

# TECHNICAL NOTE

---

USDA-Natural Resources Conservation Service  
Casper, Wyoming

---

WYOMING PLANT MATERIALS TECH NOTE 13

September 2002

## GRASS, GRASS-LIKE, FORB, LEGUME, AND WOODY SPECIES FOR THE INTERMOUNTAIN WEST

This Technical Note was developed by Dan Ogle, Plant Materials Specialist, NRCS, Boise, Idaho. This is a literature review and includes narrative descriptions for species commonly seeded or planted throughout the Intermountain West. The descriptions cover common name, scientific name, origin, sod versus bunch, life span, adaptation, seeding and planting recommendations including vigor, ease of establishment, precipitation range, planting depth, seeds per square foot at one pound rate, recommended pure stand seeding rates, recommended mixture seeding rates, and adapted cultivars/varieties or germplasm for the Intermountain West.

All seeding rates should be based on Pure Live Seed (PLS). The rates used in this guide generally target 20-30 seeds/ft<sup>2</sup> for the larger seed size varieties and 40-50 seeds/ft<sup>2</sup> for the smaller seed size varieties. The rates have also been adjusted based on past research findings for establishing stands.

### Table of Contents

Characteristics of Grasses	Pages 3 through 14
Characteristics of Grass-Like Plants	Pages 15 through 16
Characteristics of Legumes and Forbs	Pages 17 through 22
Characteristics of Woody Plants	Pages 23 through 30
Table 1 - Plant Adaptation and Seeding Rates	Pages 31 through 34
Table 2 - Common Names/Recommended Cultivars	Pages 35 through 36
References	Page 37

# GRASS, GRASS-LIKE, FORB, LEGUME AND WOODY SPECIES FOR THE INTERMOUNTAIN WEST

## DESCRIPTIONS OF SPECIES

### CHARACTERISTICS OF GRASSES

Bentgrass (Redtop) *Agrostis gigantea*

The genus including bentgrasses includes many species, usually perennial, often occurring on hydric soils. There are over 100 species worldwide including introduced species such as colonial bentgrass and creeping bentgrasses, which are important turf grasses. Approximately 20 species are native to North America. Common grasses found in wetland and riparian areas, redtop species, were probably introduced from Europe. Recommended planting depth for Redtop is 0 to 1/4 inch. Average seeds/ft<sup>2</sup> at 1 lb. rate 112. Recommend pure stand rate 1 lb./ac.

Bluegrass, Big *Poa secunda* or *P. ampla*

A medium-lived native bunchgrass which re-establishes itself well to result in long-lived stands. Well adapted for early spring grazing, sometimes as much as four weeks ahead of crested wheatgrass, but becomes unpalatable earlier in summer than most grasses. It has relatively low seedling vigor and requires as much as 4 to 8 years to reach full productivity. Because young plants are easily pulled up, grazing should be deferred until roots are well anchored. Recommended sites include intermediate and favorable sagebrush sites, sunny places on mountain brush and ponderosa pine ranges, and meadows at lower elevations. It provides excellent nesting cover for upland birds. Adapted where effective environment is comparable to 9 to 15 inches precipitation. It will not tolerate early spring flooding, high water tables, or poor drainage. It tolerates weakly acidic to weakly saline conditions. It can also be used for ground cover and erosion control on cut or burned-over timberland. Planting depth 1/4 inch or less. Adapted variety, 'Sherman'. Average seeds/ft<sup>2</sup> at 1 lb. rate 21. Recommend pure stand rate 2 lb./ac.

Bluegrass, Canby *Poa secunda* or *P. canbyi*

A long-lived native bunchgrass. This grass makes vigorous early spring growth making it well adapted to spring grazing. Where season-long moisture is available, it is commonly crowded out by other species and is difficult to establish. It thrives on short season moisture and sets seed and goes dormant in late spring. Dormant plants are very drought resistant. Recommended sites include dry, shallow and rocky well-drained soils in the sagebrush, and ponderosa pine areas. Adapted to the 9 to 15 inch precipitation environments. Planting depth 1/4 inch or less. Adapted variety, 'Canbar.' Average seeds/ft<sup>2</sup> at 1 lb. rate 21. Recommended pure stand rate 3 lb./ac. Not recommended in pure stands.

Bluegrass, Canada *Poa compressa* or *P. canadensis*

A long-lived, low growing introduced bluegrass with short rhizomes and tolerance to shade, adapted to areas of low fertility and medium acid soils. Growth occurs in the early spring providing good ground cover. This attractive low maintenance plant provides excellent groundcover and erosion control on roadsides, ditch banks, barrow pits, dam sites, under trees and recreational areas. Once established, it is very persistent and performs better than Kentucky bluegrass on poorer soils and drier sites above 18 inches precipitation. It is not well adapted to heavy grazing. Planting depth, 1/4 to 1/2 inch. Adapted low maintenance turf varieties are 'Canon' and 'Rubens'. Average seeds/ft<sup>2</sup> at 1 lb. rate 57. Recommended pure stand rate 1 lb./ac.

Bluegrass, Kentucky

*Poa pratensis*

A major lawn and turf grass, introduced from Europe, adapted to cool climates and moist growing conditions. This species has relatively low herbage production and should not be planted for pasture. It commonly out-competes desired species on irrigated pasture and along riparian areas when poor grazing management has occurred due to its low growing point which makes it very resistant to over grazing. It is an excellent erosion control species in appropriate areas and may be recommended for small acreages where no management exists. Do not plant in riparian areas, wetlands, irrigated pasture and native meadows. Kentucky bluegrass requires 18 inches of annual precipitation or irrigation. Plant at 1/4 inch or less depth. Adapted varieties, Newport, Cougar, and Troy were developed in the northwest and many others are available. Average seeds/ft<sup>2</sup> at one pound rate 50. Recommended seeding rate for turf applications 4 lb./ac.

Bluegrass, Sandberg

*Poa secunda* or *P. sandbergii*

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 the western rangelands 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 very tolerant of heavy trampling. Forage yields are very low, seed viability is generally poor, and forage quality declines rapidly in mid to late spring. 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 is a recent release from Bridger PMC. The Forest Service is nearing release of another accession. 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.

Brome, Meadow

*Bromus biebersteinii* or *B. erectus* or *B. riparius*

Previously known as *Bromus biebersteinii* this perennial long-lived, introduced, weakly rhizomatous grass reaches full productivity in 2 to 3 years. Seedling vigor is strong and palatability to livestock and wildlife is excellent. Use in pasture and hayland seedings under irrigation or non-irrigated areas where precipitation is above 14 inches annually. Applications of nitrogen during the growing season will significantly increase forage production and regrowth following clipping or grazing. Do not graze until forage has reached 8-12 inch height for best management of stand. It is moderately shade tolerant, winter hardy, recovers quickly after grazing, and is well adapted to mountain brush, aspen, conifer forest and subalpine sites in mountain valleys and plains. It is more productive and does not go dormant following harvest or under high summer temperatures as does smooth brome. It is an excellent choice in areas that are prone to early to late spring frost. Planting depth 1/4 to 1/2 inch. Varieties include 'Fleet', 'Paddock' and 'Regar'. Average seeds per ft<sup>2</sup> at 1 lb. rate 2. Recommended pure stand rate 10 lb./ac.

Brome, Mountain

*Bromus marginatus* or *B. cartinatus*

A short-lived vigorous native bunchgrass which reaches full productivity in 1 to 3 years. It establishes quickly on clean or disturbed sites, volunteers well in some situations, is moderately palatable, and valuable for quick cover. Because it is short-lived, it is replaced by long-lived species on the site or in mixtures. It is shade tolerant and must be allowed to go to seed every 3-4 years to reseed site. It is susceptible to seed head smut. Recommended sites include mountain brush, aspen, conifer forest and subalpine areas in mountain valleys and plains at medium to high altitudes and timber burns with 16 inches or more annual precipitation. Planting depth 1/4 to 1/2 inch. Adapted varieties are 'Bromar', susceptible to seed head smut and 'Garnet', a variety that is smut resistant. Average seeds per ft<sup>2</sup> at 1 lb. rate 2. Recommended pure stand rate 10 lb./ac.

Brome, Smooth

*Bromus inermis*

A long-lived, introduced aggressive sod-forming grass. Very palatable, productive, and shade tolerant. Seedlings are often weak, but once established, plants spread vegetatively to provide full stands. It has notable ability to suppress reinvasion of undesirable vegetation. Recovery is slow when cut for hay, becomes dormant during hot dry summer periods, and its tendency for sod binding requires occasional root ripping and high fertility. A very useful plant for erosion control seedings. It is best adapted to moist well-drained soils in 14 inch or higher rainfall zones. It is tolerant of slightly saline and alkaline conditions. The southern strain (Lincoln) is best for mountain brush and favorable sites in the southern sagebrush and pinyon-juniper zone. Intermediate strains (Manchar) have been best on foothill to mountain rangelands. Planting depth 1/4 to 1/2 inch. 'Manchar' is recommended for forage plantings on northern or higher elevation meadows, hayland or pasture. 'Lincoln' is recommended for erosion control and waterways, and produces less forage but is more aggressive in vegetative spread than 'Manchar'. Average seeds per ft<sup>2</sup> at 1 lb. rate 3. Recommend pure stand rate 6 lb./ac.

Canarygrass, Reed

*Phalaris arundinacea*

A widely adapted, coarse, vigorous, productive, long-lived native (sometimes introduced) sod grass. It is frost tolerant and suited to wet soils (but also somewhat drought tolerant). Initial stands are often poor because of tardy germination and weak seedlings. Once established, it can withstand continuous water inundation for 70 days in cool weather. It invades wet areas along ditches, canals, drains and is considered a weed because of this tendency. Produces an abundance of spring foliage with tremendous annual yields on moist fertile soils, high in nitrogen and organic matter. Infertile soils promote sod bound problems. It is adapted to wet soils that range in pH from 4.9 to 8.2 in rainfall areas above 18 inches. Mature stands prove to be unpalatable, requiring close grazing and mowing management for quality production. The lack of palatability and poor animal performance often characterized by reed canarygrass may result from the presence of several toxic alkaloids in the forage. Breeding new varieties low in alkaloids is on going in several breeding programs. Planting depth 1/4 to 1/2 inch. Adaptable varieties 'Rise', 'Venture' and 'Palaton'. Palaton and Venture are the result of breeding programs to reduce the alkaloid problems in this grass. Average seeds per ft<sup>2</sup> at 1 lb. rate 12. Recommend pure stand rate 4 lb./ac.

Dropseed, Sand

*Sporobolus cryptandrus*

Sand dropseed is commonly found growing on sandy soils in the Intermountain West. It most commonly grows at lower elevations and dry coarse soils in the 7 to 12 inch precipitation zones. Sand dropseed is moderately eaten by livestock and wildlife and is best utilized as winter forage when more palatable species are not available. This plant is a prolific seed producer. The seed coat of sand dropseed is very hard and scarifying seed prior to planting results in better germination. It should be used in seed mixtures on dry areas with coarse textured soils. Planting depth 1/4 inch. No varieties have been released. Average seeds per ft<sup>2</sup> at 1 lb. rate 121. Recommend pure stand rate 1 lb./ac.

Fescue, Hard

*Festuca trachyphylla* or *F. ovina duriuscula*

A very fine leafed, low growing introduced bunch grass with poor palatability to livestock. The dense root system may encourage increased rodent populations. It is widely used for turf, highway plantings, airport strips, burned over timberland and reclamation areas where a long-lived, persistent, competitive ground cover is needed, in areas having an excess of 12 inches precipitation. Seedlings are slow to establish but persist through the development of abundant fibrous roots. Early spring seedings are recommended. Planting depth 1/4 inch. 'Durar' is the adapted variety. Average seeds per ft<sup>2</sup> at 1 lb. rate 13. Recommended pure stand rate 3 lb./ac.

Fescue, Idaho

*Festuca idahoensis*

A long-lived, native, perennial bunchgrass. It has fine leaves and stems, which grow primarily from the base. It is a palatable grass in spring, cures well on the stem and makes good fall forage. It commonly greens up in fall with rain. Idaho fescue occurs abundantly on north exposures in areas with 14 inches and above rainfall and is best adapted to areas above 16 inches precipitation. It prefers medium textured soils but is also found on coarser textured soils with steep north slopes. Planting depth 1/4 to 1/2 inch. 'Joseph' and 'Nezpurs' are adapted varieties, but are very difficult to establish. Average seeds/ft<sup>2</sup> at 1 lb. rate 10. Recommended pure stand seeding rate 3 lb./ac.

Fescue, Red (Creeping)

*Festuca rubra*

A major lawn and turf grass that is long-lived, slow developing, low growing, weakly rhizomatous, very competitive, fine leafed introduced grass native to North America and Europe. Chewings and slender creeping fescue are subspecies of creeping red fescue. These fescues perform best on acidic soils (pH 5.5-7.0+) and increases in overall production as acidity increases. They are most commonly used as turf grasses and sometimes used for erosion control and roadside stabilization. It is not recommended for pasture or hayland production. It is susceptible to snow mold that can seriously weaken stands in snow prone areas. They require at least 16, but prefer 18 inches of precipitation. 'Dawson' (on saline soils), 'Fortress', 'Illahhe' and 'Recent' are adapted varieties and many others are commercially available. Average seeds per ft<sup>2</sup> at 1 lb. rate 14. Recommended seeding rate for turf applications 4 lb./ac.

Fescue, Sheep

*Festuca ovina*

A long-lived short stature introduced bunchgrass with short leaf blades. It is more drought tolerant than other fescues. Top production is low, but groundcover and root production are excellent. It is used for turf, highway plantings, airport strips, burned over timberland and reclamation areas where a long-lived, persistent, competitive ground cover is needed. Sheep fescue is best adapted to 10+ inch precipitation zones, but has been established and is reproducing in the Red Desert of Wyoming with 5-9 inches of precipitation. A very good erosion control and understory species that competes well with weeds. Early spring seedings are recommended. Planting depth 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 3 lb./ac.

Fescue, Tall

*Lolium arundinaceum* or *Festuca arundinacea*

A long-lived, high producing introduced cool-season bunchgrass suited for use under a wide range of soil and climatic conditions. It is tolerant of acid to alkaline conditions and has less palatability than most other pasture grasses, which may be grazed out of a stand if mixed with it. Suited to irrigation, subirrigation, or moderately wet conditions, as well as dryland areas where the effective precipitation is over 18 inches. Best suited for acidic to moist alkali areas in lowlands with pH from 4.7 to 9.5. It is not well adapted to sandy soils having prolonged droughty periods. It is a high forage producer under well-fertilized conditions. Planting depth 1/4 to 1/2 inch. Adaptable varieties include 'Alta', 'Fawn', and 'Forager'. 'Johnstone' is a hybrid of tall fescue and perennial ryegrass. It is more palatable than regular strains of tall fescue, but retains its wide adaptation and resiliency. NOTE: Fungal endophyte problems can develop in livestock foraging on tall fescue. This problem can be greatly reduced, if not eliminated, by seeding with endophyte-free seed (production may be lower with endophyte free plants). Average seeds per ft<sup>2</sup> at 1 lb. rate 5. Recommend pure stand rate 5 lb./ac.

Foxtail, Creeping

*Alopecurus arundinaceus*

A long-lived, deep rooted, cool-season, dense sod forming introduced grass that is adapted to wet-acidic-poorly drained pasture sites. It has low seedling vigor, but once established spreads readily by rhizomes. Growth begins early in the spring, and leaves remain green until after hard frosts in the late fall. It is very cold tolerant and can persist in areas where the frost-free period averages less than 30 days. It is only moderately salt-alkaline tolerant but produces abundant good quality forage on wet fertile sites (with proper fertility) where it is usually superior to other wet area pasture grasses such as reed canarygrass and timothy (it is similar in appearance to timothy, but seedheads are generally

black and hairy). 'Garrison' is a well-adapted cultivar. Canadian varieties 'Dan' and 'Mountain' have not been tested, but may have potential in Intermountain areas. NOTE: Seed is very light and difficult to seed without the use of cracked corn, 2 bushels of rice hulls, or other carrier. Planting depth 1/8 to 1/4 inch. Average seeds per ft<sup>2</sup> at 1 lb. rate 21. Recommend pure stand rate 3 lb./ac.

Hairgrass, Tufted *Deschampsia cespitosa*

A native, perennial, warm season grass found along streams, moist meadows, lakes and wetlands. Potential uses include streambank, shoreline, and wetland enhancement and reclamation stabilization. It is slow establishing, but long-lived with moderate production. Varieties include 'Norcoast' and 'Peru Creek', a released cultivar from Meeker PMC with adaptation in soils with a pH of 3.0 to 7.8. Additional work is being conducted at Corvallis PMC. Average seeds per ft<sup>2</sup> at 1 lb. rate 55. Recommended seeding rate 1.0 lb./ac. Not recommended in pure stands.

Junegrass, Prairie *Koeleria macrantha* or *Koeleria cristata*

A long-lived, cool season, tufted, native, perennial grass. One half to two feet in height. This species prefers deep to very deep silty to sandy soils and is rarely found in high percentages under natural conditions. It does best at 12-20 inches annual precipitation. 'Barkoel' is a released cultivar available, but limited quantities are sold commercially. Wildland collections are available and with all native plant collections you should request "Source Identified" seed. Average seeds per ft<sup>2</sup> at 1 lb. rate 53. Seeding rate 1 lb./ac. Recommended pure stand rate 1 lb./ac. Not recommended in pure stands.

Needlegrass, Green *Nassella viridula* or *Stipa viridula*

A cool season, medium fine-leaved bunchgrass native to the Great Plains and portions of the Intermountain West. It is adapted to a wide range of soils, but prefers clayey soils in 12-20 inch precipitation areas. It is moderately palatable to livestock and wildlife. It can tolerate short term flooding and has good drought tolerance in the 12-20 inch precipitation zone. Widely adapted from Alberta to New Mexico. High seed dormancy is common in seed lots and scarification and/or wet prechilling is recommended to break dormancy and improve germination. 'Lodorm' and 'Green Stipagrass' are available releases. Average seeds per ft<sup>2</sup> at 1 lb. rate 4. Recommend pure stand rate 6 lb./ac.

Needlegrass, Letterman *Achnatherum lettermanii* or *Stipa lettermanii*

A cool season, perennial, native bunchgrass. It is best adapted to mountain foothills and valleys at 5,000 to 10,000 feet elevation. It prefers at least 16 inches of precipitation. Adapted to a wide range of soils, most often clayey to loamy soils. No releases are available. Native collections specify "Source Identified" seed. Average seeds per ft<sup>2</sup> at 1 lb. rate 4. Recommend pure stand rate 6 lb./ac.

Needle and Thread *Hesperostipa comata* or *Stipa comata*

A cool season, tufted, perennial, native bunchgrass, 1-3 feet tall. Adapted to fine sandy loam to sandy soils in the 7-16 inch precipitation zone. This species is a fairly early vegetative component on sand dunes in the intermountain region. Used for grazing in spring and winter following disarticulation of seed. The long awn (3-5 inches) attached to the seed can cause injury to livestock. No cultivars are available. Native collections specify "Source Identified" seed. Average seeds per ft<sup>2</sup> at 1 lb. rate 3. Seeding rate 7 lb./ac.

Needlegrass, Thurbers *Achnatherum thurberianum* or *Stipa thurberiana*

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 again in fall if rains result in fall greenup. It is currently under development by Forest Service. Native collections specify "Source Identified" seed. Average seeds per ft<sup>2</sup> at 1 lb. rate 3. Seeding rate 7 lb./ac.

Orchardgrass *Dactylis glomerata*

A long-lived, high producing, introduced bunchgrass, adapted to well drained soils. It produces long folded leaves arising mostly from the plant base. A very shade tolerant plant that is highly palatable to livestock and wildlife, especially in the early part of the growing season. It is a widely preferred species for hay, pasture, or silage. For highest forage quality, harvest while still in the boot stage. It is less winter hardy than meadow or smooth brome or timothy and is more vulnerable to diseases than many pasture grasses. Orchardgrass is compatible in alfalfa, sainfoin and clover mixes. It can be grown under irrigation or on dryland where the effective precipitation is 18 inches or more. It requires a good fertility program for high production. It is also used in erosion-control mixes primarily for its forage value. This species does best on soils with few limitations. Avoid shallow and sandy soils. Varieties are early-, mid-, and late-season in maturity. Late-season varieties are preferred in mixture with alfalfa. Early - 'Hallmark', 'Potomac'; Mid - 'Akaroa', 'Ambassador'; Late - 'Latar' (recommended with alfalfa). 'Paiute' orchardgrass is more drought tolerant (adapted to 16 inches of precipitation) than the other varieties. Planting depth is 1/4 to 1/2 inch. Average seeds per ft<sup>2</sup> at 1 lb. rate 9. Recommend pure stand rate 3 lb./ac.

Ricegrass, Indian *Achnatherum hymenoides* or *Oryzopsis hymenoides*

A perennial native, very drought tolerant bunchgrass adapted to well drained sandy soils and dry desert ranges. Seed of most strains are very slow to germinate due to a thick seedcoat, which can be treated in sulfuric acid or with a cool moist stratification to improve germination. Untreated seed requires a greater depth of planting than most species to promote seed germination. Seedlings should be dormant fall plantings due to high seed dormancy. Recommended sites are sunny exposures in 7 inches (10 inch plus rainfall areas result in most successful seedings) or more precipitation zones with sandy or gravelly soils. 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. It is also considered an excellent wildlife species. 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 semidesert areas. 'Rimrock' is a northern variety selected for better seed retention characteristics. ARS is working on additional selections. Average seeds per ft<sup>2</sup> at 1 lb. rate 3. Recommend pure stand rate 8 lb./ac.

Ryegrass, Perennial *Lolium perenne*

A relatively short-lived, rapid developing, vigorous, high forage producing and forage quality, perennial bunchgrass adapted to a wide variety of soil conditions. Perennial ryegrass can be grown under irrigation or on dryland where the effective precipitation is 15 inches or more. To produce high yields, perennial ryegrass requires 30-50 inches of irrigation and high fertility inputs (split applications recommended). It can be grazed within two months of planting, if vegetation is 10-12 inches high and well established so livestock can not pull plants out by the roots. Well established stands are productive for 3-5 years, if annual over-seeding (5 pounds per acre) of fields occurs each year in late fall or early spring. It does best where winters are mild. It may retard the growth of other perennials if seeded too heavily in a mixture. It has good recovery after grazing in the spring but tends to go dormant in summer heat. Suited for most acidic to mildly basic (5-8 pH) areas as a turf, hay or pasture. Perennial ryegrass can be differentiated from annual ryegrass by lack of awns, whereas annual ryegrass has awns. Perennial ryegrass contains a fungal endophyte which is linked to the occurrence of ryegrass staggers (there have been reports of ryegrass staggers in Oregon and California). Planting depth 1/4 to 1/2 inch. Adapted varieties are 'Linn', and 'Manawa (H1)'. Tetraploids are also available and have shown promising results in tests at several locations. Most tetraploids are developed for short rotation pastures or

green chop. These varieties include 'Bastian', 'Grimalda', and 'Reville'. Many other varieties are available and it is recommended that you consult a seed dealer in your area for locally adapted varieties. Average seeds per ft<sup>2</sup> at 1 lb. rate 6. Recommend pure stand rate 5 lb./ac. Higher seeding rates in pure stands may be considered.

Sacaton, Alkali

*Sporobolus airoides*

Alkali sacaton is a native (Utah and Nevada and south), warm season; perennial grass that grows in large bunches, 1-3 feet tall. It sometimes forms a uniform cover and appears to be a sod type. It is slow establishing and adapted to areas with a high water table or areas that may be saline. Found in areas with saline-alkali to rocky to semiarid soils as low as 12 inches precipitation commonly with a high watertable present. It is used mainly for erosion control, forage plantings and increased diversity in adapted areas. Two cultivars released for southwestern states include 'Salado' and 'Saltalk'. 'Saltalk' is not considered winter hardy. Average seed per ft<sup>2</sup> at 1 lb. rate is 40. Seeding rate 3 lb./ac.

Squirreltail, Bottlebrush

*Elymus elymoides*

or

*Sitanion hystrix*

Bottlebrush squirreltail is a short-lived, drought tolerant, cool season, native bunchgrass. It is short to medium sized, tufted and a fair forage in winter and spring and a poor forage in summer when seedheads are present. 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 released the only cultivar available, 'Sand Hollow' in 1996. Sand Hollow is best adapted to sandy foothill rangelands receiving 12 inches or more annual precipitation. Additional bottlebrush squirreltail accessions are currently under evaluation by ARS in Logan, Bridger and Meeker PMCs and the Forest Service in Provo, Utah. Average seeds per ft<sup>2</sup> at 1 lb. rate 4. Seeding rate 7 lb./ac.

Switchgrass

*Panicum virgatum*

Switchgrass is a perennial, tall, weakly sod-forming grass native to the Midwest and the Great Plains. It grows on a wide range of soil textures and is tolerant of wet acid soils and brackish marshes. It is an excellent wildlife cover, utilized as food (seed) by songbirds and makes excellent forage for livestock. There may be a niche for this species in the corn producing areas of the Intermountain West under irrigation as a mid summer forage. It will probably not out produce other irrigated forage varieties including orchardgrass and meadow brome. The best-adapted winter hardy cultivar tested in Idaho, Nevada and Utah is 'Blackwell'. Accessions under development at Bridger PMC may also have potential. Average seeds per ft<sup>2</sup> at 1 pound rate 6. Seeding rate: 5 lb./ac.

Timothy

*Phleum pratensis*

An introduced bunchgrass adapted to cool, humid areas. It performs well, with moderate to high yields, on wet fertile pasturelands; establishes cover quickly, volunteers readily on preferred sites, is late maturing, and is very palatable early in the growing season (jointing stage) and only moderately palatable later in the growing season (post seedhead). Timothy hay is a premium feed for horses and is compatible in legume mixes. Severe damage can result from early grazing during moist conditions. It should not be grazed before the jointing stage or hayed before seedheads have emerged from boot. It recovers (regrowth) very slowly following grazing or haying. It is adapted to high elevations and areas where effective precipitation is 18 inches or irrigated. Recommended sites include moist mountain meadows, ponderosa pine zone and above. Can also be used for ground cover and erosion control on cut or burned-over timberland. Planting depth 1/8 to 1/4 inch. Adapted varieties are 'Climax', 'Mohawk'. Average seeds per ft<sup>2</sup> at 1 lb. rate 30. Recommend pure stand rate 3 lb./ac.

Wheatgrass, Beardless                      *Pseudoroegneria spicata inerme*      or      *Agropyron inerme*

A long-lived, drought tolerant, erect native bunchgrass. It differs from bluebunch wheatgrass in the absence of awns. It begins growth in early spring and readily greens up in fall following fall rains. It is very palatable, quality persists longer into growing season and yields equal to or exceed crested wheatgrass. Recommended sites include the 12-18 inch precipitation areas. It is best adapted to winter-wet and summer dry climates. It has poor seedling vigor. Planting depth 1/4 to 1/2 inch. Adapted variety is 'Whitmar'. Average seeds/ft<sup>2</sup> at 1 lb. rate 3. Recommended pure stand rate 8.0 lb./ac.

Wheatgrass, Bluebunch                      *Pseudoroegneria spicata*                      or                      *Agropyron spicatum*

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 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 'Goldar' and 'P7' for use above 12" precipitation. 'Secar', previously considered to be bluebunch wheatgrass but found to be a subspecies of thickspike wheatgrass, is more drought tolerant than bluebunch wheatgrass (See Snake River Wheatgrass) in lower (8-12") precipitation areas. Average seeds per ft<sup>2</sup> at 1 lb. rate 3. Recommend pure stand rate 8.0 lb./ac.

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

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 reportedly 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. Other cultivars available but less adapted include 'Parkway', 'Kirk' and 'Ruff'. Average seeds per ft<sup>2</sup> at 1 lb. rate 6. Recommend pure stand rate 5.0 lb./ac.

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

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. A recent release by ARS, Douglas crested wheatgrass is the first hexaploid on the market. Douglas is characterized as having larger seed, broader leaves and stays green longer 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. Planting depth 1/4 to 1/2 inch. Adapted varieties are 'Douglas', '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*

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. 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, Intermediate *Thinopyrum intermedium* or *Elytrigia intermedia* or *Agropyron intermedium*

A sod-forming, late maturing, long-lived, introduced grass, suited for use as hay and pasture, alone or with alfalfa or other legumes on medium to fine textured soils. It begins growth early in the spring and remains green and palatable into the summer, producing large amounts of quality forage. It does not mature seed at high elevations, but spreads vegetatively. Recommended for the sagebrush to high mountain zones (up to 9000 feet) and dry meadows with 12-18 inches of rainfall. 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. Planting depth 1/4 to 1/2 inch. Adapted varieties are 'Rush,' selected for excellent seedling vigor and forage quality; 'Reliant,' selected for disease resistance and production; 'Oahe' with improved seed production, forage yield, and rust resistance; 'Amur' selected for slightly more drought tolerance and 'Tegmar,' a low growing cultivar noted for erosion control, sod-formation and seedling vigor. Average seeds per ft<sup>2</sup> at 1 lb. rate 2. Recommend pure stand rate 10 lb./ac.

Wheatgrass, NewHy *Pseudoroegneria spicata* x *Elytrigia repens* or *Agropyron repens* x *Agropyron spicatum*

NewHy is a hybrid cross between quackgrass and bluebunch wheatgrass. NewHy is a mildly rhizomatous grass suited for use under a wide range of soil conditions and specifically saline conditions. It begins growth early in the spring, retaining succulence and palatability for livestock later in the summer than many grasses. Some problems exist with seedling vigor and germination which may reduce initial stands; however, once established it becomes a very vigorous, high producing, high forage quality species capable of withstanding repeated grazing with good recovery. In saline areas, NewHy is not as productive as tall wheatgrass or tall fescue, but forage quality is significantly better. The hybrid is noted for tolerance to very strongly saline soils and responds to irrigation, sub-irrigation or moderately wet conditions, and dryland areas where effective precipitation is 14 inches or more. Adapted to foothills, intermediate sagebrush and juniper sites, and higher mountain areas up to 8000 feet elevation, and on dry or wet meadows and pastures. Planting depth 1/4 to 1/2 inch. The only cultivar is 'NewHy'. Average seeds per ft<sup>2</sup> at 1 lb. rate 3. Recommend pure stand seeding rate 8 lb./ac.

Wheatgrass, Pubescent *Thinopyrum intermedium* or *Elytrigia intermedia* or *Agropyron trichophorum*

A long-lived, late maturing, sod-forming grass adapted to low-fertility sites and coarse to medium textured soils. Similar to intermediate wheatgrass 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 in Idaho and 'Manska' and 'Greenleaf'. Average seeds per ft<sup>2</sup> at 1 lb. rate 2. Recommend pure stand rate 10 lb./ac.

Wheatgrass, Siberian *Agropyron fragile* or *A. sibiricum*

Similar to standard crested wheatgrass, Siberian wheatgrass has finer leaves, and retains its greenness and palatability later into the summer than crested wheatgrasses. It yields less and has poorer seedling vigor than most crested wheatgrass cultivars. It occupies sites where standard crested wheatgrass will grow and 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' the recently released, higher seedling vigor cultivar. Average seeds per ft<sup>2</sup> at 1 lb. rate 5. Recommend pure stand rate 6 lb./ac.

Wheatgrass, Slender                      *Elymus trachycaulus trachycaulus* or                      *Agropyron trachycaulum*

Slender wheatgrass is a short-lived (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. 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, Snake River                      *Elymus wawawaiensis* or                      *Pseudoroegneria spicata*

Snake River wheatgrass is a native of the lower 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 to aciculate glumes, a more imbricate spike, and glabrate basal leaf sheaths. It is adaptable to most bluebunch wheatgrass areas but is best selected for the lower (8-12 inch precipitation) areas adapted to bluebunch wheatgrass. (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. Average seeds per ft<sup>2</sup> at 1 lb. rate 3. Recommend pure stand rate 8 lb./ac.

Wheatgrass, Streambank                      *Elymus lanceolatus* or                      *Agropyron riparium*

A long-lived, drought tolerant, creeping sod-former adapted to fine-medium textured well-drained soils. Streambank wheatgrass has excellent seeding vigor and is particularly well adapted for erosion control where effective precipitation is 10 or more inches. It has little value as forage and is primarily used for stabilization of roadsides, ditchbanks, and lakeshores. It has also been used as a drought tolerant turfgrass, but care must be taken to not over irrigate this grass or stand will be lost. Planting depth 1/4 to 1/2 inch. The only variety is 'Sodar'. Average seeds per ft<sup>2</sup> at 1 lb. rate 4. Recommend pure stand rate 6 lb./ac. (double to triple seeding rate for turf applications)

Wheatgrass, Tall                      *Thinopyrum ponticum* or                      *Elytrigia elongata* or                      *Agropyron elongatum*

A long-lived, tall-statured, coarse, vigorous, very late maturing, winter hardy introduced bunchgrass. Once established, (seedlings are slow to establish) tall wheatgrass is one of the most tolerant grasses of salt, alkali and high water table conditions. It starts growth early in the spring, reaching maturity in late summer. Reported to be the latest maturing of the wheatgrasses. Palatability is fair early in the growing season, but mature plants become very unpalatable and must be managed for use at earlier stages of growth. It does not stand continuous close grazing. Old coarse growth often makes current growth unavailable. Late standing material becomes good winter forage for livestock when used with supplemental protein sources. This grass has a very wide range of soil and climate adaptation (recommended for 14 inch or higher rainfall zones) and is useful for erosion control on critical areas. It is adapted to salty areas such as greasewood and saltgrass sites where the water table is from a few inches to several feet below ground surface. Also intermediate and favorable sagebrush, mountain brush, and juniper sites where its drought tolerance is evidenced. Planting depth 1/4 to 3/4 inch. Adapted varieties are 'Alkar' (northern areas), 'Jose' (southern areas), 'Largo' (southern areas), and 'Platte' (Great Plains - not tested in west). Average seeds per ft<sup>2</sup> at 1 lb. rate 2. Recommend pure stand rate 10 lb./ac.

Wheatgrass, Thickspike                    *Elymus macrourus* or    *E. lanceolatus*    or    *Agropyron dasystachyum*

A long-lived, native 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 when fully headed and low in nutritive value. 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'. Average seeds per ft<sup>2</sup> at 1 lb. rate 3. Recommend pure stand rate 8 lb./ac.

Wheatgrass, Western                    *Pascopyrum smithii*    or    *Agropyron smithii*

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, low seedling vigor, and low forage production of low quality forage. 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 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 14 inches and most mountain brush areas. Planting depth 1/4 to 1/2 inch. Adapted varieties, 'Rosana' (northern variety) and 'Arriba' (southern variety). Other releases include 'Barton', 'Flintlock', 'Rodan' and 'Walsh'. Average seeds per ft<sup>2</sup> at 1 lb. rate 2. Recommended pure stand seeding rate 6 lb./ac. Not recommended in pure stands. Recommended 50% mixed stand seeding rate 3.0 lb./ac.

Wildrye, Altai                    *Leymus angustus*    or    *Elymus angustus*

A winter hardy, drought resistant, long-lived, cool season bunchgrass, sometimes with short rhizomes. It is known to root to depths of 15 feet. Basal leaves are somewhat coarse, but very palatable and protein levels of 8 percent are common in standing winter-feed. 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' and 'Prairieland' are released varieties. Average seeds per ft<sup>2</sup> at 1 lb. rate 2. Recommended pure stand rate 12 lb./ac.

Wildrye, Basin                    *Leymus cinereus*    or    *Elymus cinereus*

A slightly 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 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 avoid the high growing point. Great care must be taken to avoid close grazing or clipping which may result in heavy plant loss in a single season. Winter grazing with protein supplements utilize old coarse growth and allows more effective use of new growth. Best adapted to saline to alkaline lowlands, flood plains, flow in areas, and high water holding capacity deep fine textured clayey to loamy soils that receive 10-12 inches precipitation. Plantings have been established in rainfall areas as low as 5 inches, however basin wildrye plantings are not recommended below 8 inches 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 varieties 'Magnar' (blue-green upright leaves) and 'Trailhead' (green overhanging leaves). Average seeds per ft<sup>2</sup> at 1 lb. rate 3. Recommend pure stand seeding rate 8 lb./ac. Basin wildrye is highly recommended for native species mixtures.

Wildrye, Beardless                      *Leymus triticoides*                      or                      *Elymus triticoides*

A long-lived, sod-forming native grass. It is adapted to poorly drained, wet or wet-saline-alkaline soils or dryland areas that receive at least 14 inches of precipitation. Developed primarily for stabilization and cover on wet to wet-saline soils, this plant is one of the most salt tolerant species available. It is of secondary importance as a forage species due to its coarseness in later growth stages, but is considered productive when fertilized and used for hay or winter grazing. Due to poor seedling vigor and high seed dormancy, dormant fall planting is recommended. Planting depth 1/4 inch or less in a firm weed free seedbed. Adapted variety 'Shoshone.' Another variety that may have potential, but has not been extensively tested in the Intermountain West is 'Rio'. Average seeds per ft<sup>2</sup> at 1 lb. rate 4.2. Average seeds/ft<sup>2</sup> at 1 lb. rate 4. Recommended pure stand rate 8 lb./ac.

Wildrye, Blue                                      *Elymus glaucus*

A fast developing, short-lived, cool season bunchgrass native to North America. This species is common to open forests, thickets and other areas that are semi-shaded in the 16 inch and above precipitation areas. This species is noted for its high seed production and rapid stand establishment for early erosion control in disturbed areas. Plant at 1/4 to 1/2-inch depth. No Intermountain West adapted varieties have been released. A coastal release not recommended for the Intermountain West is 'Arlington'. Average seeds/ft<sup>2</sup> at 1 lb. rate 3. Recommended pure stand rate is 7 lb./ac.

Wildrye, Mammoth                      *Leymus racemosus*                      or                      *Elymus giganteus*

A coarse introduced slightly saline tolerant, drought tolerant, creeping rhizomatous grass. It is not palatable to livestock, but can provide good cover and may be useful for calving pastures and wildlife forage and cover. It is long lived on well-drained inland sand dunes, highway right-of-ways, and dredge spoils where it will stop soil movement and provide permanent cover. It requires at least 7 inches of precipitation. It is available as seed, but can also be propagated vegetatively. Because of its showy inflorescence, it has been used as an ornamental. 'Volga' is a released cultivar. It was selected for superior performance in stabilizing inland sand dunes and critical areas on coarse textured soils. Average seeds per ft<sup>2</sup> at 1 lb. rate 2. Seeding rate 15 lb./ac.

Wildrye, Russian                                      *Psathyrostachys juncea*                      or                      *Elymus junceus*

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. Once established, 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; very sensitive to deeper placement. 'Vinall', an earlier variety, has poor seedling vigor and is not recommended. 'Swift' was selected for seedling vigor, and 'Cabree' was selected both for seedling vigor and reduced seed shattering. 'Bozoisky-Select', selected for increased seedling vigor and forage production. '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.



Sedge, Beaked

*Carex rostrata*

Beaked sedge is a medium sized, long-lived, perennial, rhizomatous, native wetland plant found at mid to high elevations in saturated to standing water conditions to 2.5 feet deep. It is adapted to moderately acidic to moderately alkaline soils. Uses include food and cover for waterfowl and songbirds and increased biodiversity in wetland communities. Livestock and wildlife utilize beaked sedge as forage in early spring. Due to poor seedling vigor, direct seeding usually results in marginal stands. Plant vegetative plugs. Fluctuate water levels for establishment. No releases have been made for the Intermountain West and seed is not commercially available. Wildland plug and seed collection is recommended. Nursery container plants may be available.

Sedge, Nebraska

*Carex nebrascensis*

Nebraska sedge is a medium sized, long-lived, perennial, rhizomatous, native wetland plant found at mid to low elevations in moist meadows, marshes, swamps, ditches, seeps, near low gradient streams and shorelines where it persists under water for up to 3 months. It commonly forms dense stands and is often the dominant species in these communities. It is adapted to moderately acidic to moderate-highly alkaline soils. Uses include erosion control, constructed wetlands, food and cover for waterfowl and songbirds, and increased biodiversity in wetland communities. Livestock and wildlife utilize Nebraska sedge as forage in early spring and late summer through fall. Due to poor seedling vigor, direct seeding usually results in marginal stands. Plant vegetative plugs. Fluctuate water levels for establishment. Four germplasm releases have been made for the Intermountain West, but seed is not commercially available. Wildland plug and seed collection is recommended. Nursery container plants may be available.

Sedge, Water

*Carex aquatilis*

Water sedge is a medium sized, long-lived, perennial, moderately rhizomatous, and native wetland plant found at mid to high elevations in saturated to shallow standing water conditions. It is adapted to moist loam to silt to sandy gravelly soils. Uses include food and cover for waterfowl and songbirds and increased biodiversity in wetland communities. Due to poor seedling vigor, direct seeding usually results in marginal stands. Plant vegetative plugs. Fluctuate water levels for establishment. No releases have been made for the Intermountain West and seed is not commercially available. Wildland plug and seed collection is recommended. Nursery container plants may be available.

Spikerush, Creeping

*Eleocharis palustris*

Creeping spikerush is a medium to tall, long-lived, perennial, strongly rhizomatous wetland plant found at mid to low elevations in wet meadows, irrigation ditches, springs, seepage areas, fresh marshes, rivers and lakeshores. It is a pioneering species that establishes quickly in soils that are flooded to 3 feet deep in spring and saturated in fall. It is best adapted to fine textured soils that are neutral, but will tolerate moderately alkaline conditions. It is used for erosion control, constructed wetlands, wildlife cover and soil stabilization. Livestock and wildlife will graze this species. Due to poor seedling vigor, direct seeding usually results in marginal stands. Planting vegetative plugs is recommended. Four germplasm releases have been made for the Intermountain West, but seed is not commercially available. Wildland plug and seed collection is recommended. Nursery container plants may be available.

Threesquare, Common

*Schoenoplectus pungens* or *Scirpus pungens*

Common threesquare is a medium sized, long-lived, perennial, rhizomatous wetland plant found at mid to low elevations in backwater areas of streams, ponds, reservoirs, and lake fringes. It is adapted to fine silty clay to sandy loam soils that experience 2 to 4 inches of standing water. It will tolerate alkaline and saline soil conditions. Uses include erosion control, constructed wetlands, food and cover for waterfowl and songbirds and increased biodiversity in wetland communities. Due to poor seedling vigor, direct seeding usually results in marginal stands. Plant vegetative plugs. Fluctuate water levels for establishment. Four germplasm releases have been made for the Intermountain West, but seed is not commercially available. Wildland plug and seed collection is recommended. Nursery container plants may be available.

## CHARACTERISTICS OF LEGUMES AND FORBS

Alfalfa

*Medicago sativa*

A very productive, palatable perennial introduced legume with numerous varieties that have specific characteristics for given purposes. Suited for use as hay, pasture, or haylage under irrigation or on dryland where the effective precipitation is 12 inches or more. Does not persist with moderate to heavy grazing on rangeland unless rest periods occur. It is vulnerable to pocket gophers because of the taproot; however, creeping varieties are less susceptible to damage. Seedlings should occur in mid spring to avoid risk to a killing frost. Seed requires inoculation with nitrogen-fixing bacteria before planting. Addition of phosphorus and potassium increase tolerance to close grazing or haying, increase number of nodules present improving nitrogen fixation, and improve production. Adapted to well-drained intermediate and favorable sagebrush, juniper, mountain brush, and ponderosa pine sites. Does poorly at higher elevations and areas with a high watertable. 'Ladak', 'Trevois,' 'Ranger', 'Spreador 3', and 'Nomad' are commonly used for low precipitation sites including juniper, sagebrush and mountain brush. ARS and USFS are working with alfalfa in hopes of selecting more drought tolerant rangeland varieties. Planting depth 1/4 to 1/2 inch. Plant in a very firm seedbed. Average seeds per ft<sup>2</sup> at 1 lb. rate 5. Full seeding rate 5 lb./ac. Full seeding rate for hayland production is commonly 10-15 pounds per acre. Recommended 25% mixed stand rate at 1.0 lb./ac for pasture situations to help reduce bloat problems.

Aster, Blueleaf

*Eurybia glauca* or *Aster glaucodes*

A native perennial forb that commonly occurs in all vegetative types from the upper sagebrush-grass to the subalpine. This forb is generally found on exposed depleted and disturbed sites. It is one of the first forbs to green up in the spring, making it highly sought out by livestock and big game. The strong rhizomatous root system enables this species to be very useful in stabilization of disturbed and erosive areas and in withstanding considerable grazing and trampling. Fall seeding is preferred. Seed can be surface to 1/2 inch deep seeded on disturbed soil. Average seeds per ft<sup>2</sup> at 1 lb. rate 12. Pure stand seeding rate 2 lb./ac. Not recommended in pure stands.

Balsamroot, Arrowleaf

*Balsamorhiza sagittata*

A long-lived broadleaf native perennial with a deep woody taproot that can be found growing on well-drained silty, loamy to granitic soils in sagebrush-grass, mountain brush, ponderosa pine, and on open sunny slopes in the aspen and coniferous forests. This forb is strongly drought-resistant (12 inch + precipitation), has good winter-hardiness, is tolerant of semi-shade, and strongly tolerant of grazing and trampling. Livestock and big game make extensive use of this forb, especially on spring ranges. It is very difficult to attain good stands of this species because of its extremely slow establishing characteristics that can take up to 8 years. Fall seeding is recommended. Seed can be drilled or broadcast but should be covered to 1/3 inch deep. Average seeds per ft<sup>2</sup> at 1 lb. rate 1. Pure stand seeding rate 20 lb./ac. Not recommended in pure stands.

Burnet, Small

*Sanguisorba minor*

A perennial winter-active introduced forb, growing to 2 feet tall. It is semi-evergreen, moderate yielding and non-leguminous but deep rooted, and has good palatability. Growth is most vigorous in fall and spring. It is best adapted to well-drained soils in the sagebrush-grass and juniper areas. It can be grown on low fertility, droughty soils as well as moderately wet acid soils. It establishes with ease but will not persist in most instances below 14 inches of precipitation or shaded, poorly drained, high watertable areas. 'Delar' is an improved forage yielding variety that should be seeded at 1/4 to 1/2-inch depth. Average seeds per ft<sup>2</sup> at 1 lb. rate 1. Recommended pure stand rate 20 lb./ac.

Clover Alsike

*Trifolium hybridum*

A short-lived (3-5 years) perennial legume that produces abundant palatable foliage on fertile soils. It produces best when used in mixtures with grasses suited for hay or pasture under irrigation or on dryland where the effective precipitation is 18 inches or more. It is adapted for use on flooded to poorly drained, acid soils, especially in cool areas. It is not well adapted to sands, droughty conditions or tolerant of shade. Makes good meadow hay and is very tolerant of cold, frost heaving and moderately alkaline conditions. Planting depth 1/4 inch. Adaptable variety is 'Aurora'. Average seeds per ft<sup>2</sup> at 1 lb. rate 16. Pure stand seeding rate 4 lb./ac. Recommended 25% mixed stand rate 1 lb./ac for pasture situations.

Clover, Red

*Trifolium pratense*

A short-lived (2-3 years) perennial legume suited primarily for hay and silage under irrigation or on dryland where the effective precipitation is 25 inches or more. Red clover requires well-drained soil and is tolerant of shaded conditions, but not tolerant of flooding, saline conditions or water logged soils. Produces best under medium acid (6.0 pH +) to neutral soil conditions. It is compatible with white clover and grasses in pasture mixtures and will reseed itself and spread under favorable conditions. Planting depth 1/4 to 1 inch. Adapted varieties are 'Kenland', 'Dollard', 'Redman', and 'Reddy'. Average seeds per ft<sup>2</sup> at 1 lb. rate 6. Pure stand seeding rate 6 lb./ac. Recommended 25% mixed stand rate 1.5 lb./ac for pasture situations.

Clover, Strawberry

*Trifolium fragiferum*

A spreading, pasture-type, perennial legume suited for use under irrigation or semi-wet to wet soils and strongly to very strongly sodic conditions. It is not adapted to dryland conditions. Less productive than white clover where the latter can be grown. 'Salina' is tolerant to winter flooding, making it a suitable legume for use adjacent to overflowing waterways. Planting depth 1/4 inch or less. Average seeds per ft<sup>2</sup> at 1 lb. rate 7. Pure stand seeding rate 8 lb./ac. Recommended 25% mixed stand rate 2 lb./ac for pasture situations.

Clover, White

*Trifolium repens*

A long-lived, stoloniferous low-growing perennial legume suited primarily for pasture, but can also be used for hay and silage. Can be grown under irrigation or on dryland where the effective precipitation is 18 inches or more. Requires medium to high fertility and adequate moisture for optimum production. Is not tolerant of strongly acid or strongly alkaline conditions. Is tolerant of poor drainage. May present a bloat hazard when it represents a high percentage of the pasture. Is a good erosion control plant on streambanks and roadsides, though usually lacking in persistence. White clover thrives best in a cool, moist, winter snow covered climate in soils with ample lime, phosphate, and potash. In general, white clover is best adapted to clay and silt soils in humid and irrigated areas. It grows successfully on sandy soils with a high water table or irrigated droughty soils when adequately fertilized. White clover is shallow rooted and seldom roots deeper than 2 feet which makes it adapted to shallow soils, when adequate precipitation or irrigation is available. There are three general types:

'Ladino' is a large type and the only hay type variety. It is two to four times as large as common white clover. It will winter kill under dry winter conditions. It requires a high soil phosphate level and good management for maximum production. 'Pilgram' and 'Merit' have been developed for winter hardiness.

Intermediate - 'Grassland Huia' is representative of the intermediate type.

Small type - 'New York' wild and 'Kent Wild' white clover are examples of the small type that is adapted to higher elevations and colder areas. It is the most drought resistant type. It is very persistent in pastures, withstands close grazing, and is the least productive of the white clover.

Average seeds per ft<sup>2</sup> at 1 lb. rate 18. Pure stand seeding rate 4 lb./ac. Recommended 25% mixed stand rate 1 lb./ac for pasture situations.

Crownvetch

*Coronilla varia*

An introduced, long-lived perennial legume with a strong rhizome and a deep taproot system. This legume does well in mountain big sagebrush, mountain brush, and aspen communities with over 21 inches of annual precipitation. It prefers soils slightly acid to basic and does especially well in calcareous derived soils. It does not do well in poorly drained soils. This semi-evergreen forb is preferred by all classes of livestock and wildlife. The strong spreading fleshy rhizome enables this species to be an excellent soil stabilizer. Crownvetch does well seeded as a component of a mixture. It requires fall seeding 1/4 to 1/2 inch deep. Three improved varieties are available: 'Emerald', 'Penngift', and 'Chemung'. All do well in the mountain brush and aspen. 'Emerald' is the smallest in stature and produces less foliage; however, it is the most aggressive underground spreader. Average seeds per ft<sup>2</sup> at 1 lb. rate 3. Pure stand seeding rate 10 lb./ac. Recommended 25% mixed stand rate 2 lb./ac for pasture situations.

Flax, Blue

*Linum perenne*

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. 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. Average seeds per ft<sup>2</sup> at 1 lb. rate 6. Pure stand seeding rate 5 lb./ac. Not recommended in pure stands.

Globemallow, Gooseberry Leaf and Scarlet

*Sphaeralcea murroana*

and

*S. coccinea*

Gooseberryleaf globemallow is a drought tolerant perennial native forb that occurs throughout juniper, sagebrush-rabbitbrush, shadscale and blackbrush communities. Greatest area of occurrence is between 8 and 12 inches annual precipitation. This species has been successfully seeded in the blackbrush, shadscale, juniper and sagebrush communities and on disturbed sites with basic soils. Fall seeding is recommended. Seed should not be planted deeper than 1/4 inch. Livestock and big game make fair to good use of this species. It greens up early in the spring and following fall storms. It is one of few forbs that can be successfully seeded on disturbed, exposed, eroded sites in harsh environments.

Scarlet globemallow is a native, low-spreading perennial with creeping rhizomes. This species has considerable drought resistance and establishes especially well on disturbed sites. Greatest area of occurrence is between 8 and 12 inches annual precipitation. It is an excellent soil stabilization species on harsh sites. Fall seeding is recommended. Seed should not be planted deeper than 1/4 inch. Average seeds per ft<sup>2</sup> at 1 lb. rate 11. Pure stand seeding rate 4 lb./ac. Not recommended in pure stands.

Milkvetch, Cicer

*Astragalus cicer*

Cicer milkvetch is a long-lived, slow establishing, late maturing, grazing tolerant, introduced, rhizomatous, non-bloating legume that requires inoculation with the proper rhizobium for successful nitrogen fixation. It is a heavy seed and forage producer and forage quality is nearly equal that of alfalfa. It is adapted to cold temperature, lowland areas, and soils with high water holding capacity that receives at least 14 inches precipitation. It is not tolerant of flooding. This species is slow to establish due to very hard seed; scarification of seed is recommended. It responds very favorably to applications of phosphorus and potassium. Well adapted to sagebrush-grass, juniper and mountain brush, except in the shade of trees or tall shrubs. Planting depth 1/4 to 3/4 inch. Recommended varieties include 'Lutana',

'Monarch' and 'Windsor'. Average seeds per ft<sup>2</sup> at 1 lb. rate 3. Pure stand seeding rate 7 lb./ac. Recommended 50% mixed stand rate 4 lb./ac for pasture situations.

#### Penstemon Species

**Alpine Penstemon**      *Penstemon venustus*: A perennial, cool season, long-lived, native half shrub, with a strong taproot and woody base. The flowers are bright lavender to purple. Its natural habitat is from 1,000 to 6,000 feet elevation and 20-35 inches precipitation. It does best in full sunlight, on open slopes of mountain valleys and foothills. It does not tolerate poorly drained soils. Potential uses include erosion control, plant diversity and beautification on droughty sites. The 'Clearwater Selection' is a release of Alpine penstemon from Aberdeen PMC.

**Firecracker Penstemon**      *Penstemon eatonii*: 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 to 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.

**Palmer Penstemon**      *Penstemon palmeri*: A short-lived, good reseeder, semi-evergreen native forb that occurs in the blackbrush, sagebrush-grass and juniper types in basic and slightly acidic soils, on disturbed and exposed sites. It is a pioneering species and is especially suited for seeding exposed, depleted, and disturbed sites. It has considerable potential as an ornamental. Big game and livestock readily seek out this species during winter and spring months. It can be fall broadcast or drilled. Do not seed deeper than 1/8 inch. The only released variety is 'Cedar,' selected for its wide area of adaptation, winter succulence, forage production and preference of livestock and wildlife.

**Rocky Mountain Penstemon**      *Penstemon strictus*: A perennial, semi-evergreen, long-lived, native forb that occurs in the upper juniper, mountain big sagebrush, mountain brush, and open areas in aspen and coniferous forest. This species does well in areas over 15 inches annual precipitation and on rocky and sandy loam soils that range from weakly acidic to alkaline. It is eaten by livestock and wildlife. Ornamentally, this species has potential. Considerable use made of this species in seeding to stabilize depleted, disturbed, and eroded sites. Seed can be broadcast or drilled up to 1/8 inch deep. Fall seeding is recommended. The variety 'Bandera' was released for its long-lived and seed production characteristics.

A number of penstemons are seeded primarily for soil stabilization on depleted, disturbed and erosive areas and as ornamentals, but no releases have been made. These include Low penstemon (*P. humilis*), Rydberg penstemon (*P. rydbergii*) and Thicketleaf penstemon (*P. pachyphyllus*).

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 14. Pure stand seeding rate 3 lb./ac. Not recommended in pure stands.

#### Sagewort, Louisiana      *Artemisia ludoviciana*

A perennial, rhizomatous, long-lived, fast-growing, native forb that occurs in many vegetative types from the sagebrush to the subalpine zone. This species does well on shallow, as well as deep, slightly acid to basic soils. It is considered a pioneering species and is commonly seeded on disturbed areas and plays an important role in providing initial soil cover and stabilization. It can be broadcast or drilled. Do not seed deeper than 1/8-inch. The variety 'Summit' was released for its vigorous rhizome activity, forage production and wide area of adaptation. Average seeds per ft<sup>2</sup> at 1 lb. rate 103. Pure stand seeding rate 1 lb./ac. Not recommended in pure stands.

#### Sainfoin      *Onobrychis viciifolia*

Sainfoin is a medium-lived, introduced, cool-season, non-bloating legume. It is impervious to alfalfa weevil, blooms early, and not as productive as alfalfa. It is highly palatable, but has problems with stem and root rot resulting in stands

that seldom live more than 10 years. Adapted to deep well-drained soils of medium texture, high lime, dryland and irrigated conditions, and slightly alkaline soils. It is not tolerant of wet soils or high water tables. Adapted to areas with 14 inches or more precipitation. It has good seedling vigor. Can be grazed or used for hay. Planting depth 1/2 to 3/4 inches. Plant in spring and fall. Adapted varieties are 'Eski', 'Melrose' and 'Renumex' for dryland plantings, and 'Remont' for irrigated plantings. Average seeds per ft<sup>2</sup> at 1 lb. rate 0.4. Full seeding rate 34 lb./ac. Recommended 50% mixed stand rate 17 lb./ac for pasture situations.

Sweetclover, Yellow

*Melilotus officinalis*

An introduced, tall, stemmy, deep rooted, biennial legume. Produces an abundance of forage the first two years and is commonly utilized as a cover crop for perennial seedings. Also reseeds and maintains good stands where perennials do not crowd it out and in years of above normal precipitation. Poor quality forage at mid to later growth stages. Adapted sites include sagebrush-grass to subalpine areas, moist salty lowlands, road cuts and roadsides. Maintains stands in grass where ample moisture is available. Suited for green manure under irrigation or on dryland where the effective precipitation is 15 inches or more. Contains Coumarin, a derivative of dicoumarol, a blood anti-coagulant. Death may occur in animals foraging on pure stands. Planting depth 1/4 to 1/2 inch. Adapted variety is 'Madrid'. Average seeds per ft<sup>2</sup> at 1 lb. rate 6. Pure stand seeding rate 4 lb./ac. Recommended 25% mixed stand rate 1 lb./ac for pasture situations and 5 to 10% mixed stand rate 0.12 to 0.25 lb./ac for covercrop situations.

Sweetvetch Utah

*Hedysarum boreale*

Utah 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 extracted from the pod and fall seeded at least 1/8 inch to 3/4 inch deep. 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 1. Pure stand seeding rate 20 lb./ac. Not recommended for pure stands.

Trefoil, Birdsfoot

*Lotus corniculatus*

A short-lived, deep-rooted, non-bloat introduced legume suited for use as pasture or hay. It can be grown under irrigation or on dryland where the effective precipitation is 16 inches or more. It is very winter hardy (where protected by snow cover), resistant to water logged soils, and useful at high elevations. Is better than alfalfa for retaining high quality forage on mature growth. The decumbent and intermediate types are more tolerant to close grazing than erect types. Tolerant of poor drainage, this legume is quite vigorous and an excellent plant for erosion control, big game food, and beautification. Has some drought tolerance and does well in the upper half of the mountain brush, openings in aspen and also irrigated pasture. Planting depth 1/4 to 1/2 inch. Adapted varieties are 'Empire' (decumbent growth), and 'Maitland' (erect growth). Average seeds per ft<sup>2</sup> at 1 lb. rate 11. Pure stand seeding rate 4 lb./ac. Recommended 50% mixed stand rate 2 lb./ac for pasture situations.

Yarrow, Western

*Achillea millefolium*

Western yarrow is a perennial native forb (member of the sunflower family). 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. 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. Average seeds per ft<sup>2</sup> at 1 lb. rate 63. Pure stand seeding rate 1 lb./ac. Not recommended for pure stands.

## CHARACTERISTICS OF WOODY PLANTS

This list includes only those shrubs that should be used in rangeland, and forestland plantings. For additional information: Refer to Idaho Plant Materials Technical Note No. 41 "Restoration and Diversification of Plant Communities with Woody Species".

Descriptions for shrubs and trees recommended for Intermountain West riparian zones can be found in Idaho Plant Materials Technical Note No. 32 "Users Guide To Propagation and Establishment of Native Shrubs and Trees for Riparian Areas".

Descriptions for shrubs and trees commonly utilized for Intermountain West windbreak or shelterbelt plantings can be found in appropriate "Tree and Shrub Handbooks" and Idaho Plant Materials Technical Note No. 43 "Tree Planting, Care and Management".

Bitterbrush, Antelope *Purshia tridentata*

Antelope bitterbrush is a native, multiple branched shrub varying in stature from low prostrate 2 feet tall forms to erect arborescent forms as tall as 15 feet. It normally occurs in well-drained, medium to sandy gravelly, or rocky soils throughout upper sagebrush, juniper, mountain brush, ponderosa pine, and lodgepole pine zones. Seedlings are vigorous and compete well when seeded with herbs. It grows fairly rapidly and furnishes considerable forage. Upright growth forms are heavily browsed during the winter. It is one of the principal species used in wildlife and range seedings. Antelope bitterbrush is an important winter browse plant for game animals, sheep, and cattle. This species maintains itself very well even under severe grazing conditions. It is not tolerant of fire. 'Lassen' antelope bitterbrush is a large upright variety suited to neutral, especially granitic soils. Other varieties include 'Fountain Green' and 'Maybell'. Wildland seed collection is a common practice and Source Identified seed is recommended when using wildland collected seed. Recommended seeding depth is 1/4 to 1/2 inch on medium textured soils to 1 inch on sandy soils. Average seeds per ft<sup>2</sup> at 1 lb. rate 0.4. Pure stand seeding rate is 1.0 lb./ac. Not recommended for pure stands. Recommended rate in mix is approximately 1/4 pound PLS per acre.

Bitterbrush, Desert *Purshia glandulosa*

Desert bitterbrush is generally shorter than antelope bitterbrush and evergreen rather than deciduous. It is most common in pinyon-juniper, blackbrush and sagebrush communities in warmer southern regions of the Intermountain West. It is more tolerant of heat and drought than antelope bitterbrush. No releases have been made. Recommended seeding depth is 1/4 to 1/2 inch on medium textured soils to 1 inch on sandy soils. Average seeds per ft<sup>2</sup> at 1 lb. rate 0.4. Pure stand seeding rate is 1.0 lb./ac. Not recommended for pure stands. Recommended rate in mix is approximately 1/4 pound PLS per acre.

Buffaloberry, Silver *Shepherdia argentea*

A native shrub to short tree up to 16 feet tall native to western North America. It is a deciduous shrub, often forming thickets, with dense ascending to erect thorny branches that are silvery-white when young. Roots are shallow, extensive, well branched and capable of fixing nitrogen. It readily suckers and is not considered palatable to livestock. Wildlife utilize it for food, cover and berries. It prefers well drained to seasonally wet medium to coarse textured soils in the 12-20 inch precipitation zones. It has weak drought tolerance, is winter hardy, intolerant of shade, and has good saline tolerance and fair fire tolerance due to its sprouting ability. It is used primarily for wildlife cover, food, and diversity in rangeland, critical areas and is usually planted as container or bareroot stock. It is sometimes confused with Russian olive, an invasive species in the habitats that silver buffaloberry occupies. 'Sakakawea' is the only released

cultivar. Hard seed coats require 20-30 minutes of acid scarification and 60-90 days of cold stratification at 68-86<sup>0</sup> F before planting. Average seeds/ft<sup>2</sup> at 1 lb. rate 0.9. It is generally not recommended for seeding and should be established with container stock.

Ceanothus or Snowbrush                      *Ceanothus velutinus*

A native of the Intermountain West, this shrub occurs in juniper, ponderosa pine, mountain brush, and aspen communities on well-drained, medium-textured soils, often rocky and shallow; also weakly acid to weakly basic and mostly non-saline soils. It commonly establishes in areas where snowbanks or drifts occur during the winter. It has moderate shade tolerance, fair drought tolerance, and good grazing tolerance. Sought out by big game and livestock. Can be seeded in conjunction with other species. Should be seeded on a firm seedbed at 1/4-1/2 inch deep in the fall. Use in game range revegetation mixtures in sagebrush, mountain brush, and juniper communities. Spreading habit, somewhat fire tolerant, and attractive flowers makes this species potentially useful in seedings or plantings for stabilizing disturbed soils and for roadside beautification. Average seeds per ft<sup>2</sup> at 1 lb. rate 2.2. Mixed stand seeding rate 1/4 lb./ac. Not recommended for pure stands.

Chokecherry                                      *Prunus virginiana*

A native shrub, 5-25 feet tall, common in moist sites such as drainages, ditches, and road shoulders and in cool and moist foothill, mountain, and canyon habitats with 12-30 inches annual precipitation. Adapted to a wide range of soil textures except dense clay; it is intolerant of poor drainage and prolonged spring flooding and high water tables. More common in silty or moderately acidic, moderately basic, and weakly saline soils. It is an aggressive root and sucker sprouting species after fire. Moderate tolerance of grazing; used extensively by livestock and big game. It can be poisonous to livestock following drought and freezing weather and when animals are grazing new twigs and leaves. It has good potential on disturbed sites as an ornamental and as a windbreak or shelterbelt specie. Can be transplanted and broadcast or drill seeded. Seed should be placed about 1/2-1.0 inch deep. Fall seeding is preferred. Average seeds per ft<sup>2</sup> at 1 lb. rate 0.1. Mixed stand seeding rate 1/4 lb./ac. Not recommended for pure stands.

Cinquefoil, Shrubby                              *Dasiphora floribunda*                      or                      *Potentilla fruiticosa*

A native, deciduous shrub, very hardy, 1 to 3 feet in height, with attractive leaves and bright yellow flowers. It is primarily used for landscaping, erosion control, and native site rehabilitation where naturally adapted. It prefers full sun locations in the 18 inch plus precipitation zone and is found on a variety of soils that are well drained, but may be saturated or have a high watertable early in the growing season. Plant 1-2 year old container or bareroot stock available through nurseries. It is not recommended for seeding.

Clematis, Western                                      *Clematis ligusticifolia*

A native, fast growing, vigorous climbing, dioecious, vine with both male and female plants. Commonly found along streams it has abundant clusters of showy white flowers that show from July into August. Seed appears cotton-like in fall when mature. It is adapted to moist, well-drained soils, can tolerate droughty periods, and prefers full sun to partial shade. Establishment requires 15 inches of annual precipitation. It is a good ground cover for erosion control, good plant for top of streambanks, may be useful as a screen, and provides habitat for some wildlife species. 'Trailer' is a cultivar released by the Pullman PMC. Plant container or bareroot stock available through nurseries. It is not recommended for seeding.

Current, Golden and Wax Current                      *Ribes aureum*                      and                      *Ribes cereum*

Fast growing native shrubs, that may, under favorable conditions, reach 10 feet in height. They grow in several forms and produces considerable foliage. Grows in 12-inch precipitation areas, but performs best where the precipitation exceeds 15 inches, especially in the juniper and mountain brush zones. Golden is an excellent erosion control plant, because it spreads both vegetatively and by seed. Golden is used in conservation plantings and has fairly good saline

tolerance. Golden is an attractive shrub that requires little maintenance, it is frequently used in recreational plantings around campgrounds, roadways, etc. They provide food (berries) and cover for upland game and year around browse for big game and livestock. They can be readily established by direct seeding and transplanting seedlings. Average seeds per ft<sup>2</sup> at 1 lb. rate 5.4-5.8. Not recommended for pure stands. Mixed stand seeding rate 1/4 lb./ac. Transplants are also recommended.

Dogwood, Redosier                      *Cornus sericea*                      or                      *C. stolonifera*

A medium sized, deciduous native shrub, with bright red twigs and stoloniferous root system. Dogwood prefers moist sites and is commonly found along perennial streams. White flowers appear in clusters in late May to mid June followed by white berries in the fall. Birds utilize the berries. It is utilized as a riparian, streambank, wildlife and windbreak plant. Silky Dogwood *Cornus amomum*, native to northeast North America has one released cultivar "Indigo". A redosier dogwood release is 'Ruby'. Dogwood is not recommended for seedings. Plant container, bareroot stock, or cuttings. Cuttings will only root at "cut" locations, so scarring bark on portion of cutting to be under the soil will promote rooting at multiple locations along cutting.

Elderberry, Blue and Red                      *Sambucus nigra*                      and                      *Sambucus racemosa*

Native, medium shrubs with broad crowns, straight trunks, 3 to 13 feet in height, with showy clusters of small yellowish white flowers, and pale blue to red fruit. Elderberry is common along banks, washes of streams, fencerows, rocky pastures, and other drier riparian locations on well-drained moist soils at mid elevations. It is most common in the 18 inch plus precipitation zones, but is found in lower precipitation areas where sub-surface moisture is available. Birds readily utilize the fruit and livestock and wildlife commonly browse the stems. Young seedlings can be transplanted at 1 to 2 years of age. 'Blanchard' blue elderberry is a release. Elderberry is not recommended for seedings and should be established or planted with container stock.

Hawthorn, Black or Douglas                      *Crataegus douglasii*                      or                      *C. douglasii* var. *douglasii*

An erect native shrub to small tree to 33 feet tall. Branches are zigzagging stems, armed with stout 1-inch thorns and reddish brown in color aging to dirty gray. Habitat it generally drier riparian zones on clay loam to sandy loam soils at mid elevations. Watertable is commonly within 40 inches of surface in spring or runoff events, but drops later in the growing season. This species is tolerant of flooding and saturated poorly drained soils. Young seedlings can be transplanted at 1 to 2 years of age. There are no releases. Hawthorn is not recommended for seedings and should be established or planted with container stock.

Kinnikinnick (Bearberry)                      *Arctostaphylos uva-ursi*

A native, creeping, small (to 12-inch) shrub. It has small, shinny, leathery, dark green leaves, red stems, and small pinkish flowers and red berries in the fall. It is adapted to a variety of soils and is most common in sunny open to semi-shaded forested areas in the north and intermountain west. Use as a ground cover. Young seedlings can be transplanted at 1 to 2 years of age. It is not recommended for seedings and should be established or planted with container stock.

Kochia, Forage                      *Kochia prostrata*

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, with reproduction taking place, 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.

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 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 or 1/10 of a pound bulk rate.

Mountain Mahogany                      *Cercocarpus species*

Two species of mountain mahogany are excellent native wildland shrubs for several purposes. Curleaf mountain mahogany (*C. ledifolius*) is an evergreen shrub or small tree up to 23 feet tall. True mountain mahogany (*C. montanus*) is a deciduous shrub generally less than 10 feet tall. Both species commonly grow in rocky, mountainous habitats in shallow soils, although true mountain mahogany, will also grow in more moist fertile soils of canyon bottoms. They prefer 14-24 inches annual precipitation. These species are not tolerant of fire. Both are valuable browse plants for game animals and livestock. Curleaf mountain mahogany is mainly browsed in the winter, whereas true mountain mahogany is utilized year around. Both are among the most palatable of shrubs to all classes of browsing animals. Both species are difficult to establish because their seedlings are vulnerable to herbaceous competition and browsing animals grazing them out. They should be seeded at 0-1/2 inch depth. 'Montane' is a widely adapted variety of true mountain mahogany. There is no released variety of curleaf mountain mahogany. Average seeds per ft<sup>2</sup> at 1 lb. rate 1.2. Mixed stand seeding rate 1/4 lb./ac. Not recommended for pure stands.

Oregongrape (Barberry)                      *Mahonia spp.*

A native, deciduous, evergreen, creeping, spiny shrub with spreading roots. Oregongrape commonly has yellow flowers and blue-black fruit. It is winter-hardy and grows in full sun to semi-shade commonly in forested areas. It is adapted to a wide range of soils, but prefers moist, well-drained sites receiving 18 inches or more precipitation. It is most commonly used in conservation, erosion control, landscaping, and wildlife plantings. Plant at 1/4-1/2 inch depth. Average seeds per ft<sup>2</sup> at 1 lb. rate 1.0. Mixed seeding rate is 1/4 lb./ac. Not recommended for pure stands. Young seedlings can be transplanted at 1 to 2 years of age.

Rabbitbrush, Green                      *Ericameria viscidiflorus*    or    *Chrysothamnus viscidiflorus*

Green rabbitbrush is a native shrub that usually grows from 12 to 40 inches tall, but varying from dwarf forms to types over 10 feet tall. Green rabbitbrush is composed of numerous subspecies and shows considerable morphological variation in size, stem, leaf, and flower characteristics. A common plant on plains, valleys, and foothills, it grows best

in openings within the sagebrush, juniper and ponderosa pine zones in loamy, sandy, gravelly, to clay-alkaline soils. It vigorously invades disturbed sites such as burned areas and overgrazed rangelands but gives way to other plants as the plant community matures. It has deep roots, heavy litter, and ability to establish on severe sites. It establishes well when seeded with grasses and forbs. Green rabbitbrush is browsed in the fall and heaviest during the winter. Control of established, unwanted stands is often difficult. Average seeds per ft<sup>2</sup> at 1 lb. rate 17.9. Not recommended for pure stands. Recommended rate in mixes is approximately 1/40 of a pound PLS per acre or 1/10 of a pound bulk rate.

Rabbitbrush, Rubber                      *Ericameria nauseosus*                      or                      *Chrysothamnus nauseosus*

Rubber rabbitbrush is a native shrub usually 12 to 80 inches tall, but varying from dwarf forms to types over 10 feet tall. Rubber rabbitbrush is composed of numerous subspecies (>20) and shows considerable morphological variation in size, stem, leaf, and flower characteristics. A common plant on plains, valleys, and foothills, it grows best in openings within the sagebrush, juniper and ponderosa pine zones in loamy, sandy, gravelly, to clay-alkaline soils. It vigorously invades disturbed sites such as burned areas, roadcuts, and overgrazed rangelands but gives way to other plants as the plant community matures. It is an excellent plant for controlling erosion because of its deep roots, heavy litter, and ability to establish on severe sites. It is used to seed mine disturbances, roadways and big game ranges. It establishes well when seeded with grasses and forbs. The value of rubber rabbitbrush as browse varies greatly between subspecies and populations. In general, the white to grayish subspecies are more palatable to livestock and big game than green subspecies. Some populations have excellent nutritive quality characteristics. Rubber rabbitbrush is browsed little in the summer, more in the fall, and heaviest during the winter. Some populations of this species may have potential as a source of industrial chemicals (rubber, resin, etc.). Control of established, unwanted stands is often difficult. Average seeds per ft<sup>2</sup> at 1 lb. rate 15.9. Not recommended for pure stands. Recommended rate in mixes is approximately 1/40 of a pound PLS per acre or 1/10 of a pound bulk rate.

Rose, Woods                                      *Rosa woodsii*

A long-lived native shrub that grows from 2-6 feet tall. It is common in well drained loamy to sandy soils on plains, foothills, and mountain sites. Tolerant of moderately acid to weakly basic but mostly non-saline soils. Most abundant in disturbed soils and open communities with reduced competition. Aggressive pioneer in abandoned fields, fence lines, disturbed sites, gullies, riparian areas and land cuts and fills. Common in 12 to over 20 inches annual precipitation. Roots are shallow and much branched with plants spreading from rhizomes. Foliage moderately palatable to livestock and big game. Provides good cover and winter food for birds and small mammals, for erosion control, and as an ornamental. Rated high potential for roadside and critical site stabilization and beautification. Can be transplanted, drilled, or broadcast seeded 1/2 inch deep. Fall seeding is required. Average seeds per ft<sup>2</sup> at 1 lb. rate 1.1. Mix seeding rate 1/4 lb./ac. Not recommended for pure stands. Young seedlings can be transplanted at 1 to 2 years of age.

Sagebrush, Big                                      *Artemisia tridentata* species (*A. t. tridentata*, *A. t. vaseyana* and *A. t. wyomingensis*)

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. Because big sagebrush establishes rapidly from direct seeding, it is useful for stabilizing washes, gullies, roadcuts, and other raw, exposed sites. It is widely seeded on big game improvement projects. Plants spread well by natural seeding and furnish considerable forage 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 is also recommended. Seed at 0-1/8 inch depth. Average seeds per ft<sup>2</sup> at 1 lb. rate; Basin 57.0, Mountain 40.0, Wyoming 57.0. Not recommended for pure seedings. Recommended rates in mixes are approximately 1/40 of a pound PLS per acre or 1/10 of a pound bulk rate.

Sagebrush, Black

*Artemisia nova*

Black sagebrush is a small spreading, aromatic native shrub commonly 6 to 12 inches tall and occasionally to 30 inches tall. It has a dull grayish-tomentose vesiture that causes most populations to appear darker than big sagebrush. It grows in dry, stony, shallow soils often over a caliche layer that receive 8-18 inches of precipitation. Usually these soils are calcareous or are derived from limestone parent materials. Individual populations of black sagebrush are differentially palatable to wildlife and livestock. In general, black sagebrush is considered excellent winter forage for sheep, antelope, and deer. It is an aggressive natural spreader from seed and can be easily established by broadcast seeding. Because it usually grows on shallow dry rocky sites, it is usually not a candidate for plant control. 'Pine Valley Ridge' is the only release. Wildland seed collection is a common practice and Source Identified seed is recommended when using wildland collected seed. Use of freshly harvested is also recommended. Seed at 0-1/8 inch depth Average seeds per ft<sup>2</sup> at 1 lb. rate 23.0. Not recommended for pure stands. Recommended rates in mix are approximately 1/40 of a pound PLS per acre or 1/10 of a pound bulk rate.

Saltbush, Fourwing

*Atriplex canescens*

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 widely 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 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. The variety '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 variety is 'Wytana', a natural hybrid of fourwing saltbush and Gardner saltbush, with lower stature. It is adapted to higher elevation and precipitation, and more northern colder areas. The most recent release by Aberdeen PMC, Snake River Plains Germplasm has better cold tolerance than other releases 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

*Atriplex gardneri*

or

*A. nuttallii*

Gardner saltbush is a low growing perennial shrub that is widespread throughout the Intermountain West including salt desert shrublands. It is usually found on basic 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 forage 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.

Serviceberry, Saskatoon

*Amelanchier alnifolia*

Serviceberry is an erect deciduous native shrub 3 to 15 feet tall. It is an important shrub in the juniper zone, less so in the big sagebrush zone, and most productive and common in sloping moist habitats within the ponderosa pine and just below the mixed conifer zone. It prefers areas that receive 14-30 inches of precipitation. Serviceberry is a valuable browse plant due to its fair-to-high palatability and ready availability to livestock and big game. It is browsed by cattle after mid-summer when the more palatable grasses and forbs have been grazed or have dried up. Big game use it chiefly in the fall and winter. The fleshy fruits are sought by a wide variety of birds and mammals. It resprouts following fire. Utah serviceberry (*A. utahensis*) is a similar species differing in its drier habitat, more pubescent and smaller leaves, and less succulent fruits. Seedlings and young plants grow slowly and can be suppressed by grasses and broadleaf herbs. Once established, serviceberry withstands very heavy browsing. Plant at 1/4-1/2 inch depth. Average seeds per ft<sup>2</sup> at 1 lb. rate 1.9. Not recommended for pure stands. Recommended rate in mix is approximately 1/4 of a pound PLS per acre.

Silverberry

*Elaeagnus commutata*

Silverberry is a multi-stemmed, deciduous native shrub 4-8 feet tall with an erect habit and slender sometimes twisted branches. New stems are initially light to medium brown and becoming dark gray with age. Leaves are alternate, oval to ovate, entire, and covered on both sides with silvery-white scales, the bottom sometimes with brown spots. The flowers are highly fragrant, yellow, and trumpet shaped. Fruit is silvery colored and often persists until late December. Late fall planting is recommended. It is most common in the mountain foothills and well-drained riparian zones of the northern Rocky Mountains receiving 14 inches or more precipitation. It tolerates drought, high pH and saline soils. It is sometimes confused with silver buffaloberry and the invasive introduced species Russian olive. Plant at 0-3/4 inch depth. Average seeds per ft<sup>2</sup> at 1 lb. rate 0.1. Not recommended for pure stands. Recommended rate in mix is approximately 2 pounds PLS per acre. Young seedlings can be transplanted at 1 to 2 years of age.

Snowberry, Common  
Snowberry, Mountain

*Symphoricarpos albus*  
*Symphoricarpos oreophilus*

Snowberry is native, deciduous, 1-5 feet tall, spreading shrub found throughout the western United States. Common snowberry is mostly found in the northern bunchgrass regions and mountain snowberry is most common in the sagebrush regions. They have small pink to white flowers and showy white berries. They reproduce by both seed and rhizomes. They resprout following fire, but mountain snowberry is less tolerant and a weaker sprouter. They are eaten readily by wildlife and sheep, but are less desirable to cattle. They like a wide range of soils except loose sandy soils, tolerate full sun, but prefer partial shading. They are generally found in the 14 inch and above precipitation zones. Uses include conservation, erosion, wildlife and upper terraces of riparian areas. They can be transplanted, drilled, or broadcast seeded from 0 to 1/2 inch deep. Fall seeding is recommended. Average seed per ft<sup>2</sup> at 1 lb. rate is 1.7. Not recommended in pure stands. Recommended rates in mixes is approximately 1/4 of a pound PLS per acre. Young seedlings can be transplanted at 1 to 2 years of age.

Sumac, Skunkbush

*Rhus trilobata*

This native shrub grows from 2-7 feet tall and can be found on most well drained soil textures. It is common on hot, dry, shallow rock, foothills and in well-drained soils. Well adapted to 10 to 20 inches annual precipitation. Thriftier in coarse-textured or disturbed soils and somewhat open communities. Moderately strong drought tolerance. Good fire and grazing tolerance. Has good potential as a stabilizer species on disturbed sites and as a windbreak species. Livestock and big game make some use of this shrub as forage. It is an excellent cover species for big game and upland game birds. It can be transplanted or direct seeded. 'Bighorn' is the only released variety. Seed may require scarification to improve germination. Seeding should occur in the fall at a depth of 1/2 to 1.0 inch deep. Average seeds per ft<sup>2</sup> at 1 lb. rate 0.5. Not recommended for pure stands. Recommended rate in mixes is approximately 1/4 of a pound PLS per acre. Young seedlings can be transplanted at 1 to 2 years of age.

Syringa (Mockorange)

*Philadelphus lewisii*

A native loosely branched medium to tall shrub (3 to 10 feet) with showy sweet scented white flowers. Syringa is the Idaho State flower. Habitat is mostly in foothills and montane zone in ponderosa pine and Douglas fir forests and in dry, rocky, well drained, moderately shaded, moist canyon bottoms and streamside areas. Deer and elk utilize it primarily during winter. It requires 18 inches of annual precipitation. Uses include upper banks of riparian zones and landscaping. Plant container or bareroot stock available through nurseries. It is not recommended for seeding.

Winterfat

*Krascheninnikovia lanata* or

*Ceratoides lanata* or

*Eurotia lanata*

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 grazing, overgrazing has greatly reduced and even eliminated winterfat in some areas. Winterfat seed maintains viability for relatively short periods of time (6 months to 4 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. 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 2.5. Not recommended for pure stands. Recommended rates in mix are approximately 1/40 of a pound PLS per acre or 1/10 of a pound/ac.bulk rate

**Table 1**  
**PLANT ADAPTATION and SEEDING RATES**  
**Plant Materials Technical Note No. 13**

<b>Common Name</b>	<b>Longevity</b>	<b>Seedling Vigor</b>	<b>Character</b>	<b>Seeds/Lb</b>	<b>1 lb/Acre Seeds/ft<sup>2</sup></b>	<b>Precip</b>	<b>Soil</b>	<b>Depth</b>	<b>PLS Rate</b>
<b>GRASSES</b>									
Bentgrass, Redtop	Long	Slow-Med.	Sod	4,900,000	112	+18	wet	0-1/4	1
Bluegrass, Big	Medium	Slow-Med.	Bunch	796,000	21	+ 9	cl-sl	1/4-1/2	2
Bluegrass, Canby	Long	Slow-Med.	Bunch	926,000	21	+ 9	c-sl	0-1/4	3
Bluegrass, Canada	Long	Slow-Med.	Sod	2,500,000	57	+18	cl-sl	1/4-1/2	1
Bluegrass, Kentucky	Long	Slow-Med.	Sod	2,156,000	50	+18	cl-sl	0-1/4	4
Bluegrass, Sandberg	Long	Slow-Med.	Bunch	925,000	21	+ 8	l-cl	0-1/4	2
Brome, Meadow	Long	Med.-Rapid	Bunch	93,000	2	+14	c-sl	1/4-1/2	10
Brome, Mountain	Short	Med.-Rapid	Bunch	90,000	2	+16	c-sl	1/4-1/2	10
Brome, Smooth	Long	Very Rapid	Sod	125,000	3	+14	cl-sl	1/4-1/2	6
Canarygrass, Reed	Long	Med.-Rapid	Sod	506,000	12	+18	c-sl	1/4-1/2	4
Dropseed, Sand	Long	Slow	Bunch	5,250,000	121	+ 7	fsl-s	0-1/4	1
Fescue, Hard	Long	Slow	Bunch	524,000	13	+14	c-sl	1/4-1/2	3
Fescue, Idaho	Long	Very Slow	Bunch	450,000	10	+16	cl-sl	1/4-1/2	3
Fescue, Red	Long	Slow	Sod	615,000	14	+18	c-sl	1/4-1/2	4
Fescue, Sheep	Long	Slow	Bunch	680,000	16	+10	c-sl	1/4-1/2	3
Fescue, Tall	Long	Medium	Bunch	200,000	5	+18	saline	1/4-1/2	5
Foxtail, Creeping	Long	Slow	Sod	841,000	21	+18	c-l	1/4-1/2	3
Hairgrass, Tufted	Long	Slow	Bunch	2,395,000	55	+18	c-sl	0-1/4	1
Junegrass, Prairie	Medium	Slow-Med.	Bunch	2,300,000	53	12-20	sil-s	1/4-1/2	1
Needlegrass species	Long	Slow	Bunch	180,000	3-4	8-20	cl-sl	1/4-1/2	6-7
Orchardgrass	Long	Medium	Bunch	375,000	9	+16	c-sl	1/4-1/2	3
Ricegrass, Indian	Long	Medium	Bunch	128,000	3	+10	l-s	1/2-3	8
Ryegrass, Perennial	Short	V. Rapid	Bunch	248,000	6	+15	cl-sl	0-1/2	5
Sacaton, Alkali	Long	Slow-Med.	Bunch	1,742,000	40	+10	wet	1/8-1/2	3
Squirreltail, B.	Long	Medium	Bunch	190,000	4	+8	cl-sl	1/4-1/2	7
Switchgrass	Long	V. Slow	Sod	274,000	6	+16	sil-sl	1/4-1/2	5
Timothy	Long	Medium	Bunch	1,319,000	30	+18	c-sl	1/4-1/2	3
Wheatgrass, Beardless	Long	Medium	Bunch	126,000	3	+12	c-sl	1/4-1/2	8
Wheatgrass, Bluebunch	Long	Medium	Bunch	139,000	3	+12	cl-sl	1/4-1/2	8
Wheatgrass, Crested AGCR	Long	Rapid	Bunch	250,000	6	+10	c-sl	1/4-1/2	5
Wheatgrass, Crested AGDE2	Long	Rapid	Bunch	153,000	4	+8	c-sl	1/4-1/2	5
Wheatgrass, Crested X	Long	Rapid	Bunch	152,000	4	+9	c-sl	1/4-1/2	5

**Table 1 Plant Materials Technical Note No. 13**

<b>Common Name</b>	<b>Longevity</b>	<b>Seedling Vigor</b>	<b>Character</b>	<b>Seeds/Lb</b>	<b>1 lb/Acre Seeds/ft2</b>	<b>Precip</b>	<b>Soil</b>	<b>Depth</b>	<b>PLS Rate</b>
<b>GRASSES</b>									
Wheatgrass, Intermediate	Long	Rapid	Sod	90,000	2	+12	cl-sl	1/4-1/2	10
Wheatgrass, Newhy	Long	Medium	Sod	131,000	3	+14	saline	1/4-1/2	8
Wheatgrass, Pubescent	Long	Rapid	Sod	80,000	2	+11	l-s	1/4-1/2	10
Wheatgrass, Siberian	Long	Medium	Bunch	163,000	5	+8	c-sl	1/4-1/2	6
Wheatgrass, Slender	Short	Rapid	Bunch	131,000	3	+10	c-sl	1/4-3/4	6
Wheatgrass, Snake River	Long	Medium	Bunch	138,000	3	+8	c-sl	1/4-1/2	8
Wheatgrass, Streambank	Long	Medium	Sod	153,000	4	+10	c-l	1/4-1/2	6
Wheatgrass, Tall	Long	V. Rapid	Bunch	79,000	2	+14	saline	1/4-3/4	10
Wheatgrass, Thickspike	Long	Medium	Sod	133,000	3	+8	l-s	1/4-1/2	8
Wheatgrass, Western	Long	Medium	Sod	96,000	2	+14	cl-sl	1/4-1/2	6
Wildrye, Altai	Long	Slow	Bunch	68,000	2	+14	saline	1/4-1/2	12
Wildrye, Basin	Long	Slow	Bunch	125,000	3	+12	sil-sl	1/4-1/2	8
Wildrye, Beardless	Long	V. Slow	Sod	181,000	4	+14	saline	1/4-1/2	8
Wildrye, Blue	Medium	Medium	Bunch	125,000	3	+16	cl-sl	1/4-1/2	7
Wildrye, Canada	Long	Medium	Sod	130,000	3	+14	cl-sl	1/4-1/2	7
Wildrye, Mammoth	Long	V. Slow	Sod	85,000	2	+12	ls-s	1/4-1/2	15
Wildrye, Russian	Long	Slow	Bunch	140,000	4	+12	c-sl	1/4-1/2	6
<b>FORBS and LEGUMES</b>									
Alfalfa	Medium	Medium	Erect	225,000	5	+14	sil-sl	1/8-1/2	5
Aster	Medium	Slow	Erect	540,000	12	+12	cl-sil	1/8-1/2	2
Balsamroot, Arrowleaf	Long	V. Slow	Erect	57,000	1	+10	sil-sl	1/4-1/2	20
Burnet, Small	Medium	Medium	Erect	42,000	1	+14	c-sl	1/8-1/2	20
Clover, Alsike	Short	Medium	Erect	700,000	16	+18	wet	1/8-1/4	4
Clover, Red	Short	Medium	Erect	275,000	6	+18	sil-sl	1/4-1	6
Clover, Strawberry	Short	Medium	Prostrate	300,000	7	+18	wet/saline	1/8-1/4	8
Clover, White	Med.-Long	Medium	Erect	800,000	18	+18	wet/cl-sil	1/8-1/4	4
Crownvetch	Long	Medium	Prostrate	110,000	3	+21	sil-sl	1/4-1/2	10
Flax, Blue	Short	Slow-Med.	Erect	278,000	6	+10	sil-sl	0-1/8	5
Globemallow	Long	Slow	Erect	500,000	11	+7	saline	1/4-1/2	4
Milkvetch, Cicer	Long	Slow	Erect	134,000	3	+15	c-l	1/4-3/4	7
Penstemon species	Medium	V. Slow	Erect	600,000	14	8-20	cl-sl	1/8-1/4	3
Sagewort, Louisiana	Short-Med.	Medium	Erect	4,500,000	103	+12	cl-sl	0-1/4	1
Sainfoin	Medium	Slow-Med.	Erect	18,000	0.4	+14	sil-s	1/4-3/4	34
Sweetclover, Yellow	Short	Med.-Rapid	Erect	260,000	6	+14	c-sl	1/8-1/2	4
Sweetvetch species	Medium	Slow	Erect	35,000	1	+10	cl-sl	1/8-1/4	20
Trefoil, Birdsfoot	Long	Slow	Erect	470,000	11	+18	c-s	1/4-1/2	4
Yarrow, Western	Medium	Slow	Prostrate	2,770,000	63	+10	cl-sl	0-1/4	1

**Table 1 Plant Materials Technical Note No. 13**

<u>Common Name</u>	<u>Longevity</u>	<u>Seedling Vigor</u>	<u>Character</u>	<u>Seeds/Lb</u>	<u>1 lb/Acre Seeds/ft2</u>	<u>Precip</u>	<u>Soil</u>	<u>Depth</u>	<u>PLS Rate</u>
<b>SHRUBS</b>									
Bitterbrush, A.	Long	Slow	Shrub	15,400	0.4	+10	cl-sl	1/4-1/2	1.0 (1/4*)
Buffaloberry, Silver	Long	Slow	Shrub	40,000	0.9	12-20	sc	1/2	plants
Ceanothus/Snowbrush	Long	Slow	Shrub	96,000	2.2	+16	sil-s	1/4-1/2	1.0 (1/4*)
Chokecherry	Long	Slow	Shrub	4,790	0.1	+12	sil-s	1/2-1.0	1.0 (1/4*)
Cinquefoil, Shrubby	Long	Slow	Shrub	>1,000,000	23.0	+18	wet-all	surface	plants
Clematis	Long	Slow	Creeping Vine	-----	-	+15	moist	-----	plants
Current, Golden	Long	Slow	Shrub	233,000	5.4	+12	sil-sl	1/16-1/4	1.0 (1/4*)
Current, Wax	Long	Slow	Shrub	251,000	5.8	+12	sil-sl	1/16-1/4	1.0 (1/4*)
Dogwood, Redosier	Long	Slow	Shrub	18,500	0.4	+16	moist	-----	cuttings
Elderberry, Blue/Red	Medium	Slow	Shrub	-----	-	+18	gravelly	-----	plants
Hawthorn, Black	Long	Slow	Sm. Tree	22,600	0.5	+12	cl-sl	0-1/4	plants
Kinnikinnick	Long	Slow	Creeping Shrub	-----	-	+18	cl-sl	-----	plants
Kochia, Forage	Long	Slow	Half-Shrub	395,000	9.0	+8	cl-sl	0-1/8	1.0 (1/40*)
Mountain Mahogany	Long	Slow	Shrub	51,900	1.2	+14	rocky	0-1/2	1.0 (1/4*)
Oregongrape	Long	Slow	Creeping Shrub	45,000	1.0	+18	moist	1/4-1/2	1/4*/plants
Rabbitbrush, Green	Long	Slow	Shrub	782,000	17.9	+10	sil-s	surface	<1.0 (1/40*)
Rabbitbrush, Rubber	Long	Slow	Shrub	693,000	15.9	+10	sil-s	surface	<1.0 (1/40*)
Rose, Woods	Long	Slow	Shrub	50,000	1.1	+12	l-sl	1/2	1.0 (1/4*)
Sagebrush, Big spp.	Long	Slow	Shrub	2,500,000	57.0 +	8-18	cl-sl	0-1/8	<1.0 (1/40*)
Sagebrush, Black	Long	Slow	Shrub	1,000,000	23.0 +	+10	limy	0-1/8	<1.0 (1/40*)
Saltbush, Fourwing	Long	Slow	Shrub	52,000	1.2	8-16	l-s	1/4-3/4	1.0 (1/4*)
Saltbush, Gardner	Long	Slow	Shrub	111,500	2.6	6-16	l-s	0-1/2	0.5 (1/4*)
Serviceberry	Long	Slow	Shrub	82,000	1.9	+14	sil-sl	1/4-1/2	1.0 (1/4*)
Silverberry	Long	Slow	Shrub	3,800	0.1	+14	sil-sl	0-3/4	2.0 (plants)
Snowberry	Long	Slow	Shrub	76,000	1.7	+14	sil-sl	0-1/2	1.0 (1/4*)
Sumac, Skunkbush	Long	Slow	Shrub	20,300	0.5	+14	rocky	1/2-1.0	1.0 (1/4*)
Syringa (Mockorange)	Long	Slow	Shrub	-----	-	+18	moist	-----	plants
Winterfat	Long	Slow	Half-Shrub	112,000	2.5	+7	limy	0-1/8	<1.0 (1/40*)

\* This rate is recommended mix rate per acre and not the 100% pure seed rate per acre. Recommended rates are based on targeting the establishment of 400 plants per acre for optimal wildlife habitat in a seed mix.

**Soil:** v fsl = very fine sandy loam; fsl = fine sandy loam; sl = sandy loam; l = loam; sil = silty; lfs = loamy fine sand; ls = loamy sand; cl = clay loam; s = sand; c = clay; sc = sandy clay; sic = silty clay; wet = saturated; moist = moist-well drained; limy = high calcium content; rocky = 2" plus rock; gravel = 1/8-2" rock.

**TABLE 2**  
**RECOMMENDED RELEASES**  
**PLANT MATERIALS TECHNICAL NOTE NO. 13**

COMMON NAME	RECOMMENDED RELEASES	COMMON NAME	RECOMMENDED RELEASES
<b>GRASSES</b>			
Bentgrass, Redtop	'Streaker' and 'Golf Star'	Bluegrass, Big	'Sherman'
Bluegrass, Canby	'Canbar'	Bluegrass, Canada	'Canon' and 'Rubens'
Bluegrass, Kentucky	multiple - turfgrass	Bluegrass, Sandberg	'High Plains'
Brome, Meadow	'Fleet', 'Paddock' and 'Regar'	Brome, Mountain	'Bromar' and 'Garnet'
Brome, Smooth	'Lincoln' and 'Manchar'	Canarygrass, Reed	'Palaton', 'Rise' and 'Venture'
Dropseed, Sand	None	Fescue, Hard	'Durar'
Fescue, Idaho	'Joseph' and 'Nezpurs'	Fescue, Red	multiple - turfgrass
Fescue, Sheep	'Bighorn' and 'Covar'	Fescue, Tall	'Alta', 'Fawn' 'Forager' and 'Johnstone'
Foxtail, Creeping	'Dan', 'Garrison' and 'Mountain'	Hairgrass, Tufted	'Norcoast' and 'Peru Creek'
Junegrass, Prairie	'Barkoel'	Needlegrass species	'Lodorm' and 'Green Stipagrass' green needlegrass
Orchardgrass	'Latar', 'Paiute' and 'Potomac' + others	Ricegrass, Indian	'Nezpar', 'Paloma' and 'Rimrock'
Ryegrass, Perennial	multiple - short-lived and high producing	Sacaton, Alkali	None for northern states
Squirreltail, B.	'Sand Hollow'	Switchgrass	'Blackwell'
Timothy	'Climax', 'Mohawk' and many others	Wheatgrass, Beardless	'Whitmar'
Wheatgrass, Bluebunch	'Goldar' and 'P7'	Wheatgrass, Crested AGCR	'Ephraim', 'Fairway', 'Kirk', 'Parkway' and 'Ruff'
Wheatgrass, Crested AGDE	'Douglas', 'Nordan' and 'Summit'	Wheatgrass, Crested X	'Hycrest' and 'CD II'
Wheatgrass, Intermediate	'Amur', 'Oahe', 'Reliant', 'Rush' and 'Tegmar'	Wheatgrass, Newwhy	'Newwhy'
Wheatgrass, Pubescent	'Greenleaf', 'Luna', and 'Manska'	Wheatgrass, Siberian	'P-27' and 'Vavilov'
Wheatgrass, Slender	'Pryor', 'Revenue' and 'San Luis' (southern variety)	Wheatgrass, Snake River	'Secar'
Wheatgrass, Streambank	'Sodar'	Wheatgrass, Tall	'Alkar', 'Jose', 'Largo' and 'Platte'
Wheatgrass, Thickspike	'Bannock', 'Critana', 'Elbee' and 'Schwendimar'	Wheatgrass, Western	'Arriba', 'Barton', 'Flintlock', 'Rodan' and 'Rosana'
Wildrye, Altai	'Eejay', 'Pearl' and 'Prairieland'	Wildrye, Basin	'Magnar' and 'Trailhead'
Wildrye, Beardless	'Shoshone'	Wildrye, Blue	'Arlington'
Wildrye, Mammoth	'Volga'	Wildrye, Russian	'Bozoisky-Select', 'Cabree', 'Mankota' and 'Swift'

**TABLE 2**  
**RECOMMENDED RELEASES**  
**PLANT MATERIALS TECHNICAL NOTE NO. 13**

COMMON NAME	RECOMMENDED RELEASES	COMMON NAME	RECOMMENDED RELEASES
<b>FORBS-LEGUMES</b>			
Alfalfa	multiple varieties available	Aster	None
Balsamroot, Arrowleaf	None	Burnet, Small	'Delar'
Clover, Alsike	'Aurora'	Clover, Red	'Dollard', 'Kenland', 'Redman' and 'Reddy'
Clover, Strawberry	'Salina'	Clover, White	'Ladino', 'Grassland Huia', 'Kent Wild', 'New York'
Crownvetch	'Chemung', 'Emerald' and 'Penngift'	Flax, Blue	'Appar'
Globemallow	None	Milkvetch, Cicer	'Lutana', 'Monarch' and 'Windsor'
Penstemon species	'Bandera', 'Cedar', 'Clearwater' & 'Richfield Selection'	Sagewort, Louisiana	'Summit'
Sainfoin	'Eski', 'Melrose' 'Renumex' and 'Remont'	Sweetclover	'Madrid'
Sweetvetch, Utah	'Timp'	Trefoil, Birdsfoot	'Empire' and 'Maitland'
Yarrow	None		
<b>SHRUBS</b>			
Bitterbrush, A.	'Fountain Green', 'Lassen' and 'Maybell'	Buffaloberry, Silver	'Sakakawea'
Ceanothus or Snowbrush	None	Chokecherry	'Schubert'
Cinquefoil	None	Clematis	'Trailer'
Current, Golden	None	Dogwood, Redosier	'Ruby'
Dogwood, Silky	'Indigo'	Elderberry, Blue	'Blanchard'
Hawthorn, Black	None	Kinnikinnick	None
Kochia, Forage	'Immigrant'	Mountain Mahogany	'Montane' mtn. mahogany
Oregongrape	None	Rabbitbrush, Green	None
Rabbitbrush, Rubber	None	Rose, Woods	None
Sagebrush, Big Basin	None	Sagebrush, Big Mountain	'Hobble Creek'
Sagebrush, Big Wyoming	'Gordon Creek'	Sagebrush, Black	'Pine Valley Ridge'
Saltbush, Fourwing	Snake River Plains Germ., 'Rincon', and 'Wytana'	Saltbush, Gardner	None
Serviceberry	None	Silverberry	None
Snowberry	'Snowbar'	Sumac, Skunkbush	'Bighorn'
Syringa	None	Winterfat	Northern Cold Desert Germplasm and 'Hatch'

## REFERENCES

---

- Cornforth, B., L. St. John and D. Ogle. *Seed Production Standards for Conservation Plants in the Intermountain West*. USDA-NRCS, Boise, Idaho. December 2001. 15p.
- Ensign, R. D. and H. L. Harris. *Idaho Forage Crop Handbook*. Idaho Agricultural Experiment Station. Bull. 547, May 1990.
- Hafenrichter, A. L. et. al. *Grasses and Legumes for Soil Conservation in the Pacific Northwest and Great Basin States*, USDA-SCS Handbook No. 339, April 1968
- Heath, Maurice E., Robert F. Barnes and Darrel S. Metcalfe. *Forages - The Science of Grassland Agriculture*, Iowa State University Press, 1985
- Hoag, J.C. *Riparian planting zones*. View from a wetland, No. 5 (1998-1999). Interagency Riparian/Wetland Project, Plant Materials Center, USDA-NRCS, Aberdeen, ID. 1999.
- Hoag, J.C., M.E. Sellers, and M. Zierke. 1995. *Wetland plant propagation tips*. View from a wetland, No. 1 (1994 1995). Interagency Riparian/Wetland Project, Plant Materials Center, USDA-NRCS, Aberdeen, ID.
- Hoag, J.C., S. Wyman, G. Bentrup, I. Holzworth, D. Ogle, J. Carleton, F. Berg, and b. Leinard. *Users Guide to Description, Propagation and Establishment of Wetland Plant Species and Grasses for Riparian Areas in the Intermountain West*. USDA-NRCS, Boise, ID and Bozeman, MT. ID-TN 38, February 2001. 50p.
- Holzworth, L., J. Moseley, D. Cash, D. Koch, and K. Green. *Dryland Pastures in Montana and Wyoming*, Cooperative Extension Service - USDA NRCS. Montana State University. EB 19. Revised September 2000. 28p.
- Holzworth, Larry K. and Loren E. Wiesner. *Grass and Legume Seed Production in Montana and Wyoming*, Montana and Wyoming Soil Conservation Districts and USDA-SCS Special Report No. 12, 1985.
- Jensen, Kevin, H. Horton, R. Reed, and R. Whiteside. *Intermountain Planting Guide*. USDA - ARS. AG 510. 2001.
- Montana State University and USDA-Natural Resources Conservation Service. 1990. *Montana Interagency Plant Materials Handbook*. Montana State University Extension Service EB 69, Bozeman, MT.
- Ogle, D., J.C. Hoag, and J. Scianna. 2000. Technical Note 32: *Users guide to description, propagation and establishment of native shrubs and trees for Riparian Areas in the Intermountain West*. USDA-NRCS, Boise, ID and Bozeman, MT. ID-TN 32, Feb. 2000. 22p.
- Sharp, W. Curtis. *Grass Varieties in the United States*, Agricultural Research Service - USDA, Agricultural Handbook No. 170, Nov. 1994
- Smith, Dale, Raymond Bela, and Richard P. Walgebach, *Forage Management* (5th Edition), 1986.
- Thornburg, Ashley A. *Plant Materials for Use on Surface-mined lands in Arid and Semiarid Regions*. SCS - USDA, SCS-TP-157 January 1982
- USDA-NRCS 2002. PLANT Database (<http://plants.usda.gov/plants>)
- Wambolt, Carl. *Montana Range Seeding Guide*. Cooperative Extension Service, Montana State University, Bulletin 347, May 1976.