

**Great Basin Native Plant Selection and Increase Project  
FY 2004 Annual Report**

**Project Title:** Establishment and Maintenance of Certified Generation 1 (G1) Seed

**Project Location:** NRCS Aberdeen, ID Plant Materials Center

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**Description of Project:** Production of Certified Generation 1 (G1) seed of Maple Grove Germplasm Lewis flax, Anatone Germplasm bluebunch wheatgrass, Snake River Plains Germplasm fourwing saltbush and Northern Cold Desert Germplasm winterfat to facilitate commercial seed production. Evaluate procedures for production of rooted cuttings of fourwing saltbush. Establish demonstration planting near Boise, ID.

**Status Report:**

**Seed Production**

**Maple Grove Germplasm Lewis Flax** – Officially released July 22, 2004. Seeded 1.8 acre field on May 31, 2002. Produced 615 pounds of seed in 2003. Shipped 240 pounds of Certified seed to commercial seed growers in 2004. Due to windstorm after swathing in 2004, only 30 pounds of seed was salvaged. Seed field plowed due to weed competition. New seed field to be established spring, 2005.

**Anatone Germplasm bluebunch wheatgrass** – Released officially March 5, 2004. Seeded 1.0 acre field on May 31, 2002. Produced 240 pounds of seed in 2003. Shipped 20 pounds of Certified seed to commercial seed growers in 2004. Produced 472 pounds in 2004 (seed analysis pending). New seed field (2.4 acres) established in May 2004.

**Snake River Plains Germplasm fourwing saltbush** – Produced 45 pounds of seed in 2003 and 2004. Shipped 2 pounds of Certified seed to commercial growers in 2004.

**Northern Cold Desert Germplasm winterfat** - Produced 15 and 10 pounds of seed in 2003 and 2004 respectively. Shipped 8 pounds of Certified seed to commercial growers in 2004.

## Propagation Studies

### Propagation of rooted fourwing saltbush from cuttings:

On August 12, 2004 cuttings were taken from mature fourwing saltbush (*Atriplex canescens*) Snake River Plains Germplasm at the Aberdeen Plant Materials Center home farm. Cuttings were made with the base approximately 1/8 to 3/16" diameter. Cuttings were placed in five gallon buckets lined with wet burlap sacs to prevent drying out. Cuttings were then transported back to the greenhouse for trimming. Field cuttings were trimmed down to approximately seven inches long and all leaves and shoots were removed except the apical shoot on the cutting. Cuttings were then dipped in Rootone® rooting hormone with fungicide. The cuttings were then placed in 40 cubic inch conetainers filled with a 1:1:1 soil mixture of peat, sand and perlite. Each conetainer contained two cuttings. Total elapsed time between cutting in the field and planting into soil was under two hours. Containers were then soaked manually with a hose and garden mist nozzle to field capacity. Planted cuttings were left in the headhouse overnight before moving into greenhouse.

Plants were maintained in the PMC greenhouse. Temperatures were maintained between 70 and 85 degrees F. Supplementary lighting was employed from 1900 to 2300 daily.

The trial was divided into two treatments involving different watering regimes. The first treatment, called hereafter traditional, was a watering schedule of 30 minutes of overhead spray on Tuesday and 60 minutes on Thursday of each week. The second treatment, misting, involved repeated mistings of 15 seconds every 20 minutes during the warm portions of the day (0700 to 2300).

#### Survival 9/27/04 (cutting + 6 weeks)

MIST	Survival	%	TRADITIONAL	Survival	%
♀	32/38	84	♀	0/40	0
♀	22/40	55	♀	12/40	30
♀	22/40	55	♀	8/40	20
♀	15/40	38	♀	0/40	0
♂	12/40	30	♂	5/40	13
<b>TOTAL</b>	<b>103/198</b>	<b>52</b>		<b>25/200</b>	<b>13</b>

Misting resulted in an overall survival of 52 percent versus 13 percent survival for the cuttings under traditional irrigation.

**Greenhouse seedling establishment study:** to evaluate fourwing saltbush seedling emergence based upon number of propagules planted per cell (5 versus 10 per cell) and to identify number of days to emergence, growth rates and transplant dates. As reported in 2002, 75 percent of the seedlings had red stems and 25 percent had white stems at time of transplant. The question arose as to whether or not this phenological difference could be

an indication of the sex of the plant. Plants are being maintained in the field to determine if this is possible.

### **Establishment of Demonstration Planting near Boise**

BLM burned site in fall of 2002. Site was sprayed by PMC in May, 2003 and 2004 with Roundup and 2,4-D at 64 oz and 16 oz. per acre respectively. Excellent kill was achieved. Due to limited breakdown of dead grass clumps that would inhibit proper seed placement with drill and to ensure a clean seedbed, the decision was made to lightly cultivate the site with a culti-packer the day before seeding. The demonstration planting was seeded November 16, 2004. There are 82 accessions of 27 native and introduced grass, forb and shrub species planted in 7 x 60 foot plots. Plots will be evaluated in 2005 to document establishment and plant performance. A plot map and description of the accessions planted was developed to allow for self guided tour of the demonstration nursery and is attached:

# NRCS Aberdeen Plant Materials Center

## Display Nursery, Orchard, Idaho

(Planted November 16, 2004)

		<b>*=Introduced species</b>	
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White River Indian Ricegrass	Thurber's Needlegrass
Nezpar Indian Ricegrass	Sherman Sandberg Bluegrass
Paloma Indian Ricegrass	High Plains Sandberg Bluegrass
Rimrock Indian Ricegrass	Mountain Home Sandberg Bluegrass
Ribstone Indian Ricegrass	Toole County, MT Sandberg Bluegrass
Sand Hollow Bottlebrush Squirreltail	Hanford Source Sandberg Bluegrass
Fish Creek Bottlebrush Squirreltail	Nordan Crested Wheatgrass*
Toe Jam Bottlebrush Squirreltail	Hycrest Crested Wheatgrass*
9019219 Bottlebrush Squirreltail	CD-II Crested Wheatgrass*
Shaniko Plateau Bottlebrush Squirreltail	Ephraim Crested Wheatgrass*
Bannock Thickspike Wheatgrass	Douglas Crested Wheatgrass*
Sodar Thickspike Wheatgrass	Roadcrest Crested Wheatgrass*
Critana Thickspike Wheatgrass	P-27 Siberian Wheatgrass*
Schwendimar Thickspike Wheatgrass	Vavilov Siberian Wheatgrass*
Pryor Slender Wheatgrass	Luna Pubescent Wheatgrass*
San Luis Slender Wheatgrass	Manska Pubescent Wheatgrass*
Revenue Slender Wheatgrass	Greenleaf Pubescent Wheatgrass*
Rosana Western Wheatgrass	Rush Pubescent Wheatgrass*
Rodan Western Wheatgrass	Eejay Altai Wildrye*
Arriba Western Wheatgrass	Pearl Altai Wildrye*
Goldar Bluebunch Wheatgrass	Prairieland Altai Wildrye*
Anatone Bluebunch Wheatgrass	Tetra-can Russian Wildrye*
Columbia Bluebunch Wheatgrass	Bozoisky Select Russian Wildrye*
Jim Creek Bluebunch Wheatgrass	Syn-A Russian Wildrye*
Wahluke Bluebunch Wheatgrass	Mankota Russian Wildrye*
P-5 Bluebunch Wheatgrass	Eagle Western Yarrow
P-7 Bluebunch Wheatgrass	Great Northern Western Yarrow
P-12 Bluebunch Wheatgrass	Timp Utah Sweetvetch
P-15 Bluebunch Wheatgrass	Richfield Selection Firecracker Penstemon
Secar Snake River Wheatgrass	Scarlet Globemallow
Expedition Snake River Wheatgrass	Maple Grove Lewis Flax
E-26 Snake River Wheatgrass	Appar Blue Flax*
SERDP Snake River Wheatgrass	Wyoming Big Sagebrush
Magnar Basin Wildrye	Snake River Plains 4-Wing Saltbush
Trailhead Basin Wildrye	Wytana 4-Wing Saltbush
Washoe Basin Wildrye	Rincon 4-Wing Saltbush
U70-01 Basin Wildrye	9016134 Gardner's Saltbush
U108-02 Basin Wildrye	Northern Cold Desert Winterfat
U100-01 Basin Wildrye	Hatch Winterfat
Initial Point Sheep Fescue	Open Range Winterfat
Covar Sheep Fescue	Immigrant Forage Kochia*

On November 16, 2004 the Aberdeen Plant Materials Center and the Idaho/Utah Plant Materials Specialist planted a new display nursery at the Orchard test site southeast of Boise. The display nursery is in cooperation with the Great Basin Native Plant Selection and Increase Project.

The Great Basin Native Plant Selection and Increase Project is a group of cooperators from the Bureau of Land Management, Forest Service, Agricultural Research Service, Utah Division of Wildlife Resources, Utah Crop Improvement Association and the Natural Resources Conservation Service who are collaborating to develop and increase native plant materials for the Great Basin and Intermountain West.

There are 82 accessions of 27 native and introduced grass, forb and shrub species planted in 7 X 60 foot plots. The purpose of this display nursery is to allow agency personnel and land owners to view these plants in action and see firsthand how the plants perform in the low precipitation environment (10 – 12 inch annual precipitation) of Southwestern Idaho. The display will also be useful in comparing different releases from within a species or in comparing native and introduced species with similar environmental requirements. The following descriptions begin at the northeastern corner plot and proceed west. Descriptions pick up again at the southeastern corner and return westward.

**Ricegrass, Indian** (*Achnatherum hymenoides*=*Oryzopsis hymenoides*=*Stipa hymenoides*)

White River, test material from Logan, UT ARS

'Nezpar' released by Aberdeen, ID PMC, 1978

'Paloma' released by Los Lunas, NM PMC, 1974

'Rimrock' released by Bridger, MT PMC, 1996

Ribstone Germplasm released by Logan, UT ARS, 2004

A native perennial, very drought tolerant bunchgrass adapted to well drained sandy to clayey soils and dry desert ranges. Seed is very slow to germinate due to a thick seed coat resulting in high seed dormancy. To improve seed germination, the seed can be treated in sulfuric acid, mechanically scarified, or dormant fall planted to allow for a cool moist stratification. Untreated seed requires a greater depth of planting than most species to promote seed germination. Recommended sites are sunny exposures in 7 inches or more precipitation zones with sandy or gravelly soils (10 inch plus rainfall areas result in most successful seedings). It grows on raw subsoil from lowlands into high mountains. Recommended planting depth is 1.5 inches in loamy soils to 3 inches on sandy to gravelly soils. It is very palatable, considered excellent winter forage, and the seed production enhances forage value because of high protein and fat content in the seed. It is also considered an excellent plant for wildlife habitat seedings. Good grazing management is necessary if stands are to persist. 'Nezpar' is a northern variety with improved germination characteristics. 'Paloma' is best adapted to southern semi-desert areas. 'Rimrock' and Ribstone Germplasm are northern varieties selected for better seed retention characteristics. White River comes from northwestern Colorado and was selected for high germinability. Average seeds per ft<sup>2</sup> at 1 lb. rate 5. Recommend pure stand rate 6 lb./ac.

**Squirreltail, Bottlebrush** (*Elymus elymoides* ssp. *elymoides* or ssp. *californicus* and *Elymus multisetus*)

Sand Hollow Germplasm released by Logan, UT ARS, 1996

Fish Creek Germplasm released by Logan, UT ARS, 2003

Toe Jam Creek Germplasm released by Logan, UT ARS, 2003

9019219, test material from Bridger, MT PMC

Shaniko Plateau, source identified release from L&H Seed

Bottlebrush squirreltail is a short-lived perennial, drought tolerant, cool season, native bunchgrass. It is short to medium sized (6 to 22 inches tall), tufted and has fair forage value in winter and spring and poor forage value in summer when seedheads are present. The bristly awns are objectionable to grazing animals and cause difficulties in seed handling, planting and harvesting. This species is often an increaser on poor condition to improving rangelands. It is adapted to a wide variety of soils including saline soils in the 8-18 inch precipitation zones. It is hoped it will have attributes that will enable it to establish a foothold in annual rangelands dominated by cheatgrass or medusahead rye. ARS and NRCS have released three squirreltail accessions, Sand Hollow Selected Germplasm (*E. multisetus*) in 1996; Toe Jam Selected Germplasm (*E. elymoides* ssp. *californicus*) in 2003; and Fish Creek Selected Germplasm (*E. elymoides* ssp. *elymoides*) in 2003. Sand Hollow is best adapted to sandy foothill rangelands receiving 12 inches or more annual precipitation in the lower Snake River Plains. Toe Jam is best adapted to loam to sandy loam soils in the Great Basin and lower to middle Snake River Plains receiving 8-14 inches of precipitation. Fish

Creek is best adapted to sandy loam to silt loam to clay loam soils receiving 10 inches or more annual precipitation in the middle to upper Snake River Plains. Average seeds per ft<sup>2</sup> at 1 lb. rate 4. Seeding rate 7 lb./ac.

**Wheatgrass, Thickspike** (*Elymus lanceolatus* ssp. *lanceolatus*=*Agropyron dasystachyum*)

'Bannock' released by Aberdeen, ID PMC, 1995

'Sodar' released by Aberdeen, ID PMC, 1954

'Critana' released by Bridger, MT PMC, 1971

'Schwendimar' released by Pullman, WA PMC 1994

A long-lived, native mildly sod-forming grass widely distributed in the northern part of the Intermountain Region. Drought tolerance, early spring growth, fair palatability, but low forage production characterizes this species. More drought tolerant than western wheatgrass, it is well suited for wind erosion control on medium to coarse-textured soils. It is best utilized as forage until early fall. It tolerates moderate grazing and considerable trampling. Adapted to disturbed range sites and dry areas subject to erosion, roadsides, and waterways in the 8-18 inch precipitation zones. Use as a native component in rangeland mixes. Planting depth 1/4 to 1/2 inch. Improved varieties include 'Bannock', 'Schwendimar', 'Critana' and 'Elbee'. Bannock is noted for its rapid establishment, moderate sod formation and greater forage production. Critana is more drought tolerant, exhibits good seedling vigor and readily establishes on critical areas. Schwendimar is noted for quick stabilization of coarse textured soils along the Columbia River. Average seeds per ft<sup>2</sup> at 1 lb. rate 3. Recommend pure stand rate 6 lb./ac.

**Wheatgrass, Slender** (*Elymus trachycaulus trachycaulus*=*Agropyron trachycaulum*)

'Pryor' released by Bridger, MT PMC, 1988

'San Luis' released by Upper Colorado Environmental Plant Center, 1984

'Revenue' released by Canada Department of Agriculture, 1970

Slender wheatgrass is a short-lived perennial (3-5 years) native bunchgrass with good seedling vigor and moderate palatability. It is valuable in erosion-control seed mixes because of its rapid development, moderate salt tolerance, and compatibility with other species. It is well adapted as a cover crop to improve soil tilth and to increase organic matter in saline sites. It tolerates a wide range of conditions and adapts well to high altitude ranges and more favorable sites on mountain brush areas receiving 10 inches or more annual precipitation. It is excellent in aspen and tall mountain brush areas and is shade tolerant. Planting depth 1/2 to 3/4 inch. 'Revenue' is a Canadian variety, selected for salinity tolerance, seed set, and forage yield. 'San Luis' is a southern variety adapted to high elevations. 'Pryor' is a northern variety, selected for superior salt tolerance, drought tolerance, and seedling vigor. Average seeds per ft<sup>2</sup> at 1 lb. rate 3.0. Recommend pure stand rate 6 lb./ac. Limit slender wheatgrass to 1 pound PLS per acre in native mixes. Higher rates effect the establishment of slower developing native species.

**Wheatgrass, Western** (*Pascopyrum smithii*=*Agropyron smithii*)

'Rosana' released by Bridger, MT PMC, 1972

'Rodan' released by ND ARS, 1983

'Arriba' released by Los Lunas, NM PMC, 1973

A long-lived, late maturing, widely distributed, winter hardy, strongly rhizomatous, native grass with coarse blue-green leaves. Western wheatgrass begins spring growth later than most wheatgrasses and is typified by poor germination and low seedling vigor. When used as pasture it is considered to be an excellent source of spring and early summer forage with protein content of 16 to 18 percent. However, forage quality rapidly declines as plants mature. It provides winter grazing if protein supplements are provided. Protein content of western wheatgrass is usually a little higher (4-5 percent) than other wheatgrasses once cured. Plantings usually result in scattered stands that spread in 3 to 4 years to site dominance. Western wheatgrass is the most aggressive native sod grass available. Once established, it becomes very persistent and provides excellent soil binding erosion control characteristics. It is productive native hay in above normal precipitation years, under water spreading, and other supplemental water irrigation systems. It is particularly productive in clayey swales and silty waterways, and has moderate to high salt tolerance. Adapted to lowlands prone to early season flooding with precipitation at or above 12 inches (use 14 inch + for areas that receive 50 percent or greater winter precipitation) and most mountain brush areas. Planting depth 1/4 to 1/2 inch. Adapted varieties include 'Rosana' (northern variety), 'Rodan' (northern variety), and 'Arriba' (southern variety). Other releases include 'Barton', 'Flintlock', and 'Walsh'. Average seeds per ft<sup>2</sup> at 1 lb. PLS rate is 3. Recommended pure stand seeding rate 6 PLS lb./ac. Not recommended in pure stands. Recommended 50% mixed stand seeding rate 3.0 lb./ac.

**Wheatgrass, Bluebunch** (*Pseudoroegneria spicata* = *Agropyron spicatum*)

'Goldar' released by Aberdeen, ID PMC, 1989

'Anatone' released by Aberdeen, ID PMC, 2004

'Columbia' released by Logan, UT ARS, 2004

Wahluke Source Identified release from BFI Seed, 2002

P-5, test material from Logan, UT ARS

'P-7' released by Logan, UT ARS, 2001

P-12, test material from Logan, UT ARS

P-15, test material from Logan, UT ARS

A long-lived, drought-tolerant, widespread native bunchgrass. It begins growth early in spring and again with the onset of fall rains. It is highly palatable and recovers rapidly after grazing but has low resistance to repeated or heavy grazing. It is not recommended as a hay crop. Several years are required for stand to obtain full productivity due to poor seedling vigor. Allow seedlings to reach maturity (seedhead development) before grazing. Recommended sites include foothills and valleys with 10-20 inches precipitation, sagebrush, ponderosa pine, mountain brush and juniper-pinyon ranges. Low plant vigor results in poor stands on sites above 6500-ft. elevation. Planting depth 1/4 to 1/2 inch. Adapted varieties are 'Anatone' for use above 10" precipitation and 'Goldar' and 'P7' for use above 12" precipitation. P-12 and P-15 are predecessor populations for the ARS release 'Columbia'. Both were collected near Lind, WA in a 10" precipitation area. 'Secar' (See Snake River Wheatgrass), previously considered to be bluebunch wheatgrass but found to be a subspecies of thickspike wheatgrass, is more drought tolerant than bluebunch wheatgrass in lower precipitation areas (8-12"). Wahluke is a source identified release collected from a 6" precipitation site in Franklin County, WA. Average seeds per ft<sup>2</sup> at 1 lb. rate 3. Recommend pure stand rate 7.0 lb./ac.,

**Wheatgrass, Snake River** (*Elymus wawawaiensis* formerly *Pseudoroegneria spicata*)

'Secar' released by Pullman, WA PMC, 1980

Expedition, test material from Logan, UT ARS

SERDP, test material from Logan, UT ARS

Jim Creek Source Identified release from BFI Seed, 2000

E-26, test material from Logan, UT ARS

Snake River wheatgrass is a native of the canyons of the Snake River and its tributaries in Washington, eastern Oregon, and western to northern Idaho. It is similar in appearance to bluebunch wheatgrass, but differs morphologically in having narrower, acuminate (pointed) to aciculate (needle-like) glumes, a more imbricate (overlapping) spike, and glabrate (without hairs) basal leaf sheaths. It is adaptable to most bluebunch wheatgrass areas but is best suited for the lower precipitation areas (8 to 12 inches). (See bluebunch wheatgrass). The only variety is 'Secar'. It is an early maturing bunchgrass with good seedling vigor and establishes well in native seed mixes. Secar is considered more drought tolerant than previously released bluebunch wheatgrasses. Expedition is said to have improved seedling establishment under drought stress compared to 'Secar' and is slated for release in the near future. Average seeds per ft<sup>2</sup> at 1 lb. rate 3. Recommend pure stand rate 7 lb./ac.

**Wildrye, Basin** (*Leymus cinereus* = *Elymus cinereus*)

'Magnar' released by Aberdeen, ID PMC, 1979

'Trailhead' released by Bridger, MT PMC, 1991

Washoe Germplasm, released by Bridger, MT PMC 2002

U70-01, test material from Great Basin Research Center, UTDWR

U108-02, test material from Great Basin Research Center, UTDWR

U100-01, test material from Great Basin Research Center, UTDWR

A slowly spreading, robust, large native bunchgrass. Basin wildrye is tall, coarse, long-lived, and highly palatable early in spring and becoming low in palatability as it matures. It is useful for calving pasture and wildlife forage and cover. Poor seedling vigor usually results in sparse stands, but one of the highest producing species once established. Do not graze new seedlings until seedheads are evident or no sooner than the end of the second growing season. Mature plants are unpalatable and need to be managed for use at earlier periods with grazing management scheduled to maintain a 10 to 12 inch stubble height to avoid removing the growing point of this species. Great care must be taken to avoid close grazing or clipping which may result in plant loss in a single season. Winter grazing with protein supplements utilize old coarse growth. Best adapted to moderately saline or alkaline lowlands, flood plains, and flow in areas with high water holding capacity. Especially suited to deep, fine textured clayey to loamy soils that receive 8-12 inches precipitation. Plantings have been established in rainfall areas as low as 5 inches, however basin

wildrye plantings are not recommended in areas with less than 8 inches annual precipitation. Particularly well suited for many juniper areas; performs well throughout the mountain brush zone and in aspen openings. Planting depth 1/2 to 3/4 inch. Adapted cultivars are 'Magnar' (blue-green upright leaves) and 'Trailhead' (green overhanging leaves) selected for excellent drought tolerance. 'Washoe' was selected for its high tolerance to acidic conditions and should be useful in mine reclamation situations. Average seeds per ft<sup>2</sup> at 1 lb. rate 3. Recommend pure stand seeding rate 7 lb./ac. Basin wildrye is highly recommended for native species mixtures.

**Fescue, Sheep** (*Festuca ovina*)

Initial Point, source identified test material collected by Idaho BLM

'Covar' released by Pullman, WA PMC, 1977

A long-lived short stature introduced bunchgrass with short leaf blades. It is more drought tolerant than other fescues. Production is low, but groundcover and root production is excellent. It is used for turf, highway plantings, airport landing strips, burned over timberland and reclamation areas where a long-lived, persistent, competitive ground cover is needed. Not recommended for pasture or hay. Sheep fescue is best adapted to 10+ inch precipitation zones. A very good erosion control and understory species that competes well with weeds. Early spring seedings are recommended. Only pure stands or mixtures with hard fescue are recommended. Planting depth 0-1/4 inch. Adapted varieties are 'Covar' and 'Bighorn'. Average seed per ft<sup>2</sup> is 16 at a 1 lb. rate. Recommended pure stand rate is 4 lb./ac.

**Needlegrass, Thurber's** (*Achnatherum thurberianum*=*Stipa thurberiana*)

Orchard, test material from USDA FS Intermountain Shrub Lab

A medium height, cool season, native bunchgrass. It is very drought tolerant and often found on well drained, rocky sites and southern exposures in the 8-16 inch rainfall zones. It has fine leaves and is fair to good forage in the early spring when most species are not productive and can green-up in fall with rainfall. It is currently under development by the Forest Service. Native seed collections should specify "Source Identified" seed. Average seeds per ft<sup>2</sup> at 1 lb. rate 3. Seeding rate 7 lb./ac.

**Bluegrass, Sandberg** (*Poa secunda* =*P. sandbergii*=*P. ampla*)

'Sherman' released by Pullman, WA PMC, 1945

High Plains Germplasm released by Bridger, MT PMC 2000

Mountain Home, test material from USDA FS Intermountain Shrub Lab

Toole County, MT, source identified release from L&H Seed

Hanford Source, source identified release from L&H Seed

Sandberg bluegrass is a small, low producing, very drought tolerant, native, perennial bunchgrass that grows in small tufts usually no larger than 6-8 inches in diameter. It is widely distributed throughout western range plant communities where it is considered an important grass for soil stabilization and forage for wildlife. It is best adapted to medium to heavy textured soils. It is found from 1,000 feet in Washington to 12,000 feet in northern New Mexico. It is adapted to 8-20 inches of moisture annually. It is tolerant of heavy trampling. Forage yields are very low, seed viability is generally poor, and forage quality declines rapidly in mid to late spring as it matures. It is one of the first grasses to green-up in the spring. Due to its low stature, Sandberg bluegrass can withstand heavy grazing pressure. On large areas of western semi-desert rangelands, overgrazing has depleted most of the desirable bunchgrasses except Sandberg bluegrass. It provides little to no forage in summer and fall unless fall rains occur. 'High Plains' Selected Class Germplasm is a recent release from Bridger PMC. 'Sherman' is a large statured plant previously released as big bluegrass (*Poa ampla*) Plant at 1/4 inch or less depth. Average seeds/ft<sup>2</sup> at one pound rate 21. Recommended pure stand seeding rate 2 lb./ac. It is best utilized in low rainfall area native mixes.

**Wheatgrass, Crested Standard type-AGDE2** (*Agropyron desertorum*)

'Nordan' released by ND AES, 1953

A very long-lived, drought tolerant bunchgrass adapted to a wide range of sites and precipitation zones as low as 9-10 inches. Growth begins early in the spring and again with fall moisture. Palatability is excellent in the spring and late fall, less during summer dormancy and after seed formation. It has very vigorous seedlings. Adapted to foothills with 9-16 inches precipitation, sagebrush, ponderosa pine, mountain brush, and juniper-pinyon ranges. Expect low vigor and poor stands above 6500 feet elevation. This species is more drought tolerant than Fairway type crested wheatgrasses. Planting depth 1/4 to 1/2 inch. Adapted varieties are 'Nordan' and 'Summit'. Average seeds per ft<sup>2</sup> at 1 lb. rate 4. Recommend pure stand rate 5 lb./ac.



**Wheatgrass, Crested** CD-II and Hycrest-hybrids (*Agropyron cristatum x A. desertorum*)

'Hycrest' released by Logan, UT ARS, 1984

'CD-II' released by Logan, UT ARS, 1996

A hybrid cross between Standard type and induced tetraploid Fairway type crested wheatgrass. Seedlings are extremely vigorous during germination and early establishment. Survives under greater competition than other crested wheatgrasses. Yields more forage (15-20%) in younger stands; is an outstanding seed producer, but more stemmy. Occupies same sites as standard and Fairway crested wheatgrass. Especially useful in drier sagebrush - cheatgrass sites. Survives in areas with 9-16 inches precipitation. Does not persist as well as Standard type crested wheatgrass or Siberian wheatgrass in very droughty sites. Planting depth 1/4 to 1/2 inch. Cultivars include 'CD-II' and 'Hycrest'. Average seeds per ft<sup>2</sup> at 1 lb. rate 4. Recommend pure stand rate 5 lb./ac.

**Wheatgrass, Crested** Fairway type-AGCR (*Agropyron cristatum*)

'Ephraim' released by USFS, 1983

'Douglas' released by Logan, UT ARS, 1994

'Roadcrest' released by Logan, UT ARS, 1998

A very long-lived, drought-tolerant, vigorous introduced bunchgrass. Similar to standard crested wheatgrass but shorter, earlier maturing, with finer stems and leaves. Establishes on similar sites (10-18 inches precipitation) as standard and grows more effectively than standard at higher elevations. This species does not survive as well as standard crested wheatgrass under severe drought conditions. Planting depth 1/4 to 1/2 inch. Adapted varieties are 'Fairway' and 'Ephraim'. 'Ephraim', is a tetraploid variety of *A. cristatum* that is weakly rhizomatous in higher rainfall areas. 'Roadcrest' is a turf-type with short rhizomes and is recommended for low maintenance lawns. 'Douglas' crested wheatgrass is the first hexaploid on the market. Douglas is characterized as having larger seed, broader leaves and stays green longer into the early summer than other types mentioned above, but requires 14 inches of precipitation or more for long-term survival. It also establishes easily, but produces less forage. Because it stays green longer than other types, it is a preferred forage selection. Douglas is not as drought resistant as Nordan, Summit, Hycrest or CD-II. Other cultivars available but less adapted include 'Parkway', 'Kirk' and 'Ruff'. Average seeds per ft<sup>2</sup> at 1 lb. rate 4. Recommend pure stand rate 5.0 lb./ac.

**Wheatgrass, Siberian** (*Agropyron fragile = A. sibiricum*)

'P-27' released by Aberdeen, ID PMC, 1953

'Vavilov' released by Logan, UT ARS, 1994

Similar to crested wheatgrass, Siberian wheatgrass has finer leaves, and retains its greenness and palatability later into the summer than crested wheatgrass. It yields less than most crested wheatgrass cultivars. It occupies sites where standard crested wheatgrass will grow but is more drought tolerant (7-16 inches of precipitation) and is especially useful on juniper sites. Once established, it is reported to be well adapted to light-sandy, droughty soils and can withstand extended periods of drought better than crested wheatgrasses. Planting depth 1/4 to 1/2 inch. Adapted varieties include 'P-27' and 'Vavilov' (improved seedling vigor). Average seeds per ft<sup>2</sup> at 1 lb. rate 4. Recommend pure stand rate 6 lb./ac.

**Wheatgrass, Pubescent** (*Thinopyrum intermedium = Elytrigia intermedia = Agropyron trichophorum*)

'Luna' released by Los Lunas, NM PMC, 1963

'Manska' released by ARS, ND, 1992

'Greenleaf' released by Canada Department of Agriculture, 1966

'Rush' released by Aberdeen, ID PMC, 1994

A long-lived, late maturing, introduced, sod-forming grass adapted to low-fertility sites and coarse to medium textured soils. Very similar to intermediate wheatgrass (pubescence on leaves and seed heads) but slightly more drought-resistant, alkali tolerant, and somewhat less palatable. It is better adapted for pasture than for hay. Its ability to remain green during the summer, when soil moisture is limited, is a significant characteristic. Adapted to foothills with 11-18 inches precipitation, this species is excellent for situations where only one to two irrigations are possible, because it readily responds to irrigation with increased forage production, but can also withstand extended drought periods when irrigation water is not available. Useful on disturbed sites for soil stabilization and erosion control. It is not shade tolerant, but is moderately tolerant of saline soil conditions. It is very useful for erosion control on a wide range of sites. Suggested varieties are 'Luna' (most commonly used), 'Rush' (released for high seedling vigor and establishment) as well as 'Manska' and 'Greenleaf'. Average seeds per ft<sup>2</sup> at 1 lb. rate 2. Recommend pure stand rate 8 lb./ac.

**Wildrye, Altai** (*Leymus angustus*=*Elymus angustus*)

'Eejay' released by Agriculture Canada, 1989

'Pearl' released by Agriculture Canada, 1989

'Prairieland' released by Agriculture Canada, 1976

A winter hardy, drought resistant, long-lived, cool season introduced bunchgrass, sometimes with short rhizomes. It is known to root and use moisture to depths of 15 feet. Basal leaves are somewhat coarse, but very palatable during the late summer and early fall (protein levels of 8 percent are common in standing winter-feed). In northern regions it is commonly swathed into windrows and utilized as forage for winter feeding operations. Adapted to moderately deep to deep loams to clay loams with 14 inch or greater rainfall. It can withstand saline conditions almost as well as tall wheatgrass and is also almost as productive as tall wheatgrass on saline sites. Seedlings develop slowly and good seedbed preparation and weed control is essential. 'Eejay', 'Pearl', 'Mustang' and 'Prairieland' are released varieties. Average seeds per ft<sup>2</sup> at 1 lb. rate 2. Recommended pure stand rate 10 lb./ac.

**Wildrye, Russian** (*Psathyrostachys juncea*=*Elymus junceus*)

'Tetracan' released by Agriculture Canada, 1988

'Bozoisky-Select' released by Logan, UT ARS, 1984

'Mankota' released by ND, ARS, 1991

Syn A, test material from Logan, UT ARS

A long-lived introduced very drought tolerant bunchgrass. Grows rapidly in the spring and produces abundant basal leaves that remain green and palatable through summer and fall as long as soil moisture is available. It endures close grazing better than most grasses. It cures well on the stump (better than most cool season grasses) and makes excellent late fall and winter feed. Russian wildrye is not suited for hay production due to the predominance of basal leaves, which makes it difficult to harvest. Once established, it competes effectively against undesirable plants and it withstands drought as effectively and is more palatable than crested wheatgrass. However, most varieties have been erratic in establishment, demonstrate poor seedling vigor, and provide poor soil protection. Seed in areas receiving at least 8 inches of precipitation. Adapted to sagebrush, mountain brush, juniper-pinyon, and moderately saline sites. Useful on soils too alkaline for crested wheatgrass and too dry for tall wheatgrass. Planting depth 1/4 to 1/2 inch; and is very sensitive to deeper placement. Highest production occurs in wide row spacing of >18 inches. On steep slopes it should be planted on the contour. 'Vinal', an earlier variety, has poor seedling vigor and is not recommended. Canadian releases include 'Swift', which was selected for seedling vigor, and 'Cabree', selected both for seedling vigor and reduced seed shattering. U.S. releases include 'Bozoisky-Select', selected for increased seedling vigor and forage production and 'Mankota', selected for establishment from deeper seeding depths. In plantings in the Intermountain West, Bozoisky-Select and Mankota should be the varieties of choice. Average seeds per ft<sup>2</sup> at 1 lb. rate 4. Recommend pure stand seeding rate 6 lb./ac.

**Yarrow, Western** (*Achillea millefolium*)

Eagle, source identified release from Geertson Seed Farms

Great Northern released by Bridger, MT PMC, 2004

Western yarrow is a perennial forb (member of the sunflower family) and is one of the most widely distributed forbs in the western United States. Native ecotypes are white flowered while Eurasian ecotypes are pink to yellow flowered. It can be found from the valley bottoms to the subalpine zone. Greatest areas of occurrence are mountain brush, aspen, and open timber. It has some shade, drought, and grazing tolerance and can be found in sandy to loamy soils ranging from weakly basic to weakly acid. Yarrow spreads by seed and rhizomes; does an especially good job on disturbed and depleted areas. It may invade adjacent areas that have proper growing conditions. Fall seeding is recommended. Depth of seeding should not exceed 1/4 inch. Western yarrow should be seeded in mixtures with other species. It is easily transplanted. It has been successfully used in plantings that receive as little as 8 inches effective precipitation. Bridger PMC has recently released Great Northern Germplasm from a source in northwestern Montana. Average seeds per ft<sup>2</sup> at 1 lb. rate 95. Pure stand seeding rate 0.25 lb./ac. Not recommended for pure stands.

**Sweetvetch, Utah (Northern)** (*Hedysarum boreale*)

'Timp' released by Upper Colorado Environmental Plant Center, 1994

Utah or Northern sweetvetch is a native perennial legume. This species occurs in the foothills and upland areas that receive 10 or more inches of precipitation. Sweetvetch prefers well-drained soils ranging from rocky, gravelly, and sandy to heavy clay. Its deep taproot enables it to take advantage of deep soil moisture

that results in considerable drought resistance and winter hardiness. Seed should be fall seeded at 1/8 inch to 3/4 inch deep. It is very slow to establish in mixed stands and requires alternate row planting to provide optimum establishment. Livestock and big game graze this species when available. Spring green up occurs early, and basal leaves remain green throughout the winter. 'Timp' is a release from Meeker PMC. Average seeds per ft<sup>2</sup> at 1 lb. rate 2. Pure stand seeding rate 18 lb./ac. Not recommended for pure stands.

**Penstemon, Firecracker** (*Penstemon eatonii*)

Richfield Selected Germplasm, released by Aberdeen, ID PMC, 1994

A perennial, erect, cool season, short-lived, good reseeder, native forb that has a fibrous root system, stems that are decumbent or reclining, leaves that are slightly pubescent, flowers on upright stems that are bright red and bloom in mid summer through early fall. It is adapted to sagebrush, juniper and ponderosa pine zones at 3,300 to 8,000 feet elevation in 10-16 inch precipitation zones. It does best in full sunlight and can survive cold winter temperatures if snow insulates the plant. It does not do well in poorly drained areas. Potential uses include erosion control, diversity and beautification. The Richfield Selection is a release of firecracker penstemon from Aberdeen PMC. Due to hard seed, plant penstemon species in late fall-early winter at soil surface to 1/8-inch depth. Average seeds per ft<sup>2</sup> at 1 lb. rate 7. Not recommended in pure stands.

**Globemallow, Scarlet** (*Sphaeralcea coccinea*)

Test material from Great Basin Research Center

Scarlet globemallow is a native, low-spreading perennial with creeping rhizomes. This species has considerable drought resistance with greatest area of occurrence is between 7 and 12 inches annual precipitation. It establishes especially well on disturbed sites. It is an excellent soil stabilization species in native species mixtures on harsh sites. Fall seeding is recommended. A hard seed coat often prevents germination. Seed should not be planted deeper than 1/4 inch. Average seeds per ft<sup>2</sup> at 1 lb. rate 17. Pure stand seeding rate 3 lb./ac. Not recommended in pure stands.

**Flax, Lewis and Blue** (*Linum lewisii* and *Linum perenne*)

Maple Grove Germplasm, released by Aberdeen, ID PMC, 2004

'Appar' released by Aberdeen, ID PMC, 1980

Blue flax is an introduced, perennial, semi-evergreen, blue-flowered forb that prefers well-drained soils that range from moderately basic to weakly acidic. It prefers growing in the open, but does have some shade tolerance. It is intolerant of poor drainage, flooding and high water tables. This species grows well in 10-18 inch precipitation areas including all three big sagebrush types, juniper and mountain brush communities. It has been successfully seeded in the salt desert shrub type. Flax does well seeded in mixtures with other species. It can be surface seeded on a disturbed seedbed and should not be seeded deeper than 1/8 inch. This semi-evergreen forb is eaten readily by big game especially during spring and winter and upland game and songbirds relish seeds. This species does well seeded on disturbed sites. 'Appar' was released for its superior forage and seed production and palatability to livestock and wildlife. Recent research has identified 'Appar' as introduced from European origins. Maple Grove Germplasm (*Linum lewisii*) is a new native release by the USDA FS and Aberdeen PMC. Average seeds per ft<sup>2</sup> at 1 lb. rate 6. Pure stand seeding rate 4 lb./ac. Not recommended in pure stands.

**Sagebrush, Wyoming Big** (*Artemisia tridentata ssp. wyomingensis*)

Test material from BLM Seed Warehouse, Boise, ID

Big sagebrush with its 4 major subspecies (basin, Wyoming, mountain, spicate) is a widely occurring, landscape dominating native shrub ranging in height from 1 to 15 feet. The lower forms generally have several main stems arising from the base; the tall forms often have a single trunk. Big sagebrush grows in a variety of soils on arid plains, valleys, and foothills to mountain slopes in the 8-18 inch rainfall areas. It is frequently associated with such shrubs as shadscale, rubber rabbitbrush, green rabbitbrush, fourwing saltbush, spiny hopsage, gray horsebrush, winterfat, broom snakeweed, antelope bitterbrush, snowberry, and serviceberry. Big sagebrush is one of the more nutritious shrubs on western winter game ranges. Palatability of the different populations of this shrub to mule deer, sheep, and other animals varies widely. It is one of the best shrubs available for use in revegetation of depleted winter game ranges in the Intermountain West. Big sagebrush establishes rapidly from direct broadcast seeding on disturbed surfaces. It is useful for stabilizing washes, gullies, road-cuts, and other raw, exposed sites. It is widely seeded on big game improvement projects. Plants spread well by natural seeding and furnish considerable browse soon after seeding. Big sagebrush is aggressive and persistent and sometimes forms closed stands, which require control measures to improve species diversity. 'Hobble Creek' is a robust, palatable form of

mountain big sagebrush adapted to areas with 14 inches or more precipitation and deeper soils. 'Gordon Creek' is a release of Wyoming big sagebrush adapted to 10-14 inches precipitation. Wildland seed collection is a common practice and Source Identified seed is recommended when using wildland collected seed. Use of freshly harvested seed is also recommended. Seed at 0-1/8 inch depth. Average seeds per ft<sup>2</sup> at 1 lb. rate; Basin 39, Mountain 45, Wyoming 39. Not recommended for pure seedings. Recommended rates in mixes are approximately 1/40 of a pound PLS per acre.

**Saltbush, Fourwing** (*Atriplex canescens*)

Snake River Plains Germplasm, released by Aberdeen, ID PMC, 2001

'Wytana' released by Bridger, MT PMC, 1976

'Rincon' released by USDA FS, 1983

Fourwing saltbush is an upright native shrub from 1 to 6 feet tall depending on site conditions and genotype. It occurs as pistillate (female), staminate (male), or more rarely monoecious (female and male) bushes. The species grows in a variety of soil types from valley bottoms and plains to mountainous areas. It is well suited to deep, well-drained sandy soil, sand dunes, gravelly washes, mesas, ridges, and slopes, but vigorous plants have been found in heavy clays as well. It is frequently found intermixed with numerous shrub and grass species. It is primarily found in the 8-16 inch precipitation zones. Fourwing saltbush is one of the most valuable forage shrubs in arid rangelands because of its abundance, accessibility, palatability, size, evergreen habitat, nutritive value, rate of growth, and large volume of foliage. Its leaves, stems, and utricles provide browse in all seasons. It withstands extremely heavy browsing and often appears to be stimulated by use. Research indicates that some ecotypes of this species may resprout following fire. This species is also one of the most important shrubs for use in rehabilitation of depleted rangelands and in soil stabilization projects. It can be established by direct seeding and by bare root and container transplanting. Fall seeding results in the best stands. The cultivar 'Rincon' is a strain best adapted to the warmer-southern big sagebrush and juniper zones but also does well in the more mesic portions of salt desert shrub areas. Another cultivar is 'Wytana', a natural hybrid of fourwing saltbush and Gardner saltbush, with lower stature. It is best adapted to higher elevation northern great plain on clayey saline soils. The most recent release by Aberdeen PMC, Snake River Plains Germplasm has better cold tolerance than Rincon and is recommended for southern Idaho, northern Nevada and northern Utah. Wildland seed collection is a common practice and Source Identified seed is recommended when using wildland collected seed. Plant at 1/4-3/4 inch depth. Average seeds per ft<sup>2</sup> at 1 lb. rate 1.2. Not recommended for pure stands. Recommended rate in mixes is approximately 1/4 of a pound PLS per acre - dewinged.

**Saltbush, Gardner or Nuttall** (*Atriplex gardneri* = *A. nuttallii*)

9016134 test material from Bridger, MT PMC

Gardner saltbush is a low growing perennial shrub that is widespread throughout the Intermountain West including salt desert shrublands. It is usually found on saline heavy textured soils in drier sites than sagebrush or fourwing saltbush, but may be in association with them and is most common in areas receiving 6-12 inches of precipitation. On adapted sites, this species establishes and grows rapidly where few other species exist. It is sensitive to over grazing and many sites that historically supported this species are now lost. It produces excellent browse in all seasons for wildlife and livestock. Wildland seed collection is a common practice and Source Identified seed is recommended when using wildland collected seed. Plant at 1/4-3/4 inch depth. Average seeds per ft<sup>2</sup> at 1 lb. rate 2.6. Not recommended for pure stands. Recommended rate in mixes is approximately 1/4 of a pound PLS per acre. It is best to plant Gardner saltbush in separate rows from other species.

**Winterfat** (*Krascheninnikovia lanata* = *Ceratoides lanata* = *Eurotia lanata*)

Northern Cold Desert Germplasm released by Aberdeen PMC, 2001

'Hatch' released by USDA FS, 1985

Open Range Germplasm, released by Bridger, MT PMC, 2002

Winterfat is an erect or spreading native sub-shrub that shows wide variation in stature from dwarf forms less than 8 inches in height to larger forms to 4 feet in height. The dwarf forms are herbaceous above with a woody base; taller forms tend to be woody throughout. Winterfat is most abundant on lower foothills, plains, and valleys with dry saline to alkaline soils that receive 7 inches or more precipitation. Winterfat is a superior nutritious winter browse for livestock and big game. Sheep, cattle, antelope, elk, deer, and rabbits utilize winterfat. Even though it is relatively tolerant to browsing, over grazing has greatly reduced and even eliminated winterfat in some areas. Winterfat seed maintains viability for relatively short periods of time (6 months to 2 years) without special treatment. Seeds require an after-ripening period for

maximum germination and germinate best at warm temperatures (77 to 80°F). Winterfat may be established by seed or by transplanting in 9 inch or greater rainfall areas (attempts to establish winterfat in lower rainfall zones commonly fails). Young seedlings are generally vulnerable to spring frosts. The upright variety, 'Hatch', is best adapted to southern ranges and produces rapid growth. The most recent release by Aberdeen PMC, Northern Cold Desert Germplasm has better cold tolerance than past releases and is recommended for southern Idaho, northern Nevada and northern Utah. Bridger PMC released Open Range Selected Germplasm in 2002 for use in the Northern Rocky Mountains and Great Plains. Wildland seed collection is a common practice and Source Identified seed is recommended when using wildland collected seed. Average seeds per ft<sup>2</sup> at 1 lb. rate 2.8. Not recommended for pure stands. Recommended rates in mix are approximately 1/40 of a pound PLS per acre.

**Kochia, Forage (*Kochia prostrata*)**

'Immigrant' released by USDA FS, 1984

A semi-evergreen perennial sub-shrub introduced from southern Eurasia. On many desert and semidesert ranges, in Russia, it is considered a valuable forage shrub often associated with crested wheatgrass. It has been seeded in the Western United States for many years as a forage and reclamation plant on semiarid locations.

Forage kochia is adapted to basic soils but not suitable for neutral or acid soils. Successful plantings have occurred on soils ranging from sandy loam to heavy clay, with the most successful plantings on heavier soils. This shrub develops a fibrous root system with a large deep taproot, and has been established in areas that receive 5 to 27 inches of annual precipitation.

Forage kochia has demonstrated its adaptability to the juniper, basin big sagebrush, Wyoming big sagebrush, and greasewood-shadscale habitats. Important characteristics: ability to establish and persist on disturbed harsh soils, high salinity and drought tolerance, tolerance of extreme temperatures (-25°C to 104°C), low oxalate levels (lower than winterfat and fourwing saltbush), ability to spread slowly from seed, high seed production, moderate shade tolerance, fair palatability for livestock and big game, food and cover for upland game birds, good fire tolerance, compatibility with other perennials, competitiveness with annuals, and ability to increase fall and winter forage quality of perennial grass stands. The lower one-third of the plant remains green and succulent year around. The upper stems and seed stalks turn brown to red and dry after seed shatter (November to December).

Protein content during winter (upper dry stems 6%, lower green stems 8-9%) is higher than what occurs in antelope bitterbrush and true mountain mahogany. Summer protein content has been found to be over 13%. Sheep and deer find this shrub palatable year around. When established in annual communities such as halogeton or cheatgrass, forage kochia can compete with annuals by reducing their dominance, density, forage, and seed production. In perennial communities, this shrub fills in interspaces but has not been observed to reduce the density of established perennials.

It is compatible in mixtures with drought tolerant grasses. Direct seeding on rangeland is best accomplished in the fall or winter by broadcasting on top of disturbed or undisturbed soil. Seed viability is generally limited to one year and use of fresh seed with a current germination analysis is highly recommended. If drill seeded, seed should not be seeded deeper than 1/16-inch. Seeding can be in combination with other perennial species. One cultivar, 'Immigrant' has been released. Average seeds per ft<sup>2</sup> at 1 lb. rate 9.0. Recommended full seeding rate 1 lb./ac. It is not recommended in pure stands. Recommended rates in mix is approximately 1/40 of a pound PLS per acre.