USDA NRCS United States Department of Agriculture
Natural Resources Conservation Service

Pullman Plant Materials Center Progress Report of Activities - 2001

Issued April, 2002

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Harvest time for a green manure cover-crop in 1937

A cover crop trial for wind-erosion control in 2001

Who We Are

The NRCS Plant Materials Program develops cost effective vegetative solutions for soil and water conservation problems. The Program consists of 26 plant materials centers (PMC), which receive financial and/or technical assistance from the NRCS. The Pullman Plant Material Center lies in the heart of the Palouse Hills region of Eastern Washington; an area that is internationally recognized for its outstanding wheat yields and sadly, some of the highest soil erosion in North America.

Soil and Water Issues of Washington & Oregon East of the Cascades

Many of the soils in this region are loess deposits that are very susceptible to wind and water erosion despite the fact that much of the region receives less than 14 inches of annual precipitation. Dry-land winter wheat farming and irrigated farming in the Columbia Basin are large and important enterprises. Unfortunately, several hundred thousand acres of cropland go into the winter with insufficient cover to protect the soil each year.

Another conservation problem stems from annual weeds that have largely replaced native rangeland vegetation in many areas. Noxious weeds are also invading our forested areas. These undesirable plants greatly impede natural revegetation and threaten wildlife that depend on a healthy environment.

Objectives

In order to combat the ever-changing environmental problems that the Palouse and surrounding regions face, the Pullman PMC is currently conducting the following projects:

- Developing technology and plant material that are drought tolerant for our areas of low precipitation
- Developing cover crops for wind erosion control
- Developing native plants that provide wildlife habitat and restore stream banks and other natural areas
- Developing techniques to enhance stands of desirable plants to suppress invasive plants

Cover Cropping in 2001

Cover cropping has a long history in the Pacific Northwest. Farming in the 1930s mined the soil of nutrients, and there was a dire need for fast-establishing plants that would produce large amounts of top growth. Because synthetic fertilizers were not readily available, these plants were needed to replenish the soil with nutrients and improve soil tilth. This practice is known as green manuring.

Much of the early testing was conducted at the Pullman Nursery Unit at the PMC. Back then, a team of horses provided the power to seed and harvest plots, and a team of dedicated USDA and Washington State University conservationists provided the hand labor. This second team was under the direction of Dr. A.L. Hafenrichter, and thus became known as “Haffie’s boys.” Together, they developed the first cover crops for use in the Pacific Northwest.

In 2001, the PMC and WSU staffs installed cover crop plantings in the irrigated Columbia Basin. These plantings were designed to improve the cost effectiveness of fall cover cropping. The first wave of plantings was installed in potato and onion fields prior to digging the crops. Cover crop seed was scattered on the fields to mimic a typical aerial seeding. Immediately after the potatoes and onions were dug the following day, the second wave of plantings was installed. Cover crop seed was scattered and incorporated to a depth of two-inches.

Our results indicated that seeding the cover crops before the potatoes and onions were dug produced thinner stands. We found that simply doubling the seeding rate was all that was needed to acquire the same plant density. Also, aboveground biomass was roughly 50 percent of the post-dig seeding until the three-leaf stage. Once the plants acquire this stage, the thin stands tillered more profusely and the amount of biomass was similar to the post-dig biomass amounts. The cost analysis data will be analyzed in 2002.

Blue Wildrye for the East Slope of the Cascades

Blue wildrye is an important soil-stabilizing grass that grows in the mountains of the Pacific Northwest. This tall, wide-leafed grass establishes quickly and frequently is among the first plants to occupy slopes following catastrophic fires. 'Elkton' and 'Arlington,' two blue wildrye cultivars developed by the Corvallis PMC in Oregon, are suited for the climatic and ecological conditions east of the Cascade Range. The need for a blue wildrye adapted to conditions east of the Cascade Range prompted the Forest Service and the Pullman PMC to collaborate on a study of this species.

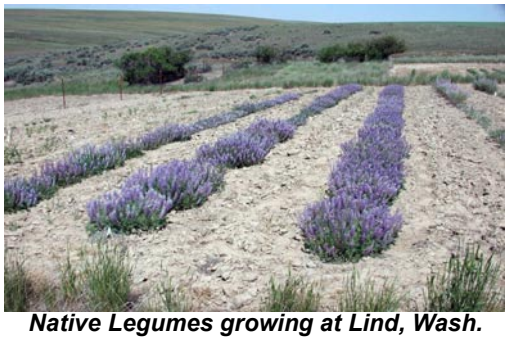
Breeder block of blue wildrye

In 1994, personnel from the Wenatchee and Umatilla National Forests gathered seed of 225 separate populations of blue wildrye. The seed was provided to the Pullman PMC in January 1995, planted to individual pots in the greenhouse, and over 3,600 plants were transplanted to the field later that spring. The study carefully evaluated several morphological features of each plant for three years, such as plant height, flowering dates, and seed color. Vicky Erickson, Forest Service Geneticist, compiled the collected data and is correlating plant characteristics with various environmental gradients. During the course of the study, several individual plant collections consistently displayed superior traits that included freedom of disease, large basal area, high seed production, and high vigor. A population that originates from the east slope of the Cascade Range near Yakima, Wash., (Accession No. 9033968; elevation of 4,500 ft, Little Naches River drainage) was selected for seed increase.

Blue wildrye, 9033968, was seeded to an increase field block at the PMC last fall. Several growers and the Washington State Crop Improvement Association have expressed great interest in this material and are hoping to obtain seed from the Pullman PMC soon.

Native Legume Study

The Pullman PMC planted a collection of native legumes at Lind, Wash., on April 13, 2000, consisting of a variety of milkvetches, lupines, vetches, clovers and others. The purpose of this planting was to provide diversity in plantings where soil protection is a priority, such as the Conservation Reserve Program. These areas in eastern Washington and Oregon receive less than 14 inches of annual precipitation.



Native Legumes growing at Lind, Wash.

After two years of evaluations, many of the milkvetches performed poorly. However, one accession stood out with excellent vigor, decent seed production without shattering, and above all, spreads out slowly from its roots. It also germinated rapidly, which is a desirable attribute for dry areas. This accession, 9033982, was collected near Summer Lake, Ore., by Mark Keller of the Hines, Oregon Field Office. It is being grown in containers in the Pullman PMC green house and will be transplanted in spring 2002 at two locations for seed increase. We are anticipating that the harvested seed from these plantings will allow us to do testing at outlying sites soon.

Wetland Mitigation on the Plant Materials Center

The City of Pullman, Wash., recently completed the installation of a 'created wetland' on the Pullman PMC. This new wetland was needed to mitigate one that was lost due to road construction. This not only makes up for the loss of the previous wetland, which was located in a different drainage, but also marks the gradual return of the original wetland lost in 1936 when Airport Creek was straightened.

Last year, Airport Creek was deeply channeled and reed canarygrass dominated the floodplain with a few large willow trees growing on its banks. Beavers occasionally ventured up the creek and went about their business of pruning the willows, but they never stayed long. Few wildlife species made use of Airport Creek because the reed canarygrass was too dense and the stream itself tended to dry down in the summer. Airport Creek was ready for a makeover.

A wetland consultant hired by the City of Pullman met with PMC staff, city engineers, and Washington State University land managers, and designed a wetland that mitigated the loss of the other wetland and prepared the new site for several wetland features.

The design was complete in 2000 and construction began soon afterward.

Contractors with the aid of bulldozers, scrapers, and track hoes created oxbows, a shallow pond with an island, and a sinuous drainage alongside Airport Creek. Even with all of this activity, Airport Creek itself was not altered in order to comply with various regulations. Planting crews hired by the City of Pullman followed the earthmovers in the spring of 2001.

Literally thousands of plastic tree-protection tubes are scattered along Airport Creek containing willows, dogwoods, serviceberries, and cottonwoods, as well as many other species transplanted in the 12-acre wetland. Plant survival was fairly high the first year and wildlife were quick to make use of the area. With time and some help from rogue beavers, Airport Creek will be dammed and the 'created wetland' will be even more functional.

Reed Canarygrass Suppression

Reed canarygrass dominates many of the streambanks in the Pacific Northwest. Recently, it has come under intense criticism because it effectively prevents trees and shrubs from establishing along the streambanks it occupies. Trees and shrubs are key to the survival of Pacific salmon runs. They provide shade to cool the water and also provide shelter for salmon fry by leaving woody debris behind in the stream channel. The debris is also critical for developing pools and riffles needed for spawning fish.

Reed canarygrass growing along a streambank

The PMC initiated a pilot study in 1996 that compared chemical and mechanical means to kill reed canarygrass in a wetland meadow with the hopes that other wetland species might re-colonize. While the control techniques proved promising, natural re-colonization by desirable vegetation did not materialize. As a result, it became quite clear that a passive revegetation approach would be inadequate to replace reed canarygrass.

A Plant Materials Technical Note entitled "Biology, History, and Suppression of Reed Canarygrass (*Phalaris arundinacea L.*)" was developed by the PMC and distributed to field offices within the Pacific Northwest states. This Technical Note also reviews the advantages and disadvantages of several techniques to suppress reed canarygrass.

A field study is currently being conducted near the Pullman PMC to evaluate 16 grass and legume treatments for revegetation on a site where reed canarygrass was suppressed with an application of glyphosate. Each species was transplanted into the dead reed canarygrass in the spring, and seeded in adjacent plots in the fall. This study will determine which grasses and legumes have the potential to persist on site and withstand re-invasion of reed canarygrass.

Another study being conducted in collaboration with the Kallispel Indian Nation is designed to evaluate the potential of replacing reed canarygrass with prairie cordgrass (*Spartina pectinata*). Resource specialists with the Kallispel Tribe identified several sites where prairie cordgrass, a culturally significant plant, appeared to be replacing reed canarygrass. The PMC initiated a battery of tests to determine if indeed reed canarygrass was being replaced. One test compared the soils under the two species, another will compare the competitiveness of both species, and another will determine the response of prairie cordgrass to fertilizer. The Kallispels and the PMC hope to develop techniques to restore stands of prairie cordgrass in meadows currently under reed canarygrass cover.

Needle-and-Thread (*Hesperostipa comata*) Seed Studies 2001

Needle-and-thread (*Hesperostipa comata* – formerly *Stipa comata*) is a native, perennial bunch grass that grows throughout much of the West, Midwest, and Canada. It is extremely drought tolerant and can grow in areas with as little as five inches of annual precipitation. It occurs in elevations from 300 to 7,500 feet and is one of the few native grasses that will grow on medium-to-coarse textured soils in the arid regions of the Pacific Northwest. Needle-and-thread begins to grow early in the spring and finishes prior to summer drought. It provides good spring forage for cattle and deer while the foliage is still green, and is used by elk in the winter.

Needle-and-thread is currently in high demand by the public land agencies for reclamation purposes. This species has the potential of being planted on as much as 500,000 acres in the United States. Unfortunately, a persistent callus and awn on this seed have greatly impeded its acceptance by the seed-growing industry. The awn must be mechanically removed, but it is not known whether this is detrimental to the seed.

A study was initiated at the Pullman PMC in late 2001 at the request of a local seed grower. The purpose of the study was to determine if needle-and thread seed viability was compromised by typical seed harvest and conditioning operations, as well as to determine if conditioned seed lost viability over time faster than unconditioned seed.

The L & H Seed Co., Inc., located in Connell, Wash., provided the Pullman PMC with three different lots of needle-and-thread seed. Lot 1 was seed that had been lightly threshed, Lot 2 was seed that had been

run through a conventional combine, and Lot 3 was seed that was run a second time through the combine. Conditions for germinating needle-and-thread were unknown, so a battery of conditions was tested to determine which condition provided optimal germination. The conditions included cold-light stratification, cold-dark stratification, 0.2 percent potassium nitrate, no stratification in the dark, and the check, which was no stratification in light.

The characteristic awn of needle-and-thread

After being placed in the germinator for 21 days, the seed that received the cold-dark stratification treatment had a 50 percent increase as compared to our control. The seeds that germinated in the dark with no stratification also had a significantly higher number of seeds germinate than the check. The potassium nitrate and cold stratification-light treatments showed absolutely zero increase in germination as compared to the check.

We plan to run these experiments again in three, six and nine months to determine if seed viability remains the same. Only Lots 2 & 3 (combined and re-combined seed lots, respectively) will be used because the threshold lot consistently results in poor germination rates.

Palouse Prairie Restoration

The Palouse Prairie, like the tall grass prairies of the Midwest, has been reduced to fragments surrounded by large areas of cropland. A group of local concerned citizens banded together to learn more about this natural landscape. Among one of the tasks identified by this group, the Palouse Prairie Foundation, was to learn more about the propagation of several key Palouse Prairie species. A seed increase block was established at the PMC to grow seed for propagation trials.

Seed harvest from most of the 40 species originally grown in the Initial Seed Increase planting produced yields in 2001 ranging from a few grams to several pounds. Four-year-old Arrowleaf balsamroot, a slow-developing, yellow-flowered plant that is prominent on the Palouse Prairie, flowered for the first time. Four-year-old Northern mule's-ears plants continued to grow as well, but did not produce flowers or seed. Two new species also were added to the planting from 1999 collections and one new species was collected during the summer of 2001.

We also initiated a series of trials on 14 different species to evaluate the effect of direct-seeding broadleaf herbaceous prairie plants, called forbs, with prairie grasses. We found that only four forb species established, two of which were annuals. Our results indicate that many forb species may benefit from fall seeding.

Trials to examine method for increasing species diversity in hard fescue plantings were also established during 2001. These trials compare transplanting and direct-seeding native forbs into mowed, unmowed, and cultivated strips and will monitor the establishment and spread of 12 species. Existing populations of native plants in the same fields were plotted and will be monitored for persistence and spread. We also found that Sandburg bluegrass may have the ability to replace Downy bromegrass on shallow, rocky (lithosolic) soils where tillage is not possible, and initiated several studies to evaluate that ability in 2001.

Lastly, a five-acre seeding of prairie grasses in 2000 was successful. The planting was sprayed and mowed to control broadleaf weeds in 2001. Trials to determine how best to introduce the native forbs and shrubs to the prairie will be initiated once the broadleaf weed population has been reduced.

For More Information

To obtain seed, plants, or information on conservation uses for PMC plant releases, contact your local NRCS office or us at:

USDA – NRCS
Pullman Plant Materials Center
P.O. Box 646211
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To learn more about these and other PMC activities, visit our website: www.wsu.edu/pmc_nrcs/ or http://Plant-materials.nrcs.usda.gov.

National PMC Locations