).

The area of adaptation for Skamania Germplasm includes the Western Columbia River Gorge, Cascade and Olympic Mountains, Coast Range and Puget lowland ecoregions (<1500 ft), including the Umpqua Valley of Oregon (<1500 ft). This is roughly equivalent to the lower elevations of USDA Major Land Resource Areas 1, 2, and 3 and USDA Plant Hardiness Zones 7b to 9b. Adaptation may extend to MLRA’s 4 and 5 in southwestern Oregon and northwestern California, but more testing is required.

Common Garden (Genecology) Study of Roemers Fescue

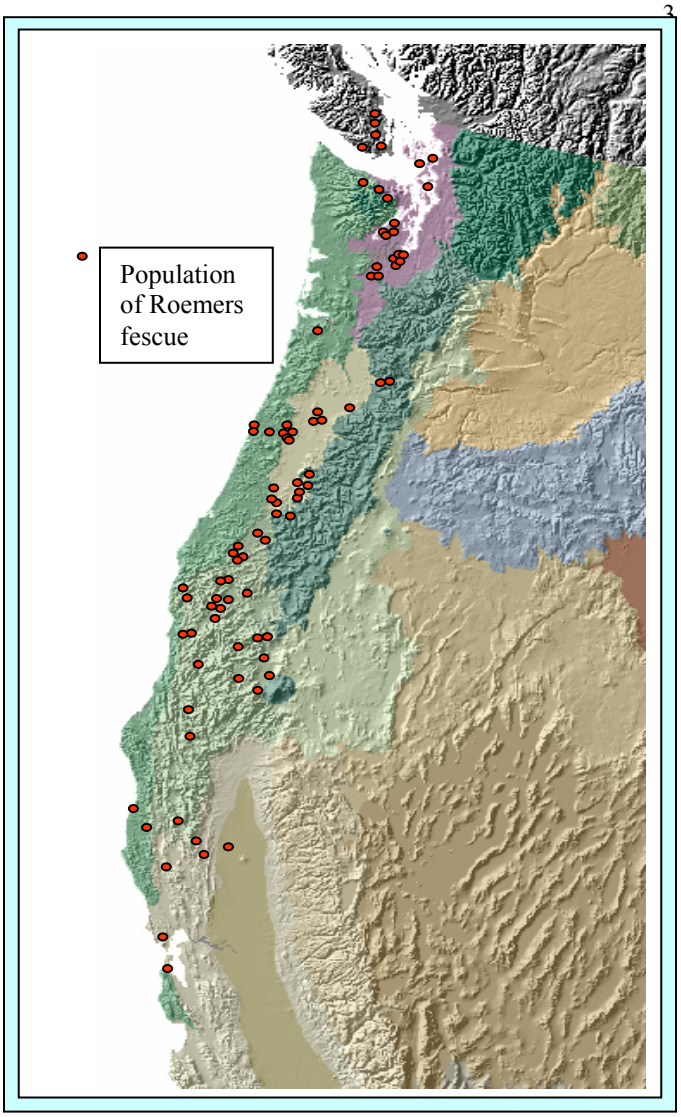
Roemers fescue (*Festuca roemeri*) is a native fine leaf fescue found exclusively west of the Cascade Mountains in Washington and Oregon as well as northwestern California. Historically it was once a dominant bunchgrass of oak savannas and prairies throughout the coastal region, in addition to being found in pine savanna on serpentine soils and the edges of grassy balds. Habitat loss has severely depleted its range and remnant populations are highly fragmented. It was

formerly thought to be west-side Idaho fescue or mistaken for red fescue.

There is widespread interest in using Roemers fescue for ecosystem restoration as well as revegetation and erosion control. However, useable seed supplies are absent or controversial because of the lack of information on the species genetic diversity and the importance of that diversity for adaptation and seed transfer across the region. In order to address these concerns, a collaborative study of Roemers fescue was initiated in 2001 between the Corvallis PMC, Institute for Applied Ecology in Corvallis, and the Bureau of Land Management. The objective is to collect seed from remaining populations throughout its natural range, grow out specimens in a uniform environment (common garden) in order to compare visual traits, and then identify patterns of variation that relate back to the plant's original environment (collection sites). The scientific study of genetic variability and adaptive properties of populations in relation to the environment is known as GENECOLGY.

Major outcomes of the work will be to (1) establish preliminary seed zones and seed transfer guidelines for Roemers fescue and (2) make pre-varietal release of populations specific to these zones for use in restoration. Other populations may potentially prove valuable for vineyard cover crops, general erosion control, low maintenance turf, or native plant landscaping.

Roemers fescue will commonly have blue foliage. (photo by Barbara Wilson, Institute for Applied Ecology)



Map of known populations of Roemers fescue (Source: Institute for Applied Ecology).

Future Plant Releases

Besides Sitka alder, other native shrubs targeted for pre-varietal release within the next two to six years include an ecotype of Pacific serviceberry (*Amelanchier alnifolia* spp *semiintegrifolia*) from western Oregon and five ecotypes of oceanspray (*Holodiscus discolor*) which will be ecoregion specific. Within 10 years additional releases are likely to include several ecotypes 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.

PLANT TECHNOLOGY

The NRCS is a USDA agency given the responsibility of administering technically based 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 is incorporated into the Field Office Technical Guide (FOTG) and becomes 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 Grazing Lands Application (GLA), Revised Universal Soil Loss Equation (RUSLE), and PLANTS database.

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

⇒ evaluating and increasing plant materials for use in soil bioengineering techniques;
⇒ evaluating monitoring and maintenance needs of sites restored or revegetated through soil bioengineering, direct seeding and planting;
⇒ assessing flood inundation tolerance of select native grass, forb, and woody species;
⇒ 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;
⇒ increasing and testing plant materials for revegetation of high elevation areas in Crater Lake National Park;
⇒ Increasing and determining seed propagation methods of wetland species for the Bureau of Land Management; and
⇒ assisting Native American tribes with collection, propagation, and establishment of culturally significant plants.

Overall, about 40 new or ongoing studies and increases were conducted in 2002-2003. Technology produced by the staff during the year included at least 12 publications and 7 oral presentations. In terms of production, over 9,000 plants, thousands of linear feet of cuttings and willow poles, and 265 pounds of seed were produced in 2002. Sixteen NRCS field offices and 40 partners (mostly other agencies), were assisted, along with many other individuals from the general public.

Soil Bioengineering Studies in Progress at the Corvallis PMC

Soil bioengineering involves the use of plant materials with or without traditional engineering structures to stabilize streambanks. Studies demonstrating some of the simpler soil bioengineering techniques, such as live stakes, fascines, pole plantings, and brush mattressing were initiated in 1994. Objectives included the evaluation of suitability and effectiveness of plant materials, particularly the Corvallis PMC cultivars of willow (*Salix* spp.), redosier dogwood (*Cornus sericea* spp *occidentalis*), and Douglas spirea (*Spiraea douglasii*), at several locations within the PMC service area. Since that time, four of these studies (Mill Creek, Dean Creek, West Fork Dairy Creek, Columbia River dredge spoils) have been established and evaluated at least annually through 2002.

Results of these studies have been informative. Effectiveness of technique, species/ecotype varied with site. Access to soil moisture during the first growing season is critical to survival of plant materials, particularly live stakes and fascines. Competition from herbaceous species, particularly reed canarygrass (*Phalaris arundinacea*), greatly reduces survival and growth of live stakes and stem density in the brushmattress.

Browsing by mammals and rodents also affects survival and growth of plant materials. Lastly, even with appropriate design, excellent site preparation, quality plant materials, and proper installation, an effective maintenance and monitoring plan is key to the continued success of soil bioengineering practices.

Besides testing existing PMC cultivars, Corvallis is also evaluating a number of additional native shrubs common to our service area for their potential use as live stakes and fascines, as well as their general ability to root in a greenhouse or field from dormant, hardwood cuttings. Results from four of these trials (sites) evaluated since 2000 have shown there are several other shrubs with potential for soil bioengineering besides redosier dogwood and Douglas spirea. They include black twinberry (*Lonicera involucrata*), common snowberry (*Symphoricarpos albus*), salmonberry (*Rubus spectabilis*), and Pacific Ninebark (*Physocarpus capitatus*). Even mockorange (*Philadelphus lewisii*) demonstrates good rooting ability in light textured soils. However, site conditions are more exacting for these native shrubs and none will perform as well as native willows even under the best of conditions.

Fall Planting of Unrooted Cuttings, Stakes, and Branches Should Improve Success of Native Shrubs for Soil Bioengineering

Previously, soil bioengineering, live stake, and standard rooting trials using native shrubs have only been conducted by the PMC in late winter or early spring using dormant materials. However, fascines, stakes, and brush mattresses have been successfully installed in the fall using willows. Could the same be done with easy to root native shrubs? That is, can dormant materials, collected and immediately planted outdoors in the fall (October-November), root over winter prior to ever leafing out in spring? The answer is yes, at least for cuttings of black twinberry, common snowberry, salmonberry, Douglas spirea and mockorange.

Results from two recent rooting trials (2001-2002 and 2002-2003) demonstrate that 90-100 percent of the cuttings of these species will readily root over winter. The first study which compared cuttings collected on three different dates (October 26, November 8, and December 10), generally confirmed that the earlier the cuttings are taken and planted the better. Furthermore, root development of black twinberry, common snowberry, and salmonberry easily exceeded that of 'Mason' redosier dogwood, was as good or better than Douglas spirea, and approached that of 'Plumas' sitka willow (*Salix sitchensis*). However, Pacific ninebark rooted sporadically at best over winter. It may require warmer soil temperatures or a longer period of time.

There is good reason to believe that rooting trail results will extrapolate to live stakes and other soil bioengineering techniques. For example, in 2000-2001 salmonberry fascines harvested and installed at Boyce Creek in Kitsap County, WA, in mid-September (with leaves stripped) proved very successful. Furthermore, it is easy to speculate that survival of cuttings, fascines, and other soil bioengineering practices made and planted in the fall, should improve drastically over winter and early spring installations, simply because the roots are already well developed long before the material ever leafs out. The PMC now recommends that soil bioengineering and and the planting of unrooted cuttings be completed in the fall whenever possible.

Over winter root development on hardwood cuttings of redosier dogwood, black twinberry, common snowberry, and salmonberry (left to right). Cuttings were harvested and planted outdoors in late October.

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 try and 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*). Results will be presented in 2004.

Beside these species, other native grasses were increased and their production or propagation methods evaluated in 2001. They include rice cutgrass (*Leersia oryzoides*), Pacific bluejoint (*Calamagrostis canadensis*), and tall mannagrass (*Glyceria elata*) which are all wetland or marsh grasses, and Roemers fescue (*Festuca roemeri*), an upland grass. Seed of these species is made available for field scale testing on private and public lands.

Seed increase of rice cutgrass in PMC pond.

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. In 2002-03, evaluations on rice cutgrass, pine bluegrass (*Poa scabrella*), Lemmon's needlegrass (*Achnatherum lemmonii*), bearded fescue (*Festuca subulata*), Alaska oniongrass (*Melica subulata*), and nodding semaphore grass (*Pleuropogon refractus*) demonstrated or confirmed that cold, moist stratification periods of 180-240, 30-60, 90, 30, 70-90 days, and 90 days respectively, were important for the seed germination of each species. Other native grasses like Prairie junegrass (*Koeleria macrantha*), nodding trisetum (*Trisetum cernuum*), and slender hairgrass (*Deschampsia elongata*) appear to have no similar requirements for germination.

Finally, significant amounts of time and funds have been put into obtaining and evaluating seed harvesting, cleaning and conditioning equipment. The goal is to define and perfect these methods for PMC releases in order to maximize seed quality and ease of planting.

PLANT MATERIALS CENTER PARTNERS WITH OTHER AGENCIES

Wetland Species for the Bureau of Land Management

The Corvallis Plant Materials Center (PMC) entered into a new agreement in the spring of 2002 with Bureau of Land Management (BLM) to perform seed germination trials of 21 native wetland and wet prairie species. The West Eugene Wetlands program has been collecting wild seed and sowing it into wetland restoration projects. Some species have been difficult to establish or have very high labor costs associated with collections. The PMC agreed to discover and document propagation techniques from seed for these species and to evaluate their potential for agronomic seed increase. Activities in 2002 included germination trials on 21 species, seed increase on five annual forbs, and containerized production of 18 species. Five species of annuals were selected for experimental seed increase with positive results. A total of 489

grams of seed were produced. The PMC successfully germinated 19 of 21 species and produced a total of 4756 plants. Further agreements with the BLM may include seed increase of three S*idalcea* species and trials to control seed predation by weevils.

Upland Plants and Technology for the National Park Service

The Corvallis PMC has developed cooperative agreements with the National Park Service since 1988, involving Olympic National Park, Mount Rainier National Park, and Crater Lake National Park. This cooperative work was initiated to share technical expertise and to develop indigenous native plant materials for use in park revegetation programs. Over the past 15 years the Corvallis PMC has had the opportunity to collect, increase and test more than 50 native plant species, produce several hundred pounds of native grass/forb seed and thousands of containerized stock, and investigate revegetation techniques onsite in Crater Lake and Mount Rainier National Parks. High standards of seed quality and genetic integrity are guaranteed by isolating fields for each species. Information on collection, field establishment and management, and seed production and processing techniques for grasses and forbs, propagation and containerized stock production of herbaceous and woody species, and results of tests or trials are compiled and published in annual reports and presented at meetings. Many have recently been added as protocols to the Native Plant Network website (www.nativeplantnetwork.org).

In 2002, the Corvallis PMC continued with the seed increase of one sedge and two native grasses as part of an annually amended agreement with Crater Lake National Park. The purpose is to produce material for revegetation associated with the Mazama Dorm Project. The PMC produced 152.5 bulk pounds of California brome (*Bromus carinatus*), 105.8 pounds of blue wildrye (*Elymus glaucus*) and 0.5 pounds of thick-headed sedge (*Carex pachystachya*). Excellent purity results were obtained for all seed lots and germination was satisfactory. No other work with either Mt. Rainier or Crater Lake National Parks occurred in 2002, although negotiations took place for new projects to begin in 2003 and 2004.

CORVALLIS PMC WORKS WITH TRIBES

Cooperative work between the Confederated Tribes of the Warm Springs Reservation of Oregon and the Corvallis PMC concluded on bulrush or tule (*Scirpus acutus*). This species is an important cultural resource plant used for mat making, funeral and name giving ceremonies, lodge and floor coverings, traditional garments, and even a food source at certain times of the year. Several experiments and demonstration plantings were conducted between 1997 and 2000. Final results were reported in a poster presentation at the PNW Society for Ecological Restoration-Society of Wetland Scientists, joint regional conference in Portland, OR (March 2003).

In 2002 the PMC and Warm Springs NRCS office propagated and planted a field evaluation planting of common chokecherry (*Prunus virginiana*). This species is an important traditional food crop for the Warm Springs Tribes. The PMC produced 200 containerized seedlings in winter. They were then out planted in April along a seasonal stream on the reservation in order to enhance the plant community and compare growth and survival with and without a plastic, woven weed barrier.

Finally, work continues with common and great camas (*Camassia quamash, Camassia leichtlinii*), both highly valued for their traditional use in "cakes", as a sweetener, and as a trade commodity when dried. Data continues to be collected each spring from a wetland revegetation trial using camas sown under three different site preparation treatments (burn, till, mow) with and without with herbicide and mulch. In addition, great camas is being managed in rows for seed production. After four growing seasons the plot has reached flowering stage (2003).

TECHNOLOGY TRANSFER: DEMONSTRATIONS AND TECHNICAL PUBLICATIONS FOR 2002-3

New Native Grass Demonstration Garden

In 2001, PMC staff began designing a native grass garden to demonstrate the growth habit and flowering of native wetland, forest, and upland grasses. Seeds of 32 species were collected from wild sources, donated by cooperators, or bought from local seed companies. The wetland portion of the garden was excavated 18 inches, a pond liner was laid down, and the soil was replaced. Water level is controlled seasonally to simulate a Willamette Valley wetland. Trials were performed on those species with unknown germination requirements. Plugs were produced and plants were then transplanted in a mulched planting bed in the spring of 2002. The garden will be used for informational purposes such as training NRCS and SWCD staff as well as others that are interested in using native grasses. The PMC plans to produce fact sheets for each of the 32 grasses in 2003-04.

Slender hairgrass (left) and slender wheatgrass (right) are excellent choices for cover and erosion control on wet and dry prairies, respectively.

Threatened and Endangered Species Garden

After completion of the production of plants for the grass demonstration, PMC staff began designing an endangered species garden. 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*). In the fall of 2002, the seeds were sown in containers and placed in a cooler for the cold-moist stratification period needed to break seed dormancy. Seedlings were moved to a greenhouse in early spring of 2003 and later, transplanted into a mulched bed adjacent to the native grasses.

Technical Notes are a primary means by which new technology developed by the PMC is disseminated to NRCS, SWCD and other partners, as well as private cooperators. Technical reports, brochures, plant guides, and fact sheets summarizing work and plant releases are also produced. Major publications in 2002 included:

- "Ability of Pacific Northwest Native Shrubs to Root From Hardwood Cuttings (with Summary of Propagation Methods for 22 Species). Plant Materials Technical Note No. 30 (Oregon).
- "Native Shrubs as a Supplement to the Use of Willows as Live Stakes and Fascines in Western Oregon and Western Washington." Plant Materials Technical Note. No. 31 (Oregon).
- "Skamania Germplasm Sitka Alder". Fact Sheet.
- "The 2001 Mount Rainier National Park Annual Report: Mather Memorial Parkway Project".
- "The 2001 Crater Lake National Park Annual Report: Mazama Dorm".
- "The 2001 Crater Lake National Park Annual Report: Vidae Falls Picnic Area".
- In addition to these, three other technical papers were written and produced in 2002.

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Photos by PMC staff unless otherwise indicated.