

NEW NATIVE PRE-VARIETAL GERMPLASM RELEASES FOR THE NORTHERN GREAT PLAINS AND INTERMOUNTAIN REGION¹

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Abstract: The reclamation/restoration industry relies heavily on native plant materials. The majority of native seed is obtained from commercial seed growers, as wildland collections are not a reliable source of the quantity and quality to meet the current demand. Most of the commercially available native plant material for the northern Great Plains and Intermountain region are cultivars, and more recently pre-varietal germplasm, released by USDA-Natural Resources Conservation Service (NRCS) Plant Materials Centers (PMCs) and the USDA Agricultural Research Service (ARS), Logan, Utah. New pre-varietal releases are often composites of multiple ecotypes resulting in more genetic diversity and a wider range of adaptation. Recent releases by the Montana (Bridger), North Dakota (Bismarck), Idaho (Aberdeen), and Colorado (Meeker) Plant Materials Centers and ARS-Logan, Utah, include:

Grasses • High Plains Sandberg bluegrass (*Poa secunda* J.Presl³)

- Bad River blue grama (*Bouteloua gracilis* Willd. ex Kunth)
- Itasca little bluestem (*Schizachyrium scoparium* [Michx.] Nash)
- Garnet mountain brome (*Bromus marginatus* Nees ex Steud.)
- P-7 bluebunch wheatgrass (*Pseudoroegneria spicata* [Pursh] A. Love)
- Sand Hollow bottlebrush squirreltail (*Elymus elymoides* [Raf.] Swezey)
- Washoe basin wildrye (*Leymus cinereus* [Scribn. & Merr.] A. Love)

Forbs • Antelope slender white prairieclover (*Dalea candida* Michx. ex Willd.)

- Bismarck purple prairieclover (*Dalea purpurea* Vent.)
- Old Works fuzzy-tongue penstemon (*Penstemon eriantherus* Pursh)

Shrubs • Open Range winterfat (*Krascheninnikovia lanata* [Pursh] A.D.J. Meuse & Smit)

- Northern Cold Desert winterfat (*Krascheninnikovia lanata* [Pursh] A.D.J. Meuse & Smit)
- Snake River fourwing saltbush (*Atriplex canescens* [Pursh] Nutt.)

Trees

- Bridger-Select Rocky Mountain juniper (*Juniperus scopulorum* Sarg.)
- Hunter ponderosa pine (*Pinus ponderosa* var. *scopulorum* Engelm.)

Additional Key Words: reclamation, restoration, northern-adapted ecotypes

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The new releases and pending releases will add even more species' diversity to future seed mixtures used for mineland reclamation, range renovation, wildlife habitat, and numerous farmland conservation programs. As federal land management agencies and conservation groups push for the use of local-origin ecotypes, the proven seedling vigor, establishment success, and seed production capabilities of cultivars and pre-varietal releases should continue to make them the preferred native seed source for the reclamation and seed production industry.

Introduction

Availability of native seed/plants is primarily dependent upon commercially grown plant material and secondarily dependent on wildland collections. Commercial growers serve three major markets: introduced forages for hay and pasture, ornamental/turf, and native reclamation/restoration. Since the 1970s, many cultivar releases developed by U.S. Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS) Plant Materials Centers (PMCs), and the USDA-Agricultural Research Service (ARS) have been the backbone of native seed mixtures for mineland reclamation, range renovation, wildlife habitat, roadside restoration, native landscaping, and farmland conservation. The Surface Mining Control and Reclamation Act of 1977 helped to promote the demand for adapted native species for coal strip mine reclamation and prompted the development of many of these cultivars (appendix table 1). Nationwide, the PMCs have made 534 releases, most of which are native to various parts of the United States. During 2001, over 9,000 metric tons of certified and common seed of the top 250 PMC releases were produced (estimated value of \$83.5 million) by commercial growers. Historically, these releases have been in the form of cultivars with a single source origin. In recent years, the seed certification industry and plant breeders have been using the Pre-Varietal release option, releasing germplasm with multiple site origins and broader genetic diversity in a shorter time period.

Native Germplasm Release Options

The majority of the native germplasm releases presently on the market in the northern Great Plains, Intermountain region, and Pacific Northwest, are made by the PMC's and the ARS in

cooperation with individual state foundation seed programs. This ensures a high rate of participation by commercial growers in seed certification programs and, subsequently, the availability of high quality seed.

Cultivar Release

A Cultivar (cultivated variety) release is germplasm that has had its performance evaluated in comparison to numerous other accessions of the same species, has been compared to other top performers in replicated trials, and has been extensively field-tested. These releases often have single site origins, but increased demand for genetic diversity and broader range of adaptation has encouraged the development of multi-origin polycrosses (outcrossing) or multi-origin composites (selfing or apomixis). Each generation through which a Cultivar is multiplied is indicated by a class name, i.e., Breeder, Foundation, Registered, and Certified.

Pre-Varietal Release

Now accepted by the Association of Official Seed Certifying Agencies (AOSCA) and regulated through most state seed/plant certification agencies, the pre-variatal release mechanism allows release of germplasm to the commercial market in far less time. A Pre-Varietal release is germplasm that does not meet the progeny and locations-years requirement of a cultivar. Labeling must include the word "Germplasm," along with a name descriptive of its origin or intended use and the level of testing, i.e., Source Identified, Selected, or Tested (Example: Open Range Tested Class Germplasm of winterfat) (USDA-NRCS 2000). This release technique is being used on high demand species with no previous released material, or for the release of plant material of a specific source. AOSCA does not permit the same generation class names for Pre-Varietal releases as for Cultivars, thus each generation is numbered: G₀ (equivalent to Breeders), G₁ (equivalent to Foundation), G₂ (equivalent to Registered), and G₃ (equivalent to Certified).

Source Identified: Any germplasm collected from a documented site can be certified as Source Identified. The seed certification agency must visit the site just prior to harvest to verify the species' identity, the associated species, and general geographic features such as elevation, latitude, and longitude. Seed can be sold directly (G₀) or taken to a farm to raise one generation (G₁) beyond the original collection. All Source Identified harvests will be given a "natural"

designation on the certification tag unless there is a deliberate selection in the initial harvest or in the harvest of any increase fields. Source Identified certification tags are orange.

Selected Class. This class can be used on germplasm that is compared to other accessions or cultivars of that species for at least 2 years and shows superiority for characteristics that in some way will meet client needs. Genetic manipulation may or may not be conducted; however, if no purposeful manipulation occurs, then the plant material is eligible for a "natural" designation on the certification label. Manipulated material can involve the use of progeny of a crossing block (outcrossing) or a physical mix of germplasm (selfing or apomixis). Selected Class certification tags are blue.

Tested Class. These releases shall be the progeny of plants whose parentage has been tested and has proven genetic superiority, or possesses distinctive traits for which the heritability is stable. Replicated, multiple site testing over a period of 3-6 years must be conducted that statistically validates superior traits. As with the Selected Class, genetic manipulation may or may not occur, but must not occur to be eligible for a "natural" designation. Tested Class certification tags are green.

Recent Native Releases

The following is a summary of the new northern-adapted native releases that have been released in the last 6 years. Note that many of them are multi-origin poly-crosses or composites. Lesica and Allendorf (1999) recommended the use of genotype mixes (multi-origin composites or poly-crosses) on highly disturbed sites, as they would likely evolve genotypes adapted to the novel ecological challenges of that particular site; and Marshall & Brown (1973) stated that populations of multiple ecotypes are likely to show increased long-term stability compared to single-line populations.

There is a big push in the Plant Materials Program to get more forb and shrub species on the commercial market to help add species diversity to native seed mixes. Some of the pending forb and shrub releases include western yarrow (*Achillea millefolium* L.), prairie coneflower (*Ratibida columnifera* [Nutt.] Woot. & Standl.), dotted gayfeather (*Liatris punctata* Hook.),

blanketflower (*Gaillardia aristata* Pursh), silverleaf phacelia (*Phacelia hastata* Dougl. ex Lehm.), penstemon (*Penstemon* sp. Schmidel), common snowberry (*Symphoricarpos albus* [L.] Blake), and Gardner saltbush (*Atriplex gardneri* [Moq.] D. Dietr.).

High Plains Selected Class germplasm of Sandberg bluegrass (*Poa secunda* J. Presl.)

Released by: Bridger PMC (2000)

High Plains is the first official release of Sandberg bluegrass. This release is a composite of three accessions collected from the high plains of Wyoming, near Gillette (Campbell Co.), Casper (Natrona Co.), and Granger (Uinta Co.). Initial testing was done on a coal strip mine in the Red Desert and a bentonite mine in the Big Horn Basin of Wyoming. Sandberg bluegrass is a conspicuous component of short-grass prairies, as it is the first grass to green up in the spring and the first to head out. Because it cures so early, it offers little forage throughout the summer and fall months. This species is considered an increaser on heavily used sites and a pioneer on surface manipulated rangeland sites. It is an often-requested species for inclusion in native mixes to add species diversity and plant community stability.

Bad River Selected Class germplasm of blue grama (*Bouteloua gracilis* [Willd. ex Kunth] Lag. ex Griffiths)

Released by: Bismarck PMC (1996)

Bad River blue grama originated from a private seed harvest of a native stand along the south fork of the Bad River in Haakon Co., South Dakota. This selection was made based on its emergence, vigor, leafiness, and adventitious root development. Bad River blue grama was found to have higher mean crude protein, lower acid detergent fiber (ADF), and neutral detergent fiber (NDF) at anthesis (mid-July) than other collections of blue grama. Bad River, adapted to northern latitudes, is used in native seed mixes on mineland reclamation, rangeland disturbances (pipelines, roadways, etc.), and wildlife habitat.

Itasca Selected Class germplasm of little bluestem (*Schizachyrium scoparium* [Michx.] Nash)

Released by: Bismarck PMC (1996)

Itasca little bluestem is the result of an extensive collection and evaluation of 588 accessions of little bluestem from North Dakota, South Dakota, and Minnesota. Itasca is a composite of 72

accessions from two major population areas: eastern North Dakota/north-central South Dakota and central/northeastern Minnesota. This germplasm was released to fill a need for a northern-adapted little bluestem with a broad genetic base. This release can be used for inclusion in native seed mixtures in the Upper Midwest and eastern portion of the northern Great Plains.

Garnet Tested Class germplasm of mountain brome (*Bromus marginatus* Nees ex Steud)
Released by: Meeker EPC (2000)

Garnet mountain brome was originally collected in the ghost town of Garnet in Powell Co., Montana. Garnet was selected for its head smut resistance, longevity, ease of establishment, and good production of both seed and forage. Mountain brome is a self-pollinated, short-lived perennial grass that is often a pioneer plant that establishes on soil disturbances in mountain meadows and open forests. This species is often used in native mixes to provide early establishment and stabilization, later giving way to late seral species. Garnet has less smut damage than ‘Bromar’, but it is advisable to treat seed with a fungicide prior to planting.

P-7 Selected Class germplasm of bluebunch wheatgrass (*Pseudoroegneria spicata* [Pursh] A. Love)
Released by: ARS Logan, Utah (2001)

P-7 bluebunch is a multi-origin polycross of 25 populations from Washington, Oregon, Nevada, Utah, Idaho, Montana, and British Columbia. DNA analysis indicates that P-7 is more closely related to ‘Goldar’ than to ‘Whitmar’; however, plants may be awned like Goldar or awnless like Whitmar, though awnless plants predominate. Because of the broad genetic variation of this release, seed ripening is not as uniform as the cultivars of bluebunch wheatgrass. This germplasm release was designed for use in areas where enhanced genetic diversity was desired. The prominence of this species in the sagebrush steppe ecosystem make it ideal for inclusion in native reclamation mixes for range improvement, competition with invasive weeds, and post-fire rehabilitation.

Sand Hollow Selected Class germplasm of bottlebrush squirreltail (*Elymus elymoides* [Raf.] Swezey)
Released by: ARS-Logan, Utah (1996)

Sand Hollow bottlebrush squirreltail, the first release of this species, originated in Gem Co., Idaho. This selection belongs to the *jubatium* squirreltail taxon, referred to as big squirreltail. It is adapted to the foothill areas of the Snake River plains of Idaho and adjacent regions of Oregon, Nevada, and Utah. Bottlebrush squirreltail is self-pollinating, has rapid reproductive maturity and good seed dispersal, is cold hardy and fire tolerant, making it a good candidate for assisting ecological succession for restoration of cheatgrass/medusahead-infested rangelands. Sand Hollow was also selected for its high seed yields, above average seed weight, and late seed maturity.

Washoe Selected Class germplasm of basin wildrye (*Leymus cinereus* [Scribn. & Mirr.] A. Love
Released by: Bridger PMC (2001)

Washoe germplasm originated from an acidic, heavy-metal impacted site near the old Washoe smelter stack within the Anaconda Smelter Superfund Site near Anaconda, Montana. Washoe is the dark green type (tetraploid). It was tested in comparison to two other local collections and the released cultivars ‘Trailhead’ (tetraploid) and ‘Magnar’ (octoploid). The potential uses for this release include erosion control, wildlife food/cover, and restoration of minelands affected by acid and heavy-metal soil contamination. Washoe exhibits good drought tolerance, and superior vigor and survival on impacted soils.

Antelope Tested Class germplasm of slender white prairieclover (*Dalea candida* Michx. ex Willd.)
Released by: Bridger PMC (2000)

Antelope is a native legume that was originally collected in 1947 near Dickinson, North Dakota (Stark Co.). The recent increase in demand for native forbs, particularly legumes, stimulated the release of this germplasm. It has been extensively tested on coal strip mines in Montana and Wyoming, but was not released because of the availability of ‘Kaneb’ purple prairieclover and the relatively low demand for another prairieclover. There is presently a demand for additional forbs to add species diversity to native mixtures for mine reclamation, highway roadsides, wildlife habitat, and USDA farm programs. Antelope is the first release of this species.

Bismarck Selected Class germplasm of purple prairieclover (*Dalea purpurea* Vent.)

Released by: Bismarck PMC (2000)

Bismarck purple prairieclover was released for its vigor, foliage abundance, and above-average seed production in comparison to ten other accessions from North and South Dakota. Bismarck originated as a 1-pound collection from an area 5 miles east of Presho, South Dakota (Lyman Co.). This release fills the need for a northern adapted purple prairieclover to be used in native seed mixes for range and pasture seedings, wildlife habitat development or enhancement, prairie landscaping, and any native planting to add species diversity. Bismarck is nutritious and palatable forage for most classes of livestock and wildlife.

Old Works Source Identified Class germplasm of fuzzy-tongue penstemon (*Penstemon eriantherus* Pursh var. *eriantherus*)

Released by: Bridger PMC (2001)

Old Works fuzzy-tongue penstemon originated from an open, dry, south-facing slope in an area that has been exposed to aerial emissions from past copper smelting operations, resulting in elevated levels of heavy metals and sulfur compounds. The lavender to pale purple flowered penstemon can be utilized in reclamation mixtures on dry, open prairie to forested sites that have low pH and heavy-metal contamination. This release also has potential for native landscaping.

Open Range Tested Class germplasm of winterfat (*Krascheninnikovia lanata* Pursh Guldenstaedt)

Released by: Bridger PMC (2002)

Open Range winterfat is a composite of three collections from the northern Great Plains: near Terry, Montana (Custer Co.), near Bridger, Montana (Carbon Co.), and from near Rawlins, Wyoming (Carbon Co.). Open range has been field tested in Montana, Wyoming, North Dakota, Idaho, Nevada, and Kansas. This release has had excellent establishment on a wide variety of soils and climatic conditions. The persistent leaves and late season crude protein (7-11%) make this species a very desirable winter browse species for all classes of livestock and most wildlife. Seed that has been processed down to a naked utricle is much easier to meter through a drill than the fluffy, unprocessed seed. Research at the Bridger PMC has shown that the processed seed can be readily established and has just as long shelf life as the unprocessed seed.

Northern Cold Desert Selected Class germplasm winterfat (*Krascheninnikovia lanata* Pursh. Guldenstaedt)

Released by: Aberdeen PMC (2001)

Northern Cold Desert winterfat is a composite of five accessions, four originating in Utah and one from Colorado. This germplasm was released specifically because of its cold hardiness and adaptation to the northern region of the natural range of winterfat. Anticipated uses are rangeland restoration, erosion control, and for livestock and big game winter browse in arid to semi-arid and saline/alkaline areas. The release has been found to establish on clay loams to gravelly loams, stoney loams, and rocky outcrops.

Snake River Plains Selected Class germplasm fourwing saltbush (*Atriplex canescens*)

Released by: Aberdeen PMC (2001)

Snake River Plains fourwing saltbush is a composite of four accessions, all from the Snake River plains of southern Idaho. This germplasm was released because of its cold hardiness and the need for a better-adapted northern source of fourwing saltbush. The anticipated use of this germplasm is erosion control, rangeland restoration, livestock and big game browse, and wildlife plantings in dry, moderately saline or alkaline areas. It is adapted to shallow rocky loams, sandy loams, gravelly loams, and silt loams that are well-drained to moderately well-drained. This release is better adapted to the northern Great Basin than are 'Marana', 'Rincon', and 'Santa Rita'.

Bridger-Select Selected Class germplasm of Rocky Mountain juniper (*Juniperus scopulorum* Sarg.)

Released by: Bridger PMC (1998)

Bridger-Select Rocky Mountain juniper was selected for rate of height growth, uniformity in shape, vigor, and crown density. The 181-tree seed orchard represents a bulk of 26 seed sources from Montana (11), North Dakota (6), Wyoming (4), Nebraska (3), and South Dakota (2). Rocky Mountain juniper is a native, drought-tolerant, evergreen small tree that is used primarily for windbreaks and shelterbelts, although it has wildlife, reclamation, and naturalistic landscaping uses. The survival and growth rate of Bridger-Select far exceeds other commercially available material in the Northern Great Plains. Bridger-Select is usually available as 2-0 containerized stock.

Hunter Selected Class germplasm of ponderosa pine (*Pinus ponderosa*. var *scopulorum* Engelm.)

Released by: Bridger PMC (2002)

Hunter ponderosa pine was selected for its superior height growth, seedling survival, and vigor. The origin of the Hunter germplasm is from 38 parent trees (Nebraska [16], Montana [15], and South Dakota [7]) consisting of 12 provenances (Nebraska [5], Montana [6], and South Dakota [1]). Foundation seed from the 200-tree orchard at the Bridger PMC goes directly to state and private nurseries for production of 2-0 containerized stock. The release is adapted for use in the northern Great Plains east of the Continental Divide. Ponderosa pine is a particularly good candidate for a medium to large evergreen tree for windbreaks and shelterbelts, with good potential for wildlife habitat, reclamation, and xeriscaping.

In Defense of Cultivars and Pre-Varietal Releases

There is a concerted effort by some agencies and conservation groups to reduce the widespread use of cultivars and pre-varietal releases in favor of local-origin ecotypes. DNA fingerprinting and electrophoretic analysis has documented genetic variability within and among different plant populations. However, with some outcrossing species, gene flow is sufficient to introduce novel alleles into widely separated populations (Loveless and Hamrick, 1984). In many cases it is a matter of personal interpretation as to what constitutes a unique or significantly different plant population. There is a concern that cultivars will contaminate local gene pools (Knapp and Rice, 1994), aggressively out-compete local genotypes (Lesica and Allendorf, 1999), or not be adapted to remote sites because of loss of genetic diversity of a commercially grown population (Lacy, 1987). The shift to the use of local origin ecotypes has these shortcomings.

- ◆ The seed industry is reluctant to grow small acreages of plant material with a limited area of use and demand. They also fear that increased demand for the site-specific ecotypes will reduce the demand for cultivar production--the primary source of income for the majority of growers, both big and small. As the size of the field decreases, the production cost per pound of pure live seed significantly increases (Scianna and others,

2001). A demand for smaller production fields of an increased number of ecotypes creates isolation, harvesting, and cleaning problems for growers. There is also a fear that the production of local-origin ecotypes may be limited to a few select growers.

◆ Depending on the severity of the disturbance, local ecotypes may not be the most successful alternative. Seriously disturbed sites bear little ecological resemblance to the habitat from which a local ecotype evolved (Lesica and Allendorf, 1999). Jain and Bradshaw (1966) found that those species that colonize and evolve on a disturbed site may actually be genetically different from individuals of the same species on adjacent undisturbed sites. Also, local late seral dominants are less likely to establish successfully than early colonizing (pioneer) species of local or remote sources (Johnson and Billings, 1962; Chambers and others, 1984; Harper, 1977).

◆ The random collection of germplasm from specific areas or zones does not ensure sampling of the population with the best seedling vigor, adequate resistance to insects and pathogens, significant seed production, or ultimately the best persistence in a restoration mix. Successful stand establishment is not guaranteed just because you are using a local-origin ecotype. Just because we know a species grew on a site historically does not mean the same genotype, or even the same species will thrive if reintroduced (Millar and Libb, 1989). There is a major investment of time and money in the increase of plant material from a collection to large-scale production; therefore, it would be beneficial to have some level of certainty that a local-origin ecotype will perform adequately before making that investment.

◆ The collection of native germplasm and the direct seeding for field increase is very risky because of variable seed quality of native collections. Seed set and subsequent seed viability are at the mercy of the annual climate and environmental conditions. For successful commercial seed production of local-origin germplasm, breeders' seed should first be produced under cultivated conditions to ensure uniform, viable seed for use by commercial growers, even at the possible risk of some genetic drift and natural selection.

Summary

Cultivars and pre-varietal releases of native species are presently the backbone of the reclamation/restoration industry and the commercial seed industry. USDA Plant Materials Centers and the USDA Agricultural Research Service are the primary breeders involved in developing native plant germplasm. The emphasis has changed from cultivars of single origin to multiorigin polycrosses and composites to increase genetic diversity and range of adaptation. There are several new pre-varietal releases of northern-adapted and never-before-released species that should add to the species diversity of reclamation/restoration mixes for mined land rangeland renovation, highway roadsides, wildlife habitat, native landscaping, and farm conservation projects. Any drastic change to requiring the exclusive use of local-origin ecotypes could significantly affect the commercial seed industry and, in turn, not necessarily increase the success of reclamation/restoration plantings.

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Appendix Table 1. Commonly used and newly released native Cultivars and Pre-Varietal releases adapted for use in the northern Great Plains, northern Intermountain, and northern Desert Basin regions.

Scientific Name COOL-SEASON GRASSES	Common Name	Cultivar/Germplasm	Primary Agency	Release Date	Germplasm Origin	Form of Release
<i>Achnatherum hymenoides</i>	Indian ricegrass	Nezpar	ID PMC	1978	Whitebird, ID	Cultivar
		Rimrock	MT PMC	1996	Yellowstone Co., MT	Cultivar
<i>Bromus marginatus</i>	mountain brome	Garnet	CO EPC	2000	Powell Co., MT	Tested Germplasm
		Bromar	WA PMC	1946	Whitman Co., WA	Cultivar
<i>Deschampsia cespitosa</i>	tufted hairgrass	Peru Cr.	CO EPC	1994	Summit Co., CO	Cultivar
<i>Elymus canadensis</i>	Canada wildrye	Mandan	ARS-ND	1946	Morton Co., ND	Cultivar
<i>Elymus elymoides</i>	bottlebrush squirreltail	Sand Hollow	ARS-UT	1996	Gem Co., ID	Selected Germplasm
<i>Elymus waiwaiwiensis</i>	Snake River wheatgrass	Secar	WA PMC	1980	Lewiston, ID	Cultivar
<i>Elymus lanceolatus</i>	thickspike wheatgrass	Bannock	ID PMC	1995	Comp. WA, OR, ID	Cultivar
		Critana	MT PMC	1971	Hill Cty., MT	Cultivar
		Schwendimar	WA PMC	1994	The Dalles, OR	Cultivar
	streambank wheatgrass	Sodar	ID PMC	1954	Grant Co., OR	Cultivar
<i>Elymus trachycaulus</i>	slender wheatgrass	Pryor	MT PMC	1988	Carbon Co., MT	Cultivar
		Revenue	AgCanada	1961	Revenue, Saskatchewan, Canada	Cultivar
		Primar	WA PMC	1946	Beebe, MT	Cultivar
		San Luis	CO EPC	1975	San Luis Valley, CO	Cultivar
<i>Festuca idahoensis</i>	Idaho fescue	Nezpurs	U of Idaho	1983	ID, OR, WA, MT, WY, CA, B.C. Sask	Cultivar
		Joseph	U of Idaho	1983	ID, OR, WA, MT, WY, CA, B.C. Sask	Cultivar
<i>Leymus cinereus</i>	basin wildrye	Trailhead	MT PMC	1991	Musselshell Co., MT	Cultivar
		Magnar	ID PMC	1979	Saskatchewan, Canada	Cultivar
		Washoe	MT-PMC	2001	Deer Lodge Cpounty, MT	Selected germplasm
<i>Leymus triticoides</i>	beardless wildrye	Shoshone	MT PMC	1980	Riverton, WY	Cultivar
<i>Nassella viridula</i>	green needlegrass	Lodorm	ARS-ND	1970	Bismarck, ND	Cultivar
<i>Pascopyrum smithii</i>	western wheatgrass	Rosana	MT PMC	1972	Rosebud Co., MT	Cultivar
		Rodan	ARS-ND	1983	Morton Co., ND	Cultivar
<i>Poa secunda</i>	Sandberg bluegrass	High Plains	MT PMC	2000	Comp. 3 WY sites	Selected Germplasm
<i>Poa ampla</i>	big bluegrass	Sherman	WA PMC	1945	Sherman Co., OR	Cultivar
<i>Poa canbyii</i>	Canby bluegrass	Canbar	WA PMC	1979	Columbia Co., WA	Cultivar
<i>Pseudoroegneria spicata</i>	bluebunch wheatgrass	Goldar	ID PMC	1989	Aberdeen, ID	Cultivar
		P-7	ARS-UT	2001	WA, OR, NV, UT, ID, MT, B.C.	Selected Germplasm

Appendix Table 1. (Cont'd) Commonly used and newly released native Cultivars and Pre-Varietal releases adapted for use in the northern Great Plains, northern Intermountain, and northern Desert basin regions.

Scientific Name	Common Name	Cultivar/Germplasm	Primary Agency	Release Date	Germplasm Origin	Form of Release
WARM-SEASON GRASSES						
<i>Andropogon gerardii</i>	big bluestem	Bison	ARS-ND	1989	Oliver Co., ND	Cultivar
		Bonilla	ND PMC	1987	Bonilla, SD	Cultivar
		Sunnyview	SDSU	1998	Union Co., SD	Cultivar
<i>Bouteloua curtipendula</i>	sideoats grama	Killdeer	ND PMC	1963	North Dakota	Informal
		Pierre	ND PMC	1961	Stanley Co., SD	Cultivar
<i>Bouteloua gracilis</i>	blue grama	Bad River	ND PMC	1996	Haakon Co., SD	Selected
		Birds Eye	Private	1998	Wind River Canyon, WY	Source Identified
<i>Buchloe dactyloides</i>	buffalo grass	Bismarck	ND PMC	1996	Central ND	Selected
<i>Calamovilfa longifolia</i>	prairie sandreed	Goshen	MT PMC	1976	Goshen Co., WY	Cultivar
		Pronghorn	ARS-NE	1988	NE & KS	Cultivar
<i>Panicum virgatum</i>	switchgrass	Dacotah	ARS-ND	1989	Breien, ND	Cultivar
		Forestburg	ND PMC	1987	Sanborn Co., ND	Cultivar
<i>Schizachyrium scoparium</i>	little bluestem	Badlands	ND PMC	1996	ND & SD	Selected
		Itasca	ND PMC	2001	ND, SD, MN	Selected
<i>Spartina pectinata</i>	plains cordgrass	Red River	ND PMC	1998	ND, SD, MN	Selected
FORBS						
<i>Dalea candida</i>	slender white prairieclover	Antelope	MT/ND PMC	2000	Dickinson, ND	Tested
<i>Dalea purpurea</i>	purple prairieclover	Kaneb	KS PMC	1975	Riley Co., KS	Cultivar
		Bismarck	ND PMC	2000	South Dakota	Selected
<i>Echinacea angustifolia</i>	narrow-leaved coneflower	Bismarck	ND PMC	2000	North Dakota	Selected
<i>Hedysarum boreale</i>	northern sweetvetch	Timp	CO EPC	1994	Utah Co., UT	Cultivar
<i>Helianthus maximiliani</i>	Maximilian sunflower	Medicine Creek	ND PMC	2000	South Dakota	Selected
<i>Helianthus pauciflorus</i>	stiff sunflower	Bismarck	ND PMC	2000	North Dakota	Selected
<i>Linum lewisii</i>	Lewis flax	Appar	ID PMC	1980	Custer Co., SD	Cultivar
<i>Penstemon eatonii</i>	firecracker penstemon	Richfield	ID PMC	1994	Sevier Co., UT	Selected
<i>Penstemon venustus</i>	alpine penstemon	Clearwater	ID PMC	1994	Clearwater River, ID	Selected
<i>Penstemon erianterus</i>	fuzzy-tongue penstemon	Old Works	MT-PMC	2001	Deer Lodge County, MT	Source Identified germplasm

Appendix Table 1. (Cont'd) Commonly used and newly released native Cultivars and Pre-Varietal releases adapted for use in the northern Great Plains, northern Intermountain, and northern Desert Basin regions.

Scientific Name	Common Name	Cultivar/Germplasm	Primary Agency	Release Date	Germplasm Origin	Form of Release
SHRUBS						
<i>Artemisia tridentata</i> ssp., <i>vaseyana</i>	big sagebrush	Hobble Creek	FS	1987	Springville, UT	Cultivar
<i>Atriplex x aptera</i>	fourwing saltbush	Wytana	MT PMC	1976	Musselshell Co., MT	Cultivar
<i>Atriplex canescens</i>	fourwing saltbush	Snake River Plains	ID PMC	2001	Southern Idaho	Selected
<i>Eleagnus commutata</i>	silverberry	Dupuyer Streambank	MT PMC	2000	Pondera Co., MT	Source Identified
		Pondera Floodplain	MT PMC	2000	Pondera Co., MT	Source Identified
<i>Eriogonum niveum</i>	snow buckwheat	Umatilla	WA PMC	1991	Umatilla Co., WA	Cultivar
<i>Krascheninnikovia lanata</i>	winterfat	Open Range	MT PMC	2002	MT & WY 3 sites	Tested
		Northern Cold Desert	ID PMC	2002	Southern Idaho	Selected
<i>Purshia tridentata</i>	antelope bitterbrush	Maybell	CO PMC	1997	Moffat Co., CO	Cultivar
<i>Rhus trilobata</i>	skunkbush sumac	Bighorn	NM PMC	1979	Basin, WY	Cultivar
<i>Shepherdia argentea</i>	silver buffaloberry	Sakakawea	ND PMC	1984	Canada	Cultivar
<i>Symphoricarpos albus</i>	Common snowberry	Prospectors	MT-PMC	2001	Deer Lodge County, MT	Selected germplasm
TREES						
<i>Juniperus scopulorum</i>	Rocky Mountain juniper	Bridger-Select	MT PMC	1998	Comp. N. Great Plains	Selected
<i>Pinus ponderosa</i>	ponderosa pine	Hunter	MT PMC	2002	Comp. N. Great Plains	Selected