

PLANT MATERIALS TECHNICAL NOTE

Acid and Heavy Metal Tolerant Plants for Restoring Plant Communities in the Upper Clark Fork River Basin

by

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Integration of Selected Native Plant Materials for Enhanced Restoration Activities in the UCFRB

Introduction

Efforts to restore functional native plant communities in the Upper Clark Fork River Basin (UCFRB) began in 1995 with the Development of Acid Tolerant Cultivars (DATC) study, and continued in 2004 with the Development of Acid/Heavy Metal Tolerant Releases (DATR) phase of the project. The site conditions at the Comparative Evaluation Planting (CEP), known as Stucky Ridge, had an average soil pH of 4.5. Most soil samples contained arsenic and copper concentrations exceeding EPA's upper range for phytotoxicity. Some samples had phytotoxic levels of zinc. Both phases involved seed collection of native indigenous (local) plants found growing throughout the UCFRB. The collected seeds were increased at the United States Department of Agriculture (USDA), Natural Resource Conservation Service (NRCS), Bridger Plant Materials Center (BPMC), and then planted and evaluated at various sites in the Anaconda Superfund site, often in comparison to other releases and seed sources. Although testing and selection were designed specifically for the site conditions characteristic of the Anaconda-Butte area, these seed sources may perform well in other critical areas and non-critical areas with similar climates.

This Technical Note describes or lists four categories of plants. The first category includes indigenous collections released by the BPMC and Deer Lodge Valley Conservation District for restoration in the Butte-Anaconda area on acid- and heavy metal-laden soils. These selections typically performed better than other cultivars, selections, and seed sources when planted in test plots at Anaconda. These collections include: Copperhead Germplasm slender wheatgrass, *Elymus trachycaulus* ssp. *trachycaulus* (accession number 9081620); Washoe Germplasm basin wildrye, *Leymus cinereus* (9081627); Opportunity Germplasm Nevada bluegrass, *Poa secunda* (9081633); Old Works Germplasm fuzzytongue penstemon, *Penstemon eriantherus* (9081631) (Old Works Germplasm fuzzytongue penstemon was released but not tested); Prospectors Germplasm common snowberry, *Symphoricarpos albus* (9078388); and Mill Creek Germplasm silver buffaloberry, *Shepherdia argentea* (9081334). Each selection is described later in this document.

The second category of plants potentially adapted to the Anaconda-Butte area includes local collections that were considered promising based on their growth and frequency in the Anaconda area, but for various reasons were not released. Testing may or may not have been conducted. These include bluebunch wheatgrass, *Pseudoroegneria spicata* (accession number 9081636); horizontal juniper, *Juniperus horizontalis* (9081623); Indian ricegrass, *Achnatherum hymenoides* (9081628 and 9081629); silverleaf phacelia, *Phacelia hastata* (9081632); Woods' rose, *Rosa woodsii* (9081638); Baltic rush, *Juncus balticus* (9087653); woolly cinquefoil, *Potentilla hippiana* (9076274); redbud, *Agrostis gigantea* (9081619 - non-native species); western wheatgrass, *Pascopyrum smithii* (9081968); ponderosa pine, *Pinus ponderosa* (9078320); and golden currant, *Ribes cereum* (9081329). Based on projected availability, cost, likelihood of commercial production, and other factors, those species that are likely to be commercially produced are described later in this document, the others are not.

The third category of plants includes non-local seed sources that performed moderately well and are worthy of consideration. They include: Open Range winterfat, *Krascheninnikovia lanata*; 'Goldar' bluebunch wheatgrass, *Pseudoroegneria spicata*; 'Secar' Snake River wheatgrass, *Elymus wawawaiensis*; 'Trailhead' basin wildrye, *Leymus cinereus*; western snowberry, *Symphoricarpos occidentalis* (Weston county, WY); and ponderosa pine, *Pinus ponderosa* (Lawrence County, SD). These selections and seed sources are not described in this document.

The fourth category of plants includes local and non-local species and selections tested at Anaconda that, for undetermined reasons, did not perform well. They include: 'Nortran' tufted hairgrass, *Deschampsia caespitosa*; 'Gruening' alpine bluegrass, *Poa alpina*; 'Canbar' and 'Sherman' Sandberg bluegrass, *Poa secunda*; 'Rodan' western wheatgrass, *Pascopyrum smithii*; 9078675, 9081678, and 9082274 Pacific aster, *Symphyotrichum chilense*; 9081679 slender cinquefoil, *Potentilla gracilis*; 9082098 cushion buckwheat, *Eriogonum ovalifolium*; Richfield Select firecracker penstemon, *Penstemon eatonii*; and 'Bandera' Rocky Mountain penstemon, *Penstemon strictus*; 9078692 alumroot, *Heuchera* spp.; and 9076238 scarlet globemallow, *Sphaeralcea coccinea*. These selections and seed sources are not described in this document.

I. Plant Releases for Acid and Heavy Metal Sites in the Anaconda-Butte Area.

COPPERHEAD GERmplasm SLENDER WHEATGRASS

Elymus trachycaulus ssp. *trachycaulus*



Slender wheatgrass

General Description

Copperhead Germplasm slender wheatgrass, *Elymus trachycaulus* ssp. *trachycaulus* (accession number 9081620), was released in 2006 by the USDA-NRCS Plant Materials Center in Bridger, Montana. Copperhead is a short-lived perennial bunchgrass functioning as a pioneer species on disturbed sites. It is adapted for use on drastically disturbed acid/heavy-metal impacted areas in mountain valleys and low- to mid-mountain elevations in the northern Rocky Mountain region.

Origin

This selection originated from a native wildland population found growing on an impacted site east of the former copper smelter in Anaconda, Montana. Copperhead exhibits superior emergence, survival, and biomass production on amended acid/heavy-metal impacted soils under the ambient climatic conditions of the UCFRB in Deer Lodge County, Montana. The original collection site, with a soil surface pH of 4.3, has an average annual precipitation of 13.93 inches and an elevation of 5,000 feet. Copperhead is best used in native reclamation mixtures for its rapid establishment and site stabilization. Although Copperhead did not perform significantly better than 'Pryor' or 'San Luis' slender wheatgrasses in the first year of the study, it was the top performer in 2004 through 2007.

Stand Establishment

Copperhead contains approximately 145,000 seeds per pound. A seeding rate of 7 pure live seed (PLS) pounds per acre is recommended for a full stand (drilled). Reference Plant Materials Technical Note No. MT-46 (Rev. 4) when developing seed mixes and calculating seeding rates, especially when seeding Critical Area Plantings and/or broadcasting the seed, as these situations warrant seeding rate increases. When used in a mix, adjust the seeding rate to the desired percentage of mix, however, slender is recommended to not be more than 15% due to its aggressive competition during establishment. Copperhead is a prolific seed producer. Seed production characteristics and techniques are similar to other slender wheatgrasses. Seed is often readily available on the commercial market.

WASHOE GERMLASM BASIN WILD RYE

Leymus cinereus



Washoe Germplasm basin wildrye

General Description

Washoe Germplasm basin wildrye, *Leymus cinereus* (accession number 9081627), was released in 2002 by the USDA-NRCS Plant Materials Center in Bridger, Montana. Washoe is a tall, coarse, robust, perennial bunchgrass native to the intermountain region of the western United States. It is a long-lived, cool-season grass with coarse fibrous roots and a few short rhizomes that bind the soil.

Origin

The selection originated from a collection in Deer Lodge County near the defunct Washoe smelter stack south of Anaconda, Montana. The original collection site, with a soil surface pH of 5.1, has an average annual precipitation of 13.00 inches and is at an elevation of 6,132 feet.

Conservation Uses

Potential conservation uses for Washoe include erosion control, wildlife food/cover, and restoration of minelands affected by acid and heavy metal soil contamination. Washoe's drought tolerance and extensive fibrous root system make it an excellent plant for soil stabilization, especially on erosive hillsides in areas that receive 8 to 20 inches of annual precipitation. It is a high forage producer, palatable to all classes of livestock and wildlife, and provides good winter forage. It is not generally recommended for spring or summer forage because it has an elevated growing point that is easily damaged by grazing. The tall, upright stature of this bunchgrass is ideal for providing wind protection and cover for small animals and birds.

Stand Establishment

Washoe should be seeded with a disk or furrow drill into a firm, weed-free seedbed at a depth of 1/4- to 1/2-inch on medium- to fine-textured soil, and 1 inch or less on coarse-textured soils. When seeding this selection, a full stand seeding rate of 6 pounds PLS per acre or 24 PLS seeds per square foot, is recommended. When used in a mix, adjust the seeding rate to the desired percentage of mix. Due to wildrye's poor seedling vigor, the percentage of the mix may need to be higher than other components, especially if these other species have rapid establishment. Washoe contains approximately 176,000 seeds per pound. Light roller packing after planting improves seed-to-soil contact and subsequent germination. Reference Plant Materials Technical Note No. MT-46 (Rev. 4) when developing seed mixes and calculating seeding rates, especially when seeding Critical Area Plantings and/or broadcasting the seed, as these situations warrant seeding rate increases.

OPPORTUNITY GERmplasm NEVADA BLUEGRASS

Poa secunda



Opportunity Germplasm Nevada bluegrass

General Description

Opportunity Germplasm Nevada bluegrass, *Poa secunda* (accession number 9081633), was released in 2007 by the USDA-NRCS Plant Materials Center in Bridger, Montana. Opportunity is a long-lived perennial bunchgrass. It is a medium- to tall-stature, cool-season grass. Opportunity is best adapted to elevations of 2,000 to 6,000 feet, performing more favorably on lower-elevation sites. The selection exhibits superior seedling emergence, percent cover, stand persistence, vigor rating, seedling and stand survival, mean plant height, and biomass production on fertilized and lime-amended, acid/heavy-metal impacted sites under the ambient climatic conditions of the Upper Clark Fork Watershed (Deer Lodge County, Montana).

Origin

Opportunity originated from wildland collections near Anaconda, Montana. The original collection site, with a soil surface pH of 4.3, has an average annual precipitation of 13 inches and is located at an elevation of 5,132 feet.

Conservation Uses

In addition to mine land reclamation, Opportunity can be used for the reseeding of burned range and forest lands because of its ability to produce roots that suppress weed establishment and growth. Because of its early-season growth, it provides excellent spring grazing for wildlife and livestock, as well as providing cover and nesting habitat for upland game birds. Opportunity can also be used in other conservation applications, such as native range restoration, wildlife habitat enhancement practices, and logging road re-vegetation.

Stand Establishment

Opportunity averages 1,029,000 seeds per pound. It establishes well when drilled at a rate of 50 PLS per square foot (approximately 22 seeds per linear foot of row in 6- to 7-inch row spacing). This is equivalent to 2 PLS pounds per acre when drill seeded. Ideal planting depth ranges from 1/8- to 3/8-inch. Reference Plant Materials Technical Note No. MT-46 (Rev. 4) when developing seed mixes and calculating seeding rates, especially when seeding Critical Area Plantings and/or broadcasting the seed, as these situations warrant seeding rate increases. When used in a mix, adjust the seeding rate to the desired percentage of mix. Light roller packing after planting improves seed-to-soil contact and subsequent germination following either method of planting. Planting in late winter to early spring in areas characterized by light, frequent spring showers is ideal. Dormant fall seeding can be conducted in lieu of spring planting. It may be possible to sow Opportunity in late summer in areas where supplemental irrigation is available or late-growing-season showers are likely. Severely acidic sites should be amended with lime and deep tilled prior to planting. Soils characterized by high surface concentrations of heavy metals should be plowed or deep tilled prior to planting.

OLD WORKS GERmplasm FUZZYTONGUE PENSTEMON

Penstemon eriantherus



Beth Graham photo

Old Works fuzzy-tongue penstemon

General Description

Old Works Germplasm fuzzytongue penstemon, *Penstemon eriantherus* (accession number 9081631), was released in 2002 by the USDA-NRCS Plant Materials Center in Bridger, Montana. It is a native blue-flowering perennial forb adapted to loamy and sandy soils. It is commonly found in dry, open terrain from prairies into mountains. Following the first years growth they bloom from May through July.

Origin

Old Works was originally collected within the Anaconda Smelter Superfund Site, in Deer Lodge County, Montana. The collection site is located approximately one mile north of Anaconda at an elevation of 5,720 feet. Seed was collected from plants on a southwest-facing slope on gravelly, sandy loam-textured soil. Soil samples taken at the collection site had a pH of 5.8 and had moderately phytotoxic levels of arsenic and copper.

Conservation Uses

Old Works performs well in moderately acidic and heavy metal contaminated soils common around hardrock mines. Its adaptation to dry open terrain makes it a valuable addition to shrub and rangeland restoration plantings. Old Works is an attractive wildflower, which is suitable for use in Xeriscaping[®], attracting pollinators, and rock gardens. This species is considered an important food source for many classes of wildlife and birds. Both herbage and seeds are utilized.

Stand Establishment

Old Works should be seeded with a drill or broadcast at a depth of 1/4-inch or less into a firm, weed-free seedbed. The full-stand seeding rate for the forb is approximately 3 pounds of PLS per acre or 25 PLS per square foot. This species, however, would typically be used in a mix with other species and therefore planted at a lower seeding rate. Reference Plant Materials Technical Note No. MT-46 (Rev. 4) when developing seed mixes and calculating seeding rates, especially when seeding Critical Area Plantings and/or broadcasting the seed, as these situations warrant seeding rate increases. When used in a mix, adjust the seeding rate to the desired percentage of mix. This selection contains approximately 358,000 seeds per pound. Dormant fall seeding (after approximately November 1) provides the cold stratification needed to overcome seed dormancy and allow germination the following spring. Growth of the species begins in early spring. Plants generally bloom the second growing season after planting.

PROSPECTORS GERMLASM COMMON SNOWBERRY

Symphoricarpos albus



Common snowberry

General Description

Prospectors Germplasm common snowberry, *Symphoricarpos albus* (accession number 9078388), was released in 2002 by the USDA-NRCS Plant Materials Center in Bridger, Montana. This selection is an excellent soil stabilizer. It is a cool-season plant with densely branched rhizomatous roots, often forming dense thickets about 3 feet tall, which makes it an excellent soil stabilizer.

Origin

Seed was collected from plants growing in a loamy-textured soil on an east-facing slope at the Anaconda Smelter Site near the defunct Washoe Smelter. The original collection site had a soil surface pH of 4.1 to 6.0, an average annual precipitation of 13 inches, and an elevation of 6,000 feet. Elevated levels of heavy metals and sulfur compounds are characteristic of the collection site soil. Arsenic, cadmium, copper, lead, and zinc concentrations ranged from benign to above phytotoxic levels. Prospectors was selected for its superior adaptation to moderately acidic and heavy metal-laden soils.

Conservation Uses

Prospectors is an important food, nesting, and cover species for many game and songbirds. Bighorn sheep, pronghorn antelope, and deer also browse the foliage and twigs. It contains a higher percentage of crude protein in the fall and winter compared to grasses and forbs, but lower concentrations in the spring and summer. Crude protein in the leaves and stem ranges from 3 to 14 percent. This species is generally considered “poor” to “fair” forage for cattle and “fair” to “good” forage for sheep and goats in the winter.

Stand Establishment

Prospectors establishes best when 1-0 or 2-0 stock is used. This selection has “fair” seedling establishment rates and “good” survival rates, once established. Seeds have a hard, tough covering. To overcome dormancy, seeds should be warm stratified at room temperature for 60 to 90 days followed by 120 to 180 days of cold stratification at about 34° F to 38° F. Seeds can be stratified using several methods. One method is to sow seeds 1/4-inch deep into containers filled with standard potting mix. A second method is to wrap seeds in cheesecloth placed in a ventilated plastic bag filled with lightly moistened perlite, peat moss, or vermiculite. After the stratification period, the seeds are removed from the cheesecloth and planted 1/4-inch deep in potting mix. Prospectors germinates best under full sun at approximately 75° F day / 65° F night temperatures. There are about 72,000 seeds per pound.

Softwood and semi-hardwood cuttings taken between June and August will root readily. Hardwood cuttings are best taken from December to February. Tip stem cuttings 6 to 8 inches in length should be dipped in IBA talc or solution (1,000 to 3,000 parts per million) and then inserted in a shaded mist bed containing perlite, sand, vermiculite, or a mixture of these materials. Mist should be applied at about 6-second intervals every 6 minutes, although this will vary with location and facility. Bottom heat maintained at 70° F improves rooting. Root initiation occurs in approximately 5 to 6 weeks. Upon sufficient root development, cuttings should be transplanted to containers. The containerized plants should be placed in a shade house for 4 to 8 weeks prior to full sun exposure. Plants grow well using standard nursery potting mixes, fertilization, and irrigation practices.

MILL CREEK GERMLASM SILVER BUFFALOBERRY

Shepherdia argentea



Beth Graham photo

Mill Creek silver buffaloberry



Beth Graham photo

Mill Creek silver buffaloberry

General Description

Mill Creek Germplasm silver buffaloberry, *Shepherdia argentea* (accession number 9081334), was released in 2010 by the USDA-NRCS Plant Materials Center in Bridger, Montana. Mill Creek is a native, thicket-forming shrub. It may develop into a small tree reaching a mature height ranging from 3 to 20 feet, and a crown width of 8 to 14 feet. The branches often terminate in thorns.

Origin

Mill Creek originated as a wild land collection in the upper Clark Fork River basin of western Montana where a native population was found growing on soil impacted by acid and heavy-metal contamination, and where effects of wind and surface water erosion were widespread. The seed was collected on the east side of "B" Hill near Radio Hill Road, south of Anaconda, Montana. The original collection site had a soil surface pH of 4.5 to 6.0, an average annual precipitation of 13.93 inches, and an elevation of 5,320 feet.

Conservation Uses

Mill Creek provides ideal cover and nesting sites for a variety of birds, and is a favored food for sharp-tailed grouse and songbirds. It provides browsing and shelter for large and small wildlife and is considered important browse for big game animals. With its moderately tall, thorny and dense stature, Mill Creek is well suited for outer rows of windbreaks and shelterbelts. The species is capable of fixing nitrogen, and therefore may be an important nitrogen source for other species in adjacent plantings. Mill Creek provides excellent bank stabilization once established and, although it grows well on well-drained sites, it can tolerate some period of saturated soil conditions. The selection is well adapted for use on many severely disturbed acidic and heavy metal impacted areas of low- to mid-mountain elevations in the northern Rocky Mountain region. It can also be used in other conservation applications such as saline reclamation, riparian and woody draw restoration, wildlife habitat enhancement, and mined land reclamation.

Stand Establishment

Dormant bareroot or container nursery stock, planted in the spring, is the preferred planting method for Mill Creek. A small percentage of Mill Creek seeds germinate without pre-treatment, although moist chilling improves both total germination and germination rate. Mill Creek averages 4,000 seeds per pound. It can be established by direct seeding in the early spring or by dormant sowing in late fall or early winter. The recommended seeding rate for Mill Creek for a full stand is 0.5 to 1.0 pounds of PLS per acre when drill seeded. When used in a mix, adjust the seeding rate to the desired percentage of mix. A seeding depth of 1/2- to 3/4-inch is recommended. Reference Plant Materials Technical Note No. MT-46 (Rev. 4) when developing seed mixes and calculating seeding rates, especially when seeding Critical Area Plantings and/or broadcasting the seed, as these situations warrant seeding rate increases.

II. Promising Indigenous Accessions That Were Not Released.

Plants in this second category are potentially well-adapted to the Anaconda-Butte area and include local collections considered promising based on their growth and frequency in the Anaconda area, but for various reasons were not released.

BLUEBUNCH WHEATGRASS

Pseudoroegneria spicata



Bluebunch wheatgrass

General Description

Bluebunch wheatgrass, *Pseudoroegneria spicata*, is a perennial cool-season native bunchgrass growing 18 to 40 inches tall. It is best adapted for use on foothill and mountain rangelands that receive more than 12 inches annual rainfall, for re-establishment of native plant communities, vegetative firebreaks, critical area stabilization, and reclamation purposes. Bluebunch wheatgrass is drought resistant, persistent, and adapted to stabilization of disturbed soils.

Origin

The original collection site had a soil surface pH of 4.3, an average annual precipitation of 13.93 inches, at an elevation of 5,308 feet. In May 2003, many bluebunch wheatgrass accessions were planted at the Stucky Ridge Comparative Evaluation Planting (CEP) approximately two miles northeast of Anaconda, Montana. Two accessions, 'Goldar' and locally collected 9081636, had significantly better seedling densities than 50% of the accessions tested. The local accession 9081636, however, did not perform significantly better than 'Goldar'. Bluebunch wheatgrass has "fair" seedling vigor and establishment, and is tolerant of acidic to slightly alkaline soil conditions.

Conservation Uses

Bluebunch wheatgrass is considered desirable forage for elk and sheep in the summer. It is also desirable feed for sheep, elk, deer, and antelope in the fall and desirable forage for sheep, elk, and deer in the winter. Its drought tolerance, combined with extensive root systems and good seedling vigor, make this species ideal for reclamation in areas receiving 12 to 20 inches annual precipitation.

Stand Establishment

Bluebunch wheatgrass should be seeded as a dormant planting in late fall with a drill to a depth of 1/4- to 1/2-inch in a firm, weed-free seedbed. The full stand seeding rate is 8 PLS pounds per acre. For critical area stabilization, double the seeding rate to 16 PLS pounds per acre. When used in a

mix, adjust the seeding rate to the desired percentage of mix. There are approximately 139,000 seeds per pound.

HORIZONTAL JUNIPER

Juniperus horizontalis



Corey Gucker photo
Horizontal juniper



Cass County Extension photo
Horizontal juniper

General Description

Horizontal juniper, *Juniperus horizontalis*, is an evergreen shrub with long, trailing or creeping branches. Horizontal juniper is drought and cold tolerant, grows in basic or acid soils, withstands browsing, and is long lived. Horizontal juniper is desirable for watersheds with erodible, harsh, and exposed sites. The species can be sensitive to mine spoils and typically does better if topsoil has been applied on mined sites.

Origin

Horizontal juniper (accession number 9081623) was tested at the Mill Creek Woody CEP, a 0.4-acre study site, located four miles southeast of Anaconda, Montana. The original collection site, with a soil surface pH of 4.1 to 6.0, has an average annual precipitation of 13 inches, and an elevation of 6,000 feet. Elevated levels of heavy metals and sulfur compounds are characteristic of the collection site soil. Arsenic, cadmium, copper, lead, and zinc concentrations ranged from benign to above phytotoxic levels.

Conservation Uses

Many wildlife species including big game, small mammals, and birds feed on horizontal juniper and utilize horizontal juniper habitats. Both white-tailed and mule deer feed on this species and utilize horizontal juniper habitats. Use is typically greatest in the winter or spring. Small mammal browsing of horizontal juniper is substantial. Palatability of this species is considered “poor” for domestic livestock and elk, “fair” for white-tailed deer, and “good” for mule deer, pronghorn, nongame birds, and small mammals.

Stand Establishment

Horizontal juniper can be propagated by seed or cuttings. The seed requires a stratification period. The recommended stratification treatment is 90 days of warm 20° C night / 30° C day (68° F night / 86° F day), moist conditions followed by 120 days of cool 5° C (41° F), moist conditions. There are approximately 29,500 seeds per pound and the recommended seeding rate for a full stand is 2 PLS pounds per acre. Dormant cuttings taken in the fall or winter root better than those taken in

the summer. Two-year-old nursery stock may establish and survive better than younger stock. It is recommended to transplant dormant shrubs in the spring when soil moisture is likely available. Establishment of horizontal juniper is slow.

INDIAN RICEGRASS

Achnatherum hymenoides



Gary A. Monroe photo

Indian ricegrass

General Description

Indian ricegrass, *Achnatherum hymenoides*, is a perennial, cool-season, native bunchgrass growing 12 to 20 inches tall. It is very winter hardy and has a broad climatic range of adaptation. It can be found at elevations ranging from 2,000 to 10,000 feet and grows best in areas averaging 8 to 14 inches of annual precipitation. Indian ricegrass has a fibrous root system and is drought tolerant, which makes it desirable for erosion control and reclamation in many arid and semiarid areas.

Origin

Four different varieties of Indian ricegrass were tested at the Stucky Ridge CEP. Two cultivars, 'Rimrock' and 'Nezpar', were releases from seed sources not indigenous to the area. Two accessions, 9081628 and 9081629, were indigenous to the area. In May 2003, all four seed sources were planted at the Stucky Ridge CEP approximately two miles northeast of Anaconda, Montana. The Stucky Ridge site has a soil pH of 4.3, an average annual precipitation of 12 to 14 inches, and an elevation of 5,308 feet. In the June 24, 2003 sampling of the Stucky Ridge CEP, 'Nezpar' had the greatest seedling density, followed by 'Rimrock', and then 9081629 Indian ricegrass, with 9081628 Indian ricegrass showing the lowest density. By August 23 2003, the non-indigenous selections retained their relative positions for seedling density, whereas 9081628 was third in density and 9081629 had the lowest density.

Conservation Uses

Indian ricegrass is used by domestic cattle, sheep, and horses and is highly palatable during most of the year, with the exception of late spring when seed heads are forming. It provides valuable

forage for cattle in winter. It also is important forage for elk, deer, and antelope. It provides good cover for small mammals.

Stand Establishment

A factor limiting the use of Indian ricegrass is its high percentage of dormant seed. Research has shown that modest seed coat scarification with sandpaper plus a 6-10 month moist chilling period at approximately 38° F to 40° F results in the highest germination of Indian ricegrass seeds. Dormant field planting in fall (after soil temperatures reach 40° F or less) with light seed coat scarification is the preferred method for establishment of Indian ricegrass. The recommended full stand seeding rate for Indian ricegrass is 5 PLS pounds per acre or approximately 27 PLS seeds per square foot. There are approximately 235,000 seeds per pound. It should be seeded with a drill at a depth of 1/2- to 1-inch on medium to fine-textured soils and 1 to 3 inches on coarse-textured soils. Reference Plant Materials Technical Note No. MT-46 (Rev. 4) when developing seed mixes and calculating seeding rates, especially when seeding Critical Area Plantings and/or broadcasting the seed, as these situations warrant seeding rate increases.

SILVERLEAF PHACELIA

Phacelia hastata



Matt Lavin photo

Silverleaf phacelia

General Description

Silverleaf phacelia, *Phacelia hastata*, is a tap-rooted perennial that colonizes sandy or gravelly, dry mineral substrate, or disturbed soil from the foothills to above timberline. It is common in rocky gullies or outcrops within valley grasslands. It blooms from May through September providing a food source for pollinators.

Origin

Silverleaf phacelia (accession number 9081632) was a wildland collection made near Anaconda, Montana. The original collection site had a soil surface pH of 4.3, an average annual precipitation of 13.93 inches, and an elevation of 5,308 feet. In May 2003, silverleaf phacelia was planted at the Stucky Ridge CEP approximately 2 miles northeast of Anaconda, Montana. None of the phacelia emerged the first year. In the following years it exhibited good vigor, growth, and seed production.

Conservation Uses

Silverleaf phacelia is an important plant for pollinators. Its abundant flowers provide a continuous source of nectar and pollen needed by pollinators and other beneficial insects. Silverleaf phacelia is very resistant to drought.

Stand Establishment

The species has “fair” seedling establishment rates and “good” survival rates once established. To overcome dormancy, seeds require 60 days of cold, moist stratification prior to germination. Dormant fall seeding (after approximately November 1) provides the cold stratification needed to overcome seed dormancy and allow germination the following spring. Growth of this species begins in early spring. For container propagation, maintain greenhouse temperatures between 69° F and 77° F during the day and 60° F to 64° F at night. Germination is best under cooler temperatures. Good germination percentages are obtained if containers are fall-sown, left under ambient environmental conditions (unheated) where they undergo winter stratification and fluctuating spring temperatures. Silverleaf phacelia has approximately 153,000 seeds per pound. The recommended seeding rate for a full stand is 6 PLS pounds per acre.

WOODS' ROSE

Rosa woodsii



J.S. Peterson photo

Woods' rose

General Description

Woods' rose, *Rosa woodsii* (accession number 9081638), is a spreading to erect, long-lived shrub native to the central and western U.S. and Canada. Woods' rose is a widely adapted species and grows in many habitat types. It is an understory plant in dry and moist forest communities, and also grows in sagebrush, juniper, mountain, plains and desert grasslands, prairie and alpine habitats. It primarily grows on upland sites, but can be found in wetlands, riparian areas, marshes, and along lakeshores. Woods' rose is an excellent plant for re-vegetating disturbed sites because it produces rhizomes, regenerates quickly, and has excellent survivability. It can be used to rehabilitate mine spoils and road cuts, control soil erosion on hillsides, and stabilize eroded stream banks.

Origin

The original collection site, with a soil surface pH of 4.53, has an average annual precipitation of 10 to 14 inches, and an elevation of 5,168 feet. In the fall of 2000, Woods' rose was planted at the Mill Creek Woody CEP approximately four miles southwest of Anaconda, Montana. It was selected for its superior adaptation to moderately acidic and heavy metal-laden soils.

Conservation Uses

Insects, birds, small mammals, and large mammals eat Woods' rose fruit. Antelope, mule deer, white-tailed deer, elk, and moose browse the leaves and branches. The plant provides cover for many birds, and small mammals. Woods' rose can serve as winter and spring forage for cattle and sheep. The fruit (hips) of wild rose persist into the winter, are high in Vitamin C, and can be made into jellies, syrups, and tea.

Stand Establishment

Woods' rose averages about 51,000 seeds per pound. It has "fair" seedling establishment rates and "good" survival rates once established. The hips should be picked when they are bright red and the flesh removed from around the seeds. To overcome dormancy, dry seeds should have a warm stratification period of 60 to 90 days at 65° F to 75° F, followed by chilling the seeds for 90 to 120 days at 34° F to 40° F. Seedlings should be allowed to grow for one year to develop an adequate root system before transplanting. Seedlings can be planted in the field in containers or as bareroot stock. Hardwood cuttings, softwood cuttings, root suckers or layering, can also be used to reproduce Woods' rose.

III. Non-Local Seed Sources That Performed Moderately Well

- A. 'Open Range' winterfat, *Krascheninnikovia lanata*,
The accession showed significant emergence the first year of planting. By the second growing season it exhibited good vigor, growth, and seed production.
- B. 'Goldar' bluebunch wheatgrass, *Pseudoroegneria spicata*,
The accession increased in percentage of stand cover and biomass over the course of the study.
- C. 'Secar' Snake River wheatgrass, *Elymus wawawaiensis*,
The accession increased in percentage of stand cover and biomass over the course of the study.
- D. 'Trailhead' basin wildrye, *Leymus cinereus*,
The accession increased in percentage of stand cover and biomass over the course of the study.
- E. Western snowberry, *Symphoricarpos occidentalis* (Weston county, WY),
This is the only nonlocal source that performed better than the local source in the Woody CEP at Mill Creek.
- F. Ponderosa pine, *Pinus ponderosa* (Lawrence County, SD).
The accession performed as well as the local accession in the Woody CEP at Mill Creek.

IV. Local and Non-Local Species and Selections Tested at Anaconda that Did Not Perform Well

- A. 'Nortran' Tufted hairgrass, *Deschampsia caespitosa*
- B. 'Gruening' Alpine bluegrass, *Poa alpina*
- C. 'Canbar' and 'Sherman' Sandberg bluegrass, *Poa secunda*
- D. 'Rodan' Western wheatgrass, *Pascopyrum smithii*
- E. Pacific aster, *Symphyotrichum chilense* (9078675, 9081678, 9082274)
- F. Slender cinquefoil, *Potentilla gracilis* (9081679)
- G. Cushion buckwheat, *Eriogonum ovalifolium* (9082098)
- H. Richfield Select Firecracker penstemon, *Penstemon eatonii*
- I. 'Bandera' Rocky Mountain penstemon, *Penstemon strictus*
- J. Alumroot, *Heuchera* spp. (9078692).
- K. Scarlet globemallow, *Sphaeralcea coccinea* (9076238).

Literature Cited / Additional Information

Cornish, J. 2007. Final Report – Acid/Heavy Metal Tolerant Plants, Mine Waste Technology Program Mine Waste Technology Program Activity III, Project 30. MWTP-291, MSE Technology Applications, Inc., Butte, Montana. Available at: nepis.epa.gov/Adobe/PDF/P1008QI9.pdf

Gucker, C. L. 2006. *Juniperus horizontalis*. In: Fire Effects Information System, [Online]. USDA, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. Available at: <http://www.fs.fed.us/database/feis/plants/shrub/junhor/all.html>

Jones, T., and D. Nielson. 1992. Germination of Pre-Chilled Mechanically Scarified and Un-Scarified Indian Ricegrass Seed. *J. Range Management* 45:175-179.

Laursen, S.B. and H.E. Hunter. 1986. Windbreaks for Montana – a landowner's guide. Bulletin 366. Montana State University Cooperative Extension Service Bozeman, MT.

Majerus, M., Scianna, J., Jacobs, J. 2013. Seeding Rates for Conservation Species for Montana Plant Materials Technical Note No. MT-46 (Rev. 4). Available at: http://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIALS/publications/mtpmctn12046.pdf

Monsen, S. B., R. Stevens, N.L. Shaw. 2004. Shrubs of other families. In: Monsen, Stephen B.; Stevens, Richard; Shaw, Nancy L., comps. Restoring western ranges and wildlands. Gen. Tech. Rep. RMRS-GTR-136-vol-2. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station: 598-698.

Munshower, F. F. 1998. Grasses and Grasslike Species for Revegetation of Disturbed Lands In The Northern Great Plains and Adjacent Areas with Comments About Some Wetland Species. Reclamation Research Unit Publication No. 9805, Montana State University, Bozeman, MT.

Ogle, D., L. St. John, M. Stannard, J. Cornwell, and L. Holzworth. 2011. Pasture and Range Seedings – Planning, Installation, Evaluation, Management. Technical Note 10. USDA-NRCS. Boise, ID. 35 p.

Scianna, J., J. Jacobs, R. Kilian. 2012. Overcoming Seed Dormancy in Indian Ricegrass (*Achnatherum hymenoides*). Plant Materials Technical Note Number MT-77. USDA-NRCS. Bozeman, MT. 4 p.

Scianna, J. 2003. Propagation Protocol for Production of Field-Grown *Rosa Woodsii* Lindl. Plants (2+0 and 3+0 Bareroot); USDA-NRCS Bridger Plant Materials Center, Bridger, Montana. In: Native Plant Network. Available at <http://www.nativeplantnetwork.org>. University of Idaho College of Natural Resources, Forest Research Nursery, Moscow, ID.

Shaw, N.L., S.B. Monsen, and R. Stevens. 2004. Rosaceous shrubs. In: S.B. Monsen, R. Stevens and N.L. Shaw, eds. Restoring western ranges and wildlands. USDA Forest Service Gen Tech Rep. RMRS-GTR-136-vol-2, USDA Forest Service Rocky Mountain Research Station, Fort Collins, CO.

USDA-NRCS. 2013. The PLANTS Database (<http://plants.usda.gov>). National Plant Data Team, Greensboro, NC 27401-4901 USA.

Ogle, D., St. John, L., Jones, T. Ed. (rev. St. John, 2013). Plant Guide for Indian Ricegrass (*Achnatherum hymenoides*). USDA-Natural Resources Conservation Service, Aberdeen Plant Materials Center. Aberdeen, Idaho 83210.

Winslow, S.R. 2012. Basin Wildrye *Leymus cinereus*: A Native Grass for Conservation Use in Montana and Wyoming Technical Note No. MT-85. USDA-NRCS Bridger Plant Materials Center, Bridger, Montana. Available at:
http://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIALS/publications/mtpmctn11283.pdf