TECHNICAL NOTE

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GRASS, GRASS-LIKE, FORB, LEGUME, AND WOODY

SPECIES FOR THE

INTERMOUNTAIN WEST

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This is a literature review and common knowledge documentation of the authors. This document includes narrative descriptions for species commonly occurring and/or seeded or planted throughout the Intermountain West. The descriptions cover common name, scientific name, origin, sod verses bunch, life span, adaptation, seeding and planting recommendations including vigor, ease of establishment, precipitation range, pollinator attributes, planting depth, seeds per square foot at a one pound rate, recommended pure stand seeding rates, recommended mixture seeding rates, and adapted cultivars/varieties or germplasm for the Intermountain West. Source identified germplasm should only be recommended for geographic locations near collection site of original collections. This document is not a blanket endorsement of the listed species. Additional information can be found in plant guides, plant fact sheets and other appropriate guides. Consult the USDA-NRCS, PLANTS Database at http://plants.usda.gov/ for additional information.

All seeding rates are based on Pure Live Seed (PLS). The rates used in this guide generally target 20-30 seeds/ft^2 for the larger seed size accessions (< 500,000 seeds per pound) and 40-50 seeds/ft^2 for the smaller seed size accessions (> 500,000 seeds per pound). The rates have also been adjusted based on past research findings for establishing stands and optimizing production. For additional seeding rate calculations see information on page 43.

The first scientific name listed in plant narratives is the accepted name in 2010 as found in the USDA-NRCS, PLANTS Database and should be considered the proper scientific name. All other scientific names listed are intended for cross-reference in older publications.

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

DESCRIPTION OF SPECIES

CHARACTERISTICS OF GRASSES

Bentgrass, Redtop *Agrostis gigantea*

The *Agrostis* genus includes many species, usually perennial, often occurring on hydric soils. There are over 100 species worldwide of which approximately 20 are native to North America. Colonial bentgrass and creeping bentgrasses are important turf grasses. Bentgrasses are long-lived, fine textured, usually stoloniferous and commonly occur in wetland and riparian areas. Many naturalized stands were probably introductions from Europe. Recommended planting depth for redtop bentgrass is 0 to 1/4 inch. Average seeds/ft^2 at 1 lb. rate is 115. Recommend pure stand seeding rate is 0.5 lb/ac.

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

A medium-lived native bunchgrass, which re-establishes from seed for long-lived, stands. 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 poor 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 sagebrush - grass sites at 2,000 to 6,000 feet elevation, sunny places on mountain brush and ponderosa pine ranges. It provides excellent nesting cover for upland birds. It is adapted to 9 to 20 inch 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. Use only in native seed mixtures due to its slow establishment. Planting depth is 0-1/4 inch. Adapted variety is 'Sherman'. Average seeds/ft^2 at 1 lb. rate is 21. Recommend pure stand seeding rate is 2 lb/ac.

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 but can be slow to establish. 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 is 1/4 to 1/2 inch. Adapted low maintenance turf varieties are 'Canon', Foothills Germplasm, 'Rubens' and 'Talon'. Average seeds/ft^2 at 1 lb. rate is 37. The recommended pure stand seeding rate is 2 lb/ac. The recommended seeding rate for turf applications is 6 lb/ac.

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

Canby bluegrass is a long-lived native, understory bunchgrass. This grass makes vigorous early spring growth for spring grazing. Where season-long moisture is available, it is commonly crowded out by other species. It thrives on early season moisture and sets seed and goes dormant in late spring. Plants go dormant easily to resist drought. Recommended sites include dry, shallow and rocky well-drained soils in the sagebrush, and ponderosa pine areas. It is adapted to 9 to 15 inch precipitation zones. Use only in native seed mixtures due to its slow establishment. Planting depth is 1/4 inch or less. Adapted variety is 'Canbar.' Average seeds/ft^2 at 1 lb. rate is 21. The recommended pure stand seeding rate is 2 lb/ac. Not recommended in pure stands.

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. Do not plant in riparian areas, wetlands, irrigated pasture and native meadows. Kentucky bluegrass requires 18 inches of annual precipitation or irrigation. Planting depth is 1/4 inch or less. Numerous adapted varieties have been developed in the northwest and are available. Average seeds/ft^2 at one pound rate is 50. Recommended seeding rate is for turf applications is 4 lb/ac.

Bluegrass, Mutton (Muttongrass) *Poa fendleriana*

Muttongrass is a perennial bunchgrass growing to 2.5 feet tall. It is an important understory component in juniper, pinon pine – juniper, ponderosa pine and sagebrush steppe plant communities. It is also occasionally found in aspen, Engelmann spruce and lodgepole pine plant communities. It is a drought tolerant species found most commonly on well drained clay loam to silt loam to sandy to gravelly soils. It is adapted to areas receiving 10 to 22 inches annual precipitation. There are no releases currently available. However Aberdeen PMC currently has this species under advanced evaluation. Planting depth is 1/8 - 1/4 inch or less. Average seeds/ft^2 at one pound rate is 20. Recommended pure stand seeding rate is 2 lb/ac. It is best utilized in low rainfall area native mixes.

Bluegrass, Nevada *Poa secunda* or *P. nevadensis*

A medium- long lived native bunchgrass, which re-establishes from seed. Adapted for early to mid spring grazing, sometimes as much as 2 weeks ahead of crested wheatgrass, but becomes less desirable early in summer. It matures similar to big bluegrass, but is much later maturing than Sandberg bluegrass. It has poor seedling vigor and requires as much as 2- 4 years to reach full productivity. Because young plants are easily pulled up, grazing should be deferred until roots are well anchored. Recommended sites include mountain foothill and mountain sites in sagebrush - grass sites at 2,000 to 8,000 feet elevation, sunny places on mountain brush and ponderosa pine ranges. It provides excellent nesting cover for upland birds. It is adapted to 10 to 20 inch 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. Use only in native seed mixtures due to its slow establishment. Planting depth is 0-1/4 inch. Adapted variety is Opportunity Selected Germplasm. Average seeds/ft^2 at 1 lb. rate is 21. Recommend pure stand seeding rate is 2 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 western range plant communities where it is considered an important grass for soil stabilization and forage for wildlife. It is best adapted to medium to heavy textured soils. It is found from 1,000 feet in Washington to 12,000 feet in northern New Mexico. It is adapted to 8-20 inches of moisture annually. It is tolerant of heavy trampling. Forage yields are very low, seed viability is generally poor, and forage quality declines rapidly in mid to late spring as it matures. It is one of the first grasses to green-up in the spring. Due to its low stature, Sandberg bluegrass can withstand heavy grazing pressure. On large areas of western semi-desert rangelands, overgrazing has depleted most of the desirable bunchgrasses except Sandberg bluegrass. It provides little to no forage in summer and fall unless fall rains occur. High Plains Selected Germplasm is a release from Bridger PMC. Reliable Selected Germplasm is a release by ARS. Mountain Home Source Identified release originating from the Mountain Home, Idaho areas is also available. Planting depth is 1/4 inch or less. Average seeds/ft^2 at one pound rate is 21. Recommended pure stand seeding rate is 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 erectus* 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 stand management. It is moderately shade tolerant, winter hardy, recovers quickly after grazing, and is well adapted to sites that had supported 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 smooth brome does. It is an excellent choice in areas that are prone to early to late spring frost. It is productive and compatible in mixtures with legume species such as alfalfa, sainfoin, cicer milkvetch, and birdsfoot trefoil. Planting depth is 1/4 to 1/2 inch. Varieties include ‘Cache’, 'Fleet', "Montana PVP', 'MacBeth PVP', 'Paddock' and 'Regar'. Average seeds per ft^2 at 1 lb. rate is 2. Recommended pure stand seeding rate is 10 lb/ac.

Brome, Mountain *Bromus marginatus* or *B. cartinatus*

Mountain brome is a short-lived vigorous native bunchgrass which reaches full productivity in 1- 3 years. It establishes quickly on clean or disturbed sites, volunteers well on disturbed sites, is moderately palatable, and valuable for quick cover. Because it is short-lived, it is replaced by long-lived species over time. 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 at medium to high altitudes and timber harvest or burns with 16 inches or more annual precipitation. Planting depth is 1/4 to 1/2 inch. Adapted varieties are 'Bromar', susceptible to seed head smut and Garnet Tested Class Germplasm, which is believed to be more smut resistant. Average seeds per ft^2 at 1 lb. rate is 2. The recommended pure stand rate is 10 lb/ac. Limit mountain brome to 2 lb. PLS per acre in native mixes. Higher rates effect establishment of slower developing native species.

Brome, Smooth *Bromus inermis*

A long-lived, introduced aggressive sod-forming grass. It has notable ability to suppress invasion of undesirable vegetation and is also an excellent erosion control species. Smooth brome is very shade tolerant. Seedlings are often weak, but once established, plants spread vegetatively to provide full stands. Recovery is slow when mowed and it becomes dormant during hot dry summer periods. It should not be planted directly adjacent to areas being restored to native plant communities. It is best adapted to moist well-drained soils in 14 inch or higher rainfall zones. Cultivars have traditionally been divided into three adaptation types: northern, southern and intermediate. Only southern and intermediate types are recommended for the Intermountain West. It is tolerant of slightly saline and alkaline conditions. The southern type (Lincoln) is best for sites that had supported mountain brush and favorable sites in the southern sagebrush and pinyon-juniper zone. An intermediate type, (Manchar) performs best on foothill to mountain rangelands. Planting depth is 1/4 to 1 /2 inch. 'Manchar' is recommended for erosion and invasive species control plantings on northern or higher elevation areas. 'Lincoln' is recommended for erosion control and waterways, but is more aggressive in vegetative spread than 'Manchar'. Average seeds per ft^2 at 1 lb. rate 3. Recommend pure stand seeding rate is 6 lb/ac.

Canarygrass, Reed *Phallaris arundinecea*

A widely adapted, coarse, vigorous, productive, long-lived Eurasian and North American sod grass. It is frost tolerant and suited to wet soils with a pH range of 4.9 to 8.2. It has moderate drought tolerance on upland soils, but requires greater than 18 inches annual precipitation. It has the ability to utilize tremendous amounts of nitrogen and is used to remove nitrogen from dairy, food processing and other effluent. Initial stands are often poor because of poor 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 a serious weed in these areas because of this tendency. Produces very high annual yields on moist fertile soils, high in nitrogen and organic matter. It becomes sod-bound with infertile soil conditions. 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 ongoing in several Midwest breeding programs. Planting depth is 1/4 to 1/2 inch. Adapted varieties include '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^2 at 1 lb. rate 12. Recommend pure stand seeding rate is 4 lb/ac.

Dropseed, Sand *Sporobolus cryptandrus*

Sand dropseed is a warm season grass commonly found growing on sandy to gravelly soils and highly compacted loamy 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 has a low grazing preference 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 is 1/4 inch. No varieties have been released. Average seeds per ft^2 at 1 lb. rate 122. Recommend pure stand seeding rate is 1.0 lb/ac.

Fescue, Hard *Festuca brevipila* *or Festuca trachyphylla* or *F. ovina duriuscula*

A very fine-leaved, low growing introduced bunch grass with poor palatability to livestock. It is widely used for turf, highway plantings, airport landing strips, burned over timberland and reclamation areas where a long-lived, persistent, competitive ground cover is needed. It is adapted to areas having an excess of 14 inches precipitation. Seedlings are slow to establish but persist through the development of abundant fibrous roots. The dense root system may encourage increased rodent populations. Early spring seedings are recommended. Only pure stands or mixtures with sheep fescue are recommended. Planting depth is 0-1/4 inch. 'Durar' is the adapted variety. Average seeds per ft^2 at 1 lb. rate 13. The recommended pure stand seeding rate is 4 lb/ac.

Fescue, Idaho *Festuca idahoensis*

Idaho fescue is 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 is 1/4 to 1/2 inch. 'Joseph' and 'Nezpurs' are adapted varieties, but are very difficult to establish due to poor seedling vigor. Winchester Source Identified Germplasm is a selection originating from the Winchester grade between Lewiston and Grangeville, Idaho. Average seeds/ft^2 at 1 lb. rate is 10. Recommended pure stand seeding rate is 4 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. They perform best on acidic soils (pH 5.5-6.5) and overall production increases 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 areas prone to extended snow cover. 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. Planting depth is 0-1/4 inch. Average seeds per ft^2 at 1 lb. rate 14. Recommended pure stand seeding rate is 4 lb/ac. The recommended seeding rate for turf applications is 15 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. Production is low, but groundcover and root production is excellent. It is used for turf, highway plantings, airport landing strips, burned over timberland and reclamation areas where a long-lived, persistent, competitive ground cover is needed. Not recommended for pasture or hay. Sheep fescue is best adapted to 10+ inch precipitation zones. It is a very good erosion control and understory species that competes well with weeds. Early spring seedings are recommended. Only pure stands or mixtures with hard fescue are recommended. Planting depth is 0-1/4 inch. Adapted varieties are 'Covar' and 'Bighorn'. Average seed per ft^2 is 16 at a 1 lb. rate. The recommended pure stand seeding rate is 4 lb/ac.

Fescue, Tall *Schedonorus phoenix* or *Festuca arundinacea*

A long-lived, deep rooted, high producing introduced cool-season bunchgrass suited for use under a wide range of soil and climatic conditions. It has lower palatability than most other pasture grasses and other species will be grazed out of a mixed stand. 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, saline to 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. It should only be recommended as a monoculture seeding or if in a mixture, seeded in an alternate row planting because it is very competitive and tends to out-compete other species in a seeding mixture. Planting depth is 1/4 to 1/2 inch. Adaptable varieties include 'Alta', 'Fawn', 'Forager' and ‘Tuscany II’. Turf types are becoming more prevalent on the market and many of these contain endophytes. '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^2 at 1 lb. rate is 5. The recommend pure stand seeding rate is 5 lb/ac. The recommended seeding rate for turf applications is 40 lb/ac.

Foxtail, Creeping *Alopecurus arundinaceus*

Creeping foxtail is a long-lived, cool-season, dense sod forming introduced grass that is adapted to wet- slightly saline-acidic-poorly drained 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). It can be invasive in wet areas. It is compatible with cicer milkvetch in a mixture. 'Garrison' and 'Retain' are well-adapted cultivars: Seed is very light and difficult to seed without the use of cracked corn, 2 bushels of rice hulls, or other carrier. Planting depth is 1/8 to 1/4 inch. The average seeds per ft^2 at 1 lb. rate is 17. The recommend pure stand seeding rate is 3 lb/ac.

Hairgrass, Tufted *Deschampsia cespitosa*

A native, perennial, cool season bunchgrass 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. Corvallis PMC has released Willamette and Tillamook Selected class releases, but they are not recommended for planting in the Intermountain region. Average seeds per ft^2 at 1 lb. rate 57. Recommended seeding rate is 2 lb/ac. Not recommended in pure stands.

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

A long-lived, cool season, tufted, North American and European perennial grass, 0.5- 2 feet in height. This species prefers deep to very deep silty to sandy soils and is a component of a rangeland plant communities. It does best at 12-20 inches annual precipitation. 'Barkoel' (a European ecotype) is a released cultivar available, but limited quantities are sold commercially. Wildland collections are available, and as with all native plant collections you should request "Source Identified" seed. Average seeds per ft^2 at 1 lb. rate 53. Seeding rate 1 lb/ac. The recommended pure stand seeding rate is 1 lb/ac. Not recommended in pure stands.

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

Green needlegrass is a cool season, medium to fine-leafed 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 has good drought tolerance in the 12-20 inch precipitation zone. It is widely adapted from Alberta to New Mexico. High seed dormancy levels are common and scarification and/or wet prechilling (fall dormant planting) is recommended to break dormancy and improve germination. It is used primarily as a part of native seed mixtures. The cultivars 'Lodorm' and 'Green Stipagrass' and Cucharas Selected Germplasm are available releases. The average seeds per ft^2 at 1 lb. rate is 4. Recommend pure stand seeding rate is 6 lb/ac.

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

Letterman needlegrass is 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, but most often found on clayey to loamy soils. No releases are available. Native seed mixtures should specify "Source Identified" seed. Average seeds per ft^2 at 1 lb. rate is 3. The recommend pure stand seeding rate is 6 lb/ac.

Needlegrass, Thurber's *Achnatherum thurberianum* or *Stipa thurberiana*

Thurber's needlegrass is a medium height, cool season, native bunchgrass. It is very drought tolerant and often found on well drained, rocky sites and southern exposures in the 8-16 inch rainfall zones. It has fine leaves and is fair to good forage in the early spring when most species are not productive and can green-up in fall with rainfall. It is currently under development by Forest Service. Native seed mixtures should specify "Source Identified" seed. The average seeds per ft^2 at 1 lb. rate is 4. Seeding rate is 6 lb/ac.

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

Needle and Thread is a cool season, tufted, perennial, native bunchgrass, 1-3 feet tall. It is 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 seed mixtures should specify "Source Identified" seed. The average seeds per ft^2 at 1 lb. rate is 3. Seeding rate is 6 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 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 optimum forage quality and regrowth, 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. Not well adapted to areas that are cold and very dry in winter and areas that commonly experience mid to late spring frost. 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 and good drainage. 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^2 at 1 lb. rate 12. Recommend pure stand seeding rate is 4 lb/ac.

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

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

Ryegrass, Perennial *Lolium perenne*

A relatively short-lived, rapid developing, vigorous, high forage producing with high quality forage, introduced 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 as much as 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 is generally not recommended in a mixture with other grasses because of strong grazing animal preference towards perennial ryegrass over other grasses. It has good recovery after grazing in the spring but tends to go dormant when summer temperatures exceed 80º F. 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 usually 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 is 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 and be sure to request a forage type. Average seeds per ft^2 at 1 lb. rate 6. Recommend pure stand seeding rate is 4 lbs/ac (15 lb/ac irrigated forage).

Sacaton, Alkali *Sporobolus airoides*

Alkali sacaton is a native (central 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 grows 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 considered more winter hardy. Average seed per ft^2 at 1 lb. rate is 39. Seeding rate is 2 lb/ac.

Squirreltail, Big *Elymus multisetus* or *Sitanion hystrix*

Big squirreltail is a short-lived, drought tolerant, cool season, native bunchgrass. It is short to medium sized (6 to 22 inches tall), tufted and has fair forage value in winter and spring and poor forage value in summer when seedheads are present. The bristly awns are objectionable to grazing animals and cause difficulties in seed handling, planting and harvesting. This species is often an increaser on poor condition to improving rangelands. It is adapted to a wide variety of soils including saline soils in the 12-18 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. ARS and NRCS have released one big squirreltail accessions, Sand Hollow Selected Germplasm (*E. multisetus)* in 1996. It has not been fully tested and its full range of adaptation is not known at this time. Sand Hollow is best adapted to sandy foothill rangelands receiving 12 inches or more annual precipitation in the lower Snake River Plains. Average seeds per ft^2 at 1 lb. rate is 4. Seeding rate is 6 lb/ac.

Squirreltail, Bottlebrush *Elymus elymoides* ssp. *elymoides or californicus* or *Sitanion hystrix*

Bottlebrush squirreltail is a short-lived, drought tolerant, cool season, native bunchgrass. It is short to medium sized (6 to 22 inches tall), tufted and has fair forage value in winter and spring and poor forage value in summer when seedheads are present. The bristly awns are objectionable to grazing animals and cause difficulties in seed handling, planting and harvesting. This species is often an increaser on poor condition to improving rangelands. It is adapted to a wide variety of soils including saline soils in the 8-18 inch precipitation zones. It is hoped it will have attributes that will enable it to establish a foothold in annual rangelands dominated by cheatgrass or medusahead. ARS and NRCS have released two bottlebrush squirreltail accessions; Toe Jam Creek Selected Germplasm (*E. elymoides* ssp. *californicus)* in 2003; and Fish Creek Selected Germplasm (*E. elymoides* ssp. *elymoides)* in 2003. These have not been fully tested and their full range of adaptation is not known at this time. Toe Jam is best adapted to loam to sandy loam soils in the Great Basin and lower to middle Snake River Plains receiving 8-14 inches of precipitation. Fish Creek is best adapted to sandy loam to silt loam to clay loam soils receiving 10 inches or more annual precipitation in the middle to upper Snake River Plains. Additional bottlebrush squirreltail accessions are currently under evaluation by ARS in Logan, NRCS at Bridger and Meeker PMCs and the Forest Service in Provo, Utah. Average seeds per ft^2 at 1 lb. rate is 5. Seeding rate is 6 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 provides excellent wildlife cover, and seed is utilized as food by songbirds and game birds. It provides excellent late summer 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 exceed forage production of other irrigated forage varieties including orchardgrass and meadow brome. The best-adapted winter hardy cultivar tested in Idaho, Nevada and Utah is 'Blackwell'. Other releases include 'Dakotah', 'Forestburg', and 'Sunburst'. Accessions under development at Bridger PMC may also have potential. Average seeds per ft^2 at 1 pound rate is 10. Seeding rate is 4 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 seed head development). It should be grazed before the jointing stage and hayed before seed heads have emerged from boot. 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 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 cool, moist meadows, ponderosa pine zone and above. It can also be used for ground cover and erosion control on cut or burned-over timberland. Planting depth is 1/8 to 1/2 inch. Adapted varieties are ‘Aurora’, 'Climax', and 'Mohawk'. The average seeds per ft^2 at 1 lb. rate is 28. Recommend pure stand seeding rate is 3 lb/ac.

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

Beardless wheatgrass is 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 forage yields are equal to crested wheatgrass. Recommended sites include the 12-18 inch precipitation areas in mountain foothills after timber harvest or wildfire. 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^2 at 1 lb. rate is 3. The recommended pure stand seeding rate is 8.0 lb/ac.

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

Bluebunch wheatgrass is a long-lived, drought-tolerant, widespread native bunchgrass. It begins growth early in spring and again with the onset of fall rains. It is highly palatable and recovers rapidly after grazing but has low resistance to repeated or heavy grazing. It is not recommended as a hay crop. Several years are required for stand to obtain full productivity due to poor seedling vigor. Allow seedings 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 is 1/4 to 1/2 inch. Adapted varieties are Anatone Selected class germplasm for use above 10 inches of precipitation and 'Goldar' and 'P7' for use above 12 inches of precipitation. 'Secar' (See Snake River Wheatgrass), previously considered to be bluebunch wheatgrass but found to be a subspecies of thickspike wheatgrass, is more drought tolerant than bluebunch wheatgrass in lower precipitation areas (8-12"). The average seeds per ft^2 at 1 lb. rate is 3. Recommend pure stand seeding rate is 8.0 lb/ac.

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

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

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

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

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

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

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

Intermediate wheatgrass is a mildly rhizomatous 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. It is recommended for the sagebrush to high mountain zones (up to 9000 feet) and deep, upland soils with 13-18 inches of rainfall. This species is excellent for situations where only one to three irrigation applications 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. It is 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 is 1/4 to 1/2 inch. Adapted varieties are 'Rush,' selected for excellent seedling vigor, drought tolerance, and forage yield; 'Reliant,' selected for disease resistance and production; 'Oahe' with improved seed production, forage yield, and rust resistance; 'Amur' selected for slightly more drought tolerance performs well at higher elevations, and 'Tegmar', a low growing cultivar noted for erosion control, sod-formation and seedling vigor. Average seeds per ft^2 at 1 lb. rate 2. Recommend pure stand seeding rate is 10 lb/ac.

Wheatgrass, RS Hybrid (NewHy) *Pseudoroegneria spicata x Elytrigia repens* or *Agropyron repens x A. spicatum*

RS Hybrid (Newhy) wheatgrass is a 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, RS Hybrid is not as productive as tall wheatgrass or tall fescue, but forage quality is significantly better. RS 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. It is adapted to foothills, intermediate sagebrush and juniper sites, and higher mountain areas up to 8000 feet elevation, and on saline dry or wet bottomland and pastures. Planting depth is 1/4 to 1/2 inch. The cultivars ‘NewHy’ and ‘AC Saltlander’ are available. Average seeds per ft^2 at 1 lb. rate 3. Recommend pure stand seeding rate is 8 lb/ac.

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

Pubescent wheatgrass is a long-lived, late maturing, introduced sod-forming grass adapted to low-fertility sites and coarse to medium textured soils. It is very similar to intermediate wheatgrass (except it has pubescence on leaves and seed heads) and is 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 three irrigation applications 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. It is 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), 'Manska' and 'Greenleaf'. Average seeds per ft^2 at 1 lb. rate 2. Recommend pure stand seeding rate is 10 lb/ac.

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

Siberian wheatgrass is similar to crested wheatgrass. Siberian wheatgrass has finer leaves, and retains its greenness and palatability later into the summer than crested wheatgrass. It yields less than most crested wheatgrass cultivars. It occupies sites where standard crested wheatgrass will grow but is more drought tolerant (7-16 inches of precipitation) and is especially useful on juniper sites. Once established, it is reported to be well adapted to light-sandy, droughty soils and can withstand extended periods of drought better than crested wheatgrasses. Planting depth is 1/4 to 1/2 inch. Adapted varieties include 'Vavilov' and 'Vavilov II' (released in 2008 with improved seedling vigor). Average seeds per ft^2 at 1 lb. rate is 4. Recommend pure stand seeding rate is 6 lb/ac.

Wheatgrass, Slender *Elymus 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 and is shade tolerant. Planting depth is 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. Another recommended northern variety release is 'First Strike' which is a germplasm recently released by ARS. Average seeds per ft^2 at 1 lb. rate 3.0. Recommend pure stand seeding rate is 6 lb/ac. Limit slender wheatgrass to 1- 2 pounds PLS per acre in native mixtures. Higher rates limit the establishment of slower developing native species in a seed mixture.

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 (pointed) to aciculate (needle-like) glumes, a more imbricate (overlapping) spike, and glabrate (without hairs) basal leaf sheaths. It is adapted to most bluebunch wheatgrass sites, but is best suited for the lower precipitation areas (8 to 12 inches). (See bluebunch wheatgrass). Two varieties are available; 'Discovery' and 'Secar' are early maturing bunchgrasses with good seedling vigor. They establishes well in native seed mixtures. Snake River wheatgrass is more drought tolerant than released bluebunch wheatgrasses. Average seeds per ft^2 at 1 lb. rate is 3. Recommend pure stand seeding rate is 8 lb/ac.

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

A long-lived, very 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 8 or more inches. It has little value as forage and is primarily used for stabilization of roadsides, airport runways, 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 is 1/4 to 1/2 inch. The only variety is 'Sodar'. Average seeds per ft^2 at 1 lb. rate 3. Recommend pure stand seeding rate is 6 lb/ac. Seeding rate for turf and critical area applications should be approximately 24 lb/ac.

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

Tall wheatgrass is 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. It is 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 or sites with high watertables) and is useful for erosion control on critical areas. Provides nesting and food for upland game birds and is also used for wind barriers to control soil erosion and drifting snow. 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. It is also adapted to intermediate and favorable sagebrush, mountain brush, and juniper sites where its drought tolerance is evidenced. Planting depth is 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^2 at 1 lb. rate 2. Recommend pure stand seeding rate is 10 lb/ac on good soils. Increase seeding rate to 15 lb/ac. on saline soils.

Wheatgrass, Thickspike *Elymus lanceolatus* ssp. *lanceolatus* 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 until early fall. It can tolerate moderate grazing and considerable trampling. It is 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 is 1/4 to 1/2 inch. Improved varieties include 'Bannock', 'Critana' and 'Elbee'. Bannock is noted for its rapid establishment, moderate sod formation and greater forage production. Critana is more drought tolerant, exhibits good seedling vigor and readily establishes on critical areas. Average seeds per ft^2 at 1 lb. rate is 3. Recommend pure stand seeding rate is 6 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 and low seedling vigor. When used as pasture it is considered to be an excellent source of spring and early summer forage with protein content of 16 to 18 percent. However, forage quality rapidly declines as plants mature. It provides winter grazing if protein supplements are provided. Protein content of western wheatgrass is usually a little higher (4-5 percent) than other wheatgrasses once cured. Plantings usually result in scattered stands that spread in 3 to 4 years to site dominance. Western wheatgrass is the most aggressive native sod grass available. Once established, it becomes very persistent and provides excellent soil binding erosion control characteristics. It is productive native hay in above normal precipitation years, under water spreading, and other supplemental water irrigation systems. It is particularly productive in clayey swales and silty waterways, and has moderate to high salt tolerance. Adapted to lowlands prone to early season flooding with precipitation at or above 12 inches (use 14 inch + for areas that receive 50 percent or greater winter precipitation) and most mountain brush areas. Planting depth is 1/4 to 1/2 inch. Adapted varieties include ‘Recovery’ (northern variety released in 2009), 'Rosana' (northern variety), 'Rodan' (northern variety), and 'Arriba' (southern variety). Other releases include 'Barton', 'Flintlock', and 'Walsh'. Average seeds per ft^2 at 1 lb. PLS rate is 3. Recommended pure stand seeding rate is 8 lb/ac. Not recommended in pure stands. Recommended 50% mixed stand seeding rate is 4.0 lb/ac.

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

A winter hardy, drought resistant, long-lived, cool season introduced bunchgrass, sometimes with short rhizomes. It is known to root and use moisture to depths of 15 feet. Basal leaves are somewhat course, but very palatable during the late summer and early fall (protein levels of 8 percent are common in standing winter-feed). In northern regions it is commonly swathed into windrows and utilized as forage for winter feeding operations. It is adapted to moderately deep to deep loams to clay loams with 14 inch or greater rainfall. It can withstand saline conditions almost as well as tall wheatgrass and is also almost as productive as tall wheatgrass on saline sites. Seedlings develop slowly and good seedbed preparation and weed control is essential. 'Eejay', 'Pearl', 'Mustang' and 'Prairieland' are released varieties. Average seeds per ft^2 at 1 lb. rate 2. Recommended pure stand seeding rate is 12 lb/ac.

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

Basin wildrye is a slightly spreading, robust, large native bunchgrass. Basin wildrye is tall, coarse, long-lived, and highly palatable early in spring, 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 grazing new seedings until seedheads are evident or at the end of the second growing season. Mature plants are unpalatable and need to be managed for use at earlier periods with grazing management scheduled to maintain a 10 to 12 inch stubble height to avoid removing the growing point of this species. Great care must be taken to avoid close grazing or clipping which may result in plant loss in a single season. The old coarse growth is readily utilized under winter grazing when protein supplements are provided. Best adapted to moderately saline or alkaline lowlands, flood plains, and flow in areas with high water holding capacity. Especially suited to deep, fine textured clayey to loamy soils that receive 8-12 inches precipitation. Plantings have been established in rainfall areas as low as 5 inches, however basin wildrye plantings are not recommended in areas with less than 8 inches annual precipitation. Particularly well suited for many juniper areas; performs well throughout the mountain brush zone and in aspen openings. Planting depth is 1/2 to 3/4 inch. Adapted cultivars are 'Magnar' (blue-green upright leaves), 'Trailhead' (green overhanging leaves) selected for excellent drought tolerance and 'Continental' a hybrid cross between Magnar and Trailhead. Washoe another release was selected for high tolerance to acidic conditions and should be useful in mine reclamation situations. Average seeds per ft^2 at 1 lb. rate is 3. Recommended pure stand seeding rate is 8 lb/ac. Basin wildrye is highly recommended for native species mixtures.

Wildrye, Blue *Elymus glaucus*

Blue wildrye is 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. Planting depth is 1/4 to 1/2 inch. No Intermountain West adapted varieties have been released, but a selection is being developed by the Pullman PMC. Northwest coastal releases are not recommended for the Intermountain West. They include 'Arlington' and 'Elkton'. Average seeds/ft^2 at 1 lb. rate is 3. Recommended pure stand seeding rate is 8 lb/ac.

Wildrye, Canada *Elymus canadensis*

Canada wildrye is a short-lived cool season bunchgrass native to North America in the 15-inch and greater rainfall areas. Its seedheads commonly droop, spikelets are tipped with one inch curling awns giving it a bristly appearance and its auricles are large and clasping. It grows primarily on sites that are moist with sandy soil in western prairies and foothill to mountainous areas. It tolerates very cold temperatures and can grow late into fall and early winter. It establishes quickly, peak production occurs in the second and third growing seasons, and then production and stand declines thereafter. It is commonly used for reclamation where quick establishment is desirable for erosion control. It is not strongly competitive, thus allows slower establishing species to establish and dominate over time. It is considered very palatable to cattle and horses in early growth stages. It is a prolific seed producer. Planting depth is 1/4 to 1/2 inch. 'Mandan' was released from Bismarck, North Dakota PMC. Average seeds/ft2 at 1 lb. rate is 3. Recommended pure stand seeding rate is 8 lb/ac.

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

Mammoth wildrye is a coarse textured, introduced slightly saline tolerant, drought tolerant, creeping rhizomatous grass. It is palatable to livestock early in the growing season and can provide good cover and may be useful for calving pastures and wildlife cover. It is long lived on well-drained inland sand dunes, highway right-of-ways, juniper sites, 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. It is typically transplanted onto sand dunes for stabilization. Because of its showy inflorescence, it has been used as an ornamental and seed heads have been used in floral arrangements. 'Volga' is the only released cultivar. It was selected for superior performance in stabilizing inland sand dunes and critical areas on coarse textured soils. Average seeds per ft^2 at 1 lb. rate is 1. The recommended seeding rate is 15 lb/ac.

Wildrye, Manystem *Leymus multicaulis* formerly - *Leymus triticoides or Elymus triticoides*

Manystem wildrye (formerly beardless wildrye) is a long-lived, sod-forming introduced grass. It is adapted to poorly drained, wet or wet-saline-alkaline soils or dryland areas that receive at least 14 inches of precipitation. Selected 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, establishment is difficult and dormant fall planting is recommended. Planting depth is 0-1/4 inch in a firm weed free seedbed. 'Shoshone' was originally released as a beardless wildrye, but has been determined to be manystem wildrye, *Leymus multicaulis*. Another variety that may have potential, but has not been extensively tested in the Intermountain West is 'Rio'. Average seeds per ft^2 at 1 lb. rate is 4. Recommended pure stand seeding rate is 6 lb/ac.

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

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

CHARACTERISTICS OF GRASS-LIKE PLANTS

Descriptions for additional grass and grass-like species recommended for Intermountain West wetland and riparian zones can be found in Idaho Plant Materials Technical Note No. 38 "Users Guide to Description, Propagation and Establishment of Wetland Plant Species and Grasses for Riparian Areas in the Intermountain West".

Bulrush, Alkali *Schoenoplectus maritimus* or *Scirpus maritimus*

Alkali bulrush is a short-lived, pioneering, perennial, rhizomatous native wetland plant found at mid to low elevation in marshes, transient wetlands, pond margins and backwater areas. It frequently forms large dense stands on alkaline and saline sites. It is found on most soils from sands to clays with pH as high as 9.0. It survives periods of flooding to depths of 3 feet. Due to poor seedling vigor, direct seeding usually results in marginal stands. Planting vegetative plugs is recommended. It is used primarily for erosion control, constructed wetlands, wildlife cover, and increased plant diversity. It reduces wind and wave erosion on exposed soils. Livestock and wildlife rarely utilize alkali bulrush as a forage species. Four germplasm releases have been made for the Intermountain West, but seed is not commercially available. Wildland plug and seed collection is recommended. Nursery-grown container plants may be available.

Bulrush, Hardstem *Schoenoplectus acutus* or *Scirpus acutus*

Hardstem bulrush is a tall, stout, long-lived, perennial, rhizomatous native wetland plant commonly found in monotype stands at mid to low elevation in marshes and long lake and reservoir shorelines. It inhabits areas of standing water ranging from 3 to 8 feet deep. Stands are reduced when it is exposed to extended periods deep water. It tolerates alkaline, saline and brackish soils. It can spread up to 1 foot per growing season. It also tolerates periods of drought and will resprout after fire. Due to poor seedling vigor, direct seeding usually results in marginal stands. Planting vegetative plugs is recommended. Uses include erosion control, constructed wetlands, and increased biodiversity in wetland communities. Livestock will utilize hardstem bulrush under heavy winter snow conditions as forage. Stands are valued for waterfowl feed and nesting. Four germplasm releases have been made for the Intermountain West, but seed is not commercially available. Wildland plug and seed collection is recommended. Nursery-grown container plants may be available.

Cattail, Broadleaf *Typha latifolia*

Common cattail is tall, stout, long-lived, perennial, rhizomatous native wetland plant commonly found in large monotype stands in marshes, along shorelines, and drainage areas. It is adapted to silty clay to sand to gravelly soils with season long saturated soils and standing or slow moving water to 8-12 inches deep. It will not tolerate heavy clay soils. It will tolerate long periods of flooding (to 3 feet deep), long periods of drought, saline soils, and resprouts following burning. It can be very invasive. Uses include erosion control, cover and food source for waterfowl and muskrats, 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.

Rush, Baltic *Juncus arcticus ssp. littoralis* or *Juncus balticus*

Baltic rush is a short, long-lived, perennial, rhizomatous, native wetland plant commonly found at mid to low elevations, but occasionally in higher mountain locations in wet depressions, swales, moist meadows, sloughs, and near spring sources. It prefers sites that experience spring flooding followed by a dropping watertable and extended periods of drought. It is adapted to clay to silt to coarse substrate and peat soils. Uses include food and cover for waterfowl, songbirds and small mammals and increased biodiversity in wetland communities. Livestock do not utilize baltic rush. 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-grown container plants may be available.

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-grown 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-grown 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-grown 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-grown 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-grown 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. Compatible with most dryland and irrigated forage grasses. It 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. Root proliferating alfalfa types are more tolerant to grazing than crown type alfalfas. Seedings should occur in mid spring to avoid risk to a killing frost. Seed requires inoculation with nitrogen-fixing bacteria before planting. The addition of phosphorus and potassium, increase tolerance to close grazing or haying, increase number of nodules present improving nitrogen fixation, and improve production. Bloat can be a problem when grazing alfalfa. Planting a 75 percent grass 25 percent alfalfa mixture will greatly reduce the risk of bloat. It is adapted to well-drained intermediate and favorable sagebrush, juniper, mountain brush, and ponderosa pine sites. It 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 areas. Irrigated varieties are not less drought tolerant than dryland varieties. Falcata alfalfa (yellow blossom alfalfa) should also be considered for low precipitation sites. The recommended Falcata release is Don. The irrigated varieties differ in that they respond better to supplemental water. A major difference in varieties is the fall dormancy rating. Fall dormancy is correlated with winter hardiness (this information is available from several sources to help you in making a selection). ARS, Pullman PMC and FS are working with alfalfa in hopes of selecting more drought tolerant rangeland varieties. Varieties are being changed and improved continually. Consult Extension Service or seed supplier for information on new varieties adapted to specific areas. Planting depth is 1/16 to 1/2 inch in a very firm, weed-free seedbed. Average seeds per ft^2 at 1 lb. rate 5. Full seeding rate for pasture and range plantings is 5 lb/ac. Full seeding rate for hayland production is commonly 10-20 pounds per acre. Recommended 25% mixed stand rate at 1.0 lb/ac for grazing situations to help reduce bloat problems.

Aster, Blueleaf *Eurybia glauca* or *Aster glaucodes*

Blueleaf aster is 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. It is considered a good pollinator species and blooms from late spring into fall. 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. Planting depth is 0 to 1/2 inch. Average seeds per ft^2 at 1 lb. rate 18. 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 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 more than 1/3 inch deep. Average seeds per ft^2 at 1 lb. rate 1. Pure stand seeding rate 20 lb/ac. Not recommended in pure stands.

Beeplant, Rocky Mountain *Cleome serrulata*

This native annual species inhabits western foothills, plains, roadsides and disturbed areas. It has low to moderate water requirements at 8 to 10 inches or greater rainfall. It does best in full sun. It grows from 12 to 48 inches with numerous fragrant, pink to purple flowers that flower in summer to fall attracting bees and butterflies. Average seeds per ft^2 at 1 lb. rate 1.5. Pure stand seeding rate is 15 lb/ac. Not recommended in pure stands.

Biscuitroot species *Lomatium species*

The primarily biscuitroot species in the intermountain west are fernleaf biscuitroot, grays biscuitroot and nineleaf biscuitroot. They are native, relatively short-lived forbs. They are considered important pollinator species that flower in spring to early summer. They are also considered important insect host species important to sage grouse. Average seeds per ft^2 at 1 lb. rate 1. Not recommended in pure stands – use 6 lb/ac. for pure stand rate.

Blanket-Flower *Gaillardia aristata*

Perennial forb from 12 to 18 inches tall with solitary, large daisy-like, yellow and reddish flowers. It is drought tolerant and adapted to 16 inches of mean annual rainfall or more. It prefers moderately deep to deep coarse to medium loamy soils and partial to full sun. It is an excellent pollinator species and blooms from late spring through early fall. Average seeds per ft^2 at 1 lb. rate 3.0. Pure stand seeding rate is 8 lb/ac. Not recommended in pure stands.

Burnet, Small *Sanguisorba minor*

A perennial semi-evergreen introduced forb, growing to 2 feet tall. It has moderate forage production and is 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. Small burnet is very palatable to livestock and wildlife and upland game and songbirds utilize its seed. It is a good pollinator species and blooms from mid spring into mid-summer. Grazing should be deferred to the second growing season to allow plants to become established. 'Delar' is an improved forage yielding variety that should be seeded at 1/4 to 1/2-inch depth. Average seeds per ft^2 at 1 lb. rate 1. Recommended pure stand seeding rate is 20 lb/ac.

Clover, Alsike *Trifolium hybridum*

Alsike clover is a short-lived (3-5 years) perennial legume that produces abundant palatable foliage on fertile soils. It is a good pollinator species and blooms in spring. 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 wet-bottomland hay and is very tolerant of cold temperatures, frost heaving and moderately saline-alkaline conditions with high water tables. Bloat is a potential problem. Planting depth is 1/8- 1/4 inch. Adapted variety is 'Aurora'. Average seeds per ft^2 at 1 lb. rate is 16. Pure stand seeding rate 3 lb/ac. Recommended 25% mixed stand seeding rate is 1 lb/ac for grazing 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. It is a good pollinator species and blooms in spring. 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 is 1/8- 1/4 inch.

The bloat hazard with red clover is nearly the same as alfalfa. Because it is short lived, second year production is usually greater than the first or third. Adapted varieties are 'Big Bee', 'Kenland', 'Dollard', 'Redman', and 'Reddy'. Average seeds per ft^2 at 1 lb. rate 6. Pure stand seeding rate 6 lb/ac. Recommended 25% mixed stand seeding rate is 1.5 lb/ac for grazing 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 saline-sodic conditions. It is not adapted to dryland conditions. It is a good pollinator species and blooms in spring. Less productive than white clover where the latter can be grown. Strawberry clover is more salt tolerant than any of the clovers normally used in the Intermountain West. Bloat hazard is medium. 'Salina' is tolerant to winter flooding, making it a suitable legume for use adjacent to overflowing waterways. Planting depth is 1/4 inch or less. Average seeds per ft^2 at 1 lb. rate is 7. Pure stand seeding rate is 4 lb/ac. Recommended 25% mixed stand seeding rate is 1 lb/ac for grazing 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. It requires medium to high fertility and adequate moisture for optimum production. It is not tolerant of strongly acid or strongly alkaline conditions and is not tolerant of poor drainage. It is a good pollinator species and blooms in spring. It 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 mountain and intermountain 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^2 at 1 lb. rate is 18. Pure stand seeding rate is 4 lb/ac. Recommended 25% mixed stand seeding rate is 1 lb/ac for grazing situations.

Columbine *Aquilegia species*

A perennial forb from 10 to 30 inches tall with nodding, blue to red to yellow to purple to pink to white flowers depending on species. It is drought tolerant and adapted to 16 inches of mean annual rainfall or more. It prefers moderately deep to deep coarse to medium loamy soils and partial to full sun. It is an excellent pollinator species and blooms from spring through mid summer. Average seeds per ft^2 at 1 lb. rate 8.0. Pure stand seeding rate is 3 lb/ac. Not recommended in pure stands.

Coneflower, Purple *Echinacea purpurea*

A fairly drought tolerant (16 inch plus rainfall) native forb requiring slight shade to full sun. The single-borne purple flowers are found on long stems from 24 to 36 inches tall and bloom in summer. It is well adapted to prairie grasslands to moist forest habitats. It prefers medium textured soils. Average seeds per ft^2 at 1 lb. rate 2.7. Pure stand seeding rate is 9 lb/ac. Not recommended in pure stands.

Coneflower Western *Rudbeckia occidentalis*

A native forb requiring slight shade to full sun and 24 inches or more rainfall. The single-borne purple flowers are found on long stems from 24 to 60 inches tall and blooms in summer. It is well adapted to prairie grasslands to moist forest habitats. It prefers medium to fine textured soils. Average seeds per ft^2 at 1 lb. rate 8.0. Pure stand seeding rate is 3 lb/ac. Not recommended in pure stands.

Crownvetch *Coronilla varia*

Crownvetch is a long-lived, introduced perennial legume with a strong rhizome and a deep taproot system. This legume does well in sites that had supported mountain big sagebrush, mountain brush, and aspen communities with over 15 inches of annual precipitation. It prefers soils slightly acidic 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 but often become weedy. It requires fall seeding 1/4 to 1/2-inch deep but seedling vigor is poor. Three improved varieties are available: 'Emerald', 'Penngift', and 'Chemung'. 'Emerald' is the smallest in stature and produces less foliage; however, it is the most aggressive underground spreader. Average seeds per ft^2 at 1 lb. rate is 2. Pure stand seeding rate is 13 lb/ac. Recommended 25% mixed stand seeding rate is 3 lb/ac for grazing 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. Blue flax does well seeded in mixtures with other species. It can be surface seeded on a disturbed seedbed and should not be seeded deeper than 1/8 inch. This semi-evergreen forb is eaten readily by big game especially during spring and winter and upland game and songbirds relish seeds. It is a good pollinator species and blooms in spring into early summer. This species does well when 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^2 at 1 lb. rate is 8. Pure stand seeding rate is 3 lb/ac. Not recommended in pure stands.

Flax, Lewis *Linum lewisii*

A native, perennial, semi-evergreen, blue to white 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. Lewis flax does well seeded in mixtures with other species. It can be surface seeded on a disturbed seedbed and should not be seeded deeper than 1/8 inch. This semi-evergreen forb is eaten readily by big game especially during spring and winter and upland game and songbirds relish seeds. It is a good pollinator species and blooms in spring into early summer. This species does well when seeded on disturbed sites. Maple Grove Selected

class germplasm (*Linum lewisii)* is a native release by the Forest Service and NRCS Aberdeen PMC. Average seeds per ft^2 at 1 lb. rate is 5. Pure stand seeding rate is 5 lb/ac. Not recommended in pure stands.

Gayfeather, Dotted or Dotted Blazing Star *Liatris punctata*

Dotted gayfeather is a long-lived native forb that grows from 8 to 30 inches tall. It requires 24 inches of rainfall or greater. Flowering stems are single or in clusters from a woody base. It's rose-purple to white corollas flower from late summer through fall. Average seeds per ft^2 at 1 lb. rate is 3. Pure stand seeding rate is 8 lb/ac. Not recommended in pure stands.

Geranium, Sticky Purple *Geranium viscosissimum*

A native perennial forb that grows from 12 to 36 inches tall. It has sticky glandular hairs that densely cover the stems and leaves. The 5 petal purple to pinkish white flowers occur in clusters near the top of the plant. It flowers from spring through summer. It requires 16 inches or more mean annual precipitation and prefers medium textured soils. Average seeds per ft^2 at 1 lb. rate is 1.3. Pure stand seeding rate is 20 lb/ac. Not recommended in pure stands.

Globemallow, Gooseberry Leaf and Scarlet *Sphaeralcea grossulariifolia* 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. A hard seed coat often prevents germination. 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 with greatest area of occurrence is between 8 and 12 inches annual precipitation. It establishes especially well on disturbed sites. It is an excellent soil stabilization species in native species mixtures on harsh sites. It is a good pollinator species and blooms in spring. Fall seeding is recommended. A hard seed coat often prevents germination. Seed should not be planted deeper than 1/4 inch. Average seeds per ft^2 at 1 lb. rate is 17. Pure stand seeding rate is 2 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, low-bloating legume that requires inoculation with the proper rhizobium for successful nitrogen fixation. It is a heavy seed and forage producer and forage quality and hay yields are nearly equal that of alfalfa. It is slow to dry in windrows due to its large stems and requires a pickup attachment on swather to cut. It is adapted to cold temperature, lowland areas, and soils with high water holding capacity that receives at least 14 inches precipitation. It is moderately 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. It is very compatible with irrigated pasture grasses and should be considered as a substitute for alfalfa at higher elevations where alfalfa winterkills or where high watertables limit alfalfa's adaptation. It is a good pollinator species and blooms in spring into early summer. Well adapted to sagebrush-grass, juniper and mountain brush areas, except in the shade of trees or tall shrubs. Planting depth is 1/4 to 1/2 inch. Recommended varieties include 'Lutana', 'Monarch' and 'Windsor'. Average seeds per ft^2 at 1 lb. rate is 3. Pure stand seeding rate is 7 lb/ac. Recommended 50% mixed stand rate is 4 lb/ac for pasture situations.

Penstemon Species

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 through early fall. It is adapted to sagebrush, juniper and ponderosa pine zones at 3,300 to 8,000 feet elevation in 10-16 inch precipitation zones. It does best in full sunlight and can survive cold winter temperatures if snow insulates the plant. It does not do well in poorly drained areas. Potential uses include erosion control, diversity and beautification. The Richfield Selection is a release of firecracker penstemon from Aberdeen PMC. Due to hard seed, plant penstemon species in late fall-early winter at soil surface to 1/8-inch depth. Average seeds per ft^2 at 1 lb. rate is 7. Pure stand seeding rate is 4 lb/ac. Not recommended in pure stands.

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. The flowers are pink to lavender and bloom in late spring to early summer. 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. Due to hard seed, plant penstemon species in late fall-early winter at soil surface to 1/8-inch depth. Average seeds per ft^2 at 1 lb. rate is 7. Pure stand seeding rate is 4 lb/ac. Not recommended in pure stands.

Rocky Mountain Penstemon *Penstemon strictus*: A perennial native semi-evergreen forb that is long-lived and occurs in the upper juniper, mountain big sagebrush, mountain brush, and open areas in aspen and coniferous forest. Flowers are bright blue to purple and bloom from mid May to late June. 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. It has good potential as an ornamental. It is widely used to stabilize depleted, disturbed, and eroded sites. Seed can be broadcast or drilled up to 1/8 inch deep. Fall seeding for hard seed stratification is recommended. The variety 'Bandera' was released for its long-lived and seed production characteristics. Plant this species in late fall-early winter on soil surface to 1/8-inch depth. Average seeds per ft^2 at 1 lb. rate is 7. Pure stand seeding rate is 4 lb/ac. Not recommended in pure stands.

Venus 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 Venus penstemon from Aberdeen PMC. Due to hard seed, plant this species in late fall-early winter at soil surface to 1/8-inch depth. Average seeds per ft^2 at 1 lb. rate is 25. Pure stand seeding rate is 2 lb/ac.

A number of additional penstemon species are currently under development including sagebrush penstemon, sand penstemon and hotrock penstemon.

A number of other penstemon species are also seeded primarily for soil stabilization on depleted, disturbed and erosive areas and used as ornamentals, but no releases have been made. These include Low penstemon, Rydberg penstemon and thickleaf penstemon.

Prairie Clover, Western *Dalea ornata* Prairie Clover, Purple *Dalea purpureum*

A perennial taproot legume that grows to 12- 24 inches in height. The light pink to purple 5 petal flowers occur in dense cylinder-shaped spikes from 3/4 to 2 1/2 inches long. The flowers bloom upward along the spike from early spring to midsummer. It is adapted to low to moderate elevations with 14 inches or greater precipitation. It prefers soils derived from weathering basalt and volcanic ash. Average seeds per ft^2 at 1 lb. rate is 5.0. Pure stand seeding rate is 5 lb/ac. Not recommended in pure stands.

Sagewort, Louisiana (cudweed sagewort) *Artemisia ludoviciana*

Louisiana sagewort is a perennial, rhizomatous, long-lived, fast-growing, native forb to sub-shrub 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. Germination is low (30 to 40 percent) and plants often take 3 years to mature and set seed. Seed requires light to germinate and it must be broadcast or drilled with seed placement on the soil surface. 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^2 at 1 lb. rate is 86. The pure stand seeding rate is 0.25 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; however, it is 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. Stands can be maintained long-term by allowing established plants to reseed every 3 to 4 years. It is 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. It is adapted to areas with 14 inches or more precipitation. It has good seedling vigor but seedlings are weakly competitive against weeds or other plants. Can be grazed or used for hay. It is a good pollinator species and blooms in spring into early summer. Melrose and Remont varieties have the best regrowth characteristics. Plant in spring or fall at seeding depth of 1/2 to 3/4 inch. Adapted varieties are 'Eski', 'Melrose' and 'Renumex' for dryland plantings and 'Remont' for irrigated plantings. Average seeds per ft^2 at 1 lb. rate is 0.4. The full seeding rate is 34 lb/ac. The recommended 50% mixed stand rate is 17 lb/ac for pasture situations.

Sunflower, Maximilian *Helianthus maximiliani*

Maximilian sunflower is an aggressive native, rhizomatous, spreading perennial forb. It often grows 3- 5 feet tall. It prefers full sunlight, is moderately drought tolerant, and produces showy yellow ray flowers from early summer into fall. It prefers clay to silt loam soils. It is most commonly found in 12 inch and higher rainfall areas. Prairie Gold and Medicine Creek are two releases commercially available. Average seeds per ft^2 at 1 lb. rate is 5. The full seeding rate is 4 lb/ac. The recommended mixed stand rate is 1 lb/ac or less for wildlife situations.

Sweetclover, Yellow *Melilotus officinalis* Sweetclover, White *M. alba*

Sweetclover is an introduced, tall, stemmy, deep rooted, biennial legume. It produces an abundance of forage the first two years and is commonly utilized as a cover crop for perennial seedings. It reseeds and maintains good stands where perennials do not crowd it out and in years of above normal precipitation. It is poor quality forage at mid to later growth stages. It is adapted to many sites including sagebrush-grass to subalpine areas, moist salty lowlands, road cuts and roadsides but does not tolerate acid soils. It maintains stands in grass where ample moisture is available. It is suited for green manure or green-chop haylage under irrigation or on dryland where the effective precipitation is 15 inches or more. Sweetclover is the most drought tolerant of the commercially available legumes and has been used successfully in plantings that receive as little as 9 inches effective precipitation. It is a good pollinator species and blooms in spring into early summer. Sweetclover contains Coumadin, a derivative of dicoumarol, a blood anti-coagulant. Death may occur in animals foraging on pure stands or from spoiled hay or silage. The planting depth is 1/8 to 1/2 inch. Adapted varieties are ‘Norgold’, 'Madrid', ‘Polara’ and “Yukon’. Average seeds per ft^2 at 1 lb. rate is 6. Pure stand seeding rate is 4 lb/ac. Recommended 25% mixed stand rate is 1 lb/ac for pasture situations or 5 to 10% mixed stand seeding rate of 0.10 to 0.25 lb/ac for rangeland seed mixtures.

Sweetvetch, Northern or 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 fall seeded at 1/8 inch to 3/4 inch deep. It is very slow to establish in mixed stands and requires alternate row planting to provide optimum establishment. Livestock and big game graze this

species when available. Spring green up occurs early, and basal leaves remain green throughout the winter. 'Timp' is a release from Meeker PMC. Average seeds per ft^2 at 1 lb. rate is 2. Pure stand seeding rate is 10 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. It 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. If plants are allowed to go to seed, stands will persist for many years. Is short lived (2-4 years), making reseeding necessary. It is a nuisance in subsequent crops because of its ability to recruit from the seedbank. Also it may invade adjacent areas that have proper growing conditions. Has some drought tolerance and does well in the upper half of the mountain brush, openings in aspen and also irrigated pasture. It is a good pollinator species and blooms in summer into early fall. Planting depth is 1/4 to 1/2 inch. Recommend alternate row plantings to allow birdsfoot trefoil to establish when planted as part of a seeding mixture that includes grasses. Adapted varieties are 'Empire' (decumbent growth), and 'Maitland' (erect growth). Average seeds per ft^2 at 1 lb. rate is 9. Pure stand seeding rate 3 lb/ac. Recommended 50% mixed stand seeding rate is 2.5 lb/ac for grazing situations.

Yarrow, Western *Achillea millefolium var. occidentalis*

Western yarrow is a perennial (sunflower family) and is one of the most widely distributed forbs in the western North America. Native ecotypes are white flowered while Eurasian ecotypes of common yarrow, *Achillea millifolium var. millefolium,* are pink to yellow flowered. Do not plant common yarrow. Western yarrow 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. It is a good pollinator species and blooms in spring into late summer. Western yarrow spreads by seed and rhizomes; does an especially good job on disturbed and depleted areas. It may invade adjacent areas that have proper growing conditions. Fall seeding is recommended. Depth of seeding should not exceed 1/4 inch. Western yarrow should be seeded in mixtures with other species. It is easily transplanted. It has been successfully used in plantings that receive as little as 8 inches effective precipitation. Bridger PMC has released Great Northern Selected Germplasm from a source in northwestern Montana. Yakima Source Identified Germplasm is a multi-origin germplasm released by the ARS. Eagle Source Identified Germplasm originated from a site near Boise, Idaho. Average seeds per ft^2 at 1 lb. rate is 95. Pure stand seeding rate is 0.5 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 is a good pollinator species and blooms in spring. It grows fairly rapidly and furnishes considerable browse. 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. Most seeds are dormant and require pre-chilling stratification to germinate. Seeding often results in rodents collecting and caching the seeds. The best method for establishment is by transplanting containerized seedlings or dormant fall seeding with seed that is two to three years old at a depth of 1/2 to 1 inch. Recommended transplant rate is 200 shrubs per acre. Average seeds per ft^2 at 1 lb. rate is 0.4. Pure stand seeding rate is 2 lb/ac. Not recommended for pure stands. Recommended rate in mixture is approximately 0.25 pound PLS per acre. This species is most commonly established with nursery grown plants.

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. It is a good pollinator species and blooms in spring. No releases have been made. Seeds are largely dormant and require pre-chilling to germinate. Seeding often results in rodents collecting and caching the seeds. The best method for establishment is by transplanting containerized seedlings or dormant fall seeding with seed that is two to three years old at a depth of 1/2 to 1 inch. Average seeds per ft^2 at 1 lb. rate is 0.4. Pure stand seeding rate is 2 lb/ac. Not recommended for pure stands. Recommended rate in mixture is approximately 0.25 pound PLS per acre. This species is most commonly established with nursery grown plants.

Buckwheat, Snow *Eriogonum niveum*

Snow buckwheat is a perennial half-shrub that grows on rocky or gravelly hillsides in areas that receive 7-18 inches precipitation. It usually is less than 2.5 feet tall. The foliage is silvery and very pubescent. The flowers are white and showy, and are an excellent source of late season nectar for bees. The seed matures in late fall and seedlings emerge in early spring. It is an excellent erosion control plant for mine spoils and rocky road cuts. Many insects are attracted to it and they are important food sources for small birds. Wildlife also use it for cover and forage. It has great ornamental appeal and is an ideal plant for xeriscape plantings. The Pullman PMC released ‘Umatilla’ snow buckwheat in 1991 and commercial seed production is underway. Average seed per ft^2 at 1 lb. Rate is 11. The pure stand seeding rate is 2

lb/ac. Not recommended in pure stands. Recommended seeding rates in mixes is 0.5 pound PLS per acre. This species is most commonly established with nursery grown plants.

Buckwheat, Sulphur-flower *Eriogonum umbellatum*

Sulphur-flower buckwheat is a perennial half-shrub that grows on rocky or gravelly mountain foothills and canyon areas that receive 12-25 inches precipitation. It is often found growing in association with mountain big sagebrush and antelope bitterbrush plant communities. It usually is less than 2.0 feet tall. The leaves are about an inch long, shiny green on top and wooly pubescent below. The flowers are clusters of sulphur-yellow-orange-reddish somewhat rounded showy heads. It is a good pollinator species and blooms in summer into early fall. They are an excellent source of late season nectar for bees. The seed matures in late fall and seedlings emerge in early spring. Insects are attracted to this plant and it is important food sources for small birds. Wildlife use sulphur-flower buckwheat for cover and forage. It has great ornamental appeal and should be an ideal plant for xeriscape plantings. There are no releases of sulphur-flower buckwheat. However, collection and evaluation of this species is underway at Aberdeen, ID PMC. Average seed per ft^2 at 1 lb. Rate is 5. The pure stand seeding rate is 4 lb/ac. Not recommended in pure stands. Recommended seeding rates in mixes is 0.5 pound PLS per acre. This species is most commonly established with nursery grown plants.

Buckwheat, Whorled *Eriogonum heracleoides*

Whorled or parsnip-flower buckwheat is a perennial half-shrub that grows on rocky or gravelly mountain foothills and canyon areas that receive 12-25 inches precipitation. It is often found growing in association with mountain big sagebrush and antelope bitterbrush plant communities. It usually is less than 2.5 feet tall. The leaves are covered with dense white pubescent hairs making the foliage appear green – blue-grayish in color. It is a good pollinator species and blooms in summer into early fall. The flowers are white to cream and showy, and are an excellent source of late season nectar for bees. The seed matures in late fall and seedlings emerge in early spring. Many insects are attracted to this plant and it is important food sources for small birds. Wildlife use whorled buckwheat for cover and forage. It has great ornamental appeal and should be an ideal plant for xeriscape plantings. There are no releases of whorled buckwheat. However, collection and evaluation of this species is underway at Aberdeen, ID PMC. Average seed per ft^2 at 1 lb. Rate is 3. The pure stand seeding rate is 7 lb/ac. Not recommended in pure stands. Recommended seeding rates in mixes is 0.5 pound PLS per acre. This species is most commonly established with nursery grown plants.

Buffaloberry, Silver *Shepherdia argentea*

Silver buffaloberry is 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 use the foliage and berries for food and the plant for cover. It prefers well drained to seasonally wet medium to course textured soils in the 12-20 inch precipitation zones. It is drought tolerant, 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, diversity in rangeland, critical areas and as a windward shrub in windbreaks. 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 stratification at 68-86^0 F before planting. It is not recommended for seeding and should be established with bareroot or container stock.

Cherry, Nanking *Prunus tomentosa*

A winter-hardy, fast growing, attractive, short-lived (approximately 10 years) shrub that grows to 8 feet in height. It readily sprouts to form dense thickets. It grows best on deep, moist soils in the 16 inch plus precipitation zones. It has good wildlife browse values and good bird cover and nesting values. It is considered an excellent pollinator species and flowers in spring. Plant as container or bareroot stock.

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. It is more common in silty or moderately acidic, moderately basic, and weakly saline soils. It is an aggressive root and sucker sprouting species after fire. It is considered an excellent pollinator species and flowers in spring. It has moderate tolerance of grazing; used extensively by livestock and big game. It can concentrate cyanic acid and 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 species. Can be transplanted and broadcast or drill seeded in the fall because seed needs pre-chilling to break embryo dormancy. Seed should be placed about 1/2-1.0 inch deep. Fall seeding is preferred. Average seeds per ft^2 at 1 lb. rate 0.1. Pure stand seeding rate 1-2 lb/ac. Mixed stand seeding rate 1/4 lb/ac. Not recommended for pure stands. This species is most commonly established with nursery grown plants.

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

Shrubby cinquefoil is 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. It is considered an excellent pollinator species and flowers in spring to early summer. Plant 1-2 year old container or bareroot stock available through nurseries. It is not recommended for seeding. This species is most commonly established with nursery grown plants.

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 June into August. It is considered an excellent pollinator species and flowers in spring. Seed appears cotton-like in fall when mature. It is adapted to moist but well-drained soils, can tolerate droughty periods, and prefers full sun to partial shade. It typically occurs in areas that receive between 10-20 inches of effective precipitation. However, studies conducted by Pullman PMC show that it will grow in sites that receive as little as 7 inches of effective 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. It is a layering plant, which makes it useful for stabilizing steep roadcuts. Can be invasive and becomes a pest when it climbs adjacent plants, affecting their health and obscuring their beauty. 'Trailar' is a cultivar released by the Pullman PMC that originates from plants in Walla Walla county, Washington. Plant container or bareroot stock available through nurseries. It is not recommended for seeding. This species is most commonly established with nursery grown plants.

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

Golden currant is a fast growing native shrub, which may, under favorable conditions, reach 10 feet in height. They grow in several forms and produce 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. It is considered an excellent pollinator species and flowers in spring. Golden currant is an excellent erosion control plant, because it spreads both vegetatively and by seed. Golden currant is used in conservation plantings and has fairly good saline tolerance. Golden currant 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. The seed of most Ribes species are highly dormant and require prolonged pre-chilling and a wide range of diurnal temperatures to germinate. Transplanting seedlings is best method of establishment. Average seeds per ft^2 at 1 lb. rate is 5 to 6. Not recommended for pure stands. Mixed stand seeding rate is approximately 1/4 lb/ac. Transplants of container or bareroot stock materials are also very successful.

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. A redosier dogwood release from New York is 'Ruby'. Three Selected Class Germplasm have been released by Pullman PMC: Harrington (MLRA B7 and B8); Cheney (MLRA B9 and B10); and Wallowa (MLRA E43 and E44). 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. Rooting of dogwood cuttings can be improved by applying thiram as a fungicide treatment.

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

Elderberry is a native, medium shrub with broad crowns, straight trunks, 3- 13 feet in height, with showy clusters of small yellowish white flowers, and pale blue to red fruit. It is considered an excellent pollinator species and flowers in spring to early summer. 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 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 the only release. Elderberry is not recommended for seedings and should be established with container stock.

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

Hawthorn is 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. Its preferred habitat is 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. It is considered an excellent pollinator species and flowers in spring. Hawthorn is in the Rose family and is an alternate host to apple cedar rust. This disease can cause damage to the plant and mask its aesthetics in years favoring fungal diseases. Young seedlings can be transplanted at 1 to 2 years of age. There are no releases. Hawthorn is generally not recommended for seedings and should be established or planted with container stock.

Kinnikinnick (Bearberry) *Arctostaphylos uva-ursi*

Kinnikinnick is 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. Plants can also be established from vegetative clones from mother plants. It is not recommended for seedings and should be established or planted with container stock.

Kochia, Forage *Bassia prostrata* or *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 in areas that receive 5 to 27 inches of annual precipitation.

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

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

It is compatible in mixtures with drought tolerant grasses. Direct seeding on rangeland is best accomplished in the fall or winter by broadcasting on top of disturbed or undisturbed soil. Seed viability is generally limited to one year and use of fresh seed with a current germination analysis is highly recommended. If a drill is used for seeding, seed should not be placed deeper than 1/16-inch. Seeding can be in combination with other perennial species. One cultivar, 'Immigrant' has been released. The ARS in Logan, Utah is evaluating other accessions with taller statures that would extend above winter snow to provide livestock and wildlife better access to forage for winter grazing. Average seeds per ft^2 at 1 lb. rate is 9. Recommended full seeding rate is 2 lb/ac. It is not recommended in pure stands. Recommended seeding rate in mixtures is approximately 1/4 of a pound PLS per acre.

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 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. Curlleaf 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 animal damage. Seed is also extremely dormant and requires prolonged pre-chilling. They are compatible in native species mixtures. 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^2 at 1 lb. rate is 1. Mixed stand seeding rate is 1/4 lb/ac. Not recommended for pure stands. This species is most commonly established with nursery grown plants.

Oregongrape (Barberry) *Mahonia* spp.

Oregongrape is 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 15 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^2 at 1 lb. rate is 1.0. Seeding rate in mixtures is 1/4 lb/ac. Not recommended for pure stands. This species is most commonly established with nursery grown plants. Young seedlings can be transplanted at 1 to 2 years of age.

Peashrub, Siberian *Caragana arborescens*

A very hardy, deciduous, leguminous shrub that grows to 20- 30 feet in height. It has pinnate leaves with up to 18 small leaflets. It is widely adapted and very drought and cold tolerant. It is used extensively in windbreak and shelterbelt plantings. It is very tolerant of snow loads and performs very well in snow fence applications. It has good wildlife food and cover values and good pollinator species values. It flowers in spring. Once established it survives in 12 inch and above rainfall areas and even lower precipitation zones when irrigated. Plant as container or bareroot stock.

Plum, American *Prunus americana*

A moderately dense, deciduous, somewhat spiny shrub with a broad crown that grows to 15 feet in height. It is long-lived, winter hardy, intolerant of shade and drought. It readily sprouts to form dense thickets. It grows best on deep, moist soils in the 20 inch plus precipitation zones. It has good wildlife browse values and good bird cover and nesting values. It is considered an excellent pollinator species and flowers in spring. Plant as container or bareroot stock.

Rabbitbrush, Green *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 is considered an excellent pollinator species and flowers in late summer and fall. 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^2 at 1 lb. rate is 18. Pure stand seeding rate is 0.5 lb/ac. Not recommended for pure stands. It can be difficult to establish by seeding. Recommended rate in mixes is approximately 1/40 of a pound PLS per acre. This species is most commonly established with nursery grown plants.

Rabbitbrush, Rubber *Ericameria nauseosa* 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 is considered an excellent pollinator species and flowers in late summer and fall. 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. It can be difficult to establish from seed. Average seeds per ft^2 at 1 lb. rate is 16. Pure stand seeding rate is 0.5 lb/ac. Not recommended for pure stands. Recommended rate in mixtures is approximately 1/40 of a pound PLS per acre. This species is most commonly established with nursery grown plants.

Rose, Woods *Rosa woodsii*

Woods rose is a long-lived native shrub that grows from 2-6 feet tall. Roots are shallow and much branched with plants spreading from rhizomes. It is common in well drained loamy to sandy soils on plains, foothills, and mountain sites. It

is 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. Foliage is moderately palatable to livestock and big game. It provides good cover and winter food for birds and small mammals, for erosion control, and as an ornamental. It is considered an excellent pollinator species and flowers in late spring into summer. It has high potential for roadside and critical site stabilization and beautification. Can be transplanted, drilled, or broadcast seeded 1/2 inch deep. Fall seeding is recommended. Spring seeding requires a cold to warm to cold stratification before seeds will germinate. Average seeds per ft^2 at 1 lb. rate is 1. Pure stand seeding rate is 1 lb/ac. Mixture seeding rate is 1/4 lb/ac. Not recommended for pure stands. This species is most commonly established with nursery grown plants. Young seedlings can be transplanted at 1 to 2 years of age.

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

Big sagebrush with its 4 major subspecies (basin, Wyoming, mountain and spicate) is a widely occurring, landscape dominating native shrub ranging in height from 1 to 15 feet. The lower forms generally have several main stems arising from the base; the tall forms often have a single trunk. Big sagebrush grows in a variety of soils on arid plains, valleys, and foothills to mountain slopes in the 8-18 inch rainfall areas. It is frequently associated with such shrubs as shadscale, rubber rabbitbrush, green rabbitbrush, fourwing saltbush, spiny hopsage, gray horsebrush, winterfat, broom snakeweed, antelope bitterbrush, snowberry, and serviceberry. Big sagebrush is one of the more nutritious shrubs on western winter game ranges. Palatability of the different populations of this shrub to mule deer, sheep, and other animals varies widely. It is one of the best shrubs available for use in revegetation of depleted winter game ranges in the Intermountain West. Big sagebrush establishes rapidly from direct broadcast seeding on disturbed surfaces. It is useful for stabilizing washes, gullies, roadcuts, and other raw, exposed sites. It is widely seeded on big game improvement projects. Plants spread well by natural seeding and furnish considerable browse soon after seeding. Big sagebrush is aggressive and persistent and sometimes forms closed stands, which require control measures to improve species diversity. 'Hobble Creek' is a robust, palatable form of mountain big sagebrush adapted to areas with 14 inches or more precipitation and deeper soils. 'Gordon Creek' is a release of Wyoming big sagebrush adapted to 10-14 inches precipitation. Wildland seed collection is a common practice and Source Identified seed is recommended when using wildland collected seed. Use of freshly harvested seed is also recommended. Seed at 0-1/8 inch depth. Average seeds per ft^2 at 1 lb. rate is; Basin 39, Mountain 45, Wyoming 39. Pure stand seeding rate is 0.5 lb/ac. Not recommended for pure seedings. Recommended rate in mixtures is approximately 1/40 of a pound PLS per acre.

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 receives 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 seed is also recommended. Seed at 0-1/8 inch depth. Average seeds per ft^2 at 1 lb. rate is 21. Pure stand seeding rate is 0.5 lb/ac. Not recommended for pure stands. Recommended seeding rate in mixtures is approximately 1/40 of a pound PLS per acre.

Saltbush, Fourwing *Atriplex canesens*

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) plants. The species grows in a variety of soil types from valley bottoms and plains to mountainous areas. It is well suited to deep, well-drained sandy soil, sand dunes, gravelly washes, mesas, ridges, and slopes, but vigorous plants have been found in heavy clays as well. It is frequently found intermixed with numerous shrub and grass species. It is primarily found in the 8-16 inch

precipitation zones. Fourwing saltbush is one of the most valuable browse shrubs in arid rangelands because of its abundance, accessibility, palatability, size, evergreen habitat, nutritive value, rate of growth, and large volume of foliage. Its leaves, stems, and utricles provide browse in all seasons. It withstands extremely heavy browsing and often appears to be stimulated by use. Research indicates that some ecotypes of this species may resprout following fire. This species is also one of the most important shrubs for use in rehabilitation of depleted rangelands and in soil stabilization projects. It can be established by direct seeding and by bare root and container transplanting. Fall seeding results in the best stands. The cultivar 'Rincon' is a variety best adapted to the warmer-southern big sagebrush and juniper zones but also does well in the more mesic portions of salt desert shrub areas. Another cultivar is 'Wytana', a natural hybrid of fourwing saltbush and Gardner saltbush, with lower stature. It is best adapted to higher elevations of the Northern Great Plains on clayey saline soils. The most recent release by Aberdeen PMC, Snake River Plains Selected Germplasm has better cold tolerance than Rincon and is recommended for southern Idaho, northern Nevada and northern Utah. Wildland seed collection is a common practice and Source Identified seed is recommended when using wildland collected seed. Plant at 1/4- 3/4 inch depth. Average seeds per ft^2 at 1 lb. rate is 1. Pure stand seeding rate is 2 lb/ac. Not recommended for pure stands. Recommended rate in mixtures is approximately 1/4 of a pound PLS per acre - dewinged.

Saltbush, Gardner or Nuttall *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 saline heavy textured soils in drier sites than sagebrush or fourwing saltbush, but may be in association with them and is most common in areas receiving 6-12 inches of precipitation. On adapted sites, this species establishes and grows rapidly where few other species exist. It is sensitive to over grazing and many sites that historically supported this species are now lost. It produces excellent browse in all seasons for wildlife and livestock. Wildland seed collection is a common practice and Source Identified seed is recommended when using wildland collected seed. Plant at 1/4- 3/4 inch depth. Average seeds per ft^2 at 1 lb. rate 3. Pure stand seeding rate is 2 lb/ac. Not recommended for pure stands. Recommended rate in mixes is approximately 1/4 pound PLS per acre. It is best to plant Gardner saltbush in separate rows from other species.

Serviceberry *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. It is considered an excellent pollinator species and flowers in spring. 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. Three Selected Class Germplasm have been released by Pullman PMC: Okanogan (MLRA B7 and B8); Kendrick (MLRA B9 and B10); and Newport (MLRA E43 and E44). Plant at 1/4- 1/2 inch depth. Should be seeded in the fall to break dormancy and allow seedcoat to soften. Average seeds per ft^2 at 1 lb. rate 2. Pure stand seeding rate 1.0 lb/ac. Not recommended for pure stands. Recommended rate in mix is approximately 1/4 of a pound PLS per acre. This species is most commonly established with nursery grown plants.

Shadscale *Atriplex confertifolia*

Shadscale is a small to medium evergreen to deciduous shrub, 1- 3 feet tall. It is adapted to soils with moderate to good drainage and is very tolerant of saline to sodic conditions. It often occurs in the great basin and intermountain west salt desert shrub to sagebrush mixed in bottoms, flats and foothills from 1,500 to 7,500 feet elevations. It is highly palatable to livestock and wildlife, particularly during winter grazing periods. 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^2 at 1 lb. rate 2. Pure stand seeding rate is 2 lb/ac. Not recommended for pure stands. Recommended rate in mixes is approximately 1/4 pound PLS per acre. It is best to plant shadscale in separate rows from other species.

Silverberry *Elaeagnus commutata*

Silverberry is a multi-stemmed, suckering, deciduous native shrub 4-8 feet tall with an erect habit and slender sometimes twisted branched thicket former. 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. A low incidence of big game browse has been observed and thus it may be a good species to consider in riparian zone revegetation. It is sometimes confused with silver buffaloberry and the invasive introduced species Russian olive. Two source-identified germplasm, Pondera and Dupuyer Source Identified Germplasm have been released for use east of the continental divide in Montana. They may also be adapted to mountainous riparian areas west of the continental divide in Idaho. Plant at 0- 3/4 inch depth. Seeds are dormant and require pre-chilling for germination. Average seeds per ft^2 at 1 lb. rate 0.1. Not recommended for pure stands. Recommended rate in mix is approximately 2 pounds PLS per acre. This species is most commonly established with nursery grown plants. Young seedlings can be transplanted at 1 to 2 years of age.

Snowberry, Common and Mountain *Symphoricarpos albus* and *S. 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 upper sagebrush regions. They have small pink to white flowers and showy white berries. It is considered an excellent pollinator species and flowers in late spring into late summer. 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. They commonly form a monoculture in the moist-dry zone of riparian areas. Uses include conservation, erosion control, wildlife and plantings on upper terraces of riparian areas. They can be transplanted, drilled, or broadcast seeded from 0 to 1/2 inch deep. Very difficult to germinate because of hard seed coat and embryo dormancy that requires warm stratification. Transplanting seedlings recommended. Pullman PMC has released the Selected Class Germplasm Okanogan. Average seed per ft^2 at 1 lb. rate is 2. Pure stand seeding rate 2 lb/ac. Not recommended in pure stands on upland sites. Recommended rates in mixes is approximately 1/4 of a pound PLS per acre. This species is most commonly established with nursery grown plants. Young seedlings can be transplanted at 1 to 2 years of age.

Snowbrush *Ceanothus velutinus*

A native of the Intermountain West, this low growing (2 to 5 feet) decumbent evergreen 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 snow drifts occur during the winter. It has moderate shade tolerance, fair drought tolerance, and good browsing tolerance. It is sought out by big game and livestock for cover habitat. It can be planted in conjunction with other species. Snowbrush species seed have been shown to have both hard seedcoats and embryo dormancy. Hot water treatments soften the hard seed coat and pre-chilling generally solves embryo dormancy. For best results, it should generally be planted in the fall. When seeded, plant 1/4- 1/2 inch deep in revegetation mixtures. Spreading habit, somewhat fire tolerant, and attractive foliage and flowers makes this species potentially useful in seedings or plantings for stabilizing disturbed soils and for roadside beautification. Average seeds per ft^2 at 1 lb. rate 2. Mixed stand seeding rate 1/4 lb/ac. Not recommended for pure stands. This species is most commonly established with nursery grown plants.

Spiraea, Douglas *Spiraea douglasii*

A native shrub from 4 to 6 feet in height. It prefers deep gravelly sand to clay loam soils in moist full sun locations. It tolerates flooding and boggy poorly drained locations. Its rose to pink small dense panicle or corymb shaped flowers bloom in spring. It has a rapid growth rate and forms dense upright thickets. Average seeds per ft^2 at 1 lb. rate is 23. Pure stand seeding rate is 1 lb/ac. Not recommended for pure stands. This species is most commonly established with nursery grown plants.

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. It grows best on coarse-textured or disturbed soils and somewhat open communities. It is very drought tolerant. It is considered an excellent pollinator species and flowers in spring. 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. Establishment is very slow by seed. 'Bighorn' is the only released variety. Seed may require scarification and pre-chilling to improve germination. Transplanting seedlings recommended. Average seeds per ft^2 at 1 lb. rate 0.5. Pure stand seeding rate 2 lb/ac. Not recommended for pure stands. Recommended rate in mixes is approximately 1/4 pound PLS per acre. This species is most commonly established with nursery grown plants. 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. It can be used on upper banks of riparian zones and for landscaping. Plant container or bareroot stock available through nurseries. Two Selected Class Germplasm have been released by Pullman PMC: Colfax (MLRA B9) and St. Maries (MLRA E43). It is not recommended for seeding. This species is most commonly established with nursery grown plants.

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 browsing, over grazing has greatly reduced and even eliminated winterfat in some areas. Winterfat seed maintains viability for relatively short periods of time (6 months to 2 years) without special treatment. Seeds require an after-ripening period for maximum germination and germinate best at warm temperatures (77 to 80°F). Winterfat may be established by seed or by transplanting in 9 inch or greater rainfall areas (attempts to establish winterfat in lower rainfall zones commonly fails). Young seedlings are generally vulnerable to spring frosts. The upright variety, 'Hatch', is best adapted to southern ranges and produces rapid growth. A recent release by Aberdeen PMC is Northern Cold Desert Selected Class Germplasm. It has better cold tolerance than past releases and is recommended for southern Idaho, northern Nevada and northern Utah. Bridger PMC released Open Range Selected Class Germplasm in 2002 for use in the Northern Rocky Mountains and Northern Great Plains. Wildland seed collection is a common practice and Source Identified seed is recommended when using wildland collected seed. Average seeds per ft^2 at 1 lb. rate is 3. Pure stand seeding rate is 2 lb/ac. Not recommended for pure stands. Recommended rate in mixtures is approximately 1/4 of a pound PLS per acre.

TABLE 1
PLANT ADAPTATION AND SEEDING RATES
PLANT MATERIALS TECHNICAL NOTE NO. 24

Common Name	Longevity	Seedling Vigor	Character	Seeds/Lb	1 lb/Acre Seeds/ft^2	Precip	Soil	Depth	PLS Rate
GRASSES									
Bentgrass, Redtop	Long	Low-Med.	Sod	4,990,000	115	+18	wet	0-1/4	0.5
Bluegrass, Big	Medium	Low-Med.	Bunch	925,000	21	+ 9	cl-sl	0-1/4	2
Bluegrass, Canada	Long	Low-Med.	Sod	1,600,000	37	+18	cl-sl	1/4-1/2	2 (6 sod)
Bluegrass, Canby	Long	Low-Med.	Bunch	925,000	21	+ 9	c-sl	0-1/4	2
Bluegrass, Kentucky	Long	Low-Med.	Sod	2,200,000	50	+18	cl-sl	0-1/4	2 (4 sod)
Bluegrass, Mutton	Long	Low-Med.	Bunch	890,000	20	+10	cl-s	1/8-1/4	2
Bluegrass, Nevada	Long	Low-Med.	Bunch	925,000	21	+10	l-cl	0-1/4	2
Bluegrass, Sandberg	Long	Low-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	80,000	2	+16	c-sl	1/4-1/2	10
Brome, Smooth	Long	Very Rapid	Sod	145,000	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	Low	Bunch	5,298,000	122	+ 7	fsl-s	0-1/4	1
Fescue, Hard	Long	Low	Bunch	560,000	13	+14	c-sl	0-1/4	4
Fescue, Idaho	Long	Very Low	Bunch	450,000	10	+16	cl-sl	1/4-1/2	4
Fescue, Red	Long	Low	Sod	614,000	14	+18	c-sl	0-1/4	4 (15 sod)
Fescue, Sheep	Long	Low	Bunch	680,000	16	+10	c-sl	0-1/4	4
Fescue, Tall	Long	Medium	Bunch	205,000	5	+18	saline	1/4-1/2	5 (40 sod)
Foxtail, Creeping	Long	Low	Sod	750,000	17	+18	c-l	1/8-1/4	3
Hairgrass, Tufted	Long	Low	Bunch	2,500,000	57	+18	c-sl	0-1/4	2
Junegrass, Prairie	Medium	Low-Med.	Bunch	2,315,000	53	12-20	sil-s	1/4-1/2	1
Needlegrass, Green	Long	Low	Bunch	180,000	4	8-20	cl-sl	1/4-1/2	6
Needlegrass, Letterman	Long	Low	Bunch	150,000	3	15-30	cl-sl	1/4-1/2	6
Needlegrass, Thurber	Long	Low	Bunch	180,000	4	8-16	cl-sl	1/4-1/2	6
Needle and Thread	Long	Low	Bunch	115,000	3	7-16	fsl-s	1/4-1.0	6
Orchardgrass	Long	Medium	Bunch	540,000	12	+16	c-sl	1/4-1/2	4
Ricegrass, Indian	Long	Medium	Bunch	235,000	5	+10	l-s	1/2-3	6
Ryegrass, Perennial	Short	V. Rapid	Bunch	247,000	6	+15	cl-sl	1/4-1/2	4 (15 forage)
Sacaton, Alkali	Long	Low-Med.	Bunch	1,700,000	39	+10	wet	1/8-1/2	2
Squirreltail, Big	Long	Medium	Bunch	192,000	4	+12	cl-sl	1/4-1/2	6
Squirreltail, Bottlebrush	Long	Medium	Bunch	220,000	5	+8	cl-sl	1/4-1/2	6

Soil: vfsl = 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; g = gravel; wet = saturated; moist = moist-well drained; limy = high calcium content; rocky = 2" plus rock; gravel = 1/8-2" rock.

Common Name	Longevity	Seedling Vigor	Character	Seeds/Lb	1 lb/Acre Seeds/ft^2	Precip	Soil	Depth	PLS Rate
GRASSES									
Switchgrass	Long	V. Low	Sod	426,000	10	+16	sil-sl	1/4-1/2	4
Timothy	Long	Medium	Bunch	1,230,000	28	+18	c-sl	1/8-1/4	3
Wheatgrass, Beardless	Long	Medium	Bunch	145,000	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	175,000	4	+10	c-sl	1/4-1/2	5
Wheatgrass, Crested AGDE2	Long	Rapid	Bunch	165,000	4	+8	c-sl	1/4-1/2	5
Wheatgrass, Crested X	Long	Rapid	Bunch	165,000	4	+9	c-sl	1/4-1/2	5
Wheatgrass, Intermediate	Long	Rapid	Sod	80,000	2	+13	cl-sl	1/4-1/2	10
Wheatgrass, RS-Hybrid (Newhy)	Long	Medium	Sod	139,000	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	160,000	4	+8	c-sl	1/4-1/2	6
Wheatgrass, Slender	Short	Rapid	Bunch	135,000	3	+10	c-sl	1/2-3/4	6
Wheatgrass, Snake River	Long	Medium	Bunch	139,000	3	+8	c-sl	1/4-1/2	8
Wheatgrass, Streambank	Long	Medium	Sod	135,000	3	+8	c-l	1/4-1/2	6 (24 sod)
Wheatgrass, Tall	Long	V. Rapid	Bunch	78,000	2	+14	saline	1/4-3/4	10 (15 saline)
Wheatgrass, Thickspike	Long	Medium	Sod	135,000	3	+8	l-s	1/4-1/2	6
Wheatgrass, Western	Long	Medium	Sod	115,000	3	+12-14	cl-sl	1/4-1/2	8
Wildrye, Altai	Long	Low	Bunch	73,000	2	+14	saline	1/4-1/2	12
Wildrye, Basin	Long	Low	Bunch	130,000	3	+8	sil-sl	1/4-3/4	8
Wildrye, Blue	Medium	Medium	Bunch	145,000	3	+16	cl-sl	1/4-1/2	8
Wildrye, Canada	Short	Rapid	Bunch	115,000	3	+15	l-s	1/4-1/2	8
Wildrye, Mammoth	Long	V. Low	Sod	55,000	1	+12	ls-s	1/4-1/2	15
Wildrye, Manystem	Long	V. Low	Sod	150,000	4	+14	saline	0-1/4	6
Wildrye, Russian	Long	Low	Bunch	170,000	4	+8	c-sl	1/4-1/2	6

Common Name	Longevity	Vigor	Character	Hydrologic Regime	Rate of Spread	Precip	Flood Tolerance	Planting Method
GRASS-LIKE								
Bulrush, Alkali	Long	Rapid	Sod	to 6" depth	Medium	wetland	High	plants
Bulrush, Hardstem	Long	Rapid	Sod	to 36" depth	Rapid	wetland	High	plants
Cattail	Long	Rapid	Sod	to 12" depth	Rapid	wetland	High	plants
Rush, Baltic	Long	Rapid	Sod	Seasonally Saturated	Medium	wetland	High	plants
Sedge, Beaked	Long	Rapid	Sod	Seasonally Saturated	Rapid	wetland	High	plants
Sedge, Nebraska	Long	Rapid	Sod	Seasonally Saturated	Medium	wetland	High	plants
Sedge, Water	Long	Rapid	Sod	to 3"depth	Medium	wetland	High	plants
Spikerush, Creeping	Long	Rapid	Sod	to 6" depth	Rapid	wetland	High	plants
Threesquare, Common	Long	Rapid	Sod	to 6" depth	Rapid	wetland	High	plants

Common Name	Longevity	Seedling Vigor	Character	Seeds/Lb	1 lb/Acre Seeds/ft^2	Precip	Soil	Depth	PLS Rate
FORBS - LEGUMES									
Alfalfa	Medium	Medium	Erect	200,000	5	+14	sil-sl	1/8-1/2	5 (10- 15 hay)
Aster	Medium	Low	Erect	800,000	18	+12	cl-sil	0-1/2	2
Balsamroot, Arrowleaf	Long	V. Low	Erect	55,000	1	+10	sil-sl	0-1/3	20
Beeplant, Rocky Mtn	Annual	Medium-Rapid	Erect	66,000	1.5	+8	cl-sl	1/8-1/2	15
Biscuitroot species	Short	Medium	Erect	45,000	1	+10	gl-sil	1/4-1/2	6
Blanket-Flower	Short	Medium	Erect	132,000	3	+16	sl-sil	¼-1/2	8
Burnet, Small	Medium	Medium	Erect	42,000	1	+14	c-sl	1/4-1/2	20
Clover, Alsike	Short	Medium	Erect	700,000	16	+18	wet	1/8-1/4	3
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	4
Clover, White	Med.-Long	Medium	Erect	800,000	18	+18	wet/cl-sil	1/8-1/4	4
Columbine	Short	Medium	Erect	400,000	9	+16	cl-sil	1/8-1/4	3
Coneflower, Purple	Medium	Medium	Erect	117,000	2.7	+18	cl-fsl	1/4-1/2	9
Coneflower, Western	Medium	Medium	Erect	345,000	8	+24	cl-sl	1/4-1/2	3
Crownvetch	Long	Medium	Prostrate	98,000	2	+15	sil-sl	1/4-1/2	13
Flax, Blue	Short	Low-Med.	Erect	350,000	8	+10	sil-sl	0-1/8	3
Flax, Lewis	Short	Low-Med.	Erect	205,000	5	+10	sil-sl	0-1/8	5
Gayfeather	Short	Low	Erect	135,000	3	+24	cl-sil	1/4-1/2	8
Geranium	Short	Low	Erect	52,000	1.2	+14	cl-sil	1/4-1/2	20
Globemallow	Long	Low	Erect	750,000	17	+7	saline	1/8-1/4	2
Milkvetch, Cicer	Long	Low	Erect	130,000	3	+15	c-l	1/4-1/2	7
Penstemon, Firecracker	Short	V. Low	Erect	315,000	7	+10	cl-sl	0-1/8	4
Penstemon, Palmer	Medium	V. Low	Erect	294,000	7	+10	cl-sl	0-1/8	4
Penstemon, Rocky Mtn.	Medium	V. Low	Erect	286,000	7	+18	cl-sl	0-1/8	4
Penstemon, Venus	Medium	V. Low	Erect	1,090,000	25	+16	cl-sl	0-1/8	2
Prairie Clover	Medium	Low	Erect	210,000	5	+14	c-csl	1/4-1/2	5
Sagewort, Louisiana	Short-Med.	Medium	Erect	3,750,000	86	+12	cl-sl	0-1/4	0.25
Sainfoin	Medium	Low-Med.	Erect	18,500	0.4	+14	sil-s	1/4-3/4	34
Sunflower, Maximilian	Short	Medium	Erect	225,000	5	+12	cl-sil	1/4-3/4	4
Sweetclover, White	Short	Med.-Rapid	Erect	262,000	6	+9	c-sl	1/8-1/2	4
Sweetclover, Yellow	Short	Med.-Rapid	Erect	258,000	6	+9	c-sl	1/8-1/2	4
Sweetvetch, Northern(Utah)	Medium	Low	Erect	70,000	2	+10	cl-sl	1/8-3/4	10
Trefoil, Birdsfoot	Long	Low	Erect	375,000	9	+18	c-s	1/4-1/2	3
Yarrow, Western	Medium	Low	Prostrate	4,124,000	95	+8	cl-sl	0-1/4	0.5

Common Name	Longevity	Seedling Vigor	Character	Seeds/Lb	1 lb/Acre Seeds/ft^2	Precip	Soil	Depth	PLS Rate
SHRUBS									
Bitterbrush, A.	Long	Low	Shrub	15,400	0.4	+10	cl-sl	1/2-1.0	2 (1/4*)
Buckwheat, Snow	Medium	Low	Half-Shrub	500,000	11	+7	rocky	0-1/4	plants
Buckwheat, Sulphurflower	Long	Low	Half-Shrub	209,000	5	+14	sl-sil	0-1/4	plants
Buckwheat, Whorled	Long	Low	Half-Shrub	135,700	3	+15	sl-sil	0-1/4	plants
Buffaloberry, Silver	Long	Low	Shrub	40,000	1	12-20	sc	1/2	plants
Cherry, Nanking	Medium	Low	Shrub	4,740	0.1	+16	cl-sil	1/2-1.0	plants
Chokecherry	Long	Low	Shrub	4,790	0.1	+12	sil-s	1/2-1.0	plants
Cinquefoil, Shrubby	Long	Low	Shrub	1,000,000	23	+18	wet-all	surface	plants
Clematis	Long	Low	Creeping Vine	315,000	7	+10	moist	-----	plants
Current, Golden	Long	Low	Shrub	233,000	5	+12	sil-sl	1/16-1/4	plants
Current, Wax	Long	Low	Shrub	251,000	6	+12	sil-sl	1/16-1/4	plants
Dogwood, Redosier	Long	Low	Shrub	18,500	0.4	+16	moist	-----	cuttings
Elderberry, Blue/Red	Medium	Low	Shrub	205,000	5	+18	gravelly	-----	plants
Hawthorn, Black	Long	Low	Sm. Tree	22,600	0.5	+12	cl-sl	0-1/4	plants
Kinnikinnick	Long	Low	Creeping Shrub	40,000	1	+18	cl-sl	-----	plants
Kochia, Forage	Long	Low	Half-Shrub	395,000	9	+8	cl-sl	0-1/16	2 (1/4*)
Mountain Mahogany	Long	Low	Shrub	48,000	1	+14	rocky	0-1/2	plants
Oregongrape	Long	Low	Creeping Shrub	45,000	1	+15	moist	1/4-1/2	plants
Peashrub, Siberian	Long	Low	Shrub	19,000	0.5	+12	cl-fsl	1/4-1/2	plants
Plum, American	Long	Low	Shrub	870	0.02	+20	moist	1/4-1/2	plants
Rabbitbrush, Green	Long	Low	Shrub	782,000	18	+10	sil-s	surface	0.5 plants
Rabbitbrush, Rubber	Long	Low	Shrub	693,000	16	+10	sil-s	surface	0.5 plants
Rose, Woods	Long	Low	Shrub	50,000	1	+12	l-sl	1/2	1 (1/4*)
Sagebrush, Big spp.	Long	Low	Shrub	1,700,000	39	8-18	cl-sl	0-1/8	0.5 (1/40*)
Sagebrush, Black	Long	Low	Shrub	907,000	21	+10	limy	0-1/8	0.5 (1/40*)
Saltbush, Fourwing	Long	Low	Shrub	52,000	1	8-16	l-s	1/4-3/4	2 (1/4*)
Saltbush, Gardner	Long	Low	Shrub	114,000	3	6-16	l-s	1/4-3/4	2 (1/4*)
Serviceberry	Long	Low	Shrub	82,000	2	+14	sil-sl	1/4-1/2	plants
Shadscale	Long	Low	Shrub	64,900	2	+6	cl-sil	1/4-3/4	2 (1/4*)
Silverberry	Long	Low	Shrub	3,800	0.1	+14	sil-sl	0-3/4	plants
Snowberry	Long	Low	Shrub	76,000	2	+14	sil-sl	0-1/2	3 plants
Snowbrush Ceanothus	Long	Low	Shrub	94,000	2	+16	sil-s	1/4-1/2	plants
Spiraea, Douglas	Long	Rapid	Shrub	1,000,000	23	+24	gs-cl	1/8-1/4	plants
Sumac, Skunkbush	Long	Low	Shrub	20,300	0.5	+14	rocky	1/2-1.0	2 plants
Syringa (Mockorange)	Long	Low	Shrub	8,000,000	184	+18	moist	-----	plants
Winterfat	Long	Low	Half-Shrub	123,000	3	+7	limy	0-1/8	2 (1/4*)

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

TABLE 2
RECOMMENDED RELEASES
PLANT MATERIALS TECHNICAL NOTE NO. 24

COMMON NAME	RECOMMENDED RELEASES	COMMON NAME	RECOMMENDED RELEASES
GRASSES – Intermountain West recommended releases are underlined			
Bentgrass, Redtop	'Streaker'	Bluegrass, Big	'Sherman', Service
Bluegrass, Canada	Foothills, 'Rubens', 'Talon'	Bluegrass, Canby	'Canbar'
Bluegrass, Kentucky	'Troy' multiple - turfgrass	Bluegrass, Mutton	common
Bluegrass, Nevada	Opportunity	Bluegrass, Sandberg	Mountain Home, 'High Plains', Reliable
Brome, Meadow	'Regar', 'Paddock', 'Fleet', 'Cache', 'Montana', 'MacBeth'	Brome, Mountain	'Bromar', Garnet
Brome, Smooth	'Manchar', 'Lincoln', Rebound, Carlton	Canarygrass, Reed	'Palaton', 'Rise', 'Venture', Castot
Dropseed, Sand	common	Fescue, Hard	'Durar', Serra
Fescue, Idaho	'Nezpurs', 'Winchester', 'Joseph'	Fescue, Red	multiple – turfgrass
Fescue, Sheep	'Covar', 'Bighorn'	Fescue, Tall	'Forager', 'Johnstone', 'Tscanny II', Alta', 'Fawn'
Foxtail, Creeping	'Garrison', 'Retain'	Hairgrass, Tufted	'Norcoast', 'Peru Creek'
Junegrass, Prairie	Keystone, Battle River	Needle and Thread	Sharptail
Needlegrass, Green	'Lodorm', Cucharas, 'Green Stipagrass' , Mallard,	Needlegrass, Thurber's	common
Orchardgrass	'Latar', 'Paiute', 'Potomac', Chinook, Napier, Dawn	Ricegrass, Indian	'Nezpar', 'Rimrock', Paloma', Ribstone,Star Lake,White River
Ryegrass, Perennial	multiple - short-lived and high producing	Sacaton, Alkali	Saltalk, Salado, Vegas
Squirreltail, Big	Sand Hollow	Squirreltail, Bottlebrush	Fish Creek, Toe Jam Creek, Rattlesnake, Pueblo, Wapiti, Pleasant valley, Antelope Creek
Switchgrass	'Blackwell', 'Dakotah', 'Forestburg', 'Sunburst'	Timothy	'Aurora', 'Climax', 'Mohawk' and many others
Wheatgrass, Beardless	'Whitmar'	Wheatgrass, Bluebunch	'Anatone', 'Goldar', 'P-7'
Wheatgrass, Crested AGDE	'Nordan', 'Summit'	Wheatgrass, Crested AGCR	'Ephraim', 'Roadcrest' 'Douglas', 'Parkway', 'Ruff'
Wheatgrass, Crested X	'Hycrest II', 'Hycrest'	Wheatgrass, Intermediate	'Rush', 'Reliant', 'Amur', 'Oahe', 'Tegmar'
Wheatgrass, RS Hybrid	'Newhy', 'AC Saltlander'	Wheatgrass, Pubescent	'Luna', 'Manska', 'Manifest', 'Greenleaf, Haymaker
Wheatgrass, Siberian	Vavilov II, 'Vavilov'	Wheatgrass, Slender	'First Strike', 'Pryor', 'Revenue', 'San Luis', Adanac
Wheatgrass, Snake River	'Discovery', 'Secar'	Wheatgrass, Streambank	'Sodar'
Wheatgrass, Tall	'Alkar', 'Largo' 'Platte'	Wheatgrass, Thickspike	'Bannock', 'Critana', 'Elbee', Polar, Schwendimar
Wheatgrass, Western	'Recovery', 'Rosana', 'Ariba', 'Flintlock', 'Rodan'	Wildrye, Altai	'Mustang', 'Eejay', 'Pearl', 'Prairieland'
Wildrye, Basin	'Magnar', 'Trailhead', Continental , Washoe,	Wildrye, Blue	'Arlington', 'Elkton'
Wildrye, Canada	'Mandan'	Wildrye, Mammoth	'Volga'
Wildrye, Manystem	'Shoshone'	Wildrye, Russian	'Bozoisky II', 'Bozoisky', 'Mankota', 'Cabree', 'Swift'
GRASS-LIKE		Bulrush, Alkali	common
Bulrush, Hardstem	common	Cattail	common
Rush, Baltic	common	Sedge, Beaked	common
Sedge, Nebraska	common	Sedge, Water	common
Spikerush, Creeping	common	Threesquare, Common	common

COMMON NAME	RECOMMENDED RELEASES	COMMON NAME	RECOMMENDED RELEASES
FORBS-LEGUMES – recommended releases are underlined			
Alfalfa	multiple varieties available; Don falcata alfalfa	Aster	common
Balsamroot, Arrowleaf	common	Beeplant, Rocky Mtn	common
Biscuitroot	common	Blanket-flower	common
Burnet, Small	'Delar'	Clover, Alsike	common
Clover, Red	common	Clover, Strawberry	common
Clover, White	common	Columbine	common
Crownvetch	'Chemung', 'Emerald', 'Penngift'	Coneflower, Purple	common
Coneflower, Western	common	Flax, Blue	'Appar'
Flax, Lewis	Maple Grove	Gayfeather	common
Geranium	common	Globemallow	common
Milkvetch, Cicer	'Lutana', 'Monarch', 'Windsor'	Penstemon, Firecracker	Richfield
Penstemon, Palmer	'Cedar'	Penstemon, Rocky Mtn.	'Bandera'
Penstemon, Venus	Clearwater	Prairie Clover	common
Sagewort, Louisiana	'Summit'	Sainfoin	'Eski', 'Melrose', 'Renumex' 'Remont'
Sunflower, Maximilian	Prairie Gold, Medicine Creek	Sweetclover	‘Norgold’, 'Madrid', ‘Polara’, ‘Yukon’
Sweetvetch, Northern (Utah)	'Timp'	Trefoil, Birdsfoot	'Empire', ‘Leo’ 'Maitland'
Yarrow, Western	Eagle, Yakima, Great Northern		
SHRUBS			
Bitterbrush, A.	'Fountain Green', 'Lassen', 'Maybell'	Buckwheat, snow	Umatilla
Buckwheat, Sulphur-flower	common	Buckwheat, Whorled	common
Buffaloberry, Silver	'Sakakawea'	Ceanothus or Snowbrush	common
Cherry, Nanking	common	Chokecherry	'Schubert'
Cinquefoil	common	Clematis	'Trailar'
Current, Golden	common	Current, Wax	common
Dogwood, Redosier	'Ruby', Harrington, Cheney, Wallowa	Dogwood, Silky	'Indigo'
Elderberry, Blue	'Blanchard'	Hawthorn, Black	common
Kinnikinnick	common	Kochia, Forage	'Immigrant'
Mountain Mahogany	'Montane'	Oregongrape	common
Peashrub, Siberian	common	Plum, American	common
Rabbitbrush, Green	common	Rabbitbrush, Rubber	common
Rose, Woods	common	Sagebrush, Basin Big	common
Sagebrush, Mountain Big	common	Sagebrush, Wyoming Big	common
Sagebrush, Black	common	Saltbush, Fourwing	Snake River Plains, 'Wytana' 'Rincon'
Saltbush, Gardner	common	Serviceberry	Kendrick, Okanogan, Newport
Silverberry	common	Snowberry	Okanogan
Spiraea, Douglas	common	Sumac, Skunkbush	'Bighorn'
Syringa (Mockorange)	Colfax, St. Maries	Winterfat	Northern Cold Desert, Open Range, ‘Hatch'

TABLE 3
SEEDING RATE CALCULATIONS

Pounds per acre and seeds per row foot for various row spacing can be calculated.

Seeds per linear foot calculations can be determined using the following formula:

$$\frac{\text{Lbs Seed/Acre x No. Seeds/lb}}{43{,}560} \times \frac{\text{Row Spacing (inches)}}{\text{12 - Inches}} = \text{Number of Seeds/Linear Foot}$$

All seeding rates in narratives and table 1 are for 12- inch row spacing.

For row spacing wider than 12- inches, calculate seeding rate using the following information in Table 3:

For row spacing narrower than 12- inches, calculate seeds per row foot using the following information in Table 3:

TABLE 3

Row Spacing (Inches)	PLS Pounds / Acre	Seeds / Row Foot
6	Same as 12- inch rows	Multiply 12- inch seeds/foot by 0.50
7	Same as 12- inch rows	Multiply 12- inch seeds/foot by 0.58
9	Same as 12- inch rows	Multiply 12- inch seeds/foot by 0.75
10	Same as 12- inch rows	Multiply 12- inch seeds/foot by 0.83
12	----------	----------
14	Divide lbs/acre at 12– inch rows spacing by 1.17	Same as 12- inch rows
18	Divide lbs/acre at 12– inch rows spacing by 1.50	Same as 12- inch rows
20	Divide lbs/acre at 12– inch rows spacing by 1.67	Same as 12- inch rows
21	Divide lbs/acre at 12– inch rows spacing by 1.75	Same as 12- inch rows
24	Divide lbs/acre at 12– inch rows spacing by 2.00	Same as 12- inch rows
27	Divide lbs/acre at 12– inch rows spacing by 2.25	Same as 12- inch rows
28	Divide lbs/acre at 12– inch rows spacing by 2.33	Same as 12- inch rows
30	Divide lbs/acre at 12– inch rows spacing by 2.50	Same as 12- inch rows
35	Divide lbs/acre at 12– inch rows spacing by 2.91	Same as 12- inch rows
36	Divide lbs/acre at 12– inch rows spacing by 3.00	Same as 12- inch rows
40	Divide lbs/acre at 12– inch rows spacing by 3.33	Same as 12- inch rows
42	Divide lbs/acre at 12– inch rows spacing by 3.50	Same as 12- inch rows
48	Divide lbs/acre at 12– inch rows spacing by 4.00	Same as 12- inch rows

TABLE 4
DRILL RATES BY SPACING AND AVERAGE CERTIFIED SEED QUALITY

	Drill Seeding Rate – Lbs PLS			Ave. Seed Quality	
Common Name	**6-14" Rows**	**18-24" Rows**	**28-36"**	**Purity**	**Germination**
GRASSES			**Seed Increase**		
Bentgrass, Redtop	0.5	0.3	0.2	90	85
Bluegrass, Big	2.0	1.2	0.8	90	75
Bluegrass, Canby	2.0	1.2	0.8	90	75
Bluegrass, Canada	2.0 (6 sod)	0.7	0.5	90	75
Bluegrass, Kentucky	2.0 (4 sod)	0.5	0.3	90	75
Bluegrass, Mutton	2.0	0.5	0.3	90	75
Bluegrass, Sandberg	2.0	1.2	0.8	90	75
Brome, Meadow	10.0	5.9	3.9	95	85
Brome, Mountain	10.0	6.8	4.5	90	85
Brome, Smooth	5.0	3.8	2.5	90	85
Canarygrass, Reed	4.0	2.2	1.4	95	80
Dropseed, Sand	1.0	0.2	0.2	90	85
Fescue, Hard	4.0	2.0	1.3	95	85
Fescue, Idaho	4.0	1.2	0.8	90	80
Fescue, Red	4.0 (15 sod)	1.8	1.2	98	80
Fescue, Sheep	4.0	1.6	1.0	95	85
Fescue, Tall	5.0 (40 sod)	2.7	1.8	98	85
Foxtail, Creeping	3.0	1.5	1.0	80	80
Hairgrass, Tufted	1.5	0.5	0.3	80	75
Junegrass, Prairie	1.0	0.5	0.3	80	75
Needlegrass, Green	6.0	3.0	2.0	80	75
Needlegrass, Thurber	8.0	3.0	2.0	80	60
Orchardgrass	4.0	2.0	1.4	90	80
Ricegrass, Indian	6.0	2.3	1.5	95	80
Ryegrass, Perennial	15-25	2.2	1.5	98	90
Sacaton, Alkali	2.0	0.7	0.5	98	80
Squirreltail, B.	7.0	2.9	1.9	80	75
Switchgrass	4.0	1.3	0.9	80	80
Timothy	3.0	0.9	0.6	97	80
Wheatgrass, Beardless	7.0	3.8	2.5	90	85
Wheatgrass, Bluebunch	7.0	3.9	2.6	90	85
Wheatgrass, Crested AGCR	5.0	3.1	2.1	95	85
Wheatgrass, C. AGDE2	5.0	3.3	2.2	95	85
Wheatgrass, Crested X	5.0	3.3	2.2	95	85
Wheatgrass, Intermediate	10.0	6.8	4.5	95	90
Wheatgrass, RS Hybrid	8.0	3.9	2.6	95	85
Wheatgrass, Pubescent	10.0	6.8	4.5	95	90
Wheatgrass, Siberian	6.0	3.4	2.3	95	85
Wheatgrass, Slender	6.0	4.0	2.7	90	85
Wheatgrass, Snake River	7.0	3.9	2.6	90	80
Wheatgrass, Streambank	6.0	4.0	2.7	90	80
Wheatgrass, Tall	10.0	7.0	4.6	95	85
Wheatgrass, Thickspike	6.0	4.0	2.7	85	90
Wheatgrass, Western	8.0	4.8	3.2	85	90
Wildrye, Altai	12.0	7.5	5.0	80	75
Wildrye, Basin	7.0	4.2	2.8	80	85
Wildrye, Blue	7.0	3.8	2.5	80	85
Wildrye, Canada	7.0	4.8	3.2	80	80
Wildrye, Mammoth	15.0	9.9	6.5	80	80
Wildrye, Manystem	6.0	3.6	2.4	80	65
Wildrye, Russian	6.0	3.2	2.1	90	80

DRILL RATES BY SPACING AND AVERAGE CERTIFIED SEED QUALITY

Common Name	Drill Seeding Rate – Lbs PLS 6-14" Rows	18-24" Rows	28-36"	Ave. Seed Quality Purity	Germination
ANNUALS		**Seed Increase**			
Barley	50	30	--	96	85
Oats	50	30	--	98	85
Peas	80	60	--	98	80
Rye, Annual	40	25	--	96	70
Triticale	60	40	--	96	85
Wheat	60	40	--	96	85
FORBS - LEGUMES		**Seed Increase**			
Alfalfa	5.0 (10- 15 hay)	2.8	1.8	99	85
Aster	2.0	6.8	4.5	90	80
Balsamroot, Arrowleaf	20.0	9.9	6.5	95	80
Burnet, Small	20.0	13.0	8.6	95	90
Clover, Alsike	3.0	7.8	5.2	95	90
Clover, Red	6.0	2.0	1.3	95	90
Clover, Strawberry	4.0	1.8	1.2	95	90
Clover, White	4.0	1.4	0.9	99	85
Columbine					
Coneflower, Purple					
Coneflower, Western					
Crownvetch	13.0	5.6	3.7	90	90
Flax, Blue	4.0	2.0	1.3	95	90
Flax, Lewis	4.0	2.0	1.3	95	90
Gayfeather					
Geranium					
Globemallow	2.0	1.5	1.0	80	90
Milkvetch, Cicer	7.0	4.2	2.9	95	75
Penstemon, Venus	2.0	1.0	0.7	90	90 TZ
Penstemon, Firecracker	4.0	1.8	1.2	90	90 TZ
Penstemon, Palmer	4.0	1.9	1.2	90	90 TZ
Penstemon, Rocky Mtn.	2.0	1.9	1.3	90	90 TZ
Prairie Clover					
Sagewort, Louisiana	0.25	0.3	0.2	75	50-80 TZ
Sainfoin	34.0	29.0	20.0	90	75
Sweetclover	4.0	2.1	1.4	99	85
Sweetvetch species	18.0	7.8	5.2	95	80
Trefoil, Birdsfoot	5.0	1.5	1.0	98	85
Yarrow, Western	0.5	0.3	0.2	90+	85
SHRUBS		**Seed Increase**			
Buckwheat, Snow	not commonly seeded - plants				
Buckwheat, Sulphurflower	not commonly seeded - plants				
Buckwheat, Whorled	not commonly seeded - plants				
Bitterbrush, Antelope	70.0 (1/4*)	35.4	23.3	95+	90
Buffaloberry, Silver	not commonly seeded - plants				
Ceanothus/Snowbrush	not commonly seeded - plants				
Cherry, Nanking	not commonly seeded - plants				
Chokecherry	not commonly seeded - plants				
Cinquefoil, Shrubby	not commonly seeded - plants				
Clematis	not commonly seeded - plants				

DRILL RATES BY SPACING AND AVERAGE CERTIFIED SEED QUALITY

	Drill Seeding Rate – Lbs PLS			Ave. Seed Quality	
Common Name	**6-14" Rows**	**18-24" Rows**	**28-36"**	**Purity**	**Germination**
SHRUBS			**Seed Increase**		
Current, Golden	not commonly seeded - plants				
Current, Wax	not commonly seeded - plants				
Dogwood, Redosier	not commonly seeded - cuttings and plants				
Elderberry, Blue/Red	not commonly seeded - plants				
Hawthorn, Black	not commonly seeded - plants				
Kinnikinnick	not commonly seeded - plants				
Kochia, Forage	2.0 (1/40*)	1.4	0.9	80	35-65
Mountain Mahogany	not commonly seeded - plants				
Oregongrape	not commonly seeded - plants				
Peashrub, Siberian	not commonly seeded - plants				
Plum, American	not commonly seeded - plants				
Rabbitbrush, Green	not commonly seeded - plants				
Rabbitbrush, Rubber	not commonly seeded - plants			10- 15	50- 80
Rose, Woods	1.0 (1/40*)			85	30+ TZ
Sagebrush, Big spp.	1.5 (1/40*)	0.7	0.4	10- 15	50-80 TZ
Sagebrush, Black	1.5 (1/40*)	1.2	0.8	10- 15	50-80 TZ
Saltbush, Fourwing	20.0 (1/4*)	10.5	6.9	85	30+ TZ
Saltbush, Gardner	10.0 (1/4*)	4.8	3.2	85	30+ TZ
Serviceberry	not commonly seeded - plants				
Silverberry	not commonly seeded - plants				
Shadscale	20.0 (1/4*)	10.5	6.9	85	30+ TZ
Snowberry	not commonly seeded - plants				
Sumac, Skunkbush	not commonly seeded - plants				
Syringa (Mockorange)	not commonly seeded - plants				
Winterfat	9.0 (1/4*)	4.4	2.9	40- 80	30-70 TZ

REFERENCES

Cornforth, B., L. St. John and D. Ogle. *Seed Production Standards for Conservation Plants in the Intermountain West.* USDA-NRCS, Boise, Idaho. ID-TN 14, December 2001. 15p.

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., S. Wyman, G. Bentrup, l. 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.

Holzworth, Larry K. 2007. *Montana Seeding Rate Specifications.* USDA-NRCS, Bozeman, MT. MT-TN 46, March 2007. 6p.

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.

Ogle, D., L. St. John, M. Stannard and L. Holzworth. 2009. Technical Note 24: *Grass, Grass-Like, Forb, Legume and Woody Species for the Intermountain West*. USDA-NRCS, Boise, ID; Bozeman, MT; and Spokane, WA. ID-TN 24, Feb.. 2007. 41p.

Sharp, W. Curtis. *Grass Varieties in the United States*, Agricultural Research Service - USDA, Agricultural Handbook No. 170, Nov. 1994

Shewmaker, Glenn E. *Idaho Forage Crop Handbook.* Idaho Agricultural Experiment Station. Bull. 547, Third Edition, 2005. 99p.

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/

Wambolt, Carl. *Montana Range Seeding Guide*. Cooperative Extension Service, Montana State University, Bulletin 347, May 1976.

Young, James A. and Cheryl G.Young. Seeds of Woody Plants of North America. Disocorides Press, Portland, Oregon. 1992.