



United States Department of Agriculture

TECHNICAL NOTE

USDA - Natural Resources Conservation Service
Boise, Idaho – Salt Lake City, Utah – Spokane, Washington

Plant Materials Technical Note No. 24

May 2014
Revision

CONSERVATION PLANT SPECIES FOR THE INTERMOUNTAIN WEST

Derek Tilley, Agronomist, NRCS Plant Materials Center Aberdeen, Idaho
Dan Ogle, Plant Materials Specialist, NRCS Boise, Idaho (retired)
Loren St. John, Team Leader, NRCS Plant Materials Center Aberdeen, Idaho
Mark Stannard, PMC Manager, NRCS, Pullman, Washington
Larry Holzworth, Plant Materials Specialist, NRCS, Bozeman, Montana (retired)

This document provides narrative descriptions for conservation plant species commonly occurring and/or planted in the Intermountain West. The descriptions cover common name, scientific name, origin, growth form, life span, adaptation, and planting recommendations. Information including vigor, ease of establishment, precipitation zone, pollinator attributes, planting depth, seeds per square foot at a one pound rate, and recommended pure stand seeding rates, recommended mixture seeding rates, and adapted cultivars/varieties or germplasm are also described. Additional species specific information can be found in plant guides, plant fact sheets and other appropriate guides located at the USDA-NRCS, PLANTS Database at <http://plants.usda.gov/>.

TABLE OF CONTENTS

INTRODUCTION		4
INTERMOUNTAIN WEST ECOLOGY AND CLIMATE		4
PLANS AND SPECIFICATIONS		4
	Seed	4
	Seedbed Preparation	4
	Fertilizer	5
	Seeding	5
	Seeding Dates	5
	Table 1. Generally accepted planting dates for the Intermountain West	5
	Cover and Nurse Crops	6
	Seeding Protection	6
OPERATION AND MAINTENANCE		6
GRASSES		7
WETLAND GRASS-LIKE PLANTS		19
LEGUMES AND FORBS		21
WOODY PLANTS		36
REFERENCES		48
APPENDIX		49
	Table 2. Grass characteristics ranked by precipitation requirements (low-high)	49
	Table 3. Grass seeding information	52
	Table 4. Grass-like wetland species	54
	Table 5. Forb characteristics ranked by precipitation requirements (low-high)	55
	Table 6. Forb seeding information	60
	Table 7. Shrub characteristics ranked by precipitation requirements (low-high)	65
	Table 8. Shrub planting information	68
	Table 9. Seeding rate and seeds/row foot calculations	71

INTRODUCTION

All seeding rates are based on Pure Live Seed (PLS). The rates used in this guide generally target 20-30 seeds/ft² for the larger seed size species (< 500,000 seeds per pound) and 40-50 seeds/ft² for the smaller seed size species (> 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 table 9 on page 71. When developing seed mixtures, use a percentage of the full seeding rate to reflect the percentage desired in the mix.

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

For further information on pollinator plant species, refer to Technical Note (TN) 2a (Plants for Pollinators in the Intermountain West), TN 2b (Plants for Pollinators in the Inland Northwest), and TN 2c (Plants for Pollinators in Eastern Utah and Western Colorado). For additional information on wetland plant species see TN 38 (Description, Propagation and Establishment of Wetland-Riparian Grass and Grass-like Species in the Intermountain West). For riparian woody species see TN 32 (Native Shrubs and Trees for Riparian Areas in the Intermountain West). For information on range seeding refer to TN 9a (Plants for Saline to Sodic Soil Conditions), TN 10 (Pasture and Range Seedings, Planning-Installation-Evaluation-Management), and TN 13 (Principles of Seedbed Preparation for Conservation Seedings).

INTERMOUNTAIN WEST ECOLOGY AND CLIMATE

The plants discussed in this Technical Note are recommended for use in suitable habitat in Idaho and Utah. Many of the species may have applicability in appropriate sites beyond these boundaries.

The climate of the region is affected by location and elevation. The area lies in the rain shadow created by the Cascade or Sierra Nevada mountain ranges that block precipitation from Pacific storms. The winter weather depends on latitude. In the southern portion, winters are shorter, and have less winter precipitation and snow. In the northern portion, winters are colder and can have significant snow.

The flora at lower elevations includes deserts and xeric shrublands and temperate grasslands. Higher elevation montane habitats include temperate coniferous forests including groves and forests of various species of pine, cedar, juniper, aspen, and other trees, with understory shrubs, grasses and forbs.

PLANS AND SPECIFICATIONS

For native seed mixtures, review of the ecological site description assigned to the dominant soil at the planting site is a good place to start when selecting species and percentage of each species in the seed mixture. Generally, no more than 4 to 6 species are recommended. If the primary objective of planting is for livestock forage, a mixture of introduced species should be considered. If the site is dominated by winter annual grasses and/or other invasive species, a mixture of introduced species is recommended and thorough seedbed preparation is critical.

Seed

Use of certified seed is encouraged. All seed and planting materials shall be labeled and meet state seed/horticultural law standards. Seeding rates must be adjusted based on the seed tag purity and viability to ensure the required amount of pure live seed (PLS) is applied to site. See Plant Materials TN 4 for detailed information on seed labels and calculating seed mixtures. Most legume seed is pre-inoculated when purchased. If fresh inoculation is needed, guidance on inoculation and the proper species of viable *Rhizobia* for each legume is listed in TN 26.

Seedbed Preparation

Provide a firm weed-free seedbed (mechanically or chemically) that ensures seed contact with mineral soil and ample soil moisture to uniformly facilitate seedling emergence. *Seedbed Firmness Rule-of-thumb: a person's footprint will be no deeper than 1/2 inch.* A weed-free seedbed will generally not exceed one (1) seedling per square foot of an unwanted plant at time of planting. Use of chemicals as an alternative to mechanical seedbed preparation should be considered when appropriate.

Fertilizer

Fertilizer is generally not applied on rangeland, but when needed, will be in accordance with a soil analysis or common soil knowledge and will meet the requirements of Nutrient Management (590). Research on low rainfall areas indicates that fertilization is not economical on sites with less than 16 inches of mean annual precipitation. For forage plantings in areas with greater than 16 inches annual precipitation or irrigated, fertilizer applications will be in accordance with a soil analysis or common soil knowledge and will meet the requirements of Nutrient Management (590). Nitrogen fertilizer should not be applied before the stand is seeded or during the first growing season. During stand establishment, nitrogen fertilizer generally benefits annual grasses and weeds at the expense of the more slowly establishing perennial species.

Seeding

Seeding with a drill is recommended over broadcasting when available. The drill should provide depth control with bands or other suitable method such that seed placement depth does not exceed recommended depths expressed in this Technical Note for that species or seed mixture. Inspect, clean, repair and calibrate equipment prior to seeding to ensure proper rate, distribution and depth of seeding.

Broadcast seeding will only be used on designated seedings or special situations. Broadcast seeding rates should be 150 to 200 percent of the normal drill seeding rates. When seed is broadcast planted, field should be covered by a roll-type packer or by trampling with grazing animals following seeding to improve seed to soil contact. Seedbeds with large amounts of residue that would prevent seed from contacting mineral soil should be lightly dragged or raked prior to broadcast seeding.

Direct seeding over burned rangeland that is not infested with annual invasive grasses and weedy herbaceous species without mechanical seedbed disturbance is an acceptable practice.

Actual seeding rates of applied seeding mixture will be within 80 to 125 percent of rate specified during the planning process in the ID-CPA-025 Seeding/Planting Plan Specification.

Seeding Dates

On light sandy to loamy soils, dormant fall planting is recommended for non-irrigated plantings. On heavy to medium textured soils that tend to form soils crusts over winter, early spring planting should be considered. On irrigated land, seed anytime during the growing season when temperatures are favorable for seed germination and seedling growth but avoid seeding during very hot periods from late June to mid-August. Sufficient irrigation water must be available and applied often enough to allow the soil surface to remain moist and favorable for seed germination, emergence, and establishment. Irrigated fall seedings will be expected to attain the 3-5 leaf stage prior to cessation of growth in the fall. This requires at least 30-45 days of growth from date of planting to first killing frost.

MLRA	Spring* (before)	Fall** (before)	Dormant*** (after)
8	4/1	10/1	11/15
9	4/15	9/20	11/1
10	5/15	9/10	10/20
11	4/15	9/20	11/1
12	5/15	9/20	11/1
13	5/15	9/10	10/20
25	5/15	9/10	10/20
28A	5/1	9/20	11/1
43A	5/15	9/1	10/20
43B	5/15	9/1	10/20
43C	5/15	9/1	10/20
44	5/15	9/1	11/1
47	5/15	9/10	10/20

* Complete spring plantings as early as possible.

** Fall seedings on irrigated land only.

*** Earlier dormant planting dates are acceptable if the measured soil temperature is below 45° F.

Seeding dates may vary from these guidelines based on local experience and conditions. Fall and very early spring seedings may expose legumes and forbs to potential killing frosts during the seedling stage. For shrub plantings, refer to Idaho Plant Materials Technical Note 41, Restoration of Plant Communities with Woody Plants.

Cover and Nurse Crops

On sloping land where relatively weed-free crop residues are present or will result from the existing or planned crop, consider minimizing seedbed operations to maintain crop residues on the surface to protect the new planting. Use of a nurse crop is not acceptable for range plantings.

Seeding Protection

Temporary fencing may be required to protect new seeding from grazing animals. When plantings are irrigated for establishment, maintain adequate moisture at least in the upper six (6) inches of soil during the first four (4) weeks and then in the upper 12 inches until the end of the growing season. Noxious and invasive weeds should be controlled by mowing, clipping or herbicides. Seedlings should be allowed to attain at least 4-5 leaf stage before herbicides are applied.

OPERATION AND MAINTENANCE

Maintenance needed for range and pasture plantings include:

1. Periodic inspection and evaluation of vegetation to determine establishment and maintenance needs.
2. Management of vegetation growth, as applicable, by mowing, approved chemicals or other means to establish the desired cover.
3. Replanting due to drought, insects or other events which prevented adequate stand establishment should be addressed within 2-3 years of planting. Recommendations may vary from complete re-establishment to overseeding or spot replanting. Thin stands may only need additional grazing deferment.
4. Repair of appurtenances and fences.
5. Pest (weeds, grasshoppers, rabbits, rodents, etc.) control will be undertaken when pests are determined to be detrimental to establishing new seedlings. Any control specified shall be in accordance with Pest Management (595).
6. Stands not disturbed over long periods may become decadent, low in vigor and accumulate excess plant residues (litter) resulting in poor stand health. Periodic treatment (every 5 to 7 years) including light tillage, mowing, prescribed burning or grazing is recommended.

GRASSES

Bentgrass, Redtop

Agrostis gigantea

Redtop is a cool season, long-lived, sod forming grass native to Eurasia and North Africa. 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. Redtop is fine textured, usually rhizomatous and commonly occur in wetland and riparian areas and is used for erosion control, forage, turf and revegetation of sites with poor soils (acidic, heavy metals, mine spoils). Redtop requires a minimum of 18 inches annual precipitation. Many naturalized stands were probably introductions from Europe. Recommended planting depth for redtop bentgrass is 0 to 1/4 inch. Adapted variety is 'Streaker'. Average seeds/ft² at 1 lb. rate is 115. Recommend pure stand seeding rate is 0.5 lb/ac.

Bluegrass, Big

Poa secunda or *P. ampla*

Big bluegrass is a medium-lived native bunchgrass that establishes by seed. Big bluegrass is 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 annual 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/ft² at 1 lb. rate is 21. Recommend pure stand seeding rate is 2 lb/ac.

Bluegrass, Canada

Poa compressa or *P. canadensis*

Canada bluegrass is a long-lived, low growing introduced bluegrass with short rhizomes and tolerance to shade. This species is 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 annual precipitation. It is not well suited for grazing but can withstand heavy trampling. Planting depth is 1/4 to 1/2 inch. Adapted low maintenance turf varieties are 'Canon', Foothills Germplasm, 'Rubens' and 'Talon'. Average seeds/ft² 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 annual 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/ft² 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

Kentucky bluegrass is 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/ft² at one pound rate is 50. Recommended seeding rate is 2 lb/ac (4 lb/ac for turf applications).

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 and is rated as excellent forage for cattle and horses. It is adapted to areas receiving 10 to 22 inches annual precipitation. There are no releases currently available but source identified seed is. Planting depth is 1/8 - 1/4 inch or less. Average seeds/ft² 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*

Nevada bluegrass is a medium- long lived native bunchgrass 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 annual 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 source is Opportunity Selected Germplasm. Average seeds/ft² 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 rangelands where it is considered an important grass for soil stabilization and forage for wildlife. It is best adapted to medium to heavy textured soils. It is found from 1,000 feet in Washington to 12,000 feet in northern New Mexico. It is recommended in sites receiving 8-18 inches annual precipitation. 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 area is also available. Planting depth is 1/4 inch or less. Average seeds/ft² at one pound rate is 23. Recommended pure stand seeding rate is 2 lb/ac. It is best utilized in low rainfall area native mixes.

Brome, Meadow*Bromus biebersteinii*, *B. erectus* or *B. riparius*

Meadow brome is a perennial long-lived, introduced, weakly rhizomatous grass reaching 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 annual precipitation is above 14 inches. 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/ft² 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, 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/ft² 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

Smooth brome is 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. Regrowth 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 annual 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. Average seeds/ft² at 1 lb. rate 3. Recommended pure stand seeding rate is 6 lb/ac.

Dropseed, Sand

Sporobolus cryptandrus

Sand dropseed is a warm season grass commonly found growing on sandy to gravelly to loamy soils in the Intermountain West. It most commonly grows at lower elevations and dry coarse soils in the 7 to 12 inch annual 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 can be used in seed mixtures on dry areas with coarse textured soils. Planting depth is 1/4 inch. No varieties for the Intermountain West have been released. Average seeds/ft² at 1 lb. rate 122. Recommended pure stand seeding rate is 1 lb/ac.

Fescue, Hard

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

Hard fescue is a very fine-leaved, low growing introduced bunch grass with poor palatability to livestock. It is widely used for turf, highway plantings, landing strips, burned over forestland and reclamation areas where a long-lived, persistent, competitive ground cover is needed. It is adapted to areas with 14 inches or greater annual 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/ft² 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 or more annual rainfall. 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 can be 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/ft² at 1 lb. rate is 10. Recommended pure stand seeding rate is 4 lb/ac.

Fescue, Red (Creeping)

Festuca rubra

Red fescue is a long-lived, slow developing, low growing, weakly rhizomatous, very competitive, fine leaved grass. Native and introduced varieties from North America and Europe are available. 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, erosion control and roadside stabilization. These grasses are not recommended for pasture or hayland production and are susceptible to disease and insects. Red fescue requires 18 inches of annual precipitation. There are over 200 releases of red fescue. Planting depth is 0-1/4 inch. Average seeds/ft² 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*

Sheep fescue is 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, landing strips, burned over forestland 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 12+ inch annual precipitation sites. 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 seeds/ft² is 16 at a 1 lb. rate. The recommended pure stand seeding rate is 4 lb/ac.

Fescue, Tall*Schedonorus phoenix or Festuca arundinacea*

Tall fescue is 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. Tall fescue is suited to irrigation, subirrigation, or moderately wet conditions, as well as dryland areas where the effective annual precipitation is over 18 inches. This species is adapted to 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 produces large quantities of forage with fertilization. It should only be recommended as a monoculture seeding or if used in a mixture, seeded in an alternate row planting because it is very competitive and tends to out-compete other species. 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 or eliminated by seeding with endophyte-free seed (forage production may be lower with endophyte free plants). Endophyte- infected varieties also have allelopathic effects on some legumes. Planting depth is 1/4 to 1/2 inch. Average seeds/ft² 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 and poorly drained sites with at least 18 inches of annual precipitation. It has low seedling vigor, but once established spreads readily by rhizomes. It is palatable to all classes of livestock. 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 produces abundant, quality forage on wet sites (with proper fertility). It is usually superior to other wet area pasture grasses such as reed canarygrass and timothy. Creeping foxtail 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: The seed is very light and fluffy and difficult to seed without the use of cracked corn, rice hulls, or other carrier. Planting depth is 1/8 to 1/4 inch. The average seeds/ft² at 1 lb. rate is 17. The recommend pure stand seeding rate is 3 lb/ac.

Galletta, James'*Pleuraphis jamesii*

Galletta is a perennial, warm season grass with strong rhizomes, but commonly is found growing in bunches. Galletta is commonly found between 3,500 and 7,500 feet elevation in 6-18 inch annual precipitation zones. It is adapted to a wide variety of soils but prefers neutral to moderately alkaline soils with low water holding capacity and coarse loamy texture. It is also adapted to fine textured soils, often found on clay soils where other grasses are rare. In the Colorado Plateau region of Utah it thrives on well-drained, sandy or rocky soils. It is a desirable forage for livestock during active plant growth in late spring and early summer. 'Viva' was selected and released at the Los Lunas, New Mexico Plant Materials Center in 1979 in cooperation with the New Mexico and Colorado State University Experiment Stations. Planting depth is 1/4 to 1/2 inch. Average seeds/ft² at 1 lb rate 6. Recommended pure stand seeding rate is 4 lb/ac.

Grama, Blue*Bouteloua gracilis*

Blue grama is a short statured warm season grass found throughout the Great Plains. Blue grama demonstrates good drought, fair salinity and moderate alkalinity tolerance. It grows well on soil types as varied as sandy to clayey in texture; however its growth is not as vigorous on true sands or clays. Blue grama is not tolerant of frequent flooding or submergence. It is also intolerant of shade and acidic soils. It is variably tolerant of fire and can be damaged if burned during active growth, especially under drought conditions. Blue grama grows at elevations of 3,500 feet up to 7,000

feet in New Mexico and has been reported growing at 10,000 feet. Forage production is best where annual precipitation is 12 to 14 inches and occurs during the warmest part of summer. Released varieties include 'Lovington', 'Hachita', 'Alma' and Bad River. Planting depth is 1/4 to 1/2 inch. Average seeds/ft² at 1 lb rate 16. Recommended pure stand seeding rate is 3 lb/ac.

Hairgrass, Tufted

Deschampsia cespitosa

Tufted hairgrass is 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 in areas with 18 or more inches annual precipitation. It is also used for livestock forage. It is slow to establish, but long-lived with moderate production. Varieties include 'Nortran', '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/ft² at 1 lb. rate 57. Recommended seeding rate is 1.5 lb/ac. Not recommended for pure stands.

Junegrass, Prairie

Koeleria macrantha or *K. cristata*

Prairie junegrass is 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. It is used in restoration seed mixtures and is also used for erosion control. It has good forage value for livestock and big game during the spring. It requires 14-20 inches annual precipitation. Wildland seed is available but request "Source Identified" seed. Average seeds/ft² at 1 lb. rate 49. The recommended pure stand seeding rate is 1 lb/ac. Not recommended for pure stands.

Needlegrass, Green

Nassella viridula or *Stipa viridula*

Green needlegrass is a cool season, medium to fine-leaved bunchgrass native to the Great Plains and portions of the Intermountain West. It is adapted to a wide range of soils, but prefers clayey soils in 14-24 inch annual precipitation areas. It is moderately palatable to livestock and wildlife. It has good drought tolerance. High seed dormancy is 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. 'Lodorm', 'Green Stipagrass' 'Fowler', 'AC Millard', and Cucharas Selected Germplasm are available releases. The average seeds/ft² at 1 lb. rate is 4. Recommended 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 annual 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/ft² 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 annual precipitation 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 evaluation for release by the Forest Service. Native seed mixtures should specify "Source Identified" seed. The average seeds/ft² 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 annual 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/ft² at 1 lb. rate is 3. Seeding rate is 6 lb/ac.

Orchardgrass

Dactylis glomerata

Orchardgrass is a long-lived, introduced bunchgrass, adapted to well-drained soils. It produces long folded leaves arising mostly from the plant base and large quantities of forage under proper management. It is 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 (minimal snow cover) 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 annual 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. There are numerous varieties available. Orchardgrass varieties are divided into two main categories; early maturing and late maturing. Late maturing varieties are best suited in mixtures with alfalfa. Early maturing varieties tend to have larger forage yields. Early-maturing varieties include 'Hallmark', 'Potomac' and 'Paiute'. Paiute is more drought tolerant (adapted to 16 inches of annual precipitation) than the other varieties. Late-maturing variety is 'Latar' (very compatible with alfalfa). Planting depth is 1/4 to 1/2 inch. Average seeds/ft² at 1 lb. rate 12. Recommend pure stand seeding rate is 4 lb/ac.

Ricegrass, Indian

Achnatherum hymenoides or *Oryzopsis hymenoides*

Indian ricegrass is a native perennial, very drought tolerant bunchgrass adapted to well-drained sandy to clay loam soils and dry desert ranges. Seed is very slow to germinate due to a thick seedcoat and embryo dormancy. To improve seed germination, the seed can be treated in sulfuric acid, mechanically scarified, or dormant fall planted (preferred) 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 6 inches or more annual precipitation zones with sandy or gravelly soils (10 inch plus annual rainfall areas result in the 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 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. Upland game birds and song birds readily utilize the seed. Good grazing management is necessary for stands to persist. 'Nezpar' is a northern variety with improved germination characteristics. 'Paloma' and Star Lake Selected Class are best adapted to southern semidesert areas. White River Selected Class is intended for use in Utah, southern Idaho, eastern Oregon and southeastern Washington. 'Rimrock' and Ribstone Germplasm are northern varieties selected for better seed retention characteristics. Average seeds/ft² at 1 lb. rate is 4. Recommend pure stand seeding rate is 8 lb/ac.

Ryegrass, Perennial

Lolium perenne

Perennial ryegrass is a relatively short-lived, introduced perennial bunchgrass adapted to a wide variety of soil conditions but thrives on dark, rich soils. Perennial ryegrass is best suited for irrigated sites in this region. 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 cannot pull plants out by the roots. Well established stands are productive for 3-5 years, if annual overseeding (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 80° 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 1/2 to 3/4 inch. Perennial ryegrasses are divided into diploid and tetraploid varieties. Tetraploid varieties tend to be more upright and somewhat better forage producers. Diploid varieties tend to be more persistent under grazing. New Zealand varieties generally tend to grow earlier in the spring and later into the fall and New Holland varieties generally go dormant earlier in the fall. Due to the large number of varieties on the market, it is recommended that you consult a seed supplier in your area for up-to-date information on varieties and blends that are best suited for your area. Average seeds/ft² at 1 lb. rate 6. Recommended 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 to establish and grows in areas with saline-alkali to rocky to semiarid soils as low as 10 inches annual precipitation commonly with a high watertable present. It is used mainly for erosion control, forage plantings and increased diversity in adapted areas. Cultivars released for southwestern states include Vegas Germplasm, 'Salado' and 'Saltalk'. 'Saltalk' is considered more winter hardy. Average seeds/ft² at 1 lb. rate is 39. Seeding rate is 1 lb/ac.

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

Big squirreltail is a short-lived perennial, drought tolerant, cool season, native bunchgrass. It is short to medium sized (6 to 22 inches tall), tufted and has fair forage value in winter and spring and poor forage value in summer when seedheads are present. The bristly awns are objectionable to grazing animals and cause difficulties in seed handling, planting and harvesting. This species is often an increaser on poor to fair condition rangelands. It is adapted to a wide variety of soils including saline soils in the 12-20 inch annual 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. Planting depth is 1/4 to 1/2 inch. Sand Hollow Selected Germplasm (*E. multisetus*) was released in 1996. It is considered to be adapted to the mountain foothills of the Snake River Plain of Idaho and adjacent regions of Oregon, Nevada and Utah. Average seeds/ft² at 1 lb. rate is 4. Seeding rate is 7 lb/ac.

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

Bottlebrush squirreltail is a short-lived perennial, drought tolerant, cool season, native bunchgrass. It is short to medium sized (6 to 22 inches tall), tufted and has fair forage value in winter and spring and poor forage value in summer when seedheads are present. The bristly awns are objectionable to grazing animals and cause difficulties in seed handling, planting and harvesting. This species is often an increaser on poor to fair condition rangelands. It is adapted to a wide variety of soils including saline soils in the 8-18 inch annual 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. Toe Jam Creek Selected Germplasm (*E. elymoides* ssp. *californicus*) is adapted to loam to sandy loam soils in the northern Great Basin and lower to middle Snake River Plains receiving 8-14 inches of annual precipitation. Fish Creek Selected Germplasm (*E. elymoides* ssp. *elymoides*) 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. Other available releases include Rattlesnake Germplasm, Pueblo Germplasm, Wapiti Germplasm, Pleasant Valley Germplasm, Antelope Creek Germplasm, and Tusas Germplasm. Average seeds/ft² at 1 lb. rate is 5. Seeding rate is 7 lb/ac.

Switchgrass*Panicum virgatum*

Switchgrass is a perennial, warm season, 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, requiring a minimum of 16 inches annual precipitation. It provides excellent wildlife cover, and seed is utilized as food by songbirds and game birds. It provides excellent late summer forage for livestock and is being used for biofuel applications in the Midwest and eastern U.S. There may be a small niche for this species in the corn producing areas of the Intermountain West under irrigation as a mid-summer forage. It will not exceed forage production of other irrigated forage varieties including orchardgrass and meadow brome. The best-performing winter hardy cultivars tested in Idaho, Nevada and Utah is 'Blackwell' and 'Cave-In-Rock'. Other releases include 'Dakotah', 'Forestburg' and 'Sunburst'. Average seeds/ft² at 1 pound rate is 10. Seeding rate is 4 lb/ac.

Three-awn, Purple*Aristida purpurea*

Purple three-awn is a native perennial bunchgrass. It is not considered highly palatable but is grazed in early spring by livestock. The long awns can cause injuries as the flowers mature. This species has been established in low precipitation sites in the Intermountain Region on disturbed roadways and mined sites. Average seeds/ft² at 1 lb. rate is 6. Seeding rate is 4 lb/ac. Planting depth is 1/2 to 1 inch.

Timothy*Phleum pratensis*

Timothy is an introduced, short-lived, bunchgrass adapted to cool, humid areas. It performs well with moderate to high forage 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. Regrowth is very slow following grazing or haying. It is adapted to high elevations and areas where effective annual 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. There are many proprietary varieties grown under contract for seed companies. The average seeds/ft² at 1 lb. rate is 28. Recommend pure stand seeding rate is 3 lb/ac.

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

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 annual 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/ft² at 1 lb. rate is 3. The recommended pure stand seeding rate is 8 lb/ac.

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

Bluebunch wheatgrass is a long-lived, drought-tolerant, native bunchgrass common to the Intermountain region, Great Plains, and Northern Rocky Mountains. It begins growth early in spring and again with the onset of fall rains. It is highly palatable and recovers rapidly after grazing but has low resistance to repeated or heavy grazing. It is not recommended as a hay crop. Several years are required for stand to obtain full productivity due to poor seedling vigor. Allow seedlings to reach maturity (seedhead development) before grazing. Recommended sites include foothills and valleys with 10-20 inches annual 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/ft² at 1 lb. rate is 3. Recommend pure stand seeding rate is 8 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 annual 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. 'Ephraim' is weakly rhizomatous in higher rainfall areas. 'Roadcrest' is significantly more rhizomatous than Ephraim and is recommended for roadsides and low maintenance turf applications. '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 annual 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. Other cultivars available but less adapted include 'Parkway' and 'Ruff'. The average seeds/ft² at 1 lb. rate is 4. Recommended pure stand seeding rate is 5 lb/ac.

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

Standard type crested wheatgrass is a very long-lived, drought tolerant, introduced bunchgrass adapted to a wide range of sites and annual precipitation zones as low as 9 inches (more drought tolerant than fairway types). 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. Planting depth is 1/4 to 1/2 inch. Adapted varieties are 'Nordan' and 'Summit'. Average seeds/ft² at 1 lb. rate 4. Recommend pure stand seeding rate is 5 lb/ac.

Wheatgrass, Crested (hybrid cross between fairway and standard types)*Agropyron cristatum x A. desertorum*

This 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 and is especially useful in drier sagebrush - cheatgrass sites and survives in areas with 9-16 inches annual 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/ft² at 1 lb. rate 4. Recommended pure stand seeding rate is 5 lb/ac.

Wheatgrass, Intermediate*Thinopyrum intermedium, 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 is very useful as fall-

winter forage. 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 12-18 inches or more of annual 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 because of its heavy root production. 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 forage production; 'Oahe' with improved seed production, forage yield, and rust resistance; 'Manifest' for forage and seed yield; and, 'Tegmar', a low growing cultivar noted for erosion control, sod-formation and seedling vigor. Average seeds/ft² at 1 lb. rate 2. Recommended pure stand seeding rate is 10 lb/ac.

Wheatgrass, Pubescent

Thinopyrum intermedium, 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 annual 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. Suggested varieties are 'Luna' (most commonly used), 'Manska' and 'Greenleaf'. Average seeds/ft² at 1 lb. rate 2. Recommend pure stand seeding rate is 10 lb/ac.

Wheatgrass, RS Hybrid

Elymus hoffmanii or Pseudoroegneria spicata x Elytrigia repens

RS Hybrid wheatgrass is a hybrid cross between quackgrass and bluebunch wheatgrass. RS Hybrid wheatgrass 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 wheatgrass is not as productive as tall wheatgrass or tall fescue, but forage quality is significantly better. RS Hybrid wheatgrass is noted for tolerance to moderate – high levels of salinity and responds to irrigation, sub-irrigation or moderately wet conditions, and dryland areas where effective annual precipitation is 13 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' (salinity tolerance equal to tall wheatgrass) are available. Average seeds/ft² at 1 lb. rate 3. Recommended pure stand seeding rate is 8 lb/ac.

Wheatgrass, Siberian

Agropyron fragile or A. sibiricum

Siberian wheatgrass is a long-lived, introduced, drought tolerant, cool season bunchgrass 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 (8-16 inches of annual precipitation). It is 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', 'Vavilov II' (improved seedling vigor), and 'Stabilizer'. Average seeds/ft² 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. Adapted releases include Copperhead Selected Class Germplasm, 'First Strike', 'Pryor' and 'San Luis'. Average seeds/ft² at 1 lb. rate 3.0. Recommended pure stand seeding rate is 6

lb/ac. Limit slender wheatgrass to 1- 2 pounds PLS per acre in native mixtures as higher rates can limit the establishment of slower developing native species in a seed mixture.

Wheatgrass, Snake River

Elymus wawawaiensis

Snake River wheatgrass is a native bunchgrass of the lower canyons of the Snake River and its tributaries in Washington, eastern Oregon, and western to northern Idaho but is widely used as a surrogate for bluebunch wheatgrass because of its drought tolerance. 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 lower annual precipitation areas (8 to 13 inches). Two varieties are available; 'Discovery' and 'Secar' are early maturing bunchgrasses with good seedling vigor. They establish well in native seed mixtures. Average seeds/ft² at 1 lb. rate is 3. Recommended pure stand seeding rate is 8 lb/ac.

Wheatgrass, Streambank

Elymus lanceolatus ssp. *lanceolatus* or *Agropyron riparium*

Streambank wheatgrass is a native, 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 annual 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/ft² at 1 lb. rate 3. Recommended 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 elongate* 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 matures later than other wheatgrass species. Palatability is fair early in the growing season, but mature plants become very unpalatable and must be managed for forage 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 annual rainfall zones or sites with high watertables) and is useful for erosion control on critical areas. It 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 sagebrush, mountain brush, and juniper sites where its drought tolerance is evidenced. Planting depth is 1/2 to 3/4 inch. Adapted varieties are 'Alkar' (northern areas), 'Jose' (southern areas), and 'Platte' (Great Plains - not tested in west). Average seeds/ft² at 1 lb. rate 2. Recommended 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*, *E. lanceolatus* or *Agropyron dasystachyum*

Thickspike wheatgrass is 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. It is more drought tolerant than western wheatgrass and 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 annual precipitation zones as a component of a native seed mix. Planting depth is 1/4 to 1/2 inch. Improved varieties include 'Bannock', and 'Critana'. 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/ft² at 1 lb. rate is 3. Recommend pure stand seeding rate is 6 lb/ac.

Wheatgrass, Western

Pascopyrum smithii or *Agropyron smithii*

Western wheatgrass is 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. Once established, it becomes very persistent and provides excellent soil binding erosion control characteristics. It is a productive native hay in above normal precipitation years or with supplemental irrigation. It is particularly productive in clayey swales and silty waterways, and has moderate to high salt tolerance. It is 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) to 20 plus inches of annual rainfall. Planting depth is 1/4 to 1/2 inch. Adapted varieties include 'Recovery' (northern variety), 'Rosana' (northern variety), 'Rodan' (northern variety), and 'Arriba' (southern variety). Other releases include 'Barton' (southern variety), and 'Flintlock' (southern variety). Average seeds/ft² at 1 lb. PLS rate is 3. Recommended pure stand seeding rate is 8 lb/ac. Because of its strong spreading characteristic, it should be limited to no more than 50 percent in a seed mixture.

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 coarse, but very palatable during the late summer and early fall (protein levels of 8 percent are common in standing winter-feed). It is typically not harvested as hay because of the difficulty in harvesting. It is adapted to moderately deep to deep loams to clay loams with 14 inches or greater annual precipitation. It can withstand and is almost as productive on saline soils similar to tall wheatgrass. Seedlings develop slowly and good seedbed preparation and weed control is essential. Planting depth is 1/4 to 1/2 inch. 'Eejay', 'Pearl', 'Mustang' and 'Prairieland' are released varieties. Average seeds/ft² 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 that is tall, coarse, long-lived, and highly palatable early in spring, becoming low in palatability as it matures. It is useful as wind protection for calving pasture and wildlife forage and cover. Poor seedling vigor usually results in sparse stands, but is one of the highest forage producing species once established. Do not graze new seedlings 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 during winter grazing when protein supplements are provided. It is best adapted to moderately saline or sodic lowlands, flood plains, and in areas with high water holding capacity and is especially suited to deep, fine textured clayey to loamy soils that receive 8-18 inches annual 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. It is particularly well suited for juniper areas and it performs well throughout the mountain brush zone and in aspen openings as well as for erosion control and wildlife habitat plantings. 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 Selected Class germplasm was selected for high tolerance to acidic conditions and should be useful in mine reclamation situations. Average seeds/ft² 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 annual precipitation areas. This species is noted for its high seed production and rapid stand establishment. Planting depth is 1/4 to 1/2 inch. Two Intermountain West adapted varieties have been released by the Pullman PMC. They include Union Flat Germplasm adapted to the Palouse region of northern Idaho and eastern Washington and White Pass Germplasm adapted to the eastern slopes of the Cascade Mountains. Northwest coastal releases, 'Arlington' and 'Elkton' are not recommended for use in the Intermountain West. Average seeds/ft² at 1 lb. rate is 3. Recommended pure stand seeding rate is 8 lb/ac. It should not make up more than 50 percent of a native seed mixture because of its short life span.

Wildrye, Canada

Elymus canadensis

Canada wildrye is a short-lived cool season bunchgrass native to North America in the 15-inch and greater annual 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 10 lb/ac. It should not make up more than 50 percent of a native seed mixture because of its short life span.

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 as wind protection 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 annual precipitation. It is available as seed, but can also be established vegetatively with sprigs. 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. Planting depth is 1/2 to 3/4 inches. Average seeds/ft² at 1 lb. rate is 1. The recommended seeding rate is 15 lb/ac.

Wildrye, Manystem (Beardless)

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 annual 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. On sites that are saturated or under standing water in the spring or early summer, sprigging of vegetative rhizomes during drier conditions in fall may be accomplished. 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. Average seeds/ft² at 1 lb. rate is 3. 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. It 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. It also is used in green strips or vegetative fuel breaks because it stays greener longer into the growing season than most other grasses and tends to exclude competition from other plants in established stands. Russian wildrye is not suited for hay production due to the predominance of drooping 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. A firm, clean seedbed and shallow seeding depth is extremely important to establish Russian wildrye. Plant this species in areas receiving at least 8 inches of annual 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 is 0 to 1/4 inch; and it is very sensitive to deeper placement. Wide row spacing of ≥ 18 inches is recommended and results in the highest potential forage production. On steep slopes it should be planted on the contour. Canadian releases include 'Swift', which was selected for improved seedling emergence, 'Cabree', selected both for reduced seed shattering, 'Mayak' selected for high forage and seed yields and 'Tetracan' for improved seedling vigor and emergence from deeper seeding depth. U.S. releases include 'Bozoisky-Select' and 'Bozoisky II' which were selected for increased seedling vigor and forage production and 'Mankota', selected for improved forage yields. In plantings in the Intermountain West, Bozoisky-Select, Bozoisky II and Mankota 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/ft² at 1 lb. rate is 4. The recommended pure stand seeding rate is 6 lb/ac.

WETLAND GRASS-LIKE PLANTS

Descriptions for additional species recommended for wetland and riparian zones can be found in Idaho Plant Materials TN 38 “Description, Propagation and Establishment of Wetland – Riparian Grass and Grass-Like Species for 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. 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. Wildland seed collection and plug propagation for transplanting 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 of deep water. It tolerates alkaline, saline and brackish soils. It may 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. 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. Wildland seed collection and plug propagation for transplanting 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. Fluctuate water levels for establishment. Wildland seed collection and plug propagation for transplanting is recommended. Nursery-grown container plants may be available.

Rush, Baltic

Juncus arcticus ssp. *littoralis* or *J. balticus*

Baltic rush is a short statured, 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. Fluctuate water levels for establishment. Wildland seed collection and plug propagation for transplanting 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. Fluctuate water levels for establishment Wildland seed collection and plug propagation for transplanting 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. Fluctuate water levels for establishment. Wildland seed collection and plug propagation for transplanting is recommended. Nursery-grown container plants may be available.

Sedge, Water*Carex aquatilis*

Water sedge is a medium sized, long-lived, perennial, moderately rhizomatous, 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. Fluctuate water levels for establishment. Wildland seed collection and plug propagation for transplanting 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. Wildland seed collection and plug propagation for transplanting 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. Fluctuate water levels for establishment. Wildland seed collection and plug propagation for transplanting is recommended. Nursery-grown container plants may be available.

LEGUMES AND FORBS

Alfalfa and yellow blossom alfalfa

Medicago sativa and *M. sativa* ssp. *falcata*

A very productive, palatable perennial introduced legume with numerous varieties that have specific characteristics for given purposes. Suited for use as hay, pasture, or pollinator plantings under irrigation or on dryland where the effective annual 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. Creeping 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 increases tolerance to close grazing or haying, increases number of Rhizobium nodules present improving nitrogen fixation, and improves forage 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 sagebrush, juniper, mountain brush, and ponderosa pine sites. It does poorly at higher elevations and areas with a high watertable. 'Ladak', 'Trevois', 'Rambler', 'Ranger', 'Spreador', and 'Nomad' are commonly used for low precipitation sites including juniper, sagebrush and mountain brush areas. Irrigated varieties are less drought tolerant than dryland varieties.

Falcata alfalfa (yellow blossom alfalfa) should also be considered for low precipitation sites. The recommended Falcata releases are Don, Yellowhead and SD201. 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 Forest Service are working with alfalfa in hopes of selecting more drought tolerant rangeland varieties. New varieties are being developed 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/ft² 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, Gray (Blue)

Eurybia glauca or *Aster glaucodes*

Gray aster is a native perennial forb that commonly occurs in all vegetative types from the upper sagebrush-grass to the subalpine with a minimum of 10 inches annual precipitation. 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 plant 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/ft² at 1 lb. rate is 18. Pure stand seeding rate is 3 lb/ac. Not recommended in pure stands.

Aster, Western

Symphotrichum ascendens

Western aster is a rhizomatous perennial forb common to sagebrush, rabbitbrush and pinyon juniper communities with a minimum of 14 inches annual precipitation. It is frequently found in wetter sites at low elevations including riparian areas in cottonwood and willow communities and in ornamental hanging gardens. At higher elevations it is found in mountain brush, aspen and spruce-fir communities. Western aster is a valuable species for attracting native pollinators. It is visited by native bees and butterflies. Planting depth is 0 to 1/4 inch in a firm, weed-free seedbed. Average seeds/ft² at 1 lb. rate 46. Pure stand seeding rate is 1 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 (14 inch + annual precipitation zones), 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 during the spring. It has good pollinator characteristics, yellow colored flowers, blooms from May through June and attracts bees and butterflies. It is very difficult to attain good stands of this species because of its extremely slow establishment characteristics which can take up to 8 years. Fall seeding is recommended. Seed can be drilled or broadcast but should not be covered more than 1/4 inch deep. Average seeds/ft² at 1 lb. rate 1. Pure stand seeding rate is 18 lb/ac. Not recommended in pure stands.

Balsamroot, Carey's*Balsamorhiza careyana*

This native forb has a slow growth rate, an upright growth habit and grows to a height of 1-2 feet. It has low to moderate water requirements at 8-20 inches or greater annual precipitation. It does best in full sun. It has numerous fragrant, yellow colored flowers that flower in April-May attracting bees. Planting depth is 0-1/4 inch. Average seeds/ft² at 1 lb. rate 1.2. Pure stand seeding rate is 18 lb/ac. Not recommended in pure stands.

Balsamroot, Cutleaf*Balsamorhiza macrophylla*

Cutleaf balsamroot is a native perennial forb found in the Rocky Mountain subalpine and upper montane grasslands and on montane sagebrush steppe. It is most abundant on well-drained soils ranging from clay to gravelly in texture. It is found from 4,500 to 7,000 feet elevation in areas receiving 14 to 40 inches annual precipitation. Drill or broadcast seed at a depth of 0-1/4 inches. Pure stand seeding rate is 18 lb/ac. Average seeds/ft² at 1 lb rate 1.

Balsamroot, Hooker's*Balsamorhiza hookeri*

Hooker's balsamroot is similar in appearance to cutleaf balsamroot but has shorter leaves. Hooker's balsamroot occurs in sagebrush, pinyon-juniper and mountain brush communities receiving 9-20 inches annual precipitation. Planting depth is 0-1/4 inch. Average seeds/ft² at 1 lb. rate 1. Pure stand seeding rate is 18 lb/ac. Not recommended in pure stands.

Beeflower, Yellow*Cleome lutea*

This native annual species inhabits western foothills, plains, roadsides and disturbed areas. It has low to moderate water requirements at 8-12 inches annual precipitation. It does best in full sun. It grows from 24-36 inches with numerous fragrant, yellow colored flowers that flower in May-June, attracting bees and butterflies. Seed should be planted at 0-1/4 inches. Average seeds/ft² at 1 lb. rate is 2.3. Pure stand seeding rate is 11 lb/ac. Not recommended in pure stands.

Beeplant, Rocky Mountain*Cleome serrulata*

Rocky Mountain beeplant is a native annual species that inhabits western foothills, plains, roadsides and disturbed areas. It has low to moderate water requirements at 13 inches or greater annual precipitation. It does best in full sun. It grows from 12-72 inches tall with numerous fragrant, pink to purple colored flowers that bloom in summer to fall, attracting bees and butterflies. Seed at 0-1/8 inch depth. Average seeds/ft² at 1 lb. rate 1.5. Pure stand seeding rate is 17 lb/ac. Not recommended in pure stands.

Bergamot, Wild (Bee Balm)*Monarda fistulosa*

Wild bergamot is a native perennial forb with fragrant leaves and flowers adapted to areas receiving 20 to 60 inches of annual precipitation. Bees, butterflies and hummingbirds use the plant for nectar. Seed should be sown on the surface to 1/8 inch depth. Average seeds/ft² at 1 lb. rate is 30. Pure stand seeding rate is 2 lb/ac. Not recommended in pure stands.

Biscuitroot, Bigseed*Lomatium macrocarpum*

Bigseed biscuitroot is a native deep taprooted perennial forb adapted to sites receiving 8-16 inches annual precipitation. Seed should be sown from 1/8-1/2 inch deep. Average seeds/ft² at 1 lb rate is 2. Pure stand seeding rate is 11 lb/ac. Not recommended in pure stands.

Biscuitroot, Fernleaf*Lomatium dissectum*

Fernleaf biscuitroot is an important pollinator plant attracting bees, flies, beetles and butterflies and is considered an important insect host species for sage-grouse. It grows in areas receiving 14 to 30 inches annual precipitation. Seed should be sown 1/8-1/2 inch deep. Average seeds/ft² at 1 lb rate is 1. Pure stand seeding rate is 24 lb/ac. Not recommended in pure stands.

Biscuitroot, Gray's*Lomatium grayi*

Gray's biscuitroot is a native deep taprooted perennial forb adapted to sites receiving 8-16 inches annual precipitation and is also considered an important insect host plant for sage-grouse. Seed should be sown from 1/8-1/2 inch deep. Average seeds/ft² at 1 lb rate is 1. Pure stand seeding rate is 24 lb/ac. Not recommended in pure stands.

Biscuitroot, Nineleaf*Lomatium triternatum*

Nineleaf biscuitroot is a native, relatively long-lived forb. It is considered an important pollinator species that flowers from May-July. The yellow-green colored flowers attract bees, flies, beetles and butterflies. It is adapted to sites receiving 12-20 inches annual precipitation. It is an important insect host species important to sage grouse. Average seeds/ft² at 1 lb. rate 1. Pure stand seeding rate is 24 lb/ac. Not recommended in pure stands.

Blackeyed Susan*Rudbeckia hirta*

Black-eyed Susan is a biennial forb about 3 feet tall with yellow ray flowers and dark brown spherical centers. This plant offers protection and food to several song and game birds. 28-65 inches annual precipitation is required. Seeding depth is 1/8 to 1/4 inch. Average seeds/ft² at 1 lb. rate 37. Pure stand seeding rate is 1 lb/ac. Not recommended in pure stands.

Blanketflower*Gaillardia aristata*

Blanketflower is a perennial native forb from 12-18 inches tall with solitary, large daisy-like, yellow and sometimes reddish colored flowers. It is drought tolerant and adapted to areas receiving at least 16 inches of annual precipitation. It prefers moderately deep to deep coarse to medium loamy soils and partial to full sun. It is an excellent pollinator plant and blooms from late June through September. Seeding depth is 1/4 to 1/2 inch. Average seeds/ft² at 1 lb. rate 4.3. Pure stand seeding rate is 5 lb/ac. Not recommended in pure stands.

Blazingstar, Dotted*Liatris punctata*

Dotted blazingstar is a long-lived native forb that grows from 8-48 inches tall. It requires at least 18 inches of annual precipitation. Flowering stems are single or in clusters from a woody base. They are considered good pollinator plant and attract bees and butterflies. Seeding depth is 1/8 to 1/4 inch. Average seeds/ft² at 1 lb. rate is 3. Pure stand seeding rate is 8 lb/ac. Not recommended in pure stands.

Blazingstar, Prairie*Liatris pycnostachya*

Prairie blazingstar is a long-lived forb native to the Midwestern U.S. It grows from 8-48 inches tall and requires 16-30 inches of annual precipitation. Flowering stems are single or in clusters from a woody base. It is considered a good pollinator plant and attracts bees and butterflies. Seeding depth is 1/8 to 1/4 inch. Average seeds/ft² at 1 lb. rate is 3. Pure stand seeding rate is 9 lb/ac. Not recommended in pure stands.

Blazingstar, Smoothstem*Mentzelia laevicaulis*

Smoothstem blazingstar is a native biennial or short-lived perennial with a deep taproot and a single, branched stem. Smoothstem blazingstar is a source of nectar and pollen for native bees, butterflies and moths. Seed should be drilled to 1/4-1/2 inch. Adapted to areas with medium to coarse grained soils in areas receiving 7 to 15 inches annual precipitation. Seeding depth is 1/4 to 1/2 inch. Average seeds/ft² at 1 lb. rate is 7. Pure stand seeding rate is 4 lb/ac. Not recommended in pure stands.

Burnet, Small*Sanguisorba minor*

Small burnet is a perennial semi-evergreen introduced forb, growing to 2 feet tall. It has moderate forage production and is non-leguminous, deep-rooted, and has good palatability. Growth is most vigorous during the spring and fall if rainfall occurs. It is best adapted to well-drained soils in the sagebrush-grass and juniper areas with a minimum of 15 inches annual precipitation. 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 annual 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 plant and blooms from mid spring into mid-summer and is considered a good nectar producer. 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/ft² at 1 lb. rate 1. Recommended pure stand seeding rate is 26 lb/ac.

Cardinalflower*Lobelia cardinalis*

Cardinalflower is a native perennial forb with bright red flowers. It is a very attractive nectar source for hummingbirds and is adapted to sites with 28 or more inches annual precipitation. Seed at 0 to 1/8 inch depth. Average seeds/ft² at 1 lb. rate is 250. Pure stand seeding rate is 0.2 lb/ac. Not recommended in pure stands.

Cinquefoil*Potentilla* spp.

Cinquefoil species are rapidly establishing, upright, native forbs growing from 1-3.5 feet in height. They do best in high rainfall areas with 18 inches or more annual precipitation or under moist to saturated soil conditions. They are considered good pollinator plant. The white to yellow flowers attract bees and butterflies from June-July. There are a multitude of species of cinquefoil. Seed is known to be available for tall cinquefoil (*P. arguta*) and bigflower cinquefoil (*P. fissa*). Average seeds/ft² at 1 lb. rate is 40-100. Pure stand seeding rate 0.5-2 lb/ac. Not recommended in pure stands.

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 plant that blooms in spring. It produces best when used in mixtures (limit to 25 percent in forage mixtures to prevent bloat) with grasses suited for hay or pasture under irrigation or on dryland where the effective annual 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 and is not shade tolerant. 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 varieties are 'Aurora' and 'Dawn'. Average seeds/ft² at 1 lb. rate is 16. Pure stand seeding rate 3 lb/ac. Recommended 25% mixed stand seeding rate is 0.75 lb/ac for grazing situations.

Clover, Red*Trifolium pratense*

Red clover is a short-lived (2-3 years) biennial/perennial, introduced legume suited primarily for hay and silage under irrigation or on dryland where the effective annual precipitation is 25 inches or more. It is a good pollinator plant especially for bumblebees 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 with soil pH of 6.0 or higher. It is compatible with cool season 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 year. Adapted varieties are 'Pennscoff', 'Chesapeake', 'Kenland', and 'Dollard'. Average seeds per ft² at 1 lb. rate 6. Pure stand seeding rate 6 lb/ac. Recommended 25% mixed stand (to prevent bloat) seeding rate is 1.5 lb/ac for grazing situations.

Clover, Strawberry*Trifolium fragiferum*

Strawberry clover is a spreading, pasture-type, perennial legume suited for use under irrigation or semi-wet to wet saline and alkaline soils. It is not adapted to dryland conditions. It is a good pollinator plant and blooms in spring. It is 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. Common strawberry clover is reported to be self-fertile but the variety Salina is reported to be self-sterile and needs cross pollination. Placing colonies of honey bees near fields will help increase seed yields. Planting depth is 1/4 inch or less. Average seeds/ft² at 1 lb. rate is 7. Pure stand seeding rate is 4 lb/ac. Recommended 25% mixed stand (to prevent bloat) seeding rate is 1 lb/ac for grazing situations.

Clover, White*Trifolium repens*

White clover is 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 annual precipitation is 18 inches or more. It is best adapted to clay and silt soils in moist areas. It requires medium to high fertility and adequate moisture for optimum production. Dry soils limit establishment and persistence and lack of winter hardiness and lack of snow cover also limits use of white clover. It is a good pollinator plant especially for honey bees and blooms in spring. It may present a bloat hazard when it represents a high percentage of the pasture. It 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. 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 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; 'New York' is the most drought resistant type. Average seeds/ft² at 1 lb. rate is 18. Pure stand seeding rate is 4 lb/ac. Recommended 25% mixed stand (to prevent bloat) seeding rate is 1 lb/ac for grazing situations.

Columbine*Aquilegia spp.*

Columbine are perennial forbs 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 annual precipitation. It prefers moderately deep to deep coarse to medium loamy soils and partial to full sun. It is an excellent pollinator plant and blooms from spring through midsummer. Cultivated hybrid varieties are available but should not be used for pollinator plantings. Average seeds/ft² at 1 lb. rate 9. Pure stand seeding rate is 3 lb/ac. Not recommended in pure stands. It is difficult to establish by direct seeding under field conditions.

Coneflower, Prairie (Mexican hat)*Ratbida columnifera*

Prairie coneflower is a native forb requiring slight shade to full sun and 16 inches or more annual precipitation. The single-borne yellow-orange colored flowers are found on stems from 12-18 inches tall. It blooms in June-August. It is well adapted to prairie grasslands habitats. It prefers medium to fine textured soils. Seeding depth ¼-1/2 inch. Average seeds/ft² at 1 lb. rate 17. Pure stand seeding rate is 3 lb/ac. Not recommended in pure stands.

Coneflower, Purple*Echinacea purpurea*

Purple coneflower is a drought tolerant (14 inch + annual precipitation) forb native to the Midwest requiring slight shade to full sun. The single-borne purple colored flowers are found on long stems from 6-24 inches tall and bloom in summer-early fall. It is well adapted to prairie grasslands to moist forest habitats. It prefers medium textured soils. Seeding depth is 1/8-1/4 inch Average seeds/ft² at 1 lb. rate 3. Pure stand seeding rate is 9 lb/ac. Not recommended in pure stands.

Crownbeard, Golden*Verbesina encelioides*

Golden crownbeard is a native annual forb 16 to 30 inches tall with yellow colored composite flowers. Crownbeard is adapted to sites receiving 10 to 20 inches annual precipitation. Average seeds/ft² at 1 lb. rate 8. 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 strong rhizomes and deep taproot system. This legume does well in sites that 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. There is little to no bloat hazard in grazing crownvetch. It is considered a good pollinator plant, attracting bees to its white-pink colored flowers in May-June. The strong spreading fleshy rhizomes enable this species to be an excellent soil stabilizer. Crownvetch does well seeded as a component of a mixture but often becomes weedy. It requires fall seeding 1/4-1/2-inch deep and seedling vigor is poor. Seed inoculation is required in order to fix nitrogen. 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 root spreader. Average seeds/ft² at 1 lb. rate is 3. Pure stand seeding rate is 8 lb/ac. Recommended 25% mixed stand seeding rate is 2 lb/ac for grazing situations.

Dustymaiden, Douglas'*Chaenactis douglasii*

Douglas' dustymaiden is a native biennial-perennial forb with a medium upright growth rate, 6-18 inches tall with flowering stems to 25 inches tall. The composite flowers are white to pinkish colored. It is an excellent pollinator species that attracts bees in June-July. It is adapted to medium to coarse soils with a pH of 4.2-8.0. It is found in a variety of plant communities including shadscale, sagebrush, pinyon-juniper, mountain brush and pine-fir forests receiving 9-30 inches or more annual precipitation. Seeding depth is 0-1/8 inch. Average seeds/ft² at 1 lb. rate is 8. Pure stand seeding rate is 3 lb/ac. It is recommended as component in pollinator seed mixtures at 10 percent or less of the mix.

Fireweed*Chamerion angustifolium or Epilobium angustifolium*

Fireweed is a native perennial, rhizomatous forb with a rapid upright growth rate, 2-4 feet tall in areas receiving 18 + inches annual precipitation. It is an excellent pollinator plant with pink to purple colored flowers that are attractive to bees in June-September. Seeding depth 0-1/8 inch. Average seeds/ft² at 1 lb. rate is 149. Pure stand seeding rate is 0.5 lb/ac. It is recommended as component in pollinator seed mixtures at 10 percent or less of the mix.

Flax, Blue*Linum perenne*

Blue flax is an introduced, short-lived 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 10-20 inch annual 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. Although plants are short-lived, seed production will maintain the species in a plant community. 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/ft² at 1 lb. rate is 8. Pure stand seeding rate is 4 lb/ac. Not recommended in pure stands.

Flax, Lewis*Linum lewisii*

Lewis flax is a native, short-lived 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 10-20 inch annual 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 in seed 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 but is not as competitive as blue flax. Maple Grove Selected class germplasm is a native release by the Forest Service and NRCS Aberdeen PMC. Average seeds/ft² at 1 lb. rate is 5. Pure stand seeding rate is 4 lb/ac. Not recommended in pure stands.

Fleabane, Aspen*Erigeron speciosus*

Aspen fleabane is an upright native forb with slow growth rate that grows 24-36 inches tall and requires a minimum of 18 inches annual precipitation. It is considered a good pollinator plant for bees and butterflies. Flowering occurs from June-July. Seeding depth 1/8-1/4 inch. Average seeds/ft² at 1 lb. rate is 44. Pure stand seeding rate is 1 lb/ac. Not recommended in pure stands.

Fleabane, Engelmann's*Erigeron engelmannii*

Engelmann's fleabane is an upright native forb growing 9-12 inches tall. It is considered a good pollinator plant for bees and butterflies in areas with 8-20 inches annual precipitation. Flowering occurs from June-July. Seeding depth 1/8-1/4 inch. Average seeds/ft² at 1 lb. rate is 23. Pure stand seeding rate is 2 lb/ac. Not recommended in pure stands.

Fleabane, Shaggy*Erigeron pumilus*

Shaggy fleabane is a low growing native forb growing 4-12 inches tall. It is considered a good pollinator plant for bees and butterflies. This species is adapted to sites with 6-17 inches annual precipitation. Flowering occurs from June-July. Seeding depth 1/8-1/4 inch. Average seeds/ft² at 1 lb. rate is 41. Pure stand seeding rate is 1 lb/ac. Not recommended in pure stands.

Geranium, Sticky*Geranium viscosissimum*

Sticky geranium is a native perennial forb that grows 12-36 inches in height. It has sticky glandular hairs that densely cover the stems and leaves. The 5 petaled purple to pinkish white colored flowers occur in clusters near the top of the plant. It flowers from May-June. It requires 16 inches or more annual precipitation and prefers medium textured soils. Seeding depth 1/4-1/2 inch. Average seeds/ft² at 1 lb. rate is 1.3. Pure stand seeding rate is 20 lb/ac. Not recommended in pure stands.

Gilia, Scarlet*Ipomopsis aggregata*

Scarlet gilia is an erect native forb growing 12-36 inches tall. It can be found in a variety of plant communities from sagebrush to spruce-aspen sites in areas receiving 13-40 inches annual precipitation. The tubular red flowers are visited

by hummingbirds and moths. Seed should be planted on the surface from 0-1/8 inch. Average seeds/ft² at 1 lb. rate is 8. Pure stand seeding rate is 3 lb/ac. Not recommended in pure stands.

Globemallow

Sphaeralcea spp.

Gooseberryleaf, Munro's and Scarlet globemallow are drought tolerant perennial native forbs that occur throughout juniper, sagebrush-rabbitbrush, shadscale, salt desert shrub and blackbrush plant communities. Greatest area of occurrence is between 6 and 14 inches annual precipitation. Livestock and big game make fair to good use of these species. They green up early in the spring and following summer and fall rain storms. They are good pollinator plants and bloom in mid April-June. These species have limited success when seeded on disturbed sites. Dormant fall seeding is recommended. A hard waxy seed coat often prevents germination and various seed scarification treatments have been evaluated with variable results in germination rates. Seed should not be planted deeper than 1/4 inch. Average seeds/ft² at 1 lb. rate is 17. Pure stand seeding rate is 2 lb/ac. Not recommended in pure stands.

Goldenaster, Hairy False

Heterotheca villosa

Hairy false goldenaster is a short lived low growing perennial forb with yellow colored flowers occurring in areas receiving 10-26 inches annual precipitation. Seed should be planted 1/8 to 1/4 inch deep. Average seeds/ft² at 1 lb. rate is 17. Pure stand seeding rate is 3 lb/ac. Not recommended in pure stands.

Goldenbanner

Thermopsis montana

Goldenbanner is a perennial native legume which can be used in pollinator plantings at middle to high elevations and 20-30 inches annual precipitation. The yellow colored flowers are attractive to bees and bumblebees. This species is toxic to livestock and should be strictly limited to ungrazed pollinator plantings. Seed should be planted 1/4 to 1/2 inch. Average seeds/ft² at 1 lb. rate is 0.7. Pure stand seeding rate is 36 lb/ac. Not recommended in pure stands.

Goldeneye, Showy

Heliomeris multiflora or *Viguera multiflora*

Showy goldeneye is a long-lived perennial native forb with attractive yellow colored flowers. It is adapted to medium to coarse soils in areas receiving 16 to 25 inches annual precipitation. Seed should be planted 1/8 to 1/4 inch deep. Average seeds/ft² at 1 lb. rate is 23. Pure stand seeding rate is 2 lb/ac. Not recommended in pure stands.

Goldenrod

Solidago spp.

Goldenrod species are rapid developing, upright, rhizomatous, native forbs that grow from 0.5-3 feet tall. They are considered fair to good wildlife forage and good pollinator plant. Hay for livestock that has goldenrod mixed in can be toxic to livestock. Goldenrod should be strictly limited to ungrazed pollinator plantings. Goldenrod requires a minimum of 16 inches annual precipitation. Their yellow colored flowers attract bees and butterflies in the fall from August-October. Seeding depth is 1/8-1/4 inch deep. Average seeds/ft² at 1 lb. rate is 45-100. Pure stand seeding rate is 1 lb/ac. Goldenrod is recommended as a component in pollinator seedings typically making up less than 10% of the seed mixture.

Hawksbeard, Largeflower

Crepis occidentalis

Largeflower hawksbeard is a long lived perennial taprooted forb. The leaves provide forage for sage-grouse and the flowers attract a variety of native bees. Largeflower hawksbeard is adapted to areas receiving 12-18 inches mean annual precipitation. Recommended seeding depth is 1/4 to 1/2 inch. Average seeds/ft² at 1 lb. rate is 2. Pure stand seeding rate is 10 lb/ac.

Hawksbeard, Limestone, Slender, Tapertip

Crepis intermedia, *C. atribara*, *C. acuminata*

Hawksbeard species including limestone, tapertip and slender are native forbs with a slow growth rate and upright habit that grow from 10-30 inches tall in areas receiving 8-20 inches annual precipitation. They are considered excellent wildlife forage and good pollinator plants with yellow colored flowers. They attract bees and butterflies in May-June. Seeding depth is 1/4-1/2 inch. Average seeds/ft² at 1 lb. rate is 18. Pure stand seeding rate is 3 lb/ac. They are recommended as components in rangeland and pollinator seed mixtures. They are normally less than 10% of the seed mixture.

Hyssop, Mountain Giant

Agastache pallidiflora

Mountain giant hyssop is native to southern Colorado in areas receiving 12-24 inches annual precipitation. This species may be suitable for use in pollinator plantings in the eastern portion of our area. Plants reach 12 to 30 inches in height. Seeding depth is 0-1/8 inch. Average seeds/ft² at 1 lb. rate is 34. Pure stand seeding rate is 1 lb/ac.

Hyssop, Nettleleaf Giant*Agastache urticifolia*

Nettleleaf giant hyssop is a long lived perennial forb growing 30 to 36 inches in height. It has pale lavender colored flowers which attract bees and bumblebees. This species is adapted to a wide range of soils in areas receiving 18 to 36 inches annual precipitation. Seed should be planted no deeper than 1/8 inch. Average seeds/ft² at 1 lb. rate is 32. Pure stand seeding rate is 1 lb/ac.

Iris, Blue-flag*Iris missouriensis*

Blue-flag iris is a short lived rhizomatous forb common to moist sites with a minimum of 24 inches annual precipitation or in areas with run-in moisture. It is a valuable pollinator plant attracting a variety of bees, butterflies and hummingbirds. Fresh iris roots and rhizomes maybe toxic and should not be planted in pastures used for grazing or hay. Seed should be planted 1/4-1/2 inch deep. Average seeds/ft² at 1 lb. rate is 0.5. Pure stand seeding rate (not recommended) is 54 lb/ac.

Lupine*Lupinus spp.*

Lupines are native perennial legumes that commonly have blue to purplish colored flowers, but yellow flowered species also exist. Lupines require a minimum of 10 inches annual precipitation. The flowers are visited by bees and bumblebees. The plants are grazed by deer but are toxic to cattle and sheep. Plantings should be strictly limited to ungrazed pollinator habitat. Seed should be planted 1/4-1/2 inch. Average seeds/ft² at 1 lb. rate is 0.5. Pure stand seeding rate is approximately 50-70 lb/ac. Not recommended in pure stands.

Milkvetch, Basalt*Astragalus filipes*

Basalt milkvetch is an erect native legume with a moderate growth rate, 1-3 feet tall. Unlike some milkvetch species, basalt milkvetch is not toxic to livestock. It is considered excellent wildlife forage and a good pollinator plant with white to cream colored flowers. It attracts bees and butterflies in May-July and is adapted to areas receiving 8-12 inches annual precipitation. Seeding depth is 1/4-1/2 inch. Average seeds/ft² at 1 lb. rate is 2.7. Pure stand seeding rate is 9 lb/ac. It is recommended as component in rangeland and pollinator seed mixtures. It is normally less than 10% of the seed mixture. USDA-ARS released NBR-1 in 2008 from multiple accessions throughout the Great Basin.

Milkvetch, Canada*Astragalus canadensis*

Canada milkvetch is a prostrate to upright native legume with a moderate growth rate that grows from 1-2.5 feet tall and requires a minimum of 20 inches annual precipitation. It is an excellent pollinator species with cream colored flowers that are particularly attractive to bees and butterflies in June-July. However this species is toxic to livestock and should only be used in ungrazed pollinator plantings. It is also known to be a host for some white and sulphur butterfly larvae. Seeding depth 1/4-1/2 inch. Average seeds/ft² at 1 lb. rate is 4. Pure stand seeding rate is 4 lb/ac. It is recommended as component in pollinator seed mixtures. It is normally less than 10% of the seed mixture.

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 conditioner attachment on a swather or frequent turning of windrows to adequately dry for hay. It is adapted to cold temperature, lowland areas, and soils with high water holding capacity that receives at least 14 inches annual precipitation. It is moderately tolerant of flooding. This species is slow to establish due to very hard seed and 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 watertables limit alfalfa production. It is a good pollinator plant attracting bumble bees, honey bees and leafcutter bees and blooms in spring into early summer. It is 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/ft² at 1 lb. rate is 3. Pure stand seeding rate is 8 lb/ac. Recommended 50% mixed stand rate is 4 lb/ac for pasture situations.

Milkweed, Butterfly*Asclepias tuberosa*

Butterfly milkweed is a perennial native forb with a slow upright growth rate to 1-3 feet tall. It is toxic to livestock but is an excellent pollinator plant with orange flowers that are particularly attractive to butterflies in July–August. This species is adapted to wetter sites receiving 28-45 inches annual precipitation. Plantings should be strictly limited to

ungrazed pollinator habitat. Planting depth is 1/8-1/2 inch. Average seeds/ft² at 1 lb. rate is 1.5. Pure stand seeding rate is 15 lb/ac. It is recommended as component in pollinator seed mixtures. It is normally less than 10% of the seed mixture.

Milkweed, Showy

Asclepias speciosa

Showy milkweed is a perennial native forb with erect to ascending stems common to field margins and disturbed areas receiving 16 to 30 inches annual precipitation. The flower is rose-purple colored with hoods elevated above the corolla in pink, aging yellow. Showy milkweed is host to a wide variety of butterflies and other insects including monarch butterflies which are specific to milkweeds. Milkweeds are believed to be poisonous to cows and sheep. Plantings should be strictly limited to ungrazed pollinator habitat. Planting depth 1/8-1/2 inch. Average seeds/ft² at 1 lb. rate is 1.7. Pure stand seeding rate is 15 lb/ac. It is recommended as component in pollinator seed mixtures.

Mule-ears

Wyethia amplexicaulis

Mule-ears is a long lived native perennial forb with large, sunflower-like flowers which bloom in late spring and early summer. Mule deer prefer mules-ears early in the growing season. Sheep forage new leaves in spring and early summer. Mature foliage is coarse and harsh, and plants dry out by mid-summer, so it is little used after early summer. Elk, deer, and all classes of livestock eat the flower heads. It is adapted to areas receiving 12 to 20 inches mean annual precipitation and is highly competitive once established. The seeds provide food for small birds and mammals. Seeding depth is 0-1/8 inch. Average seeds/ft² at 1 lb. rate is 0.6. Pure stand seeding rate is 39 lb/ac. It is recommended as component in pollinator seed mixtures.

Paintbrush, Indian

Castilleja spp.

Indian paintbrush is a native perennial forb. Common species are generally adapted to sites receiving 8-15 inches mean annual precipitation. It is hemiparasitic and is best established using greenhouse grown materials that have been raised with a host plant.

Pea, Fewflower

Lathyrus pauciflorus

Fewflower pea is a creeping native perennial legume with showy purple colored flowers. It can be used in pollinator seedings in areas receiving 5 to 14 inches annual precipitation. It attracts bees and serves as a larval host for butterflies. Seeding depth 1/8-1/2 inch. Average seeds/ft² at 1 lb. rate is 0.3. Pure stand seeding rate is 87 lb/ac. Not recommended in pure stands.

Pearly Everlasting, Western

Anaphalis margaritaceae

Pearly everlasting is a small statured native perennial forb with whitish colored flowers growing in sites with 10 to 35 inches annual precipitation. It is visited by bees and butterflies and is a larval host plant of the Virginia lady butterfly. Seeds should be planted no deeper than 1/8 inch. Average seeds/ft² at 1 lb. rate is 188. Pure stand seeding rate is 0.3 lb/ac. Not recommended in pure stands.

Penstemon, Bluestem

Penstemon cyanocaulis

Bluestem penstemon is a low growing, perennial, short lived native penstemon reaching 8 to 18 inches tall with showy, blue colored flowers. It attracts bumblebees, mason bees and mining bees. This species is adapted to areas receiving 6 to 15 inches annual precipitation in medium to coarse soil conditions. Due to hard seed, plant penstemon species in late fall-early winter at soil surface to 1/8-inch depth. Average seeds/ft² at 1 lb. rate is 15. Pure stand seeding rate is 3 lb/ac. Not recommended in pure stands.

Penstemon, Broadleaf

Penstemon angustifolius

Broadleaf penstemon is a short lived, native forb growing up to 36 inches in height. It is adapted to areas of medium to coarse soils in sites receiving 9 to 35 inches annual precipitation. The lavender colored flowers bloom in the spring. Due to hard seed, plant penstemon species in late fall-early winter at soil surface to 1/8-inch depth. Average seeds/ft² at 1 lb. rate is 7. Pure stand seeding rate is 3 lb/ac. Not recommended in pure stands.

Penstemon, Firecracker

Penstemon eatonii

Flowers of firecracker penstemon are on upright stems, are bright red color, and bloom in midsummer through early fall. It is a short-lived, native perennial and is adapted to sagebrush, juniper and ponderosa pine zones at 3,300 to 8,000 feet elevation in 10-18 inch annual precipitation zones. It is a good pollinator plant and its flowers attract bees and hummingbirds from June-July. 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/ft² at 1 lb. rate is 7. Pure stand seeding rate is 3 lb/ac. Not recommended in pure stands.

Penstemon, Low

Penstemon humilis

Low penstemon is a low growing (4-10 inches tall), usually mat forming, purple flowered, native penstemon adapted to areas receiving 10 to 16 inches mean annual precipitation. Due to hard seed, plant penstemon species in late fall-early winter at soil surface to 1/8-inch depth. Average seeds/ft² at 1 lb. rate is 22. Pure stand seeding rate is 2 lb/ac. Not recommended in pure stands.

Penstemon, Palmer

Penstemon palmeri

Palmer penstemon is a short-lived, semi-evergreen native forb that occurs in blackbrush, sagebrush-grass and juniper plant communities. It is adapted to basic and slightly acidic soils, on disturbed and exposed sites in 10-16 inch precipitation zones at 3,500-6,000 feet elevation. The flowers are pink to lavender color 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. The only released variety is 'Cedar,' selected for its wide area of adaptation, winter succulence, and winter forage production. Due to hard seed, plant penstemon species in late fall-early winter at soil surface to 1/8-inch depth. Average seeds/ft² at 1 lb. rate is 13. Pure stand seeding rate is 2 lb/ac. Not recommended in pure stands.

Penstemon, Rocky Mountain

Penstemon strictus

Rocky Mountain penstemon is a native, perennial forb, 12-36 inches tall. It is semi-evergreen, long-lived, and occurs in the upper juniper, mountain big sagebrush, mountain brush, and open areas in aspen and coniferous forest plant communities. Flowers are bright blue to purple in color and bloom from mid-May to late June. This species is adapted to areas with 15-20 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 longevity and seed production characteristics. Plant in late fall-early winter on soil surface to 1/8-inch depth. Average seeds/ft² at 1 lb. rate is 11. Pure stand seeding rate is 2.7 lb/ac. Not recommended in pure stands.

Penstemon, Royal (Sagebrush or Showy)

Penstemon speciosus

Royal penstemon is a perennial native forb with an upright habit and moderate growth rate, growing from 12-24 inches tall with sky blue colored flowers. Royal penstemon inhabits dry flats, slopes and draws in sagebrush-grass, mountain shrub and juniper plant communities and is adapted to loam to fine sandy loam soils that receive 12 + inches annual precipitation. It is a good pollinator plant and its bright blue flowers attract bees and butterflies from June-July. Due to hard seed, plant penstemon species in late fall-early winter at soil surface to 1/8-inch depth. Average seeds/ft² at 1 lb. rate is 9. Pure stand seeding rate is 3 lb/ac. Not recommended in pure stands.

Penstemon, Rydberg's

Penstemon rydbergii

Rydberg's penstemon is a medium lived penstemon growing 24 to 36 inches tall. Flowers are blue to purple color with a densely golden-yellow bearded staminode; this species is adapted to areas receiving 20 to 30 inches annual precipitation. The blue colored flowers are visited by small native bees. Due to hard seed, plant penstemon species in late fall-early winter at soil surface to 1/8-inch depth. Average seeds/ft² at 1 lb. rate is 3. Pure stand seeding rate is 3 lb/ac. Not recommended in pure stands.

Penstemon, Scabland (Hotrock)

Penstemon deustus

Scabland penstemon grows 8-24 inches tall, is a short-lived, native, perennial, and bears whitish colored flowers. It is best adapted to 8 inches or greater annual precipitation on soils derived from basalt parent materials. It is a good pollinator plant attracting bees and butterflies from June-July. Due to hard seed, plant penstemon species in late fall-early winter at soil surface to 1/8-inch depth. Average seed per ft² at 1 lb. rate is 66. Pure stand seeding rate is 1 lb/ac. Not recommended in pure stands.

Penstemon, Sharpleaf (Sand)*Penstemon acuminatus*

Sharpleaf penstemon is a short-lived, native, perennial forb with an upright habit and moderate growth rate, growing 8-24 inches tall. It is adapted to well-drained loam to fine sandy loam soils with a pH 5.0-8.0 and 8-10 inches or more annual precipitation. It is a good pollinator plant and its blue colored flowers attract sweat bees, bumble bees, honey bees and leafcutter bees from May-July. Due to hard seed, plant penstemon species in late fall-early winter at soil surface to 1/8-inch depth. Average seeds/ft² at 1 lb. rate is 9. Pure stand seeding rate is 3 lb/ac. Not recommended in pure stands.

Penstemon, Sulphur (Taper-leaved)*Penstemon attenuatus*

Sulphur penstemon is a short-lived native perennial forb with an upright habit and moderate growth rate, growing 6-36 inches tall. It grows in dry meadows and moist, open to wooded slopes in the mountains and foothills that receive 12-25 inches annual precipitation and well drained, medium textured soils. It is a good pollinator plant and its blue-purple-pink colored flowers attract bees and butterflies from May-July. Due to hard seed, plant penstemon species in late fall-early winter at soil surface to 1/8-inch depth. Average seeds/ft² at 1 lb. rate is 20. Pure stand seeding rate is 1.5 lb/ac. Not recommended in pure stands.

Penstemon, Thicketleaf*Penstemon pachyphyllus*

Thicketleaf penstemon is a short-lived, native, perennial forb 12 to 20 inches tall with blue to violet colored flowers. It is distributed throughout the Great Basin and occurs on dry gravelly or sandy soils in sagebrush, pinyon juniper, gambel oak, ponderosa pine and bristlecone plant communities with 12-20 inches annual precipitation. Seed this species in late fall-early winter on soil surface to 1/8-inch depth. Average seeds/ft² at 1 lb. rate is 19. Pure stand seeding rate is 3 lb/ac. Not recommended in pure stands.

Penstemon, Venus*Penstemon venustus*

Venus penstemon is a native, long-lived forb or subshrub 12-32 inches tall. The flowers of Venus penstemon are bright lavender to purple in color. Its natural habitat is from 1,000 to 6,000 feet elevation and 20-35 inches annual precipitation. It does best in full sunlight on open slopes of mountain valleys and foothills. It does not tolerate poorly drained soils. 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 penstemon species in late fall-early winter at soil surface to 1/8-inch depth. Average seeds/ft² at 1 lb. rate is 20. Pure stand seeding rate is 1 lb/ac.

Penstemon, Yellow*Penstemon confertus*

Yellow penstemon is a short-lived native perennial forb with an upright habit and moderate growth rate, 8-24 inches tall. It grows in moist meadows and forest openings at mid elevations. It is a good pollinator plant and its light yellow to cream colored flowers attract bees and butterflies from June-July. It is best adapted to 18 inch plus precipitation zones. Due to hard seed, plant penstemon species in late fall-early winter at soil surface to 1/8-inch depth. Average seeds/ft² at 1 lb. rate is 10. Pure stand seeding rate is 2 lb/ac. Not recommended in pure stands.

Phacelia, Silky*Phacelia sericea*

Silky phacelia is a long-lived native forb with a woody base adapted to areas receiving 18-30 inches annual precipitation. The lavender colored flowers are arranged in short clusters that are often coiled like the tail of a scorpion. It is attractive to a variety of insects as well as gardeners. Seed should be broadcast or drilled no deeper than 1/8 inch. Average seeds/ft² at 1 lb. rate is 10. Pure stand seeding rate is 2 lb/ac. Not recommended in pure stands.

Phacelia, Silverleaf*Phacelia hastata*

Silverleaf phacelia is a native, short-lived, upright forb 6-24 inches tall. It is adapted to stony, sparsely vegetated soil or talus in grasslands, sagebrush steppe, woodlands, meadows and open forest from the valleys to alpine. Leaves are mostly basal and flowers are in dense, tightly coiled cluster and are white or lavender color. It is considered a good pollinator and sage grouse brood rearing habitat plant. The flowers attract bees from June-August. This species is adapted to 10-18 inch precipitation zones. Average seeds/ft² at 1 lb. rate is 10. Pure stand seeding rate is 2 lb/ac. Not recommended in pure stands.

Prairie Clover, Blue Mountain or Western*Dalea ornata*

Purple prairie clover is a native perennial, upright, taproot legume that grows from 1-2.5 feet in height. The light pink to purple colored, 5 petaled flowers occur in dense cylinder-shaped spikes from 0.75-2.5 inches long. The flowers bloom upward along the spike from June-August. They are adapted to low to moderate elevations with 14 inches or

greater annual precipitation. They prefer sandy to gravelly soils and soils derived from weathering basalt and volcanic ash. Magestic and Spectrum Germplasm western prairie clover were released in 2011. Seeding depth is 1/4-1/2 inch. Average seeds/ft² at 1 lb. rate is approximately 3.5. Pure stand seeding rate is 5 lb/ac. Not recommended in pure stands.

Prairie Clover, Purple

Dalea purpurea

A native perennial, upright, taproot legume that grows from 1-2.5 feet in height. The light pink to purple colored flowers occur in dense cylinder-shaped spikes from 0.75-2.5 inches long. The flowers bloom upward along the spike from June-August. Purple prairie clover is adapted to low to moderate elevations with 14 inches or greater annual precipitation. They prefer sandy to gravelly soils and soils derived from weathering basalt and volcanic ash. 'Kaneb', Bismark Germplasm and Central Iowa Germplasm are releases. Seeding depth 1/4 to 1/2 inches. Average seeds/ft² at 1 lb. rate is approximately 7. Pure stand seeding rate is 7 lb/ac. Not recommended in pure stands.

Prairie Clover, Searls'

Dalea searlsiae

Searls' prairie clover is a perennial, upright, taproot legume that grows from 1-2.5 feet in height. The light pink to purple colored flowers occur in dense cylinder-shaped spikes from 0.75-2.5 inches long. The flowers bloom upward along the spike from June-August. This species is adapted to low to moderate elevations with 7-12 inches annual precipitation preferring sandy to gravelly soils and soils derived from weathering basalt and volcanic ash. Seeding depth is 1/4-1/2 inch. Average seeds/ft² at 1 lb. rate is approximately 3.5. Pure stand seeding rate is 7 lb/ac. Not recommended in pure stands.

Prairie Clover, White

Dalea candida

White prairie clover is a perennial, warm season, herbaceous, native legume with white colored flowers common in the Great Plains. This species is found growing primarily on well drained sandy, gravelly, and silt soils, rarely on clay or lowland sites. It occurs on sites that receive 10 to 18 inches of annual precipitation. Seeding depth is 1/4-1/2 inch. Average seeds/ft² at 1 lb. rate is approximately 10. Pure stand seeding rate is 2 lb/ac. Not recommended in pure stands.

Prairie Smoke

Geum triflorum

Prairie smoke is a moderate to rapidly developing upright native rhizomatous forb that grows from 6-12 inches in height. It has reddish pink to purple colored, nodding globular flowers that bloom in late spring. As the flower fades and seeds begin to form, the styles elongate to form upright feathery gray tails which resemble a plume or feather duster. It is considered a good pollinator plant. It attracts bees from May-July. It is best adapted to 18 inch and higher annual precipitation zones and well-drained soils but does not tolerate wet soil conditions during winter. Seeding depth 1/4-1/2 inch. Average seeds/ft² at 1 lb. rate is 16. Pure stand seeding rate is 3 lb/ac. Not recommended in pure stands.

Primrose, Evening

Oenothera caespitosa

Evening primrose is a low-growing, native, caespitose (occurring in clumps or tufts), short lived, rhizomatous, perennial forb with large white and pink colored flowers. The flowers open and are visited by moths in the evening hours. This species is drought tolerant and adapted to areas receiving 7 to 20 inches annual precipitation. It is commonly found on steep dry slopes and sandy soils. Seed should be planted no deeper than 1/8 inch. Average seeds/ft² at 1 lb. rate is 30. Pure stand seeding rate is 2 lb/ac. Not recommended in pure stands.

Pussytoes

Antennaria spp. (*rosea*)

Pussytoes is a low-growing, native perennial forb with whitish pink colored flowers that often form mats. It is adapted to a broad range of conditions from 8 to 40 inches annual precipitation. Seed should be surface broadcast or drilled to no more than 1/8 inch. Average seeds/ft² at 1 lb. rate is 152. Pure stand seeding rate is 0.3 lb/ac. Not recommended in pure stands.

Sagebrush, White (Louisiana 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 with a minimum of 12 inches annual precipitation. This species does well on shallow, as well as deep, slightly acid to basic soils. It is considered a pioneering species and is commonly seeded on disturbed areas and plays an important role in providing initial soil cover and stabilization. It provides nesting cover for pollinators. 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/ft² at 1 lb. rate is 86. The pure stand seeding rate is 1 lb/ac. Not recommended in pure stands.

Sainfoin

Onobrychis viciifolia

Sainfoin is a medium-lived, introduced, cool-season, non-bloating legume. It is highly palatable to sheep and cattle and is preferred over alfalfa. First cut hay yields are often greater than those for alfalfa but later cuttings commonly yield less than alfalfa. Long term survival under irrigated or wet conditions is limited due to crown and root rot diseases 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, 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 annual precipitation. It has good seedling vigor but seedlings are weakly competitive against weeds or other highly aggressive plants. Can be grazed or used for hay. It is a good pollinator plant and blooms in spring into early summer with showy pink, white, or purple colored flowers. Adapted varieties include 'Delaney', 'Eski', 'Melrose', 'Nova', 'Remont', 'Renumex', and 'Shoshone'. Plant in spring or fall at a seeding depth of 1/4 to 3/4 inch and seed should be inoculated with rhizobium. Average seeds/ft² at 1 lb. rate is 0.7. The full seeding rate is 34 lb/ac. The recommended 50% mixed stand rate is 17 lb/ac for pasture situations. For pollinator plantings, use 5-15% in your seeding mixtures.

Sunflower, Annual

Helianthus annuus

Annual sunflower is a tall, native annual forb reaching heights in excess of 6 ft. The flowers are large and showy, up to 5 inches across at the end of branches. Yellow colored ray flowers surround brown disk flowers. It was originally cultivated by North American Indians and had many ethnobotanic uses and is a major seed oil crop in the Midwest. It is considered a good pollinator plant, flowering in summer and fall, and provides seed to foraging birds and small mammals. It also has alleopathic effect on other plants. It is drought tolerant and can be grown in areas with as little as 8 inches annual precipitation. There are numerous cultivated varieties available. The planting depth is 1/4 to 1/2 inch. Average seeds/ft² at 1 lb. rate is 1. Pure stand seeding rate is 24 lb/ac. Annual sunflower can spread via seed and become weedy, and should be limited to 1 lb/ac or less for wildlife/pollinator plantings.

Sunflower, Common Woolly (Oregon sunshine)

Eriophyllum lanatum

Common woolly sunflower is a low growing (4-18 inches tall) drought tolerant native perennial forb adapted to sites receiving 10-25 inches annual precipitation. It is grayish colored, woolly and leafy with several branched stems ending in short leafless stalks. It has yellow composite flowers and blooms during the summer and fall which attract butterflies, bees and moths. Seed should be drilled 1/4- 1/2 inch. Average seeds/ft² at 1 lb. rate is 20. Pure stand seeding rate is 2 lb/ac.

Sunflower, Maximilian

Helianthus maximiliani

Maximilian sunflower is a native, rhizomatous perennial, 3 to 6 feet tall. Numerous yellow flowers grow on their own stalks and are up to 5 inches across and bloom in summer and fall attracting pollinators. It is palatable to wildlife and livestock and birds consume the seed. It prefers moist clay soil but is tolerant of sandy and sandy loam textures. It is adapted to areas with 18 to 25 inches annual precipitation. Releases include Prairie Gold, Aztec, and Medicine Creek. Seed should be drilled 1/4- 1/2 inch deep. Average seeds/ft² at 1 lb. rate is 5. Pure stand seeding rate is 5 lb/ac. For range seeding mixtures, use 1/4-1/2 pound per acre seeding rate.

Sunflower, Oneflower

Helianthella uniflora

Oneflower sunflower is a native perennial forb 2-3 feet tall ending in solitary yellow colored flowers. The flower heads are erect and up to 2.5 inches wide. It occurs on open exposures on hillsides in sagebrush, pinyon juniper, mountain brush, and ponderosa pine, aspen and spruce fir plant communities. It is adapted to non-saline, coarse, shallow, well drained soils in areas receiving 12 to 35 inches annual precipitation. It is a valuable rangeland forb grazed by livestock and wildlife and the showy flowers are a pollen source for a variety of bees, blooming in summer. The seed is eaten by birds. The planting depth is 1/8 to 1/4 inch. Average seeds/ft² at 1 lb. rate is 1. Pure stand seeding rate is 26 lb/ac.

Sunflower, Prairie

Helianthus petiolaris

Prairie sunflower is a native, taprooted annual growing 1 to 3 feet in height. Ray flowers are yellow and disk flowers are red-purple in color and blooms during the summer. The seeds attract birds. This species is adapted to sites receiving over 9 inches annual precipitation, sandy soils and disturbed areas. Seed should be drilled to a depth of 1/8 to 1/4 inch. Average seeds/ft² at 1 lb. rate is 3. Pure stand seeding rate is 9 lb/ac.

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

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 stands where perennials do not crowd it out and during years of above normal precipitation. It is poor quality forage at mid to later growth stages. Sweetclover is the most drought tolerant commercially available legume and has been used successfully in plantings that receive as little as 9 inches effective annual precipitation but is best suited to 12-20 inch annual precipitation zones and is adapted to all soil textures and slight to moderate levels of salinity. It is adapted to many sites including sagebrush-grass to subalpine areas, moist salty lowlands, 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 annual precipitation is 15 inches or more. It is a good pollinator plant and blooms in spring to early summer with either white or yellow colored flowers as the common names imply. It is a valued plant for honey production. 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. Sweetclover is sometimes considered to be a weedy or invasive species, particularly in years with very wet late winter and spring precipitation. The planting depth is 1/8 to 1/2 inch. The majority of marketed seed is common seed which seem to perform just as well as released varieties. Adapted varieties are 'Goldtop', 'Madrid', 'Norgold', and 'Yukon' which are yellow varieties and 'Evergreen' and 'Polara' which are white varieties. Average seeds/ft² at 1 lb. rate is 6. Pure stand seeding rate is 4 lb/ac. Do not exceed 1 lb/ac of seed in conservation, rangeland and pollinator seed mixtures.

Sweetvetch, Northern (Utah)*Hedysarum boreale*

Northern or Utah sweetvetch is a native perennial legume 1-2 feet tall, sometimes with rhizomes. This species occurs in foothills and upland areas that receive 10-18 or more inches of annual precipitation. Sweetvetch prefers well-drained loamy soils but also occurs on rocky, gravelly, and sandy to heavy clay soil textures. Its deep taproot enables it to take advantage of deep soil moisture that results in considerable drought resistance and winter hardiness. Seed should be planted in the fall or early spring (dormant) at 1/4 to 1/2 inch deep. Inoculate seed to enhance nitrogen fixation. 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. It is considered a good pollinator plant with pink, purple or white colored flowers that bloom in May-June. Spring green up occurs early, and basal leaves remain green throughout the winter. 'Timp' is a release from Meeker PMC. Average seeds/ft² at 1 lb. rate is 1. Pure stand seeding rate is 24 lb/ac. Not recommended for pure stands.

Tansyaster, Bigelow's*Machaeranthera bigelovii*

Bigelow's tansyaster is a native, short lived, drought tolerant perennial forb 1-3 feet tall. It occurs in the southern Rocky Mountain region of Wyoming, Colorado, New Mexico and Utah at elevations of 7,500-11,500 feet, 6-18 inches annual precipitation and requires full sun. A variety of generalist bees utilize the deep violet to blue-white colored flowers in late summer and early fall. It does not have value as forage for livestock. The planting depth is 0 to 1/8 inch. Average seeds/ft² at 1 lb. rate is 29. Pure stand seeding rate is 2 lb/ac.

Tansyaster, Hoary*Machaeranthera canescens*

Hoary tansyaster is a short-lived perennial native forb with a moderate growth rate and erect stature 6-30 inches tall. It is common in plant communities including shadscale and Wyoming big sagebrush on valley floors to mountain big sagebrush, aspen and limber pine on mountain slopes with 8-15 inches annual precipitation. It is common in degraded to disturbed sites and is sometimes considered to be a weedy species on rangelands. It is considered an excellent pollinator plant with blue to purple flowers that bloom from late July into October. It attracts bees, butterflies and moths. It is an important species for sage grouse during brood rearing because of the insects the plant attracts. Average seeds/ft² at 1 lb. rate is 30. Pure stand seeding rate is 2 lb/ac. It is recommended as component in rangeland, pollinator and sage grouse seed mixtures. It typically makes up less than 10% of the seed mixture.

Tansyaster, Tansyleaf*Machaeranthera tanacetifolia*

Tansyleaf tansyaster is a low statured (6-12 inches tall), spreading, annual native forb often forming clumps or mounds with deeply cut leaves which appear fern-like and delicate, purple colored flowers. It occurs from Utah south to Arizona, New Mexico and Texas and is adapted to well-drained, sandy or rocky soils. It is somewhat less drought tolerant than other tansyasters requiring 16 or more inches annual precipitation. It blooms from May to October. The planting depth is 0 to 1/8 inch. Average seeds/ft² at 1 lb. rate is 9. Pure stand seeding rate is 3 lb/ac.

Trefoil, Birdsfoot*Lotus corniculatus*

Birdsfoot trefoil is a short-lived, deep-rooted, non-bloat introduced legume suited for use as pasture or hay and in conservation plantings for erosion control and wildlife food and cover. It can be grown under irrigation or on dryland where annual precipitation is 20 inches or more. It is very winter hardy (where protected by snow cover), resistant to water logged soils where alfalfa will not establish or persist, and useful at high elevations. It is better than alfalfa for retaining high quality forage on mature growth. The decumbent 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 forage, pollinator plantings and beautification. The yellow flowers attract bees from June-August. If plants are allowed to go to seed every third year or so, stands will persist for many years. It is short lived (2-4 years), making reseeding necessary if not allowed to go to seed. It can be a nuisance in subsequent crops because of its ability to recruit from the seedbank. It may invade adjacent areas that have similar growing conditions. Planting depth is 1/4 to 1/2 inch and seed should be inoculated. 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), 'Norcen' (decumbent to erect growth), 'Leo' (decumbent), and 'Maitland' (erect growth). Average seeds/ft² at 1 lb. rate is 9. Pure stand seeding rate 3 lb/ac. Recommended 50% mixed stand seeding rate is 1.5 lb/ac for grazing situations.

Vetch, American*Vicia americana*

American vetch is a broad ranging (found throughout most of U.S. with exception of the southeast and New England), native, rhizomatous, climbing vine legume with a moderate growth rate and spreading habit, 1-2 feet tall. It will only reach its full height if it can attach itself to a supporting structure. It is considered excellent wildlife and livestock forage, and a good pollinator plant. It can also be used as a cover crop in cropland preceding late spring-planted crops. It has purple colored flowers that are attractive to bees and blooms from May-June. It is adapted to fine and medium textured soils and in areas with a minimum of 10 inches annual precipitation and full sun. Seeding depth 1/4-1/2 inch. Fall seeding is recommended to break dormancy. Average seeds/ft² at 1 lb. rate is 0.75. Pure stand seeding rate is 33 lb/ac. It is recommended as component in pollinator seed mixtures. It is normally less than 10% of the seed mixture.

Yarrow, Western*Achillea millefolium* var. *occidentalis*

Western yarrow is a perennial, native forb, 12-40 inches tall and is one of the most widely distributed forbs in western North America. Native ecotypes are white flowered while Eurasian ecotypes of common yarrow, *Achillea millefolium* var. *millefolium*, are pink to yellow flowered. Do not plant common yarrow in range seedings. 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 plant and blooms in spring into late summer. Western yarrow spreads by seed and rhizomes and is well suited for use on disturbed sites. It may invade adjacent areas that have similar growing conditions and degraded plant communities. Spring seeding is recommended but may also be planted in fall as a dormant seeding. Depth of seeding is 0-1/8 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 annual precipitation. Bridger PMC 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/ft² at 1 lb. rate is 95. Pure stand seeding rate is 0.5lb/ac. Not recommended for pure stands and should be limited to 5-10 percent of a seed mix.

WOODY PLANTS

This list includes only those shrubs that should be used in conservation, rangeland, and forestland plantings. For additional information: Refer to Idaho Plant Materials TN 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 TN 32 (Native Shrubs and Trees for Riparian Areas in the Intermountain West). Descriptions for shrubs and trees commonly utilized for Intermountain West windbreak and shelterbelt plantings can be found in North Dakota Tree Handbook, Idaho Plant Materials TN 43 (Tree Planting, Care and Management), and TN 50 Conservation Shrubs and Trees for the Intermountain West.

Apache Plume

Fallugia paradoxa

Apache plume is a native shrub 2-6 feet tall with grayish-white, pubescent branches, dark green leaves and white colored flowers. Fruit clusters with feathery, purplish tails said to resemble Apache headdress. In the Intermountain West it can be found growing in southern Utah and Nevada in areas receiving 8 to 20 inches annual precipitation and is adapted to gravelly, sandy soils on slopes, open woods and dry washes. It blooms from May to October. Establishment with nursery grown materials is recommended.

Bitterbrush, Antelope, Desert and Mexican cliffrose

Purshia tridentata, P. glandulosa, and P. mexicana

Bitterbrush are native, multiple branched shrubs varying in stature from low prostrate (2 feet tall) forms to erect arborescent forms as tall as 15 feet. They normally occur in well-drained, medium to sandy, gravelly, or rocky soils. Desert bitterbrush and Mexican cliffrose are more drought tolerant and can be established in areas receiving 6 to 12 inches annual precipitation. Antelope bitterbrush occurs throughout the mid - upper sagebrush, juniper, mountain brush, ponderosa pine, and lodge pole pine zones in sites with 10 to 15+ inch annual precipitation. Seedlings are vigorous. They are good pollinator plants for bees and butterflies. The yellow colored flowers bloom in April-June. It grows fairly rapidly and furnishes considerable browse. Upright growth forms are heavily browsed during the winter. Bitterbrush is important winter browse for big game, sheep, and cattle. 'Lassen' antelope bitterbrush is a large upright variety suited to neutral, especially granitic soils. Other releases include Fountain Green and Maybell, both pre-variety germplasm releases. Wildland seed collection is a common practice and Source Identified seed is recommended when using wildland collected seed. Most seed is dormant and requires pre-chilling stratification to germinate. Direct seeding under field conditions often results in rodents collecting and caching the seeds. Direct seeding is risky with limited success. The best method for establishment is by transplanting containerized seedlings. Recommended transplant rate is 200-300 shrubs per acre. Average seeds/ft² 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.

Buckwheat, Snow

Eriogonum niveum

Snow buckwheat is a perennial half-shrub that grows on rocky or gravelly hillsides on sagebrush desert and dry ponderosa pine forest openings in areas that receive 7-18 inches annual 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. 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 dry landscape plantings. The Pullman, WA PMC released 'Umatilla' snow buckwheat in 1991. It is most commonly established with nursery grown plants. Average seeds/ft² at 1 lb. rate is 9. Pure stand seeding rate is 2.5 lb/ac. Not recommended for pure stands.

Buckwheat, Sulphurflower

Eriogonum umbellatum

Sulphur-flower buckwheat is a perennial half-shrub that grows on rocky or gravelly mountain foothills and canyon areas with shallow sandy soils that receive 8-18+ inches annual precipitation. It is often found growing in association with mountain big sagebrush, antelope bitterbrush and pinyon-juniper plant communities. It usually is less than 2 feet tall and typically forms low, broad clumps. The leaves are about an inch long, shiny green on top and wooly pubescent below. The flowers are clusters of sulphur-yellow-orange-reddish color and showy umbel-shaped heads. The seeds are an important food source for many species of birds and small animals. Quail, sage grouse, deer and mountain sheep eat the leaves, and insects found on the plants are an important food source for sage grouse chicks. The leaves have low protein content and low to medium palatability for livestock. It is a good pollinator plant attracting a wide variety of bees and other native pollinators and blooms in summer. They are an excellent source of late season nectar for bees. The seed matures in late fall. It has great ornamental appeal and is an ideal plant for dryland landscape plantings. Seeds require 8-12+ weeks of cold, moist stratification in order to germinate. 'Sierra' was released by Lockeford, CA

Plant Materials Center in 1987. It is most commonly established with nursery grown plants. The planting depth is 0 to 1/8 inch. Average seeds/ft² at 1 lb. rate is 5. Pure stand seeding rate is 4 lb/ac. Not recommended for pure stands and should be limited to 5-10 percent of a seed mix.

Buckwheat, Parsnipflower or 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 annual 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, typically forming low, broad clumps. The leaves are covered with dense white pubescent hairs making the foliage appear green – blue-grayish in color. It is a good pollinator plant and blooms in early summer. The flowers are white to cream colored and showy, and are an excellent source of late season nectar for bees. The seed matures in late summer. Many insects are attracted to this plant and it is important food sources for small birds, (especially sage grouse chicks). Wildlife use whorled buckwheat for cover and forage. It has great ornamental appeal and is an ideal plant for dryland plantings. There are no releases of whorled buckwheat. However, collection and evaluation of this species is underway at Aberdeen, ID PMC. Seeds require 16-24 weeks of cold, moist stratification to germinate. It is most commonly established with nursery grown plants. The planting depth is 0 to 1/8 inch. Average seeds/ft² at 1 lb. rate is 4. Pure stand seeding rate is 6 lb/ac. Not recommended for pure stands and should be limited to 5-10 percent of a seed mix.

Buffaloberry, Silver

Shepherdia argentea

Silver buffaloberry is a shrub to short tree from 3 to 20 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. It is considered a good pollinator plant for bees and butterflies. The inconspicuous to yellow colored flowers bloom from May-July. Wildlife use the foliage and berries for food and the plant for cover. It prefers well drained to seasonally wet medium to coarse textured soils in the 12-20 inch annual precipitation zones. It is drought tolerant, winter hardy, intolerant of shade, and has slight saline tolerance and fair fire tolerance due to its sprouting ability. It is used primarily for wildlife cover and food, recreation and beautification plantings and as outside rows of multiple row 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 scarification and stratification before planting. It is not recommended for seeding and should be established with bareroot or container stock.

Cactus, Pricklypear

Opuntia spp.

Prickly pear cactus is a fleshy native subshrub or shrub with spiny thickened branches, 1 to 2 feet tall. The showy yellow or pink flowers are visited by bees and beetles. The plants also provide cover and protection for small mammals and reptiles. Pricklypear can be used in xeriscape and pollinator plantings but is not recommended for range seedings. It is best adapted to areas with 10 to 20 inches annual precipitation. The most efficient way to establish pricklypear is with vegetative cuttings. Cuttings or stem joints will readily root into well drained soils. The planting depth is 0 to 1/8 inch. Average seeds/ft² at 1 lb. rate is 3. Pure stand seeding rate is 8 lb/ac. Not recommended for pure stands and should be limited to 5-10 percent of a seed mix.

Ceanothus, Redstem

Ceanothus sanguineus

Redstem ceanothus is a hardy, upright, rapidly growing, native shrub that grows 3 to 6 feet tall and is a nitrogen fixer. It is best adapted to areas with 18 inches or more annual precipitation. It is best suited to relatively moist slopes in open or partial shade on soils that are often low in organic matter and is commonly associated with Douglas fir and mixed conifer communities of the Northwest and in the ponderosa pine zones of the Rocky Mountains. Redstem Ceanothus has good wildlife values including deer, elk and moose browse, thermal cover, berries for birds and has good pollinator traits. Its white flowers attract bees and butterflies from May-June. It has been successfully planted on logged sites, roadcuts and acid mine spoils. Plant as container or bareroot stock.

Ceanothus, Snowbrush

Ceanothus velutinus

Snowbrush ceanothus is a native, evergreen, nitrogen-fixing shrub which grows 2-9 feet tall and can form dense thickets. It occurs in juniper, ponderosa pine, mountain brush, and aspen communities on well-drained, medium-textured soils, often rocky and shallow; weakly acid to weakly basic and mostly non-saline soils; and 16 inch+ annual precipitation zones. 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. Seed has both a hard seedcoat and

embryo dormancy which makes it difficult to establish by direct seeding. Its spreading habit, somewhat fire tolerant, and attractive foliage and flowers makes this species potentially useful in plantings for stabilizing disturbed soils, pollinator plantings, and for roadside beautification. Not recommended for pure stands. This species is most commonly established with nursery grown plants.

Cherry, Nanking

Prunus tomentosa

Nanking cherry is an introduced, winter-hardy, fast growing, attractive, short-lived (approximately 10 years) shrub that grows 6 to 10 feet tall. It readily sprouts to form dense thickets. It grows best on deep, moist soils in the 16 inch plus annual precipitation zones. It has good wildlife browse values and good bird cover and nesting values. It is considered an excellent pollinator plant for bees and butterflies and is used in windbreaks and wildlife plantings. Its small pink flowers bloom in April-May. Plant as container or bareroot stock.

Cherry, Western Sand

Prunus pumila

Western sandcherry is a native, rhizomatous, low growing shrub, 3 to 6 feet tall. This species is adapted to sites with medium to coarse soils receiving 20 to 40 inches annual precipitation. It produces white colored flowers and the fruit is dark purple to black when mature. It is a good pollinator plant, attracting bees and occasional butterflies. It is used in windbreaks and wildlife plantings. Use of container or bareroot stock is recommended.

Chokecherry

Prunus virginiana

Chokecherry is a native, thicket-forming shrub or small tree, 12-25 feet tall, common in moist sites such as drainages, ditches, and road shoulders and in foothill, mountain, and canyon habitats with 13-60 inches annual precipitation. It is adapted to a wide range of soil textures except dense clay and 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 plant for bees and butterflies. The white colored flowers bloom in April-May and small, ripe, dark red to purple colored cherries form several months following flowering. Wildlife and birds seek out and eat its fruit. The leaves, bark, stem and seed are all toxic, forming Hydrocyanic acid and is potentially poisonous to all classes of livestock. Maintaining adequate amounts of preferred forage in pastures will help prevent livestock poisoning. It is used in windbreaks, wildlife plantings, streambank stabilization, ornamental plantings as well as use in making jellies, jams, sauces and wines. It is most commonly established with nursery grown plants.

Cinquefoil, Shrubby

Dasiphora fruticosa or *Potentilla fruticosa*

Shrubby cinquefoil is a native, very hardy, deciduous shrub, 2 to 4 feet tall, with attractive leaves and bright yellow colored flowers. It is primarily used for landscaping, erosion control, and native site rehabilitation. It is not recommended for windbreak applications because of its short stature. It is adapted to moderately fertile, moist, well drained soils in full sun and 18+ inch annual precipitation zones. It blooms in May-June and is considered an excellent pollinator plant for moths, bees and butterflies. It is not recommended for seeding. There are a number of cultivated varieties developed for ornamental use. This species is most commonly established with nursery grown plants.

Clematis, Western

Clematis ligusticifolia

Western clematis is a native, fast growing, vigorous climbing, dioecious vine. It is commonly found along streams and has abundant clusters of showy white flowers that bloom from June into August and is considered an excellent pollinator plant. Seedheads are very showy and resemble tufts of goose down. 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 annual precipitation. However, studies conducted by Pullman PMC show that it will grow in sites that receive as little as 7 inches of annual precipitation if soils are deep and have good water holding capacity. It is a good ground cover for erosion control and its layering ability makes it useful for stabilizing steep roadcuts. It can also be used at the top of streambanks for stabilization, may be useful as a screen, and provides cover habitat for small birds and rodents. It can be invasive and become a pest when it climbs adjacent plants, affecting their health and obscuring their beauty. 'Trailer' is a cultivar released by the Pullman PMC that originates from plants in Walla Walla county, Washington. It is not recommended for seeding. This species is most commonly established with nursery grown plants.

Cotoneaster

Cotoneaster integerrimus

Cotoneaster is an introduced shrub with a moderate growth rate that grows 8-12 feet tall and is adapted to a wide variety of soil textures and sites receiving 18+ inches annual precipitation. It provides good wildlife food (fruit) and

cover and is used in windbreaks. It is considered a good pollinator plant for bees and its pinkish-white colored flowers bloom from May-June with small dark red colored berries ripening in August-September. It is susceptible to fire blight and should not be planted near apple trees. Bismarck, ND PMC released 'Centennial' for conservation use in the Great Plains. It is established with nursery grown plants.

Currant, Golden and Wax Currant

Ribes aureum and *R. cereum*

Currants are fast growing, rhizomatous native shrubs, 3-10 feet tall. They grow in several forms and produce considerable foliage. These species can be found in 12-inch annual precipitation areas, but perform best where annual precipitation exceeds 15 inches, especially in the juniper and mountain brush zones. Currants are considered an excellent pollinator plant for early bees and bumblebees. Golden currant's bright yellow colored flowers bloom in April-May and the berries ripen to a black or purplish-brown color in late summer. It is also 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. They provide food (berries) and cover for upland game and year round 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. It is best established with nursery grown plants.

Dogwood, Redosier

Cornus sericea or *C. stolonifera*

Redosier dogwood is a deciduous native shrub, with bright red twigs and stoloniferous root system, 4-10 feet tall. Dogwoods prefer moist sites and are commonly found along perennial streams but are not as tolerant of long term root saturation as some other shrubs. Creamy-white colored flowers appear in clusters in late May to mid-June followed by white colored berries in the fall. Birds utilize the berries. It is used as an ornamental, in riparian/ streambank plantings, wildlife habitat plantings and in windbreaks. There are numerous releases of redosier dogwood. 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 direct seeding. Plant container, bareroot stock, or unrooted 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 the cutting. Rooting of dogwood cuttings can be improved by applying rooting hormone.

Elderberry, Blue and Red

Sambucus nigra and *S. racemosa*

Elderberry is a native, medium shrub with broad crowns, straight trunks, 3- 13 feet tall, with showy clusters of small yellowish white colored flowers, and pale blue to red colored fruit. It is considered an excellent pollinator plant for bees and butterflies. The flowers bloom in June-July. Elderberry is common along streambanks, fencerows, rocky pastures, on well-drained moist soils at mid elevations. It is most common in 18+ inch precipitation zones, but is found in lower precipitation areas where sub-surface soil moisture is available. Birds readily utilize the fruit and livestock and wildlife commonly browse the stems. Leaves, stems and unripe fruit can be mildly toxic to humans if ingested. Young seedlings can be transplanted at 1 to 2 years of age. 'Blanchard' blue elderberry is the only release. Elderberry is not recommended for direct seeding and should be established with container stock.

Fern Bush

Chamaebatiaria millefolium

Fern bush is native to the Great Basin and is an upright, generally multi-stemmed aromatic shrub 1-6 feet tall. It has white colored flowers that bloom from June-September. It is an early successional species on cinder cones and lava flows but is also found on soils derived from limestone and granite. It naturally occurs in cracks and fissures or rock outcrops and on well-drained, dry, rocky, and gravelly canyons and mountain slopes. Fernbush is occasionally browsed by mule deer, sheep, and goats, but only rarely by cattle. It is an excellent pollinator plant and is adapted to medium to coarse soils in areas receiving 15 to 40 inches annual precipitation. It is used mostly in dryland ornamental and screen plantings that have full sun. Dormant, direct seeding at a depth of 0 to 1/8 inch can be successful, but the species is most often established using nursery grown materials.

Hawthorn, Black or Douglas

Crataegus douglasii

Hawthorn is an erect native shrub to small tree to 30 feet tall. Branches are zigzagging stems, armed with stout, 1/2- 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 where the watertable is commonly within 40 inches of surface during 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 plant for moths, bees and butterflies. The white colored flowers bloom in May-June and the fruits are dark reddish-purple to black color. 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.

Honeysuckle, Twinberry

Lonicera involucrata

Twinberry honeysuckle is a native shrub up to 12 feet tall. It is used for streambank erosion control and restoration of riparian areas. It produces small yellow colored flowers in late spring and early summer and the “twin” shiny black berries ripen in late summer. The berries are eaten by bears, small mammals, game birds and song birds. Flowers provide nectar for hummingbirds and butterflies. Browse is generally rated poor or low value for both big game and livestock. It is adapted to fine to medium textured soils in areas receiving 14 to 32 inches annual precipitation. Nursery grown plants are recommended.

Kinnikinnick (Bearberry)

Arctostaphylos uva-ursi

Kinnikinnick is a native, evergreen, creeping shrub, rarely taller than 6 inches. It has small, shiny, leathery, dark green leaves, red stems, and small pinkish colored 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 with a minimum of 14 inches annual precipitation. It is most commonly used as groundcover on sandy soils around home sites, sand dunes and on sandy banks. The fruit is eaten by a few species of songbirds and game animals and deer will sometimes browse the foliage lightly. 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 with container stock.

Kochia, Forage

Bassia prostrata or *Kochia prostrata*

Forage kochia is a semi-evergreen, perennial, sub-shrub introduced from southern Eurasia. In Russia, it is considered a valuable forage shrub often associated with crested wheatgrass. It has been seeded in the western U.S. for many years as a forage and reclamation plant on semiarid locations. Forage kochia is adapted to basic soils but not suitable for acid soils. Successful plantings have occurred on soils ranging from sandy loam to clay, with the most successful plantings on heavier soils. It develops a fibrous root system with a large deep taproot, and has been established in areas that receive as little as 5 inches of annual precipitation.

Forage kochia is adapted to juniper, basin big sagebrush, Wyoming big sagebrush, greasewood and shadscale communities. Important characteristics include: ability to establish and persist on disturbed, harsh soils; high salinity and drought tolerance; tolerance of extreme temperatures; low oxalate levels (lower than winterfat and fourwing saltbush); ability to spread slowly by 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 improve fall and winter grazing forage. 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, deer and antelope find this sub-shrub palatable year around. When established in annual communities such as halogeton or cheatgrass, forage kochia competes with annuals by reducing their dominance, density, forage, and seed production. In perennial communities, it 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 seed on the soil surface with no or minimal soil cover and gently pressing it to the soil with a packer or roller. 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, the tubes should be pulled so the seed is basically dribbled onto the soil surface and not placed deeper than 1/16-inch. Seeding can be in combination with other perennial species. 'Immigrant' forage kochia was released in 1984. In 2012, the ARS released 'Snowstorm' for its taller stature that allows it to extend above winter snow to provide livestock and wildlife better access to forage for winter grazing. Average seeds/ft² 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.

Lilac*Syringa vulgaris*

Lilac is an introduced shrub that grows 6 to 12 feet tall. It has a slow growth rate with stout ascending branches, a suckering growth habit and white to purple colored flowers that bloom in May with a pleasant fragrance. It grows on most soil types but does not tolerate poorly drained soils. It is used extensively in ornamental plantings and windbreaks. It is considered a good pollinator plant for early bees. Its white to purple flowers bloom from April-May. Plant as container or bareroot stock.

Mahogany, Mountain*Cercocarpus* spp.

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. Curleaf mountain mahogany is mainly browsed in the winter, whereas true mountain mahogany is utilized year round. 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/ft² 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.

Manzanita, Greenleaf*Arctostaphylos patula*

Greenleaf manzanita is closely related to kinnikinnick (and also hybridizes with it) but is restricted in the Intermountain region to Utah. It is a large spreading shrub reaching 6 feet tall with smooth reddish bark and has white colored flowers that bloom from April to June. Bees pollinate the flowers by grasping the flower and shaking it by actively beating their wings. The chestnut-brown colored berries are utilized by bear, deer, other small mammals and a wide variety of birds. It inhabits well-drained, rocky slopes in association with coniferous forests and high elevation chaparral. It is adapted to medium to coarse, well-drained, acidic soils in sites receiving 13 to 60 inches annual precipitation in open sunny sites. The Lockford, CA Plant Materials Center released 'Altura' in 1989 from populations at higher elevations in the Sierra Mountain Range and may not be suitable for use in the Intermountain West. This species should be established with nursery grown materials.

Mint, Frosted*Poliomintha incana*

Frosted mint is a low growing (up to 20 inches tall) native shrub, very branched with lavender colored flowers that have purple dots on the lower lip. It is commonly found growing on eroded slopes and in sandy soils in Utah, Arizona, New Mexico and southwestern Colorado. It is adapted to sites receiving 8 or more inches mean annual precipitation. Nursery produced plants are available commercially.

Mockorange, Lewis' (Syringa)*Philadelphus lewisii*

Lewis' mockorange is a native, loosely branched shrub 3 to 10 feet tall, with showy sweet scented white colored flowers and is the Idaho State flower. Its habitat is mostly in foothills and montane zones in ponderosa pine and Douglas fir forests and in dry, rocky, well drained, moderately shaded, moist canyon bottoms and streamsides. It prefers northern and eastern exposures. Deer and elk utilize it primarily during winter and is not grazed extensively by livestock. 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. Two Selected Class Germplasms have been released by Pullman PMC: Colfax (MLRA B9) and St. Maries (MLRA E43). It is not recommended for seeding.

Mockorange, Littleleaf*Philadelphus microphyllus*

Littleleaf mockorange is native to Utah and western Colorado and noted for its small leaves, fragrant white colored summer flowers, exfoliating bark and drought tolerance. Mature shrubs are up to 15 feet tall. Littleleaf mockorange is adapted to sites receiving 12 to 20 inches annual precipitation in medium to coarse textured soils. Nursery grown materials are recommended.

Mule-fat (Seep Willow)*Baccharis salicifolia*

Mule fat is native to the southwestern states including southern Utah and Colorado. It is a large shrub reaching 10 feet in height, has semi-deciduous willow-like leaves and whitish-yellow colored flowers blooming from April to October. Deer and elk browse mule-fat and is considered an important butterfly plant. It occurs in hot, arid climates in dry stream beds and ditch banks in areas receiving 10 to 15 inches annual precipitation. This species can be established using hardwood cuttings or rooted nursery grown plants.

Ninebark*Physocarpus malvaceus*

Ninebark is an upright, slow establishing, spreading native shrub that grows to 2-7 feet tall. It is most commonly found on dry hillsides, canyons and grasslands on ponderosa pine and Douglas-fir sites and less common on moist slopes and streamsides in mountain brush, aspen, and mixed conifer forests with 18+ inch annual precipitation. It is predominantly found on soils with no exposed rock and sandy loam to silty loam soil textures. It has low to moderate browsing value for livestock and wildlife because more palatable shrubs are commonly associated with it. Dense thickets provide shelter and cover for wildlife and it is a good pollinator plant. The white to cream colored flowers attract bees, butterflies and flies in May-June. Plant as container or bareroot stock.

Oceanspray*Holodiscus discolor*

Oceanspray is an upright, arching, moderate establishing, native shrub that grows 3-12 feet tall and is common west of the Cascades and remnant stands occur on higher peaks of Great Basin Mountain ranges. It requires least 18 inches or more annual precipitation and is adapted to coarse, medium and fine textured soils with pH 5.0-7.5 along streambanks, moist forests, cutover timberland, and talus slopes. Palatability for livestock and wildlife is generally considered to be poor but varies with climate and incidence of fire. It is considered good wildlife cover and is a good pollinator plant. The cream colored flowers attract bees and butterflies in May-July. Plant as container or bareroot stock.

Oregon-grape (Barberry)*Mahonia repens*

Oregon-grape is a native, deciduous, evergreen, creeping, shrub with spreading roots and grows 1-2 feet tall. Oregon-grape commonly has yellow colored flowers and blue-black colored fruit. It is winter-hardy and grows in full sun to semi-shade commonly in forested areas but is not highly competitive. Deer, and sometimes elk browse it during the fall and winter. It is adapted to a wide range of soils, but prefers moist, well-drained sites receiving 15 inches or more annual precipitation. It is used in conservation, erosion control, landscaping, and wildlife plantings. Plant seed 1/4- 1/2 inch deep in the fall to overcome stratification requirements. Average seed per ft² 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*

Siberian peashrub is an introduced, very hardy, deciduous, leguminous shrub that grows 6-14 feet tall. It has pinnate leaves with up to 18 small leaflets. It is widely adapted and very drought and cold tolerant, but does not grow well on very wet or very dry sandy soils. It is used extensively in windbreak plantings. It is tolerant of snow loads and performs very well in living snow fence applications. It has good wildlife food and cover values and good pollinator plant values. The showy, yellow colored flowers bloom in early spring and attract bees and bumble-bees. It is a food source for hummingbirds and songbirds use it for nesting. Once established, it can survive in areas with a minimum of 12 inches annual precipitation and will even survive in drier areas with supplemental irrigation. Plant as container or bareroot stock.

Plum, American*Prunus americana*

American plum is a native, moderately dense, deciduous, somewhat spiny shrub with a round-headed crown that grows 8-10 feet tall. 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 20+inch annual precipitation zones. It has good wildlife browse value and good cover and nesting value for birds. It is considered an excellent pollinator plant for bees and butterflies. The white colored flowers bloom in April-May and fruits are red to yellow colored when mature and are used to make preserves and jellies. It is used in windbreak and riparian plantings. Plant as container or bareroot stock.

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

Rubber rabbitbrush is a native shrub 1-8 feet tall. There is considerable morphological variation in size, stem, leaf, and flower characteristics and the species has been divided into two subspecies and 22 varieties (ecotypes). It is a common plant on plains, valleys, and foothills, and 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 plant for small bees and butterflies. Its yellow colored flowers bloom in August-October. 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 mining disturbances, roadways and big game ranges. The value of rubber rabbitbrush as browse varies greatly between subspecies and populations. Rubber rabbitbrush has marginal value as forage for all classes of livestock but can be an important browse on depleted rangeland and can be heavily used by wildlife during the winter. Some populations however do have excellent nutritive quality characteristics and may have potential as a source of industrial chemicals (rubber, resin, etc.). Control of established, unwanted stands is often difficult because it re-sprouts from basal buds. It can be difficult to establish by seeding. Average seeds/ft² at 1 lb. rate is 16. Pure stand seeding rate is 0.25 lb/ac but is not recommended for pure stands. Recommended rate in mixtures is approximately 1/40 pound PLS per acre. Seeding depth is 0-1/8 inch. This species is most commonly established with nursery grown plants.

Rabbitbrush, Yellow or Green

Chrysothamnus viscidiflorus

Green rabbitbrush is a native shrub that usually grows from 8-39 inches tall. There are five recognized botanical varieties of yellow rabbitbrush which can be distinguished by morphological variation in leaves and stem pubescence, and geographic distribution. It is a common plant on plains, valleys, and foothills in openings within the sagebrush, juniper and ponderosa pine zones in loamy, sandy, gravelly, to clay-alkaline soils and 7-24 inches annual precipitation. It is considered an excellent pollinator plant for butterflies. Its yellow colored flowers bloom in August-October. 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. Green rabbitbrush is browsed in the fall and winter by livestock and big game. The plants provide cover and nesting habitat for sage grouse, small birds and rodents. Control of established, unwanted stands is often difficult because it re-sprouts from basal buds. Average seeds/ft² at 1 lb. rate is 18. Pure stand seeding rate is 0.25 lb/ac. Not recommended for pure stands. It can be difficult to establish by seeding. Recommended rate in mixes is approximately 1/40 pound PLS per acre. Seeding depth is 0-1/8 inch. This species is most commonly established with nursery grown plants.

Rose, Woods'

Rosa woodsii

Woods' rose is a long-lived, spreading to erect, native shrub that grows 2-10 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, mountain sites, riparian areas, and along marshes and lake shores. It is tolerant of moderately acid to weakly basic, non-saline soils in 12-40 inch annual precipitation zones. It can be abundant and aggressive on disturbed soils and abandoned fields with reduced competition. Foliage is moderately palatable to livestock and big game. It provides good cover and winter food for birds and small mammals, for erosion control plantings, and as an ornamental. It is considered an excellent pollinator species for bees. Its pink colored flowers bloom in June-July. It can be drilled or broadcast seeded 1/2 inch deep. Fall seeding with freshly cleaned seed is recommended. Seed requires a cold-moist stratification period to germinate. Average seeds/ft² 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. Young seedlings can also be transplanted at 1 to 2 years of age.

Sage, Fringed (Prairie Sagewort)

Artemisia frigida

Fringed sage is a native, small shrub (4-16 inches tall) with silvery leaves, a pleasant sage odor, small greenish colored flowers and blooms from July to August. It can be found from Alaska to Texas in all soil types in areas receiving 10+ inches annual precipitation. It provides cover for small animals and provides food for sage grouse, antelope, elk, mountain sheep, mule deer, rabbits and rodents. It can be established using nursery materials or by seeding. Seed should be broadcast 0 to 1/8 in deep. Pure stand seeding rate is 0.5 lb/ac. Not recommended in pure stands. Recommended rate in mixtures is approximately 1/40 pound PLS per acre.

Sage, Purple (Dorr)

Salvia dorrii

Purple sage is a rounded, compact, native shrub with a moderate growth rate that grows 1-3 feet tall. It is considered good wildlife cover, attracts pollinators and is also used in ornamental plantings. It grows on sandy, rocky soils on dry open slopes, flats and foothills receiving 7-15 inches annual precipitation and is found in pinyon-juniper, sagebrush, chaparral and cool desert shrub habitat. Its purple colored flowers attract bees, butterflies and moths in May-July. It is undesirable forage to both livestock and wildlife. Average seeds/ft² at 1 lb. rate is 7. Pure stand seeding rate is 5 lb/ac. Seed can be broadcast planted in a late fall dormant planting, 0-1/4 inch deep. This species is most commonly established with nursery grown plants. Not recommended in pure stands.

Sage, Russian*Perovskia atriplicifolia*

Russian sage is an introduced, fragrant (Mint family), up-right half-shrub with a rapid growth rate that grows 2-4 feet tall. It is considered good wildlife cover and its small, purple colored flowers attract pollinators from July to October. It is easy to grow from transplants on well drained soils in full sun in areas receiving 15 to 18 inches annual precipitation. It tends to sprawl or flop over in partial shade and as the growing season progresses. This species is most commonly established with nursery grown plants.

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

Big sagebrush with its 3 major subspecies (basin, Wyoming and mountain) is a widely occurring, landscape dominating native shrub ranging from 1 to 15 feet tall. The shorter 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 8-18 inch annual precipitation zones. It is frequently associated with shrubs such 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 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 and is commonly seeded in big game habitat improvement projects. Big sagebrush establishes rapidly from direct broadcast seeding on disturbed surfaces. It is useful for stabilizing washes, gullies, roadcuts, and other raw, exposed sites. Plants can spread 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 vegetative diversity. 'Hobble Creek' is a robust, palatable form of mountain big sagebrush adapted to areas with 14 inches or more annual precipitation. 'Gordon Creek' is a release of Wyoming big sagebrush adapted to 10+ inch annual precipitation zones. Wildland seed harvest is a common practice and Certified 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 commonly as a fall dormant planting. Average seeds/ft² at 1 lb. rate is 39. Not recommended for pure seedings. Recommended rate in mixtures is 1/40 pound PLS per acre.

Sagebrush, Black*Artemisia nova*

Black sagebrush is a small spreading, aromatic native shrub commonly 4 to 12 inches tall with a flat topped crown. It has a dull grayish-tomentose vestiture that causes most populations to appear darker than big sagebrush. It grows in dry, stony, shallow soils often over a caliche layer that receives 6-18 inches of annual 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. Pine Valley Ridge Selected class pre-variety germplasm is the only release. Wildland seed harvest is a common practice and Certified 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 commonly as a fall dormant planting. Average seeds/ft² at 1 lb. rate is 21. Not recommended for pure stands. Recommended seeding rate in mixtures is approximately 1/40 pound PLS per acre.

Saltbush, Fourwing*Atriplex canescens*

Fourwing saltbush is an upright native shrub from 1 to 8 feet tall depending on site conditions and genotype. It is mostly dioecious (plants that are either pistillate (female) or staminate (male), or very rarely monoecious (female and male flowers on the same plant). 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 and is very tolerant of saline soils. It is frequently found intermixed with numerous shrub and grass species. It is primarily found in 8-14 inch annual 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. It is a short and herbaceous type better adapted to the Great Plains and mountain foothills of Idaho, Montana and Wyoming. Wildland seed harvest is a common practice and Certified Source Identified seed is recommended when using wildland collected seed. De-winged seed is recommended if drilling seed to ensure good seed flow through the drill. Plant at 1/4- 3/4 inch depth. Average seeds/ft² 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 1/4-1/2 pound PLS per acre - dewinged.

Saltbush, Gardner

Atriplex gardneri

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, fine 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 annual precipitation. On adapted sites, this species establishes and grows rapidly where few other species exist. It is sensitive to over grazing and has disappeared from many sites that historically supported this species. It produces excellent browse in all seasons for wildlife and livestock. Wildland seed harvest is a common practice and Certified Source Identified seed is recommended when using wildland collected seed. Plant at 1/4- 3/4 inch depth. Average seeds/ft² 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 and Utah Serviceberry

Amelanchier alnifolia, A. utahensis

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 annual 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 plant and the white colored flowers bloom in May-June. The fleshy fruits are sought by a wide variety of birds and mammals. Serviceberry is also used in windbreaks, streambank/riparian plantings, and as an ornamental. It resprouts following fire. Utah serviceberry (*A. utahensis*) is a similar species differing in its drier habitat, more pubescence and smaller leaves, and less succulent fruits. Seedlings and young plants grow slowly and can be suppressed by grasses and forbs. Once established, serviceberry withstands very heavy browsing. Three Selected Class Germplasm of *A. alnifolia* have been released by Pullman PMC: Okanogan (MLRA B7 and B8); Kendrick (MLRA B9 and B10); and Newport (MLRA E43 and E44). The Upper Colorado Environmental Plant Center released Long Ridge Germplasm (*A. utahensis*). Plant at 1/4- 1/2 inch depth. Should be seeded in the fall to break dormancy and allow seedcoat to soften. Average seeds/ft² 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 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 partly 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 communities and with sagebrush mixed in bottoms, flats and foothills from 1,500 to 7,500 feet elevation and less than 10 inches annual precipitation. It is highly palatable to livestock and wildlife, particularly during winter grazing periods. Wildland seed harvest is a common practice and Certified Source Identified seed is recommended when using wildland collected seed. Due to the complex mechanisms behind shadscale seed dormancy, revegetation through seeding is usually unsuccessful. Plant at 1/4- 3/4 inch depth. Average seeds/ft² 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 long lived, multi-stemmed, suckering, deciduous, nitrogen-fixing, native shrub 4-8 feet tall with an erect habit. New stems are initially light to medium brown in color and become dark gray and remain smooth 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 colored, trumpet shaped, and bloom in May-June. Fruit is silvery colored and often persists until late December. It is most common in the mountain foothills and well-drained riparian zones of the northern Rocky Mountains receiving 14 inches or more annual precipitation. It tolerates drought,

high pH and saline soils. 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. Dupuyer source is recommended for lower, riparian, bottomland sites characterized by high levels of soil moisture and periods of temporary inundation. Pondera source is recommended for upper streambank and floodplain terraces that are well drained, yet with adequate available soil moisture and both releases have potential applications in streambank stabilization, wildlife habitat and wind windbreak applications. It can become a serious weed in pastures. Fresh seed germinates readily but nursery stock planted in the spring is preferred and young seedlings can be transplanted at 1 to 2 years of age. If direct seeding, plant seed 1/2- 3/4 inch deep. Average seeds/ft² at 1 lb. rate 0.1. Not recommended for pure stands. Recommended full seeding rate is approximately 2 pounds PLS per acre.

Snowberry, Common and Mountain

Symphoricarpos albus and *S. oreophilus*

Snowberry are native, deciduous, 1-5 feet tall, spreading shrubs 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 colored flowers and showy white colored berries. Snowberry is considered an excellent pollinator plant for bees, butterflies and hummingbirds, and is also used in wildlife habitat plantings and erosion control plantings along roadways and hillsides. The flowers bloom in June-August. Snowberry fruits contain low concentrations of saponin which are mildly toxic to children. Snowberry resprouts following fire, but mountain snowberry is less fire tolerant and a weaker re-sprouter than common snowberry. They are browsed readily by wildlife and sheep, but are less desirable to cattle. Snowberry are adapted to a wide range of soils except loose sandy soils and grow well in sun or shade. Snowberry is generally found in 14+ inch annual precipitation zones. They commonly form a monoculture in the moist-dry zone of riparian areas. They can be transplanted, drilled, or broadcast seeded from 0 to 1/2 inch deep. Snowberry is very difficult to germinate because of hard seed coat and embryo dormancy that requires warm stratification. Transplanting 1 to 2 year old seedlings is recommended. Pullman PMC released Okanogan Selected Class Germplasm common snowberry. Average seeds/ft² 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 pound PLS per acre.

Spiraea, Douglas (Rose)

Spiraea douglasii

Douglas spiraea is a native, deciduous shrub 4 to 6 feet tall with upright slender limbs and spreads by suckers to form dense thickets with a rapid growth rate. Tiny, fragrant reddish-pink colored flowers form dense elongate clusters at the end of shoots and bloom in May-June. It prefers deep gravelly sand to clay loam soils in moist full sun locations. It tolerates flooding and boggy, poorly drained locations in 16 inch+ annual precipitation zones. It is considered a good pollinator plant for bees, hummingbirds, and butterflies. It is useful for streambank and shoreline stabilization as well as restoration of wetlands and provides good cover for birds and small animals. It can become invasive especially on flat moist sites with full sun. Average seeds/ft² 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.

Spiraea, Rock

Holodiscus dumosus

Rock spirea is closely related to oceanspray (*H. discolor*) but is shorter (3-9 feet tall). Flowers are numerous, small, creamy-white in color and are insect pollinated. It is adapted to areas receiving 16 to 35 inches annual precipitation and commonly occurs on well-drained, dry to moderately dry sandy or gravelly soils. It is found in a wide array of plant communities including sagebrush, pinyon-juniper, chaparral, and coniferous forest. Palatability and forage value of rock spirea are low, but it does provide food and cover for small animals and has ornamental value. Nursery grown seedlings are recommended.

Stretchberry

Forestiera pubescens var. *pubescens*

Stretchberry is a medium to tall, deciduous shrub native to the southwestern United States including Arizona, California, Nevada, New Mexico, Oklahoma, Texas and Utah. It has light green to grayish green colored leaves, grows 6-8 feet tall and is adapted to areas receiving 9 to 24 inches annual precipitation with a minimum 135 day growing season. The small yellow colored flowers are dioecious and bloom in early spring and mature to dark bluish-black colored berries in the fall. It tends to form dense, almost impenetrable hedges. It can be used in windbreaks and wildlife plantings for cover and food. 'Jemez' is a released variety from New Mexico PMC. This species is most commonly established with nursery grown plants.

Sumac, Skunkbush*Rhus trilobata*

Skunkbush sumac is a native, spreading, deciduous shrub that grows 2-7 feet tall with scented leaves and light yellow colored flowers and can be found on most well drained soil textures. It is common on hot, dry, shallow rocky sites, foothills and in well-drained soils with 8 to 18 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 plant for early bees. It blooms in May-June and has good tolerance to fire and grazing. It is used in windbreaks and riparian plantings, and for wildlife food and cover plantings. 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 is most commonly established with 1 to 2 year old nursery grown seedlings. Establishment is very slow by seed. 'Bighorn' is the only released variety. Seed may require scarification and pre-chilling to improve germination. Average seeds/ft² 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.

Willow*Salix* spp.

There are numerous native willows that are suitable for riparian areas, windbreak plantings and pollinator habitat. They come in a variety of growth types from clonal shrubs to large trees. Practically all willow species can be established using hardwood or softwood cuttings with some degree of success. See Technical Notes 32 and 43 for more information.

Winterfat*Krascheninnikovia lanata, Ceratoides lanata* or *Eurotia lanata*

Winterfat is an erect or spreading, long-lived, native sub-shrub that shows wide variation in stature from dwarf forms less than 8 inches in height to larger forms up to 4 feet tall. The dwarf forms are herbaceous above with a woody base; and taller forms tend to be woody throughout. Winterfat is widely distributed in arid plant communities of western North America and is most abundant on lower foothills, plains, and valleys with dry saline to alkaline soils that receive 7-16 inches annual 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) when stored in cool, dry conditions. Seeds require an after-ripening period for maximum germination. Winterfat may be established by direct seeding (0-1/8 inch seeding depth), or by transplanting in 9 inch or greater rainfall areas. Attempts to establish winterfat in lower rainfall zones commonly fails. The upright variety, 'Hatch', is best adapted to southern ranges and produces rapid growth. Bridger, MT PMC released Open Range Selected Class Germplasm for use in the Northern Rocky Mountains and Northern Great Plains. Wildland seed harvest is a common practice and Certified Source Identified seed is recommended when using wildland harvested seed. Average seeds/ft² at 1 lb. rate is 3. Pure stand seeding rate is 5 lb/ac. Not recommended for pure stands. Recommended rate in mixtures is 0.025 to 0.5 lb PLS/ac.

Yucca (soapweed)*Yucca* spp.

Yucca is native to the Great Plains and southwest and grows 1-4 feet tall. Yucca plants are evergreen with long sword-shaped leaves and sharp needle ends that radiate from the central base of the plant. It is best adapted to sandy soils and is very drought tolerant (7+ inches annual precipitation). It has an upright growth habit and a slow growth rate. It is considered a fair pollinator species primarily for moths. Its lily-like showy, creamy white colored flowers bloom in June-July on a flower stalk that grows above the leaves from the center of the plant. The fruit pods are 2-3 inches long and 1-2 inches wide. Inside the fruit are seeds which are thin, black and coarse. The roots have a woody thick bark covering the outer layer and the core of the root is spongy. This species is most commonly established with nursery grown plants and is used in dry ornamental plantings.

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
- 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., L. St. John, M. Stannard and L. Holzworth. 2010. 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. 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 2013. PLANT Database <http://plants.usda.gov/>
- Wambolt, Carl. *Montana Range Seeding Guide*. Cooperative Extension Service, Montana State University, Bulletin 347, May 1976.

Table 2. Grass characteristics ranked by precipitation requirements (low-high)												
Common Name	Scientific name	Origin	Character	Height (in)	Seedling vigor	Longevity	Precip	Soils				pH
								Fine	Med	Coarse	Wet	
Ricegrass, Indian	<i>Achnatherum hymenoides</i>	N	Bunch	30	Med.	Long	6-14		X	X		6.6-8.6
Three-awn, purple	<i>Aristida purpurea</i>	N	Bunch	30	Med.	Long	6-14		X	X		6.5-7.5
Galletta, James'	<i>Pleuraphis jamesii</i>	N	Sod	19	Med.	Long	6-18	X	X	X		6.6-8.4
Wildrye, mammoth	<i>Leymus racemosus</i>	I	Sod	39	Very low	Long	7-12		X	X		6.0-9.0
Dropseed, sand	<i>Sporobolus cryptandrus</i>	N	Bunch	36	Low	Long	7-12		X	X		6.6-8.0
Needle and thread	<i>Hesperostipa comata</i>	N	Bunch	48	Low	Long	7-16		X	X		6.6-8.4
Wildrye, Russian	<i>Psathrostachys juncea</i>	I	Bunch	40	Low	Long	8-12	X	X			6.5-9.0
Wheatgrass, Snake River	<i>Elymus wawawaiensis</i>	N	Bunch	48	Med.	Long	8-13		X	X		6.6-8.4
Wheatgrass, Siberian	<i>Agropyron fragile</i>	I	Bunch	36	Med.	Long	8-16	X	X	X		5.6-9.0
Needlegrass, Thurber's	<i>Achnatherum thurberianum</i>	N	Bunch	24	Low	Long	8-16		X	X		6.0-7.5
Wheatgrass, streambank	<i>Elymus lanceolatus</i>	N	Sod	32	Med.	Long	8-16	X	X			6.6-8.4
Bluegrass, Sandberg	<i>Poa secunda</i>	N	Bunch	12	Low - Med.	Long	8-18	X	X	X		6.0-8.0
Squirreltail, bottlebrush	<i>Elymus elymoides</i>	N	Bunch	24	Med.	Long	8-18		X	X		6.0-8.4
Wheatgrass, thickspike	<i>Elymus lanceolatus</i>	N	Sod	32	Med.	Long	8-18	X	X			6.6-8.4
Wildrye, basin	<i>Leymus cinereus</i>	N	Bunch	72	Low	Long	8-18		X	X		5.6-9.0
Bluegrass, Canby	<i>Poa canbyi</i>	N	Bunch	31	Low - Med.	Long	9-15	X	X	X		6.0-8.0
Wheatgrass, crested X	<i>Agropyron cristatum X</i>	I	Bunch	36	Rapid	Long	9-16	X	X	X		6.0-8.0
Wheatgrass, crested	<i>Agropyron desertorum</i>	I	Bunch	36	Rapid	Long	9-16	X	X	X		6.0-8.5
Bluegrass, big	<i>Poa ampla</i>	N	Bunch	48	low- Med.	Medium	9-20	X	X			6.0-8.0
Wheatgrass, crested	<i>Agropyron cristatum</i>	I	Bunch	36	Rapid	Long	10-18	X	X	X		6.0-8.5
Wheatgrass, slender	<i>Elymus trachycaulus</i>	N	Bunch	40	Rapid	Short	10-18	X	X			5.6-9.0
Saccaton, alkali	<i>Sporobolus airoides</i>	N	Bunch	39	Low - Med.	Long	10-18	X	X	X	X	6.6-9.0
Bluegrass, Nevada	<i>Poa nevadensis</i>	N	Bunch	39	Low - Med.	Long	10-20		X	X		6.0-8.0
Wheatgrass, bluebunch	<i>Pseudoroegneria spicata</i>	N	Bunch	48	Med.	Long	10-20	X	X			6.6-8.4

Table 2. Grass characteristics ranked by precipitation requirements (low-high) (cont.)												
Common Name	Scientific name	Origin	Character	Height (in)	Seedling vigor	Longevity	Precip	Soils				pH
								Fine	Med	Coarse	Wet	
Bluegrass, mutton	<i>Poa fendleriana</i>	N	Bunch	30	Low - Med.	Long	10-22		X	X		6.0-8.0
Wheatgrass, pubescent	<i>Thinopyrum intermedium</i>	I	Sod	48	Rapid	Long	11-18	X	X	X		5.6-8.4
Wheatgrass, intermediate	<i>Thinopyrum intermedium</i>	I	Sod	48	Rapid	Long	12-18	X	X	X		5.6-8.4
Wheatgrass, beardless	<i>Pseudoroegneria spicata inerme</i>	N	Bunch	48	Med.	Long	12-18	X	X	X		6.4-8.4
Squirreltail, big	<i>Elymus multisetus</i>	N	Bunch	25	Med.	Long	12-20	X	X			6.0-8.4
Wheatgrass, western	<i>Pascopyrum smithii</i>	N	Sod	36	Med.	Long	12-20	X	X			4.5-9.0
Grama, blue	<i>Bouteloua gracilis</i>	N	Bunch	12	Med	Long	12-22	X	X	X		6.6-8.4
Fescue, sheep	<i>Festuca ovina</i>	I	Bunch	12	Low	Long	12-22	X	X			5.5-7.5
Wheatgrass, RS hybrid	<i>Elymus hoffmanii</i>	I	Sod	53	Med.	Long	13-30	X	X	X	X	6.6-8.4
Fescue, Idaho	<i>Festuca idahoensis</i>	N	Bunch	12	Very low	Long	14-20	X	X			5.6-8.4
Junegrass, prairie	<i>Koeleria macrantha</i>	N	Bunch	24	Low - Med.	Medium	14-20		X	X		6.0-8.0
Wildrye, altai	<i>Leymus angustus</i>	I	Bunch	40	low	Long	14-24	X	X			5.9-9.0
Wildrye, manystem	<i>Leymus multicaulis</i>	I	Sod	32	Very low	Long	14-24		X	X	X	6.6-9.0
Needlegrass, green	<i>Nassella viridula</i>	N	Bunch	36	Low	Long	14-24	X	X			6.6-8.4
Brome, meadow	<i>Bromus biebersteinii</i>	I	Bunch	48	Med.-rapid	Long	14-25	X	X	X		6.6-9.0
Fescue, hard	<i>Festuca brevipila</i>	I	Bunch	12	Low	Long	14-25		X	X		4.5-8.0
Brome, smooth	<i>Bromus inermis</i>	I	Sod	48	Very rapid	Long	14-30	X	X	X		5.5-8.0
Wheatgrass, tall	<i>Thinopyrum ponticum</i>	I	Bunch	60	Very rapid	Long	14-30	X	X	X	X	6.6-10.0
Wildrye, Canada	<i>Elymus canadensis</i>	N	Bunch	60	Rapid	Short	15-45	X	X	X		5.0-7.9
Needlegrass, Letterman	<i>Achnatherum lettermanii</i>	N	Bunch	18	Low	Long	16-24		X	X		6.0-7.6
Brome, mountain	<i>Bromus marginatus</i>	N	Bunch	40	Med.-Rapid	Short	16-25	X	X	X		5.5-8.0
Wildrye, blue	<i>Elymus glaucus</i>	N	Bunch	60	Med.	Medium	16-60	X	X			5.8-8.5
Switchgrass	<i>Panicum virgatum</i>	I	Sod	60	Very low	Long	16-60	X	X	X		4.5-8.0
Orchardgrass	<i>Dactylis glomerata</i>	I	Bunch	36	Med.	Long	18-30		X			5.0-7.5

Table 2. Grass characteristics ranked by precipitation requirements (low-high) (cont.)												
Common Name	Scientific name	Origin	Character	Height (in)	Seedling vigor	Longevity	Precip	Soils				pH
								Fine	Med	Coarse	Wet	
Bluegrass, Canada	<i>Poa compressa</i>	I	Sod	27	Low - Med.	Long	18-45		X	X		5.0-7.0
Foxtail, creeping	<i>Alopecurus arundinaceus</i>	I	Sod	48	Low	Long	18-55	X	X		X	5.5-8.4
Fescue, tall	<i>Schedonorus arundinaceus</i>	I	Bunch	48	Med.	Long	18-55	X	X			5.0-9.0
Bentgrass, redtop	<i>Agrostis gigantea</i>	I	Sod	48	Low - Med.	Long	18-60	X	X		X	4.5-8.0
Hairgrass, tufted	<i>Deschampsia cespitosa</i>	N	Bunch	60	Low	Long	18-60	X	X		X	4.8-7.2
Fescue, red	<i>Festuca rubra</i>	I	Sod	39	Low	Long	18-60	X	X			5.0-7.5
Timothy	<i>Phleum pratense</i>	I	Bunch	40	Med.	Long	18-65	X	X			5.0-7.8
Bluegrass, Kentucky	<i>Poa pratensis</i>	I	Sod	36	Low - Med.	Long	18-65	X	X			5.0-8.4
Ryegrass, perennial	<i>Lolium perenne</i>	I	Bunch	24	Very rapid	Short	30-50	X	X			5.0-8.0

Table 3. Grass seeding information								
Common Name	Scientific name	Seeds/lb	Seeds/ft @ 1 lb/ac	Drill lb/ac	Seeding depth	Releases-recommended are underlined	Avg purity	Avg germ
Bentgrass, redtop	<i>Agrostis gigantea</i>	4,990,000	115	0.5	0-1/4	'Streaker'	90	85
Bluegrass, big	<i>Poa ampla</i>	925,000	21	2	0-1/4	' <u>Sherman</u> ', Service	90	75
Bluegrass, Canada	<i>Poa compressa</i>	1,600,000	37	2 (6 sod)	1/4-1/2	<u>Foothills</u> , 'Rubens', 'Talon	90	75
Bluegrass, Canby	<i>Poa canbyi</i>	925,000	21	2	0-1/4	'Canbar'	90	75
Bluegrass, Kentucky	<i>Poa prantensis</i>	2,200,000	50	2 (4 sod)	0-1/4	multiple-turfgrass	90	75
Bluegrass, mutton	<i>Poa fendleriana</i>	890,000	20	2	1/8-1/4	common	90	75
Bluegrass, Nevada	<i>Poa nevadensis</i>	925,000	21	2	0-1/4	<u>Opportunity</u>	<u>90</u>	<u>75</u>
Bluegrass, Sandberg	<i>Poa secunda</i>	1,000,000	23	2	0-1/4	<u>High Plains</u> , <u>Reliable</u> , <u>Mountain Home</u>	<u>90</u>	<u>75</u>
Brome, meadow	<i>Bromus biebersteinii</i>	93,000	2	10	1/4-1/2	' <u>Cache</u> ', ' <u>Regar</u> ', ' <u>Paddock</u> ', ' <u>Fleet</u> '	95	85
Brome, mountain	<i>Bromus marginatus</i>	80,000	2	10	1/4-1/2	' <u>Bromar</u> ', ' <u>Garnet</u> '	90	85
Brome, smooth	<i>Bromus inermis</i>	145,000	3	6	1/4-1/2	'Manchar', 'Lincoln'	90	85
Dropseed, sand	<i>Sporobolus cryptandrus</i>	5,298,000	122	1	0-1/4	common	90	85
Fescue, hard	<i>Festuca brevipila</i>	560,000	13	4	0-1/4	' <u>Durar</u> '	95	85
Fescue, Idaho	<i>Festuca idahoensis</i>	450,000	10	4	1/4-1/2	' <u>Nezpurs</u> ', ' <u>Winchester</u> ', 'Joseph'	90	80
Fescue, red	<i>Festuca rubra</i>	614,000	14	4 (15 sod)	0-1/4	multiple-turfgrass	98	80
Fescue, sheep	<i>Festuca ovina</i>	680,000	16	4	0-1/4	' <u>Covar</u> ', 'Bighorn'	95	85
Fescue, tall	<i>Schedonorus phoenix</i>	205,000	5	5 (40 sod)	1/4-1/2	' <u>Forager</u> ', ' <u>Johnstone</u> ', ' <u>Tuscanny II</u> ', 'Alta', 'Fawn'	98	85
Foxtail, creeping	<i>Alopecurus arundinaceus</i>	750,000	17	3	1/8-1/4	' <u>Garrison</u> '	<u>80</u>	<u>80</u>
Galletta, James'	<i>Pleuraphis jamesii</i>	270,000	6	4	1/4-1/2	common, 'Viva'		
Gramma, blue	<i>Boutelou gracilis</i>	711,000	16	3	1/4-1/2	'Hachita', 'Alma', 'Lovington', Bad River		
Hairgrass, tufted	<i>Deschampsia cespitosa</i>	2,500,000	57	1.5	0-1/4	'Norcoast', 'Nortran', 'Peru Creek' Tillamook, Willamette	80	75
Junegrass, prairie	<i>Koeleria macrantha</i>	2,135,000	49	1	0-1/8	common	80	75
Needlegrass, green	<i>Nassella viridula</i>	180,000	4	6	1/4-1/2	'Fowler', AC Millard, 'Lodorm', 'Green Stipagrass', 'Cucharas'	80	75
Needlegrass, Letterman	<i>Achnatherum lettermanii</i>	150,000	3	6	1/4-1/2	common	80	75

Table 3. Grass seeding information (cont.)								
Common Name	Scientific name	Seeds/lb	Seeds/ft @ 1 lb/ac	Drill lb/ac	Seeding depth	Releases-recommended are underlined	Avg purity	Avg germ
Needlegrass, Thurber's	<i>Achnatherum thurberianum</i>	180,000	4	6	1/4-1/2	common	80	60
Needle and thread	<i>Hesperostipa comata</i>	115,000	3	6	1/4-1.0	common	80	75
Orchardgrass	<i>Dactylis glomerata</i>	540,000	12	4	1/4-1/2	<u>'Latar'</u> , <u>'Paiute'</u> , <u>'Potomac'</u> , <u>'Hallmark'</u>	90	80
Ricegrass, Indian	<i>Achnatherum hymenoides</i>	162,000	4	8	1/2-3.0	<u>'Nezpar'</u> , <u>'Rimrock'</u> , <u>'Paloma'</u> Ribstone, Star, White River	95	80
Ryegrass, perennial	<i>Lolium perenne</i>	247,000	6	4 (15 forage)	1/2-3/4	multiple-shortlived and high producing	98	90
Saccaton, alkali	<i>Sporobolus airoides</i>	1,700,000	39	1	1/8-1/2	Saltalk, Salado, Vegas	98	80
Squirreltail, big	<i>Elymus multisetus</i>	192,000	4	6	1/4-1/2	Sand Hollow	80	75
Squirreltail, bottlebrush	<i>Elymus elymoides</i>	220,000	5	7	1/4-1/2	<u>Fish Creek</u> , <u>Toe Jam Creek</u> , <u>Rattlesnake</u> , Pueblo, Wapiti, Pleasant Valley, Antelope Creek	80	75
Switchgrass	<i>Panicum virgatum</i>	426,000	10	4	1/4-1/2	<u>'Blackwell'</u> , <u>'Dakotah'</u> , <u>'Forestburg'</u> , <u>'Sunburst'</u>	80	80
Three-awn, purple	<i>Aristida purpurea</i>	250,000	6	4	1/2-1.0	common		
Timothy	<i>Phleum pratense</i>	1,230,000	28	3	1/8-1/4	<u>'Aurora'</u> , <u>'Climax'</u> , <u>'Mohawk'</u> and many others	97	80
Wheatgrass, beardless	<i>Pseudoroegneria spicata inerme</i>	145,000	3	8	1/4-1/2	<u>'Whitmar'</u>	90	85
Wheatgrass, bluebunch	<i>Pseudoroegneria spicata</i>	139,000	3	8	1/4-1/2	<u>Anatone</u> , <u>'Goldar'</u> , <u>'P-7'</u>	90	85
Wheatgrass, crested	<i>Agropyron cristatum</i>	175,000	4	5	1/4-1/2	<u>'Ephraim'</u> , <u>'Roadcrest'</u> , <u>'Douglas'</u> , <u>'Parkway'</u> , <u>'Ruff'</u>	95	85
Wheatgrass, crested X	<i>Agropyron cristatum X</i>	165,000	4	5	1/4-1/2	<u>'Hycrest II'</u> , <u>'Hycrest'</u>	95	85
Wheatgrass, crested	<i>Agropyron desertorum</i>	165,000	4	5	1/4-1/2	<u>'Nordan'</u> , <u>'Summit'</u>	95	85
Wheatgrass, intermediate/pubescent	<i>Thinopyrum intermedium</i>	80,000	2	10	1/4-1/2	<u>'Rush'</u> , <u>'Manifest'</u> , <u>'Reliant'</u> , <u>'Oahe'</u> , <u>'Tegmar'</u> , <u>'Luna'</u> , <u>'Manska'</u> , <u>Greenleaf</u>	95	90
Wheatgrass, RS hybrid	<i>Elymus hoffmanii</i>	139,000	3	8	1/4-1/2	<u>'Newhy'</u> , <u>'AC Saltlander'</u>	95	90
Wheatgrass, Siberian	<i>Agropyron fragile</i>	160,000	4	6	1/4-1/2	<u>'Vavilov II'</u> , <u>'Vavilov'</u> , <u>'Stabilizer'</u>	95	85
Wheatgrass, slender	<i>Elymus trachycaulus</i>	135,000	3	8	1/2-3/4	<u>'First Strike'</u> , <u>'Copperhead'</u> , <u>'Pryor'</u> , <u>'San Luis'</u>	<u>90</u>	<u>85</u>
Wheatgrass, Snake River	<i>Elymus wawawaiensis</i>	139000	3	8	1/4-1/2	<u>'Discovery'</u> , <u>'Secar'</u>	90	80
Wheatgrass, streambank	<i>Elymus lanceolatus</i>	135,000	3	6 (24 sod)	1/4-1/2	<u>'Sodar'</u>	<u>90</u>	<u>85</u>
Wheatgrass, tall	<i>Thinopyrum ponticum</i>	78,000	2	10 (15 saline)	1/2-3/4	<u>'Alkar'</u> , <u>'Jose'</u> , <u>'Platte'</u>	95	90
Wheatgrass, thickspike	<i>Elymus lanceolatus</i>	135,000	3	6	1/4-1/2	<u>'Bannock'</u> , <u>'Critana'</u>	85	90

Common Name	Scientific name	Seeds/lb	Seeds/ft @ 1 lb/ac	Drill lb/ac	Seeding depth	Releases-recommended are underlined	Avg purity	Avg germ
Wheatgrass, western	<i>Pascopyrum smithii</i>	115,000	3	8	1/4-1/2	<u>'Recovery'</u> , 'Rosana', 'Ariba', 'Flintlock', 'Rodan'	85	75
Wildrye, altai	<i>Leymus angustus</i>	73,000	2	12	1/4-1/2	<u>'Mustang'</u> , 'Eejay', 'Pearl', 'Prairieland'	80	85
Wildrye, basin	<i>Leymus cinereus</i>	130,000	3	8	1/4-3/4	<u>'Magnar'</u> , <u>'Trailhead'</u> , <u>Continental</u> , Washoe	80	85
Wildrye, blue	<i>Elymus glaucus</i>	145,000	3	8	1/4-1/2	<u>Union Flat</u> , White Pass, 'Arlington', 'Elkton'	80	80
Wildrye, Canada	<i>Elymus canadensis</i>	115,000	3	10	1/4-1/2	'Mandan'	80	80
Wildrye, mammoth	<i>Leymus racemosus</i>	55,000	1	15	1/2-3/4	'Volga'	80	65
Wildrye, manystem	<i>Leymus multicaulis</i>	150,000	3	6	0-1/4	<u>'Shoshone'</u>	<u>80</u>	<u>80</u>
Wildrye, Russian	<i>Psathrostachys juncea</i>	170,000	4	6	0-1/4	<u>'Bozoisky II'</u> , <u>'Bozoisky'</u> , 'Mankota',	<u>90</u>	<u>80</u>

- Full stand seed rate based on drill seeding with 6-14" row spacing. For 18-24" spacing divide by 2. For 28-36" divide by 2.5. For broadcast seeding, use 1.5 or 2 times the full stand rate.

Common Name	Scientific name	Longevity	Vigor	Character	Hydrologic Regime	Rate of Spread	Flood Tolerance	Recommended planting method
Sedge, water	<i>Carex aquatilis</i>	Long	Rapid	Sod	To 3" depth	Medium	High	Transplants
Sedge, Nebraska	<i>Carex nebrascensis</i>	Long	Rapid	Sod	Seasonally saturated	Medium	High	Transplants
Sedge, beaked	<i>Carex rostrata</i>	Long	Rapid	Sod	Seasonally saturated	Rapid	High	Transplants
Spikerush, creeping	<i>Eleocharis palustris</i>	Long	Rapid	Sod	To 6" depth	Rapid	High	Transplants
Rush, baltic	<i>Juncus balticus</i>	Long	Rapid	Sod	Seasonally saturated	Medium	High	Transplants
Bulrush, hardstem	<i>Schoenoplectus acutus</i>	Long	Rapid	Sod	To 36" depth	Rapid	High	Transplants
Bulrush, alkali	<i>Schoenoplectus maritimus</i>	Long	Rapid	Sod	To 6" depth	Medium	High	Transplants
Threesquare, common	<i>Schoenoplectus pungens</i>	Long	Rapid	Sod	To 6" depth	Rapid	High	Transplants
Cattail	<i>Typha</i> spp.	Long	Rapid	Sod	To 12" depth	Rapid	High	Transplants

Table 5. Forb characteristics ranked by precipitation requirements (low-high).

Common Name	Scientific name	Early	Mid	Late	Origin	Longevity	Seedling vigor	Character	Height (in)	Precip.	Soils			Pollinators
											Fine	Med	Coarse	
Pea, few flower	<i>Lathyrus pauciflorus</i>				N			Vine	8-30	5-14	X	X	X	Bees, butterfly laval host
Globemallow, gooseberry leaf	<i>Sphaeralcea grossulariifolia</i>				N	Long	Low	Erect	18-36	6-14		X	X	Bees
Globemallow, scarlet	<i>Sphaeralcea coccinea</i>				N	Short	Low	Erect	12-18	6-14		X	X	Bees
Penstemon, bluestem	<i>Penstemon cyanocaulis</i>				N	Med.	V. Low	Erect	8-18	6-15		X	X	Bees
Fleabane, shaggy	<i>Erigeron pumilus</i>				N				4-12	6-17		X	X	Bees
Tansyaster, Bigelow's	<i>Machaeranthera bigelovii</i>				N	Short		Erect	12-36	6-18	X	X	X	Bees, butterflies
Prairie clover, Searls'	<i>Dalea searlsiae</i>				N	Med.	Low	Erect	10-24	7-14		X	X	
Blazingstar, smoothstem	<i>Mentzelia laevicaulis</i>				N	Short	Low	Erect	12-36	7-15		X	X	Bees, butterflies, moths
Primrose, evening	<i>Oenothera caespitosa</i>				N	Short	High	Prostrate	1-2	7-20		X	X	Moths
Penstemon, sharpleaf	<i>Penstemon acuminatus</i>				N	Med.	V. Low	Erect	8-24	8-10+		X	X	Bees
Milkvetch, basalt	<i>Astragalus filipes</i>				N	Med.	Low	Erect	12-36	8-12		X	X	Bees
Beeflower, yellow	<i>Cleome lutea</i>				N	Annual	Med.-Rapid	Erect	24-36	8-12	X	X		Bees, wasps, butterflies
Paintbrush	<i>Castilleja spp.</i>				N	Short	Low	Erect	6-18	8-15				
Sunflower, annual	<i>Helianthus annuus</i>				N	Annual	Medium	Erect	36-120	8-15	X	X	X	Bees, ants
Tansyaster, hoary	<i>Machaeranthera canescens</i>				N	Short	Low	Erect	24-36	8-15		X	X	Bees, butterflies
Biscuitroot, bigseed	<i>Lomatium macrocarpum</i>				N	Short	Medium	Prostrate	6	8-16			X	Bees
Biscuitroot, Gray's	<i>Lomatium grayi</i>				N	Long	Medium	Erect	6-12	8-16		X		
Hawksbeard, tapertip, limestone and slender	<i>Crepis acuminata, C. atribarba and C. intermedia</i>				N	Long	Low	Erect	10-30	8-20		X	X	Bees
Penstemon, scabland	<i>Penstemon deustus</i>				N	Long	Medium	Erect	8-24	8-14		X		
Pussytoes	<i>Antennaria sp. (rosea)</i>				N			Mat	6-12	8-40	X	X	X	Painted lady butterfly
Yarrow, western	<i>Achillea millefolium</i>				N	Med.	Low	Erect	6-24	8-60		X	X	Butterflies, some bees
Balsamroot, Carey's	<i>Balsamorhiza careyana</i>				N	Med.	Medium	Erect	24-30	8-20	X	X		Bees
Fleabane, Engelmann's	<i>Erigeron engelmannii</i>				N			Erect	9-12	8-20	X	X	X	Bees

Table 5. Forb characteristics ranked by precipitation requirements (low-high) (cont.)															
Common Name	Scientific name	Early	Mid	Late	Origin	Longevity	Seedling vigor	Character	Height (in)	Precip.	Soils			Pollinators	
											Fine	Med	Coarse		
Sunflower, prairie	<i>Helianthus petiolaris</i>		☀	☀	N	Annual	Medium	Erect	10-36	9-18			X	Bees	
Sweetclover, white	<i>Melilotus alba</i>		☼		I	Short	Med.-Rapid	Erect	12-36	9-20	X	X	X	Bees	
Sweetclover, yellow	<i>Melilotus officinalis</i>		☀		I	Short	Med.-Rapid	Erect	12-36	9-20	X	X	X	Bees	
Balsamroot, Hooker's	<i>Balsamorhiza hookeri</i>	☀	☀		N	Med.	Medium	Erect	12-24	9-20	X	X	X	Bees	
Dustymaiden, douglas'	<i>Chaenactis douglasii</i>		☼		N	Short	Medium	Erect	6-25	9-30			X	X	Bees
Penstemon, broadleaf	<i>Penstemon angustifolius</i>	☼			N	Short	V. Low	Erect	24-36	9-35			X	X	Bees, hummingbirds
Penstemon, low	<i>Penstemon humilis</i>	☼	☼		N			Erect	4-10	10-16			X	X	Bees
Penstemon, Palmer's	<i>Penstemon palmeri</i>	☼	☼		N	Med.	V. Low	Erect	24-36	10-16			X	X	Large bees
Aster, gray	<i>Aster glaucodes</i>		☼	☼	N	Short	Low	Erect	20-30	10-18			X	X	Bees, butterflies
Prairie clover, white	<i>Dalea candida</i>		☼	☼	N			Erect	24-36	10-18			X	X	Bees
Penstemon, firecracker	<i>Penstemon eatonii</i>	☼	☼		N	Short	V. Low	Erect	12-30	10-18			X	X	Bees, wasps, hummingbirds
Phacelia, silverleaf	<i>Phacelia hastata</i>	☼	☼		N	Med.	Medium	Decumbent	18-24	10-18			X	X	Bees
Sweetvetch	<i>Hedysarum boreale</i>	☼			N	Med.	Low	Erect	12-24	10-18	X	X	X	Bees, butterflies	
Flax, Lewis	<i>Linum lewisii</i>	☼	☼		N	Short	Low-Med.	Erect	12-24	10-20			X	X	Bees
Flax, blue	<i>Linum perenne</i>	☼	☼		I	Short	Low-Med.	Erect	12-24	10-20			X	X	Bees
Crownbeard, golden	<i>Verbesina encelioides</i>		☀		N		Medium	Erect	16-30	10-20	X	X			Butterflies
Sunflower, Common woolly	<i>Eriophyllum lanatum</i>	☀	☀		N	Med.	Medium	Erect	4-18	10-25			X	X	Butterflies, bees, moths
Goldenaster, hairy false	<i>Heterotheca villosa</i>		☀		N	Short	Medium	Rounded	12-18	10-26			X	X	Bees
Pearly everlasting, western	<i>Anaphilis margaritacea</i>		☼		N	Short	Medium	Erect	24-36	10-35			X		Larval butterfly host plant
Lupine, silver	<i>Lupinus argenteus</i>		☼		N	Short	High	Erect	18-24	10-45	X	X	X		Bees, bumblebees
Vetch, American	<i>Vicia americana</i>	☼	☼		N	Med.	Low	Spreading	6-12	10-50			X	X	Bees
Hawksbeard, largeflower	<i>Crepis occidentalis</i>		☀		N	Long	Low	Erect	10-30	12-18	X	X	X		Bees
Biscuitroot, nineleaf	<i>Lomatium triternatum</i>	☀	☀		N	Long	Medium	Erect	24-36	12-20				X	Bees
Penstemon, thickleaf	<i>Penstemon pachyphyllus</i>	☼	☼		N		V. Low	Erect	12-20	12-20			X		Bees

Table 5. Forb characteristics ranked by precipitation requirements (low-high) (cont.)

Common Name	Scientific name	Early	Mid	Late	Origin	Longevity	Seedling vigor	Character	Height (in)	Precip.	Soils			Pollinators
											Fine	Med	Coarse	
Mule's ears	<i>Wyethia amplexicaulis</i>	●	●		N	Long	Low	Erect	24-30	12-20	X	X		Bees, bumblebees, butterflies
Hyssop, mountain giant	<i>Agastache pallidiflora</i>			●	N				12-30	12-24	X	X	X	Bees
Penstemon, Royal	<i>Penstemon speciosus</i>	●	●		N	Med.	V. Low	Erect	12-24	12-24		X	X	Bees, moths
Penstemon, sulphur	<i>Penstemon attenuatus</i>		●		N	Med.	V. Low	Erect	6-36	12-25		X		
Alfalfa, and yellow blossom alfalfa	<i>Medicago sativa & M. falcata</i>	●			I	Med.	Medium	Erect	24-36	12-25	X	X		Bees
Sagebrush, white	<i>Artemisia ludoviciana</i>	●			N	Short	High	Erect	24-36	12-30		X	X	
Sunflower, oneflower	<i>Helianthella uniflora</i>	●	●		N	Med.	Medium	Erect	24-36	12-35		X	X	Bees, ants
Penstemon, showy	<i>Penstemon spectabilis</i>	●	●		N			Erect	24-30	12-40		X	X	Bees, wasps, hummingbirds
Gilia, scarlet	<i>Ipomopsis aggregata</i>		●		N	Biennial	Low	Erect	12-36	13-40		X	X	Hummingbirds, moths
Beeflower, Rocky Mountain	<i>Cleome serrulata</i>	●	●		N	Annual	Med.-Rapid	Erect	12-72	13-55		X	X	Bees, wasps, butterflies
Balsamroot, arrowleaf	<i>Balsamorhiza sagittata</i>	●			N	Long	V. Low	Erect	12-24	14-18		X	X	Bees, butterflies
Prairie clover, Blue Mountain	<i>Dalea ornata</i>		●		N	Short	Low-Med.	Erect	12-24	14-18	X	X		
Prairie clover, purple	<i>Dalea purpurea</i>		●		N	Med.	Low	Erect	12-36	14-20	X	X		
Biscuitroot, fernleaf	<i>Lomatium dissectum</i>		●		N	Long	Medium	Erect	6-24	14-30		X		Bees
Balsamroot, cutleaf	<i>Balsamorhiza macrophylla</i>	●			N	Long	V. Low	Erect	12-24	14-40	X	X	X	Bees
Coneflower, purple	<i>Echinacea purpurea</i>		●		N	Med.	Medium	Erect	6-24	14-40	X	X	X	butterflies, bees
Sainfoin	<i>Onobrychis viciifolia</i>	●	●		I	Med.	Low-Med.	Erect	24-60	14-45		X	X	Bees
Aster, western	<i>Symphyotrichum ascendens</i>		●	●	N	Med.	Low	Erect	12-40	14-60		X	X	Bees
Milkvetch, cicer	<i>Astragalus cicer</i>	●			I	Long	Low	Erect	12-36	14-60	X	X		Bees
Penstemon, Rocky Mountain	<i>Penstemon strictus</i>	●			N	Med.	V. Low	Erect	12-36	15-20	X	X		Bees
Burnet, small	<i>Sanguisorba minor</i>		●	●	I	Med.	Medium	Erect	12-24	15-25	X	X		Bees
Crownvetch	<i>Coronilla varia</i>	●			I	Long	Medium	Prostrate	12-24	15-40		X	X	
Geranium, sticky purple	<i>Geranium viscosissimum</i>	●	●		N	Short	Low	Erect	12-36	16-20	X	X		Bees, butterflies

Table 5. Forb characteristics ranked by precipitation requirements (low-high) (cont.)

Common Name	Scientific name	Early	Mid	Late	Origin	Longevity	Seedling vigor	Character	Height (in)	Precip.	Soils			Pollinators	
											Fine	Med	Coarse		
Tansyaster, tansyleaf	<i>Machaeranthera tanacetifolia</i>				N	Annual	Medium	Erect	6-12	16-24		X			Bees, butterflies
Goldeneye, showy	<i>Heliomeris multiflora</i>				N	Long	Medium	Erect	8-39	16-25		X	X		Bees
Penstemon, Venus	<i>Penstemon venustus</i>				N	Med.	V. Low	Erect	12-32	16-25	X	X			
Milkweed, showy	<i>Asclepias speciosa</i>				N	Long	Medium	Erect	36-48	16-30		X	X		Butterflies, beetles, bees
Blanketflower	<i>Gaillardia aristata</i>				N	Short	Medium	Erect	12-18	16-30		X	X		Bees
Blazingstar, prairie	<i>Liatris pycnostachya</i>				N	Short	Low	Erect	8-48	16-30	X	X	X		
Coneflower, prairie or Mex hat	<i>Ratibida columnifera</i>				N	Med.	Medium	Erect	12-18	16-40	X	X	X		Bees
Columbine, Colorado	<i>Aquilegia caerulea</i>				N	Short	Medium	Erect	10-30	16-40		X			Hummingbirds
Goldenrod	<i>Solidago simplex/canadensis</i>				N	Long	Medium	Erect	6-36	16-60	X	X	X		Bees, beetles
Fleabane, aspen	<i>Erigeron speciosus</i>				N			Erect	24-36	18-25		X	X		Bees, butterflies
Sunflower, maximilian	<i>Helianthus maximiliani</i>				N	Long	High	Erect	36-72	18-25	X	X	X		
Penstemon, yellow	<i>Penstemon confertus</i>				N	Med.	High	Erect	8-24	18-25		X			
Blazingstar, dotted	<i>Liatris punctata</i>				N	Short	Low	Erect	8-48	18-26	X	X	X		Bees, butterflies
Phacelia, silky	<i>Phacelia sericea</i>				N			Erect	12-18	18-30					Bees
Hyssop, nettleleaf giant	<i>Agastache urticifolia</i>				N	Long	Low	Erect	30-36	18-36	X	X	X		Bees
Prairie smoke	<i>Geum triflorum</i>				N	Short	Medium	Erect	6-12	18-40		X			
Cinquefoil	<i>Potentilla</i> spp.				N	Short	V. Low	Erect	24-36	18-50		X			Bees
Fireweed	<i>Chamerion angustifolium</i>				N			Erect	24-48	18-60	X	X			
Clover, alsike	<i>Trifolium hybridum</i>				I	Short	Medium	Erect	24-48	18-60	X	X			Bees
Clover, white	<i>Trifolium repens</i>				I	Short	Medium	Prostrate	3-14	18-70	X	X			Bees
Penstemon, Rydberg's	<i>Penstemon rydbergii</i>				N	Med.	Low	Erect	24-36	20-30	X	X			Small bees
Goldenbanner	<i>Thermopsis montana</i>				N		Medium	Erect	24-30	20-30		X	X		Bees, bumblebees
Trefoil, birdfoot	<i>Lotus corniculatus</i>				I	Long	Low	Erect	18-36	20-45	X	X	X		Bees
Milkvetch, Canada	<i>Astragalus canadensis</i>				N	Med.	Medium	Prostrate	12-30	20-50		X			

Table 5. Forb characteristics ranked by precipitation requirements (low-high) (cont.)

Common Name	Scientific name	Early	Mid	Late	Origin	Longevity	Seedling vigor	Character	Height (in)	Precip.	Soils			Pollinators
											Fine	Med	Coarse	
Bee balm (wild bergamot)	<i>Monarda fistulosa</i>		●	●	N	Med.	Medium	Erect	36-48	20-60	X	X		Bees, bumblebees
Iris, blue-flag	<i>Iris missouriensis</i>	●			N	Short	High	Erect	12-24	24-35	X	X	X	Bees, bumblebees, butterflies
Clover, strawberry	<i>Trifolium fragiferum</i>	●	●		I	Short	Medium	Erect	8-14	25-59		X		Bees
Clover, red	<i>Trifolium pratense</i>	●	●		I	Short	Medium	Erect	7-24	25-65	X	X	X	
Milkweed, butterfly	<i>Asclepias tuberosa</i>		●		N	Med.	Low	Erect	12-36	28-45		X	X	Butterflies
Cardinalflower	<i>lobelia cardinalis</i>	●	●	●	N	Med.	High	Erect	48-60	28-60		X		Hummingbirds
Blackeyed Susan	<i>Rudbeckia hirta</i>		●		N	Short	Rapid	Erect	9-36	28-65	X	X		Bees, butterflies

Table 6. Forb seeding information							
Common Name	Scientific name	Seeding depth	Seeds/lb	Drill lb/ac	Avg. purity	Avg. germ	Releases-recommended are underlined
Alfalfa	<i>Medicago sativa</i>	1/16-1/2	200,000	5 (10-20 lb/ac for hay)	99	85	Multiple varieties, 'Trevois', ' Rambler', 'Ranger', 'Spreador, 'Ladak', 'Nomad'
Alfalfa, yellow blossom	<i>Medicago sativa falcata</i>	1/16-1/2	211,000	5 (10-20 lb/ac for hay)	99	85	<u>Don'</u> , <u>Yellowhead</u> , <u>SD201</u>
Aster, gray	<i>Eurybia glauca</i>	0-1/2	800,000	3			common
Aster, western	<i>Symphyotrichum ascendens</i>	0-1/4	2,000,000	1	90	85	common
Balsamroot, arrowleaf	<i>Balsamorhiza sagittata</i>	0-1/4	55,000	18	95	80	common
Balsamroot, Carey's	<i>Balsamorhiza careyana</i>	0-1/4	55,000	18			common
Balsamroot, cutleaf	<i>Balsamorhiza macrophylla</i>	0-1/4	55,000	18			common
Balsamroot, Hooker's	<i>Balsamorhiza hookeri</i>	0-1/4	55,000	18			common
Bee balm (wild bergamot)	<i>Monarda fistulosa</i>	0-1/8	1,300,000	2			common
Beeflower, Rocky Mountain	<i>Cleome serrulata</i>	0-1/8	64,000	17			common
Beeflower, yellow	<i>Cleome lutea</i>	0-1/4	101,000	11			common
Biscuitroot, bigseed	<i>Lomatium macrocarpum</i>	1/8-1/2	100,000	11			common
Biscuitroot, fernleaf	<i>Lomatium dissectum</i>	1/8-1/2	45,000	24			common
Biscuitroot, Gray's	<i>Lomatium grayi</i>	1/8-1/2	45,000	24			common
Biscuitroot, nineleaf	<i>Lomatium tritermatum</i>	1/8-1/2	45,000	24			common
Blackeyed Susan	<i>Rudbeckia hirta</i>	1/8-1/4	1,600,000	1			common
Blanketflower	<i>Gaillardia aristata</i>	1/4-1/2	200,000	5			common
Blazingstar, dotted	<i>Liatris punctata</i>	1/8-1/4	139,000	8			common
Blazingstar, prairie	<i>Liatris pycnostachya</i>	1/8-1/4	120,000	9			common
Blazingstar, smoothstem	<i>Mentzelia laevicaulis</i>	1/4-1/2	300,000	4			common
Burnet, small	<i>Sanguisorba minor</i>	1/4-1/2	42,000	26	95	90	<u>'Delar'</u>
Cardinalflower	<i>lobelia cardinalis</i>	0-1/8	11,000,000	0.2			common
Cinquefoil, bigflower	<i>Potentilla fissa</i>	0-1/8	1,400,000	2			common
Cinquefoil, tall	<i>Potentilla arguta</i>	0-1/8	4,400,000	0.5			common

Table 6. Forb seeding information (cont.)							
Common Name	Scientific name	Seeding depth	Seeds/lb	Drill lb/ac	Avg. purity	Avg. germ	Releases-recommended are underlined
Clover, alsike	<i>Trifolium hybridum</i>	1/8-1/4	680,000	3	95	90	'Aurora', 'Dawn', common
Clover, red	<i>Trifolium pratense</i>	1/8-1/4	275,000	6	95	90	'Pennscott', Chesapeake', 'Kenland', common
Clover, strawberry	<i>Trifolium fragiferum</i>	1/8-1/4	300,000	4	95	90	'Salina', common
Clover, white	<i>Trifolium repens</i>	1/8-1/4	800,000	4	99	85	'Ladino', 'New York', common
Columbine, Colorado	<i>Aquilegia caerulea</i>	0-1/8	400,000	3			common
Coneflower, prairie or Mex hat	<i>Ratibida columnifera</i>	1/4-1/2	740,000	3			common
Coneflower, purple	<i>Echinacea purpurea</i>	1/8-1/4	128,000	9			common
Crownbeard, golden	<i>Verbesina encelioides</i>		366,000	3			common
Crownvetch	<i>Coronilla varia</i>	1/4-1/2	140,000	8	90	90	'Chemung', 'Emerald', 'Penngift'
Dustymaiden, douglas'	<i>Chaenactis douglasii</i>	0-1/8	350,000	3			common
Fireweed	<i>Chamerion angustifolium</i>	0-1/8	6,500,000	0.5			common
Flax, blue	<i>Linum perenne</i>	0-1/8	278,000	4	95	90	<u>'Appar'</u>
Flax, Lewis	<i>Linum lewisii</i>	0-1/8	260,000	4	95	90	<u>Maple Grove</u>
Fleabane, aspen	<i>Erigeron speciosus</i>	1/8-1/4	1,900,000	1			common
Fleabane, Engelmann's	<i>Erigeron engelmannii</i>	1/8-1/4	1,000,000	2			common
Fleabane, shaggy	<i>Erigeron pumilus</i>	1/8-1/4	1,800,000	1			
Geranium, sticky purple	<i>Geranium viscosissimum</i>	1/4-1/2	55,000	20			common
Gilia, scarlet	<i>Ipomopsis aggregata</i>	0-1/8	360,000	3			
Globemallow	<i>Sphaeralcea</i> spp.	1/4-1/2	500,000	2	80	90	common
Goldenaster, hairy false	<i>Heterotheca villosa</i>	1/8-1/4	726,000	3			common
Goldenbanner	<i>Thermopsis montana</i>	1/4-1/2	30,600	36			common
Goldeneye, showy	<i>Helioneris multiflora</i>	1/4-1/2	1,000,000	2			common
Goldenrod	<i>Solidago simplex/canadensis</i>	1/8-1/4	2,000,000	1			common
Hawksbeard, largeflower	<i>Crepis occidentalis</i>	1/4-1/2	105,000	10			common
Hawksbeard, tapertip, slender and limestone	<i>Crepis acuminata</i> , <i>C. atribarba</i> and <i>C. intermedia</i>	1/4-1/2	800,000	3			common

Table 6. Forb seeding information (cont.)							
Common Name	Scientific name	Seeding depth	Seeds/lb	Drill lb/ac	Avg. purity	Avg. germ	Releases-recommended are underlined
Hyssop, mountain giant	<i>Agastache pallidiflora</i>	0-1/8	1,500,000	1			common
Hyssop, nettleleaf giant	<i>Agastache urticifolia</i>	0-1/8	1,400,000	1			common
Iris, blue-flag	<i>Iris missouriensis</i>	1/4-1/2	20,000	54			
Lupine, silver	<i>Lupinus argenteus</i>	1/4-1/2	15,500	70			common
Milkvetch, basalt	<i>Astragalus filipes</i>	1/4-1/2	120,000	9			<u>NBR-1'</u>
Milkvetch, Canada	<i>Astragalus canadensis</i>	1/4-1/2	270,000	4			common
Milkvetch, cicer	<i>Astragalus cicer</i>	1/4-1/2	130,000	8	95	75	<u>'Lutana'</u> , <u>'Monarch'</u> , <u>'Windsor'</u>
Milkweed, butterfly	<i>Asclepias tuberosa</i>	1/8-1/2	70,000	15			common
Milkweed, showy	<i>Asclepias speciosa</i>	1/8-1/2	72,000	15			common
Mule's ears	<i>Wyethia amplexicaulis</i>	0-1/8	28,000	39			common
Paintbrush	<i>Castilleja spp.</i>	seedlings		N/A			common
Pea, fewflower	<i>Lathyrus pauciflorus</i>	1/8-1/2	12,500	87			common
Pearly everlasting, western	<i>Anaphilis margaritacea</i>	0-1/8	8,200,000	0.3			common
Penstemon, bluestem	<i>Penstemon cyanocaulis</i>	0-1/8	656,000	3			common
Penstemon, broadleaf	<i>Penstemon angustifolius</i>	0-1/8	313,000	3			common
Penstemon, firecracker	<i>Penstemon eatonii</i>	0-1/8	315,000	3	90	90 tz	Richfield
Penstemon, low	<i>Penstemon humilis</i>	0-1/8	952,000	2			common
Penstemon, Palmer's	<i>Penstemon palmeri</i>	0-1/8	600,000	2	90	90 tz	'Cedar'
Penstemon, Rocky Mountain	<i>Penstemon strictus</i>	0-1/8	490,000	2.7	90	90 tz	<u>'Bandera'</u>
Penstemon, Royal	<i>Penstemon speciosus</i>	0-1/8	400,000	3			common
Penstemon, Rydberg's	<i>Penstemon rydbergii</i>	0-1/8	850,000	3			common
Penstemon, scabland	<i>Penstemon deustus</i>	0-1/8	2,900,000	1			common
Penstemon, sharpleaf	<i>Penstemon acuminatus</i>	0-1/8	400,000	3			common
Penstemon, showy	<i>Penstemon spectabilis</i>	0-1/8	750,000	3			common
Penstemon, sulphur	<i>Penstemon attenuatus</i>	1/8-1/4	850,000	1.5			common

Table 6. Forb seeding information (cont.)							
Common Name	Scientific name	Seeding depth	Seeds/lb	Drill lb/ac	Avg. purity	Avg. germ	Releases-recommended are underlined
Penstemon, thickleaf	<i>Penstemon pachyphyllus</i>	0-1/8	817,000	3			common
Penstemon, Venus	<i>Penstemon venustus</i>	0-1/8	1,090,000	1	90	90 tz	Clearwater
Penstemon, yellow	<i>Penstemon confertus</i>	1/8-1/4	463,000	2			common
Phacelia, silky	<i>Phacelia sericea</i>	0-1/8	450,000	2			common
Phacelia, silverleaf	<i>Phacelia hastata</i>	1/8-1/4	450,000	2			common
Prairie clover, white	<i>Dalea candida</i>	1/4-1/2	448,000	2			common
Prairie clover, Blue Mountain	<i>Dalea ornata</i>	1/4-1/2	150,000	5			common
Prairie clover, purple	<i>Dalea purpurea</i>	1/4-1/2	317,000	7			common
Prairie clover, Searls'	<i>Dalea searlsiae</i>	1/4-1/2	148,000	7			common
Prairie smoke	<i>Geum triflorum</i>	1/4-1/2	700,000	3			common
Primrose, evening	<i>Oenothera caespitosa</i>	0-1/8	1,300,000	2			wide variability in seed count
Pussytoes	<i>Antennaria</i> sp. (<i>rosea</i>)	0-1/8	6,600,000	0.3			common
Sagebrush, white	<i>Artemisia ludoviciana</i>	0-1/4	3,000,000	1	75	50-80 TZ	'Summit'
Sainfoin	<i>Onobrychis viciifolia</i>	1/4-3/4	32,400	34			' <u>Delaney</u> ', <u>Shoshone</u> , 'Eski', 'Melrose', 'Remont'
Sweetclover, white	<i>Melilotus alba</i>	1/8-1/2	260,000	4	99	85	'Evergreen', 'Polara' recommend 1 lb/ac standard in mixture
Sweetclover, yellow	<i>Melilotus officinalis</i>	1/8-1/2	260,000	4	99	85	'Goldtop', 'Madrid', 'Norgold', 'Yukon' multiple
Sweetvetch	<i>Hedysarum boreale</i>	1/4-1/2	46,000	24	95	80	'Timp'
Sunflower, annual	<i>Helianthus annuus</i>	1/4-1/2	45,000	24	90	90	numerous cultivated varieties available
Sunflower, Common woolly	<i>Eriophyllum lanatum</i>	1/4-1/2	900,000	2			common
Sunflower, maximilian	<i>Helianthus maximiliani</i>	1/4-1/2	200,000	5			'Prairie Gold', 'Aztec', Medicine Creek
Sunflower, oneflower	<i>Helianthella uniflora</i>	1/8-1/4	41,000	26			common
Sunflower, prairie	<i>Helianthus petiolaris</i>	1/8-1/4	120,000	9			common
Tansyaster, Bigelow's	<i>Machaeranthera bigelovii</i>	0-1/8	1,283,000	2			common
Tansyaster, hoary	<i>Machaeranthera canescens</i>	0-1/8	1,300,000	2			common

Table 6. Forb seeding information (cont.)							
Common Name	Scientific name	Seeding depth	Seeds/lb	Drill lb/ac	Avg. purity	Avg. germ	Releases-recommended are underlined
Tansyaster, tansyleaf	<i>Machaeranthera tanacetifolia</i>	0-1/8	400,000	3			common
Trefoil, birdfoot	<i>Lotus corniculatus</i>	1/8-1/4	370,000	3	98	85	'Norcen', <u>Empire</u> , <u>Leo</u> , 'Maitland'
Vetch, American	<i>Vicia americana</i>	1.0-2.0	33,000	33			common
Yarrow, western	<i>Achillea millefolium</i>	0-1/8	4,400,000	0.5	90+	85	Eagle, Yakima, Great Northern

Table 7. Shrub characteristics ranked by precipitation requirements (low-high)

Soils														
Common Name	Scientific name	Origin	Height (ft)	Longevity	Early	Mid	Late	Precip.	Fine	Med.	Coarse	Wet	pH	Pollinators
Bitterbrush, Desert	<i>Purshia glandulosa</i>	N	5	Med.	☀			6-12		X	X		6.8-8.0	
Shadscale	<i>Atriplex confertifolia</i>	N	1-3	Long			☀	6-12	X	X	X		7.5-9.0	
Cliffrose, Mexican	<i>Purshia mexicana</i>	N	4-10	Long	☀			6-12			X			
Saltbush, Gardner's	<i>Atriplex gardneri</i>	N	1.5	Long			☀	6-12	X	X	X		6.6-9.0	
Sagebrush, Black	<i>Artemisia nova</i>	N	1	Long			☀	6-18	X	X	X		7.0-8.5	
Sage, Purple (Dorr's)	<i>Salvia dorrii</i>	N	1-3	Short	☀	☀		7-15		X	X		6.5-8.0	
Winterfat	<i>Krascheninikovia lanata</i>	N	1-4	Long		☀	☀	7-16		X	X		6.6-8.5	
Rabbitbrush, Yellow	<i>Chrysothamnus viscidiflorus</i>	N	1-3	Long			☀	7-24		X	X		7.0-8.5	Butterflies
Rabbitbrush, Rubber	<i>Ericameria nauseosa</i>	N	1-6	Long			☀	7-24	X	X	X		6.0-8.0	Butterflies, small bees
Buckwheat, Snow	<i>Eriogonum niveum</i>	N	2.5	Med.		☀	☀	7-18		X	X		6.5-8.0	
Yucca (Soapweed)	<i>Yucca glauca</i>	N	1-4	Long		☀		7-12		X	X		7.0-8.5	Moths
Mint, Frosted	<i>Poliomintha incana</i>	N	2		☀	☀	☀	8-12			X		6.0-7.5	
Saltbush, Fourwing	<i>Atriplex canescens</i>	N	1-8	Long			☀	8-16		X	X		6.5-9.5	
Kochia, Forage	<i>Kochia prostrata</i>	I	2-3	Long			☀	8-16	X	X	X		7.5-9.0	
Sagebrush, Wyoming big	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>	N	1-4	Long			☀	8-18	X	X	X		6.0-8.5	
Buckwheat, Sulphurflower	<i>Eriogonum umbellatum</i>	N	1-2	Long		☀		8-18		X	X		6.5-9.0	Bees, butterflies
Sumac, Skunkbush	<i>Rhus trilobata</i>	N	2-7	Long	☀			8-18		X	X	X	6.5-8.2	Bees
Apache plume	<i>Fallugia paradoxa</i>	N	2-6	Med.	☀	☀		8-20		X	X		7.0-8.0	
Sagebrush, Basin big	<i>Artemisia tridentata</i> ssp. <i>tridentata</i>	N	5-10	Long			☀	9-15		X	X		6.5-8.5	
Stretchberry	<i>Forestiera pubescens</i> var. <i>pubescens</i>	N	6-8	Med.	☀			9-24	X	X	X		7.0-8.5	
Mule-fat	<i>Baccharis salicifolia</i>	N	10	Short	☀	☀		10-15	X	X	X		7.0-8.5	Butterflies
Bitterbrush, Antelope	<i>Purshia tridentata</i>	N	2-6	Long	☀			10-15		X	X		5.6-8.4	Bees, butterflies
Clematis, Western white	<i>Clematis ligusticifolia</i>	N	vine	Long	☀	☀		10-20	X	X	X		5.6-8.4	

Table 7. Shrub characteristics ranked by precipitation requirements (low-high) (cont.)

Common Name	Scientific name	Origin	Height (ft)	Longevity	Soils									Pollinators
					Early	Mid	Late	Precip.	Fine	Med.	Coarse	Wet	pH	
Cactus, prickly pear	<i>Opuntia</i> spp.	N	2	Med.	☀	☀		10-20	X	X	X		7.0-8.8	
Sage, Fringed	<i>Artemisia frigida</i>	N	0.3-1.3	Short			☀	10-40	X	X	X		7.0-9.0	
Currant, Golden	<i>Ribes aureum</i>	N	3-10	Long	☀			12-18		X		X	6.0-8.0	Bees, bumblebees
Serviceberry, Utah	<i>Amelanchier utahensis</i>	N	3-15	Long	☀	☀		14-30		X	X		5.6-8.4	Larval butterfly host plant of butterflies
Mockorange, Littleleaf	<i>Philadelphus microphyllus</i>	N	15	Med.	☀			12-20		X	X		7.0-8.5	Bees
Buffaloberry, Silver	<i>Shepherdia argentea</i>	N	3-20	Long		☀		12-20		X		X	5.3-8.0	Bees, butterflies
Buckwheat, Whorled	<i>Eriogonum heracleoides</i>	N	2.5	Long		☀		12-25		X	X		6.5-9.0	Bees, butterflies
Rose, Wood's	<i>Rosa woodsii</i>	N	2-10	Long		☀		12-40		X	X	X	5.0-8.0	Bees
Peashrub, Siberian	<i>Caragana arborescens</i>	I	6-14	Long	☀	☀		12-50	X	X	X		5.0-8.5	
Dogwood, Redosier	<i>Cornus sericea</i>	N	4-10	Long		☀	☀	12-60		X	X	X	7.0-8.0	Butterflies
Willow	<i>Salix</i> spp.	N	8-60	Long	☀			12-60	X	X	X	X	5.5-7.5	Bees, butterflies
Currant, Wax	<i>Ribes cereum</i>	N	3-10	Long		☀		15-35		X	X	X	6.5-7.5	
Manzanita, Greenleaf	<i>Arctostaphylos patula</i>	N	6	Long	☀	☀		13-60		X	X		5.5-7.6	Bees
Chokecherry	<i>Prunus virginiana</i>	N	12-25	Long	☀			13-60		X		X	5.2-8.4	Bees, butterflies
Mahogany, Mountain	<i>Cercocarpus</i> spp.	N	10-23	Long	☀			14-24		X	X		5.5-8.7	
Serviceberry	<i>Amelanchier alnifolia</i>	N	3-15	Long	☀	☀		14-30		X			4.8-8.4	Butterflies, bees
Honeysuckle, Twinberry	<i>Lonicera involucrata</i>	N	10-12	Long	☀	☀		14-32	X	X			5.5-8.0	Butterflies, bees, hummingbirds
Kinnikinnick	<i>Arctostaphylos uva-ursi</i>	N	0.5-1	Long	☀	☀		14-45		X	X		5.5-8.0	Butterflies, hummingbirds
Silverberry	<i>Elaeagnus commutata</i>	N	4-8	Long		☀		14-45		X	X	X	5.0-7.9	
Snowberry	<i>Symphoricarpos</i> spp.	N	1-5	Long	☀	☀		14-45	X	X	X	X	6.0-7.8	Bees, butterflies, hummingbirds
Sage, Russian	<i>Perovskia atriplicifolia</i>	I	2-4	Short		☀		15-18		X	X		6.5-8.5	
Oregon grape	<i>Mahonia repens</i>	N	1-2	Long	☀			15-45		X			5.5-7.5	
Fern bush, Desert sweet	<i>Chamaebatiaria millefolium</i>	N	1-6	Med.		☀	☀	15-60		X	X		7.0-8.0	Bees

Table 7. Shrub characteristics ranked by precipitation requirements (low-high) (cont.)

Common Name	Scientific name	Origin	Height (ft)	Longevity	Soils										
					Early	Mid	Late	Precip.	Fine	Med.	Coarse	Wet	pH	Pollinators	
Sagebrush, Mountain big	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>	N	2-4	Long					16-25		X	X		6.0-8.5	
Spiraea, Rock	<i>Holodiscus dumosus</i>	N	3-9	Med.					16-35		X	X		7.0-8.0	
Ceanothus, Snowbrush	<i>Ceanothus velutinus</i>	N	2-9	Long					16-40		X	X		6.5-8.3	Butterflies
Cherry, Nanking	<i>Prunus tomentosa</i>	I	6-10	Med.					16-40		X	X		5.7-7.2	
Spiraea, Douglas (Rose)	<i>Spiraea douglasii</i>	N	4-6	Long					16-50		X	X		5.5-7.5	
Hawthorn, Black	<i>Crataegus douglasii</i>	N	30	Long					16-60	X	X		X	4.8-7.5	Moths, bees, butterflies
Oceanspray	<i>Holodiscus discolor</i>	N	3-12	Long					18-24	X	X	X		6.5-7.5	
Cinquefoil, Shrubby	<i>Dasiphora fruticosa</i>	N	1-3	Long					18-25		X		X	6.0-8.0	Moths, bees, butterflies
Cotoneaster	<i>Cotoneaster integerrimus</i>	I	8-12	Long					18-30		X			6.8-8.7	
Elderberry, Blue	<i>Sambucus nigra cerulea</i>	N	3-13	Med.					18-30		X	X	X	4.9-7.5	
Ceanothus, Redstem	<i>Ceanothus sanguineus</i>	N	3-6	Long					18-35		X	X		6.5-8.0	
Ninebark	<i>Physocarpus malvaceus</i>	N	2-7	Long					18-40	X	X	X		6.0-7.5	
Lilac, Common	<i>Syringa vulgaris</i>	I	6-12	Long					18-40	X	X	X		5.8-7.8	
Syringa (Lewis Mockorange)	<i>Philadelphus lewisii</i>	N	3-10	Long					18-50	X	X	X		7.0-8.0	
Plum, American	<i>Prunus americana</i>	N	8-10	Long					20-40		X	X		5.0-7.0	Bees, butterflies
Cherry, Western Sand	<i>Prunus pumila</i>	N	3-6	Long					20-40		X	X		5.3-7.5	Bees, butterflies

Table 8. Shrub planting information					
Common Name	Scientific name	Seeding depth	Seeds/lb	Drill lb/ac	Releases-recommended are underlined
Apache plume	<i>Fallugia paradoxa</i>	Seedlings	NA	N/A	common
Bitterbrush, Desert	<i>Purshia glandulosa</i>	Seedlings	NA	N/A	common
Bitterbrush, Antelope	<i>Purshia tridentata</i>	Seedlings	15400	2 (1/4*) or plants	common, Fountain Green, 'Lassen', Maybell
Buckwheat, Snow	<i>Eriogonum niveum</i>	0-1/4	427,000	2.5 or plants	common, Umatilla
Buckwheat, Sulphurflower	<i>Eriogonum umbellatum</i>	0-1/4	209,000	4 or plants	common
Buckwheat, Whorled	<i>Eriogonum heracleoides</i>	0-1/8	170,000	6	common
Buffaloberry, Silver	<i>Shepherdia argentea</i>	Seedlings	40,000	N/A	common, 'Sakakawea'
Cactus, prickly pear	<i>Opuntia spp.</i>	0-1/8	145,000	8	
Ceanothus, Redstem	<i>Ceanothus sanguineus</i>	Seedlings	150,000	N/A	common
Ceanothus, Snowbrush	<i>Ceanothus velutinus</i>	Seedlings	94,000	N/A	common
Cinquefoil, Shrubby	<i>Dasiphora fruticosa</i>	Seedlings	1,000,000	N/A	common
Cherry, Nanking	<i>Prunus tomentosa</i>	Seedlings	4,740	N/A	common
Cherry, Western Sand	<i>Prunus punila</i>	Seedlings	2,920	N/A	common
Chokecherry	<i>Prunus virginiana</i>	Seedlings	4,790	N/A	Schubert'
Clematis, Western white	<i>Clematis ligusticifolia</i>	Seedlings	315,000	N/A	common, 'Trailer'
Cliffrose, Mexican	<i>Purshia mexicana</i>	Seedlings	NA	N/A	common
Cotoneaster	<i>Cotoneaster integerrimus</i>	Seedlings	18,160	N/A	common
Currant, Golden	<i>Ribes aureum</i>	Seedlings	233,000	N/A	common
Currant, Wax	<i>Ribes cereum</i>	Seedlings	251,000	N/A	common
Dogwood, Redosier	<i>Cornus sericea</i>	Seedlings or cuttings	NA	N/A	common, 'Ruby', Harrington, Cheney, Wallowa
Elderberry, Blue	<i>Sambucus nigra cerulea</i>	Seedlings	205,000	N/A	common, 'Blanchard'
Fern bush, Desert sweet	<i>Chamaebatiaria millefolium</i>	0-1/8 or seedlings	144,000	8	common
Hawthorn, Black	<i>Crataegus douglasii</i>	Seedlings	22,600	N/A	common
Honeysuckle, Twinberry	<i>Lonicera involucrata</i>	Seedlings	NA	N/A	common
Kinnikinnick	<i>Arctostaphylos uva-ursi</i>	Seedlings	40,000	N/A	common

Table 8. Shrub planting information (cont.)					
Common Name	Scientific name	Seeding depth	Seeds/lb	Drill lb/ac	Releases-recommended are underlined
Kochia, Forage	<i>Kochia prostrata</i>	0-1/16	395,000	2 (1/4)*	<u>Immigrant</u> , 'Snowstorm'
Lilac, Common	<i>Syringa vulgaris</i>	Seedlings	90,720	N/A	common
Mahogany, Mountain	<i>Cercocarpus spp.</i>	Seedlings	48,000	N/A	common, 'Montane'
Manzanita, Greenleaf	<i>Arctostaphylos patula</i>	Seedlings	N/A	N/A	common
Mint, Frosted	<i>Poliomintha incana</i>	Seedlings	NA	N/A	common
Mockorange, Littleleaf	<i>Philadelphus microphyllus</i>	Seedlings	NA	N/A	common
Mule-fat	<i>Baccharis salicifolia</i>	cuttings	NA	N/A	common
Ninebark	<i>Physocarpus malvaceus</i>	Seedlings	753,000	N/A	common
Oceanspray	<i>Holodiscus discolor</i>	Seedlings	5,300,000	N/A	common
Oregon grape	<i>Mahonia repens</i>	1/4-1/2 or seedlings	45,000	N/A	common
Peashrub, Siberian	<i>Caragana arborescens</i>	Seedlings	19,000	N/A	common
Plum, American	<i>Prunus americana</i>	Seedlings	870	N/A	common
Rabbitbrush, Rubber	<i>Ericameria nauseosa</i>	0-1/8 or seedlings	693,000	0.25 (1/40)*	common
Rabbitbrush, Yellow	<i>Chrysothamnus viscidiflorus</i>	0-1/8 or seedlings	782,000	0.25 (1/40)*	common
Rose, Woods'	<i>Rosa woodsii</i>	1/2 or seedlings	50,000	1 or plants	common
Sagebrush, Basin big	<i>Artemisia tridentata</i> ssp. <i>tridentata</i>	0-1/8	1,700,000	0.25 (1/40)*	common
Sagebrush, Black	<i>Artemisia nova</i>	0-1/4	950,000	0.25 (1/40)*	common, Pine Valley Ridge selected class
Sagebrush, Mountain big	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>	0-1/8	1,700,000	0.25 (1/40)*	common, 'Hobble Creek'
Sagebrush, Wyoming big	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>	0-1/8	1,700,000	0.25 (1/40)*	common, 'Gordon Creek'
Sage, Fringed	<i>Artemisia frigida</i>	0-1/8	4,500,000	0.5	common
Sage, Purple (Dorrs)	<i>Salvia dorrii</i>	1/4-1/2 or seedlings	310000	5	common
Sage, Russian	<i>Perovskia atriplicifolia</i>	Seedlings	500,000	N/A	common
Saltbush, Fourwing	<i>Atriplex canescens</i>	1/4-3/4	52,000	2	'Wytana', 'Rincon'
Saltbush, Gardner's	<i>Atriplex gardneri</i>	1/4-3/4	114,000	2	common
Shadscale	<i>Atriplex confertifolia</i>	1/4-3/4	64,900	2	common

Table 8. Shrub planting information (cont.)					
Common Name	Scientific name	Seeding depth	Seeds/lb	Drill lb/ac	Releases-recommended are underlined
Serviceberry	<i>Amelanchier alnifolia</i>	Seedlings	82,000	N/A	common, Kendrick, Okanogan, Newport
Serviceberry, Utah	<i>Amelanchier utahensis</i>	Seedlings	25,800	N/A	common, Long Ridge Germplasm
Silverberry	<i>Elaeagnus commutata</i>	Seedlings	3,800	N/A	common, Dupuyer, Pondera sources
Snowberry	<i>Symphoricarpos</i> spp.	Seedlings	76,000	N/A	common, Okanogan
Spiraea, Douglas (Rose)	<i>Spiraea douglasii</i>	Seedlings	1,000,000	N/A	common
Spiraea, Rock	<i>Holodiscus dumosus</i>	Seedlings	5,000,000	N/A	common
Stretchberry	<i>Forestiera pubescens</i> var. <i>pubescens</i>	Seedlings	NA	N/A	common, 'Jemez'
Sumac, Skunkbush	<i>Rhus trilobata</i>	Seedlings	20,300	N/A	common, 'Bighorn'
Syringa (Lewis Mockorange)	<i>Philadelphus lewisii</i>	Seedlings	8,000,000	N/A	Colfax, St. Maries
Willow	<i>Salix</i> spp.	Cuttings	NA	N/A	common
Winterfat	<i>Krascheninikovia lanata</i>	0-1/8	123,000	5	<u>Open Range</u> , 'Hatch'
Yucca (Soapweed)	<i>Yucca glauca</i>	Seedlings	24,850	N/A	common

* Parentheses indicate recommended seeding rate within a mixture for wildlife habitat. The rate in parentheses is a set rate and should not be reduced according to the percentage in the mix.

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:

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

All seeding rates in narratives and tables 2-8 are for 12- inch row spacing.

For row spacing narrower or wider than 12- inches, calculate seeding rate using the following information in Table 9.

Table 9. Seeding rate and seeds/row foot calculations		
Row spacing (inches)	PLS Lbs/ac	Seeds/Linear 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

Non-Discrimination Policy

The U.S. Department of Agriculture (USDA) prohibits discrimination against its customers, employees and applicants for employment on the bases of race, color, national origin, age, disability, sex, gender identity, religion, reprisal, and where applicable, political beliefs, marital status, familial or parental status, sexual orientation, or all or part of an individual's income is derived from any public assistance program, or protected genetic information in employment or in any program or activity conducted or funded by the Department. (Not all prohibited bases apply to all programs and/or employment activities.)

To File an Employment Complaint

If you wish to file an employment complaint, you must contact your agency's EEO Counselor within 45 days of the date of the alleged discriminatory act, event, or in the case of a personnel action. Additional information can be found online at http://www.ascr.usda.gov/complaint_filing_file.html.

To File a Program Complaint

If you wish to file a Civil Rights program complaint of discrimination, complete the USDA Program Discrimination Complaint Form, found online at http://www.ascr.usda.gov/complaint_filing_cust.html, or at any USDA office, or call (866) 632-9992 to request the form. You may also write a letter containing all of the information requested in the form. Send your completed complaint form or letter to us by mail at U.S. Department of Agriculture, Director, Office of Adjudication, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9419, by fax at (202) 690-7442, or email at program.intake@usda.gov.

Persons with Disabilities

Individuals who are deaf, hard of hearing or have speech disabilities and you wish to file either an EEO or program complaint please contact USDA through the Federal Relay Service at (800) 877-8339 or (800) 845-6136 (in Spanish).

Persons with disabilities, who wish to file a program complaint, please see information above on how to contact us by mail or by email. If you require alternative means of communication for program information (e.g., Braille, large print, audiotape, etc.), please contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

Supplemental Nutrition Assistance Program

For any other information dealing with Supplemental Nutrition Assistance Program (SNAP) issues, persons should either contact the USDA SNAP Hotline Number at (800) 221-5689, which is also in Spanish, or call the State Information/Hotline Numbers.

All Other Inquires

For any other information not pertaining to civil rights, please refer to the listing of the USDA Agencies and Offices.

An Equal Opportunity Provider and Employer