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Guidebook to the Seeds of Native and Non-Native Grasses, Forbs and Shrubs of the Great Basin

Including portions of Oregon, Washington,
Idaho, Utah, Nevada and California

By Scott Lambert
Regional Seed Coordinator

United States Department of the Interior
Bureau of Land Management
Idaho State Office
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BLM

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INTRODUCTION

This seed and plant guide contains descriptions of almost 250 native and non-native (introduced) plants and seeds used by the U. S. Department of Interior, Bureau of Land Management (BLM) in the Great Basin region of Oregon-Washington, Idaho, Utah, Nevada, and California. It is a partial list of the grasses, forbs (wildflowers and herbaceous legumes) and shrubs available from commercial seed vendors in very limited to good quantities. The plants described are mostly considered to be plants found in aridland sites (less than 12 inches mean annual rainfall). The target audience includes natural resource specialists and other technical specialists who utilize seeds in BLM projects. The guidebook may be useful to others interested in seeds of Great Basin plants as well.

In addition to the plant descriptions section, the appendices include more detailed information on topics such as seeding depth, effective annual precipitation for Great Basin plants, seed characteristics, the minimum pure live seed (PLS) rate for BLM, native plant species by Ecoregion (EPA, Level III), commercial sources for seed, and a list of publications on plants and seeds.

This guide does not include herbaceous wetland/riparian plants such as *Carex*, *Juncus*, and *Scirpus* species, refer to “Wetland Plants of Oregon and Washington” by Guard, B.J. (1995), “Field Guide to Intermountain Rushes” by Hurd, E.G., S. Goodrich, and Shaw, N.L. (1994), “Field Guide to Intermountain Sedges” by Hurd, E.G. and others (1998), or other publications for information. Wherever possible, information is included on plant ecology, plant propagation, seeds per pound, seeding rates for mechanical drilling, soils, mean annual precipitation requirement, and commonly used cultivars (cultivated varieties).

BLM’s goal is to utilize seed of native plants, native cultivars and source-identified seed wherever possible for seedings or reestablishing plants in natural areas, wildlife habitat, wilderness study areas, or other sites with intact native plant communities. Availability and reasonable cost of seed of native plants are also important criteria for determining where, when and how much seed will be used in a project. Native species are useful for a variety of land management goals. Some examples are reduction of soil erosion on roads or other highly disturbed sites, gene pool preservation, enhance aridland and wetland functions and values, wildlife food and cover, recreation site rehabilitation, and watershed restoration.

Non-native plants/seed may be useful for emergency soil stabilization and weed control after wildfires, floods or other natural disasters. Other examples of use for non-native plants/seed include the initial seeding or planting on a highly disturbed site with few native plants or where native seed stock is not available and as forage for specific wildlife species or domestic livestock. Where native seeds are unavailable or no longer appropriate for the area, non-native seeds are utilized. In some cases, the seed of non-native plants may be used as an intermediary solution to restoring the desired native plant community.

Seed and plants of many native species may not be readily available from commercial sources. Contract growing or wildland seed collection of source identified material may be an option for some projects with specific goals such as ecosystem restoration. Contract growing or seed collection may take more time and cost more than procuring seed from a commercial grower. Native cultivars and varieties may not originate in the ecoregion or land resource area they will be planted. Determine what is acceptable for your site or area. Remember seed and plant quality standards are very important guidelines when using native or non-native plant materials.

Seeding rates given for Great Basin plants are the recommended single species drilled seeding rates. Aerial or broadcast seeding rates are usually 1.5 to two times the drilled seeding rate. BLM applies seed based on the pure live seed (PLS) seed rate, lbs. per acre. PLS is the percent pure seed multiplied by the percent of pure seed germination rate for the individual seed lot. BLM procures seed by individual seed lots; we do not accept pre-mixed seed mixes. Seed mixtures consist of several to many different species or types of seed (grasses, forbs, and shrubs). Calculate the seed mixture rate (PLS lbs/acre) based on the percent for each species/type desired in the seed mix.

All seed, native and non-native, procured and used by BLM will meet or exceed Seed Certification standards for the species or cultivar. The seed standards for each species used by BLM will meet or exceed minimum purity, minimum germination, no noxious weed seed, and less than 2.0% other crop seed.

KEY TO PLANT ENTRIES

A bracketed number after a plant name, such as [#1], means that a drawing of the plant appears in the document. A total of 61 drawings are included. A complete list of the drawings is found in the Appendices. The drawings are by Jeanne R. Janish and are reprinted by permission from “Vascular Plants of the Pacific Northwest”, University of Washington Press, Seattle, Washington, 1977.

An (I) after a plant name means the plant is Introduced (I) to western North America and is considered to be a non-native species.

An (N) after a plant name means the plant is Native (N) to a specified geographic area in western North America prior to the year 1800.

GRASSES

Native and Non-native Species in the Great Basin

LEMMON'S ALKALIGRASS

A tufted, perennial grass native to the sagebrush steppe in the western United States. Lemmon's alkaligrass is often found in alkaline areas of the Great Basin region.

BENTGRASS

The genus *Agrostis* (L.) includes many species of bentgrass, are usually perennial, often occurring on hydric soils' there are over 100 species worldwide. Some of the introduced species as colonial bentgrass and creeping bentgrass are important turf grasses. A common grass found in meadows or along streams, redtop (*A. alba*), probably originated from European seed sources.

About twenty bentgrass species are native to the USA. Several species, including spike bentgrass (*A. exarata*) and Oregon bentgrass (*A. oregonensis*), are native to meadows, riparian areas and wetlands in the western USA. Conservation drill seeding rate for bentgrasses, depending on the species, is usually two pounds, pure live seed (PLS), per acre. Bentgrass species may average up to 5,000,000 seeds per pound.

BLUEGRASS

BIG BLUEGRASS (*Poa secunda* J. Presl) (Also known as *Poa ampla*)

A long-lived, native bunchgrass, up to 24 inches in height at maturity, found throughout the temperate continental climate of the western USA. Big bluegrass is a component of the sagebrush-steppe and Palouse prairie plant communities. Soils: It occurs on loam to silt-loam soils where the mean annual precipitation is nine to 16 inches. It is often used as early spring forage, but is easily destroyed by overgrazing in the spring. It is utilized by many wildlife species. Big bluegrass competes well with winter annual weeds such as cheatgrass (*Bromus tectorum*). It is a component of sage-grouse habitat.

Cultivars/Varieties: 'Sherman' is the only released big bluegrass cultivar (USDA-NRC S, Pullman, Washington). It was originally collected from a native sagebrush-grass plant community in Sherman County, Oregon. It has been used for herbage production, erosion control, and native plant community diversity. Seeding recommendation: seed shallow in the soil, late fall or early spring with adequate moisture.

Ecoregions: Columbia Plateau, Blue Mountains, Snake River Plain, and portions of the Northern Basin and Range.

Average number of seeds per pound: 917,000. 21 seeds/sq.ft./lb/acre.

Drill seeding rate: four pounds per acre, seeded as a single species; one to two pounds per acre in a mix; seed ¼ inch into soil.

BOG BLUEGRASS (*Poa leptocoma* Trin.)

A native perennial grass that is indigenous to hydric soils in meadows, pond margins, and along streams. It naturally occurs from Alaska to northern California, east to New Mexico and Colorado; usually found at middle to high elevations. Bog bluegrass requires at least thirty inches of mean annual precipitation for establishment and survival. Not to be confused with fowl bluegrass (*P. palustris*), an introduced invasive bluegrass sometimes found in wetlands and adjacent sites.

CANADA BLUEGRASS (*Poa compressa* L.)

A low-growing bluegrass, with short rhizomes, that occurs from Newfoundland, Canada to Alaska, south to the northern States. Canada bluegrass has some shade tolerance, and tolerance of low soil fertility tolerance and moderate soil acidity. It has been used as a low maintenance groundcover and soil stabilizer for roadsides, ditch banks, cover between trees, recreation areas, and borrow pits. It needs a minimum of 18 inches of mean annual precipitation. Cultivars/Varieties: ‘Reubens’ Canada bluegrass is an introduced commercially available cultivar.

Average number of seeds per pound: 2,500,000. 57 seeds/sq.ft./lb/acre.

Drill seeding rate: four pounds per acre.

CANBY’S BLUEGRASS [#1] (*Poa secunda* J. Presl) (Formerly: *Poa canbyi*)

A long-lived, low-growing bunchgrass native to rangelands and shrub-grasslands of northwestern USA. Canby’s bluegrass is vernal dominant and adapted to short season moisture sites. It is used as an understory grass for erosion control and herbage production. Soils: It occurs on sites with silt-loam soils that receive nine to twenty inches mean annual precipitation. It greens up in the early spring and low herbage production.

Canby’s bluegrass is drought tolerant, actually drought-escaping by going dormant usually by June 1. Ecoregions: Portions of the Columbia Plateau and Blue Mountains. Cultivars/Varieties: ‘Canbar’ Canby’s bluegrass is a cultivar released by USDA-NRCS, Pullman, Washington. Canbar was originally collected from a foothills site in the Blue Mountains, Oregon. It has good vigor and seed production adapted to the interior Pacific Northwest. Canby bluegrass is not seeded as a single species in BLM projects.

Average number of seeds per pound: 930,000. 21.2 seeds/sq.ft./lb/acre.

Drill seeding rate: one to two pounds per acre in a seed mixture.

CUSICK’S BLUEGRASS (*Poa fendleriana* ssp. *fendleriana* [Steud.] Vasey)

A native perennial bluegrass found on dry to rocky slopes at middle to high elevations, from British Columbia, Canada to central California and east to North Dakota, Wyoming, and Colorado. Cusick’s bluegrass naturally occurs on silt loam to sandy loam soils; eight to 20 inches mean annual precipitation. It is a highly valued grass for herbage production for certain wildlife species and domestic livestock. It has been used for soil erosion control and soil stabilization. Ecoregions: Columbia Plateau and Blue Mountains.

Average number of seeds per pound: 890,000. 20.4 seeds/sq.ft./lb/acre.

Drill seeding rate: four pounds when seeded singly, one to two pounds in a seed mixture.

KENTUCKY BLUEGRASS (*Poa pratensis* L.)

A major lawn and turf grass, non-native, introduced from Europe, adapted to cool climates and moist growing conditions. Kentucky bluegrass usually has low herbage

production. It may persist and out-compete other desired species in middle to high elevation meadows and along stream banks. *Do not use Kentucky bluegrass in conservation or restoration plantings in riparian areas or adjacent to wetlands and meadows since it is invasive on those sites.* It requires a minimum of 18 inches of mean annual precipitation, or equivalent irrigation or runoff.

Average number of seeds per pound: 2,150,000. 50 seeds/sq.ft./lb/acre.

MUTTONGRASS (*Poa fendleriana* [Steud.] Vasey)

A native perennial found in sagebrush-steppe to wooded areas at middle elevations in the Intermountain western states. Muttongrass naturally occurs from eastern Washington to California and east through the Rocky Mountain States to New Mexico. It is closely related to Cusick's bluegrass. Muttongrass requires at least 12 inches mean annual precipitation. Ecoregions: Blue Mountains, Wasatch Mountains, Middle Rocky Mountains, and Northern Rocky Mountains. Drill seeding rate: one to two pounds per acre in a seed mixture.

SANDBERG'S BLUEGRASS [#2] (*Poa secunda* J. Presl)

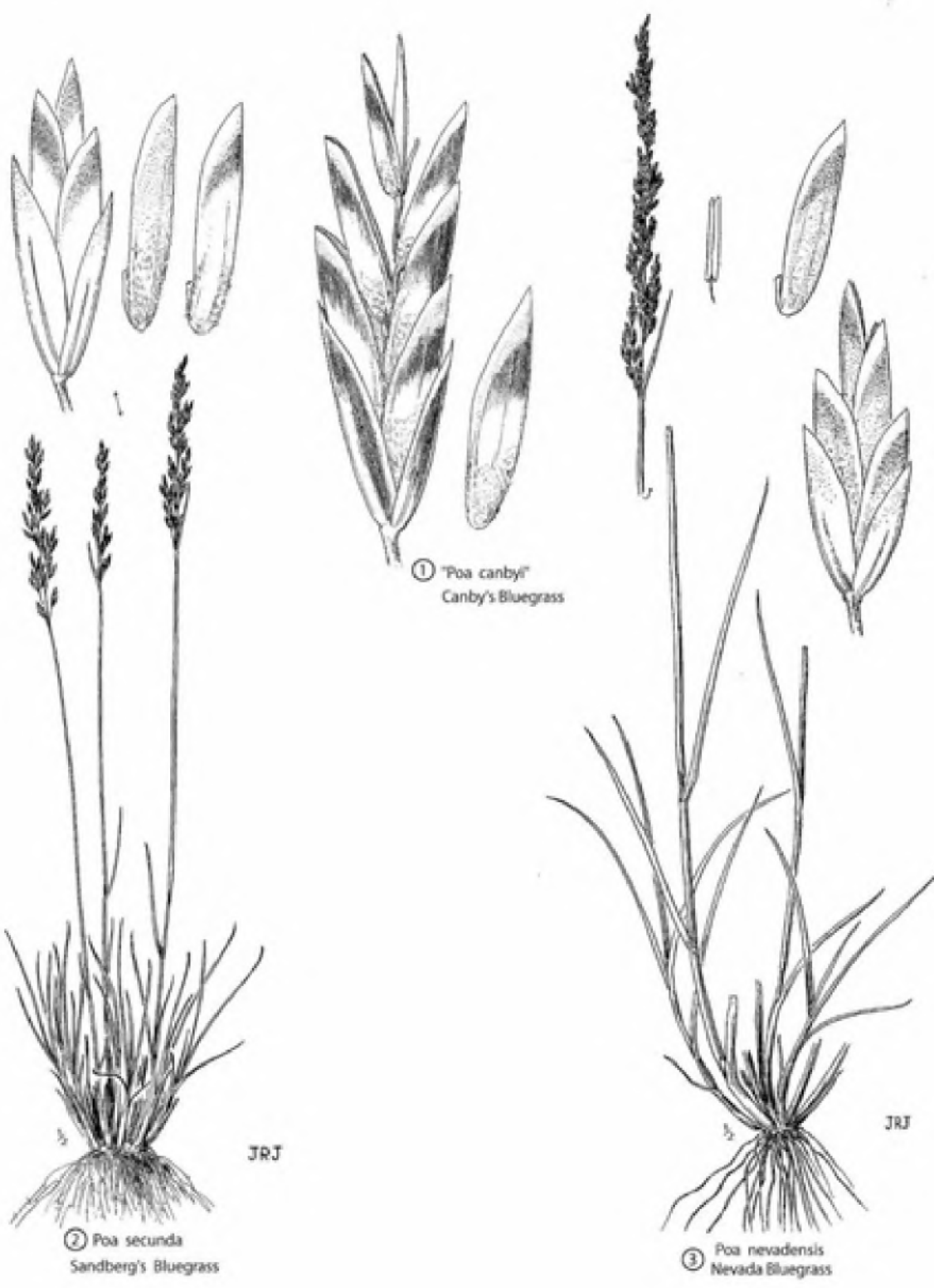
A long-lived, low-growing bunchgrass native to sagebrush-grass plant communities of the western USA and Canada. Sandberg's bluegrass is vernal dominant and adapted to short season moisture sites at low to middle elevations on silt loam to deep loam soils. It is used as an understory grass for erosion control, herbage production, and native species diversity on sites that receive seven to 18 inches mean annual precipitation. Sandberg's bluegrass greens up early in the spring. It is drought tolerant, actually drought-escaping by going dormant before mid-June until the fall rains may begin plant regrowth in September. It is an important component of sage-grouse habitat. Ecoregions: Columbia Basin, Snake River Plain, Blue Mountains, Eastern Cascades, Northern Basin and Range, Central Basin and Range. Cultivars/Varieties: The US Forest Service Shrub Sciences Lab is planning to release a prevarietal native germplasm, Mountain Home Sandberg's bluegrass. Source-identified seed is available from commercial seed vendors.

Average number of seeds per pound: 926,000. 21 seeds/sq.ft./lb/acre.

Drill seeding rate: one to two pounds/acre in seed mixture, seed shallow 1/8 to 1/4 inch.

Two other native western dry land bluegrasses may also be available for seeding:

NEVADA BLUEGRASS [#3] (*Poa nevadensis*) and **ALKALI BLUEGRASS** (*Poa juncifolia*). Recently for taxonomical purposes they have been included as subspecies of *Poa secunda*.



① "Poa canbyi"
Canby's Bluegrass

② *Poa secunda*
Sandberg's Bluegrass

③ *Poa nevadensis*
Nevada Bluegrass

JRJ

JRJ

BROMEGRASS

MEADOW BROME (*Bromus commutatus* Schrad.)

A perennial, weakly rhizomatous, non-native brome grass, introduced from Turkey in western Asia. It has been used for pasture and hayland where the mean annual precipitation exceeds 16 inches, or equivalent irrigation. The leaves are mostly basal, long, lax, and softly pubescent. It does not go dormant under high summer temperatures as does smooth brome. *Do not use meadow brome in riparian areas or adjacent to wetlands and meadows*. Cultivars/Varieties: 'Regar' meadow brome (Eurasian seed source) was released by the USDA-NRCS, Aberdeen Plant Materials Center, Idaho. Average number of seeds per pound: 93,000. 2.1 seeds/sq.ft./lb/acre.

MOUNTAIN BROME [#4] (*Bromus marginatus* Nees. ex Steud.)

A short-lived perennial, cool-season, native bunchgrass that rapidly develops to 24 to 26 inches in height. Mountain brome naturally occurs at middle to high elevations on moderately deep to deep loam soils in the western United States. It has moderately coarse culms and broad soft leaves, and has good herbage production. It does best on fertile and moist sites with a minimum of 16 inches of mean annual precipitation; but often does well on infertile, coarse, aridic soils. Mountain brome is tolerant of some soil salinity, shade tolerant, and good winter hardiness; but is intolerant of flooding. Ecoregions: Columbia Plateau (Palouse Prairie), Northern Rocky Mountains, Middle Rocky Mountains, and Wasatch Mountains.

Cultivars/Varieties: 'Bromar' is a released cultivar of mountain brome from the USDA-NRCS, Pullman, Washington. It was originally collected from a natural stand in southwestern Montana. Bromar was selected for high herbage production with a good potential in crop rotations when mixed with legumes as a green manure crop. Maximum seed and herbage production is in the second growing season. It has also been used in soil stabilization seedings and especially useful for erosion control seedings after wildland fires. 'Garnet', recently released cultivar from Colorado, has improved resistance to head smut.

Average number of seeds per pound: 140,000. 3.2 seeds/sq.ft./lb/acre.

Drill seeding rate: 12 pounds per acre; seed about 1/2 inch into soil.

Other native brome grasses in the western United States include: California brome (*Bromus carinatus*) and Columbia brome (*Bromus vulgaris*).

SMOOTH BROME (*Bromus inermis* Leyss.)

A highly variable, cool season, long-lived, sod-forming grass, non-native, introduced from Europe, may be invasive on some sites in the western USA. Smooth brome has been used for many years as forage on pasture and hay lands. It has also been used for erosion control in grassed waterways. A minimum of 16 inches of mean annual precipitation is required for establishment. *Do not use smooth brome in riparian areas, wetlands or meadows since it may be invasive in natural areas*. Cultivars/Varieties: 'Manchar' is a released cultivar from USDA-NRCS, Pullman, Washington. 'Lincoln' smooth brome is a cultivar used in the Midwestern states for livestock forage, not adapted to northern areas of the USA.

Average number of seeds per pound: 125,000. 2.9 seeds/sq.ft./lb/acre.
Drill seeding rate for erosion control or forage: seven pounds per acre.

DROPSEED

DROPSEED, SAND [#5] (*Sporobolus cryptandrus* [Torr.] Gray)

A strongly tufted, perennial, warm-season grass, up to 32 inches tall at maturity. It is native to the sagebrush steppe and desert shrub communities on sandy to sandy loam soils in the interior western USA. Sand dropseed also occurs in grasslands and foothills with eight to 20 inches mean annual precipitation.

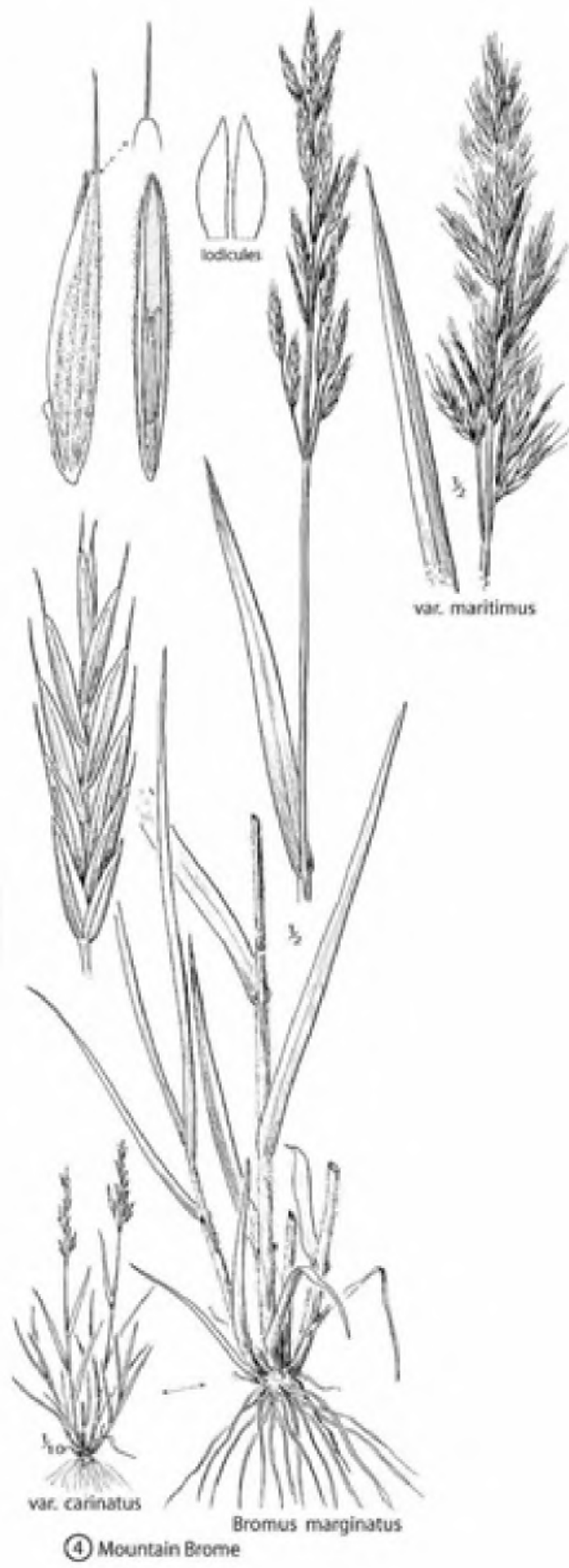
Average number of seeds per pound: 5,00,000. 115 eds/sq.ft./lb/acre.

Drill seeding rate: 1/2 to one pound per acre in a seed mix.

ALKALI SACATON (*Sporobolus airoides* [Torr.] Torr.)

A strongly tufted, perennial, warm-season grass, up to 40 inches tall at maturity. It is native to prairies, desert shrub lands, and mountain foothills, usually slightly to moderately moist, and especially characteristic of moderately alkaline soils in the interior western USA. Cultivar/variety: 'Salado' alkali sacaton was released by the USDA, NRCS Los Lunas New Mexico Plant Materials Center.

Average number of seeds per pound: 1,750,000. 40 seeds/sq.ft./lb/acre.



FESCUE GRASS

CREEPING RED FESCUE (*Festuca rubra* L.)

A long-lived, low-growing, fine-leaved, competitive (but slow development) grass, with weak rhizomes. Creeping red fescue was introduced from Europe. It performs best on acidic soils with at least 18 inches of mean annual precipitation. It has been used for soil erosion control and soil stabilization on roadsides. Cultivars/Varieties: 'Fortress' and 'Illahee' are cultivars that have been seeded on harsh, acidic, infertile sites in western Oregon and Washington. Other cultivars are also commercially available. Average number of seeds per pound: 615,000. 14.1 seeds/sq.ft./lb/acre. Drill seeding rate: four pounds per acre.

HARD FESCUE (*Festuca trachyphylla* [Hack] Krajina)

A fine-leaved, low-growing, perennial, competitive (slow rate of establishment) bunchgrass adapted to well-drained sites where the mean annual precipitation exceeds 14 inches. Hard fescue, a non-native grass, was introduced from Europe. It has a dense and voluminous root system. It has been used for erosion control and soil stabilization on hillsides and highways. Cultivars/Varieties: 'Durar' is a cultivar released by the USDA Plant Materials Center, Pullman, Washington. Several other cultivars, including 'Aurora', have been seeded for a permanent cover crop in orchards and vineyards, and seeded for turf grass. Average number of seeds per pound: 565,000. Thirteen seeds/sq.ft./lb/acre. Drill seeding rate: four pounds per acre.

IDAHO FESCUE [#6] (*Festuca idahoensis* Elmer)

A native, long-lived, cool season, perennial bunchgrass. Idaho fescue naturally occurs in sagebrush-grasslands, prairies, and meadows from British Columbia, Canada to northern California, and east to the Rocky Mountain States. It has fine, basal leaves with low annual seed production. It is slow to establish from seed and weak seedling vigor. The plants, including the mature seedhead, are ten to thirty inches in height. Soils: It does best on moderately deep to deep, fertile, silt loam to clay loam soils; it is tolerant of slightly saline, alkaline or acidic soil conditions. Idaho fescue thrives at 14 to 24 inches mean annual precipitation. Idaho fescue grows on some locations with north aspects on deep silt loam soil with ten inches of mean annual precipitation. It is moderately shade tolerant; plant crowns may be damaged or killed by fire, but it tolerates some fall burning when dormant. Idaho fescue has good spring herbage production; it is palatable to deer and elk, as well as domestic livestock. It is a component of sage-grouse habitat.

Ecoregions: Klamath Mountains, Eastern Cascades, Columbia Plateau (Palouse Prairie), Blue Mountains, Northern Rocky Mountains, and Idaho Batholith.

Cultivars/Varieties: 'Joseph' and 'Nezpurs' are Idaho fescue cultivars released by the University of Idaho, Moscow, Idaho. Winchester Idaho fescue was originally collected from a naturally occurring population in north central Idaho is also commercially available as a source-identified germplasm.

Average number of seeds per pound: 450,000. 10.3 seeds/sq.ft./lb/acre.

Drill seeding rate: four pounds per acre.

GREENLEAF FESCUE (*Festuca viridula* Vasey)

A perennial, native bunchgrass; broad-leaved grass. Greenleaf fescue naturally occurs in meadows and mountain slopes at middle to high elevations in the northwestern USA. Seeding rate: seven to eight pounds per acre.

ROEMER'S FESCUE (*Festuca roemerii* [Pavlick] Alexeev) (or *F. idahoensis* var. *roemerii*)

A perennial, native, fine-leaved bunchgrass that naturally occurs in meadows and prairies from southern British Columbia, Canada to northwestern California. Roemer's fescue is usually found as a component of prairie communities west of the Cascade Mountains, it is closely related to Idaho fescue. Soils: usually on deep silt loam with at least 24 inches mean annual precipitation. Ecoregions: Puget Lowland, Willamette Valley, and Klamath Mountains. Cultivars: source-identified seed from the Willamette Valley is available in limited quantities. Drill seeding rate: four to six pounds per acre.

SHEEP FESCUE (*Festuca ovina* L.)

A low-growing, fine-leaved, long-lived bunchgrass with basal leaf blades. Sheep fescue is more drought tolerant than other fine-leaved fescues. Soils: It does best on silt loam to loam soils with nine to 24 inches mean annual precipitation. Herbage production is low, but root growth is outstanding. Sheep fescue may take three to four years to establish on most sites. It is excellent for erosion control and soil stabilization, and is also seeded as an understory grass with taller vegetation. It has been successfully used for suppression, or competition, with many annual weeds; also seeded as a perennial cover crop in vineyards and orchards. Cultivars/Varieties: 'Covar' sheep fescue was released by the USDA-NRC S, Pullman, Washington. It was introduced from Turkey, western Asia. Covar is very short-statured, eight to 16 inches tall, the most drought tolerant cultivar currently available, and attractive bluish-green in leaf color. Other cultivars include 'Bighorn', a private release (Eurasian seed source) from Oregon that has been seeded as a perennial cover crop and turf grass in western Oregon. Blue fescue (*Festuca ovina* var. *glauca*) is an ornamental variety that has become popular in landscape projects. All sheep fescue cultivars currently available were developed or selected from foreign sources. Some botanists have identified populations of sheep fescue as native to specific areas of North America.

Average number of seeds per pound: 680,000. 15.6 seeds/sq.ft./lb/acre. Drill seeding rate: four pounds per acre seeded singly or one to two pounds in a mix. Seed sheep fescue about ¼ inch into soil.

SIXWEEKS FESCUE (*Vulpia octaflora* [Walt.] Rydb.)

An annual native fescue indigenous to sagebrush grasslands and prairies in the Intermountain West states, including most of the Great Basin. Cultivars: Source-identified sixweeks fescue seed is available in very limited quantities.

TALL FESCUE (*Festuca arundinacea* Schreb.)

A perennial, introduced bunchgrass; broad-leaved, robust fescue adapted for use as domestic livestock forage in irrigated pastures. Tall fescue is suited to irrigated lands with moderately poorly drained conditions or other areas where the effective mean annual precipitation exceeds 18 inches. Tall fescue is tolerant of strongly acidic to strongly alkaline soil conditions. It is most often used for pasture and hayland, high forage

production for livestock. It usually does not go dormant in the summer or in mild winters. *Tall fescue is not recommended for native meadows, prairies, riparian areas, or adjacent to wetlands* since tall fescue is considered to be an *invasive non-native plant in natural areas*, aggressively excludes other desirable species.

Average number of seeds per pound: 225,000. 5.2 seeds/sq.ft./lb/acre. Drill seeding rate: six pounds per acre.

WESTERN FESCUE (*Festuca occidentalis* Hook.)

A tufted, erect, perennial bunchgrass native to the western USA and Canada. Western fescue is found on moist, wooded slopes, stream banks, and lake margins, also in Ponderosa pine and Douglas fir woodlands. It thrives on silt loam to sandy loam soils that receive a minimum of 18 inches of mean annual precipitation. It has good potential for erosion control and soil stabilization seedings. Western fescue is closely related to Idaho fescue. Average number of seeds per pound: 350,000.

Drill seeding rate: eight pounds per acre.

GALLETA GRASS

GALLETA GRASS (*Hilaria jamesii* [Torr.] Benth.)

A tufted, perennial, warm-season grass up to 24 inches tall. Galleta grass is native to the desert shrub lands and grasslands of the central and southern Great Basin areas which receive some summer rainfall. Cultivar/variety: ‘Viva’ galleta grass was released by the Los Lunas New Mexico Plant Materials Center (USDA, NRC S). Commercial seed is light and fluffy, seed drills need to be set for this type of seed. Average number of seeds per pound: 170,000. 3.9 seeds/sq.ft./lb/acre. Drill seeding rate: seven pounds per acre.

HAIRGRASS

TUFTED HAIRGRASS (*Deschampsia caespitosa* [L.] Beauv.)

A perennial, tussock-forming, native grass found along stream banks, meadows, wetlands, coastal estuaries, bottomlands, and lake and pond margins. Tufted hairgrass’ natural range is circumboreal on seasonally wet or hydric soils, extending throughout cooler regions of the Northern Hemisphere where the mean annual precipitation exceeds 40 inches. This grass may naturally occur at elevations from sea level to alpine meadows. Soil: clay loam to silt loam. It is slow to establish, but is long-lived. Potential uses include stream bank and shoreline stabilization, wetland restoration, wildlife habitat and recreation area seedings. There are great genetic and morphological differences in tufted hairgrass ecotypes. The northern Pacific Coast ecotype is often a very robust plant with coarse, broad leaves, with a very high tolerance to ocean salt spray. Whereas, a Rocky Mountain ecotype from an alpine site is usually a small delicate, fine-leaved, low-growing plant, with a very low salt tolerance. About the only characteristics all tufted hairgrass ecotypes have in common are the spikelets are two-seeded, the plants are cespitose with basal leaves, and grow on moist to wet, usually acidic soils. Ecoregions: Pacific Coast Range, Puget Lowland, Willamette Valley, Cascades, Sierra Nevada, Blue Mountains, Northern Rocky Mountains, Middle Rocky Mountains, Idaho Batholith, and Wasatch Mountains. Cultivars/varieties of tufted hairgrass include: Tillamook natural

germplasm (USDA-NRCS) originally collected from a coastal estuary near Tillamook, Oregon; Linn natural germplasm (USDA-NRCS) originally collected from a low elevation meadow in the Willamette Valley, Oregon; 'Peru Creek' (EPC, Meeker, Colorado) was selected for use on high elevation sites with very acidic soil conditions; and 'Nortran' (Alaska) was developed from germplasm with origin from Alaska and a non-native European seed source (Iceland).

Average number of seeds per pound: 2,500,000. 58seeds/sq.ft./lb/acre.

Drill seeding rate: two pounds per acre; less than 1/8 inch into soil.

JUNEGRASS

PRAIRIE JUNEGRASS (*Koeleria macrantha* [Ledeb.] J.A. Schultes)

A tufted, long-lived perennial, cool season, native bunchgrass; one to two feet in height. Prairie junegrass naturally occurs on moderately deep silt loam to sandy loam soils on prairies, sagebrush-grasslands, and open woodlands in the Pacific Northwest and Intermountain West States. It is rarely found in pure stands, but is very often a component of western prairie and grassland plant communities. Prairie junegrass does best on sites with 11 to 30 inches mean annual precipitation. It is a component of sage-grouse habitat. Ecoregions: Puget Lowlands, Willamette Valley, Columbia Plateau, Blue Mountains, Northern Rocky Mountains, Middle Rocky Mountains, and Wasatch Mountains. Cultivar/variety: 'Barkola' was developed in Holland from Eurasian germplasm. Source-identified seed from western USA sources is available in limited quantities.

Average number of seeds per pound: 2,200,000. 50seeds/sq.ft./lb/acre.

Drill seeding rate: two pounds per acre; less than 1/8 inch into soil.

MANNAGRASS

MANNAGRASS (*Glyceria* sp. R. Br.)

A genus of annual and perennial grasses found in wetlands and riparian areas including several species native to western USA. Native species include northwestern mannagrass (*Glyceria occidentalis*), northern mannagrass (*G. borealis*), and tall mannagrass (*G. elata*). Mannagrasses are important facultative and obligate wetland plants.

MUHLY GRASS

MUHLY GRASS (*Muhlenbergia* sp. Schreb.)

Several species of Muhly grass (*Muhlenbergia* sp.) are native to the Great Basin region. The species that naturally occur on aridlands in the western USA include scratchgrass (*Muhlenbergia asperifolia* [Nees and Meyen] Parodi) and mat mulhly (*Muhlenbergia richardsonis* [Trin.] Rydb.) Source-identified seed may be commercially available in limited quantities.

NEEDLEGRASS

DESERT NEEDLEGRASS (*Stipa speciosa* Trin. & Rupr.)

A native perennial bunchgrass indigenous to desert shrublands in the Intermountain West states, including most of the central and southern Great Basin region. Cultivars: Source-identified seed is available in small quantities.

GREEN NEEDLEGRASS (*Nassella viridula* [Trin.] Barksworth)

A moderately tall (up to three feet tall), cool season, long-lived perennial; native to the northern Great Plains, east of the Rocky Mountains. Green needlegrass is densely tufted with bright green leaves, a deep extensive root system, and regrows in areas that receive summer rainfall. Green needlegrass grows best on clay loam soils and fractured shale soils, and is moderately tolerant of short term flooding. It requires 12 to 30 inches mean annual precipitation; tolerant of moderately alkaline soils derived from calcareous shale; variable tolerance to fire in dormant condition. Ecoregions: Northern Great Plains.

Cultivars/Varieties: ‘Lodorm’ green needlegrass is a cultivar released by the USDA-NRCS, Bismarck, North Dakota for improved forage and reclamation seedings in the Great Plains, also has lower seed dormancy than other selections. ‘Green Stipa’ green needlegrass is a cultivar from the Midwestern states.

Average number of seeds per pound: 180,000. 4.1 seeds/sq.ft./lb/acre.

Drill seeding rate: six pounds per acre.

LEMMON’S NEEDLEGRASS (*Stipa lemmonii* [Vasey] Scribn.)

A native perennial species that has a limited distribution in foothill and montane habitat, especially on sandy loam soils in the ponderosa pine regions of southern Oregon to northern California.

NEEDLE and THREAD GRASS [#7] (*Stipa comata* Trin. & Rupr.)

A native, cool season, tufted, perennial bunchgrass widespread on sands to sandy loam soils in the western states, including most of the Great Basin. Needle and thread is one to three feet in height. A notable characteristic of needle and thread is the seed has a very long (five to eight inches), barb tipped awn. It is a component of sage-grouse habitat.

Ecoregions: Columbia Plateau, Eastern Cascades, Snake River Plain, Klamath Mountains, Northern Basin and Range, Central Basin and Range. No cultivars are available at this time, but source-identified seed is collected and available from commercial vendors.

Average number of seeds per pound: 150,000. 3.4 seeds/sq ft/lb/acre.

Drill seeding rate: six pounds per acre for single species or one to two lbs. in a seed mix.

THURBER’S NEEDLEGRASS [#8] (*Stipa thurberiana* Piper)

A native, perennial, cool season bunchgrass, short to medium tall (12 to 24 inches).

Thurber’s needlegrass is indigenous to sagebrush grasslands in Oregon, Idaho, Washington, Nevada, California, Wyoming and Montana on sandy loam to rocky, shallow soils that receive six to 14 inches mean annual precipitation. It is an important component of sage-grouse habitat. Thurber’s needlegrass is found in the following ecoregions: Columbia Plateau, Blue Mountains, Snake River Plain, and Northern Basin and Range.

Cultivars/Varieties: Orchard selection of Thurber’s needlegrass was originally collected from a Wyoming big sagebrush/bunchgrass community near Orchard, Idaho; the US

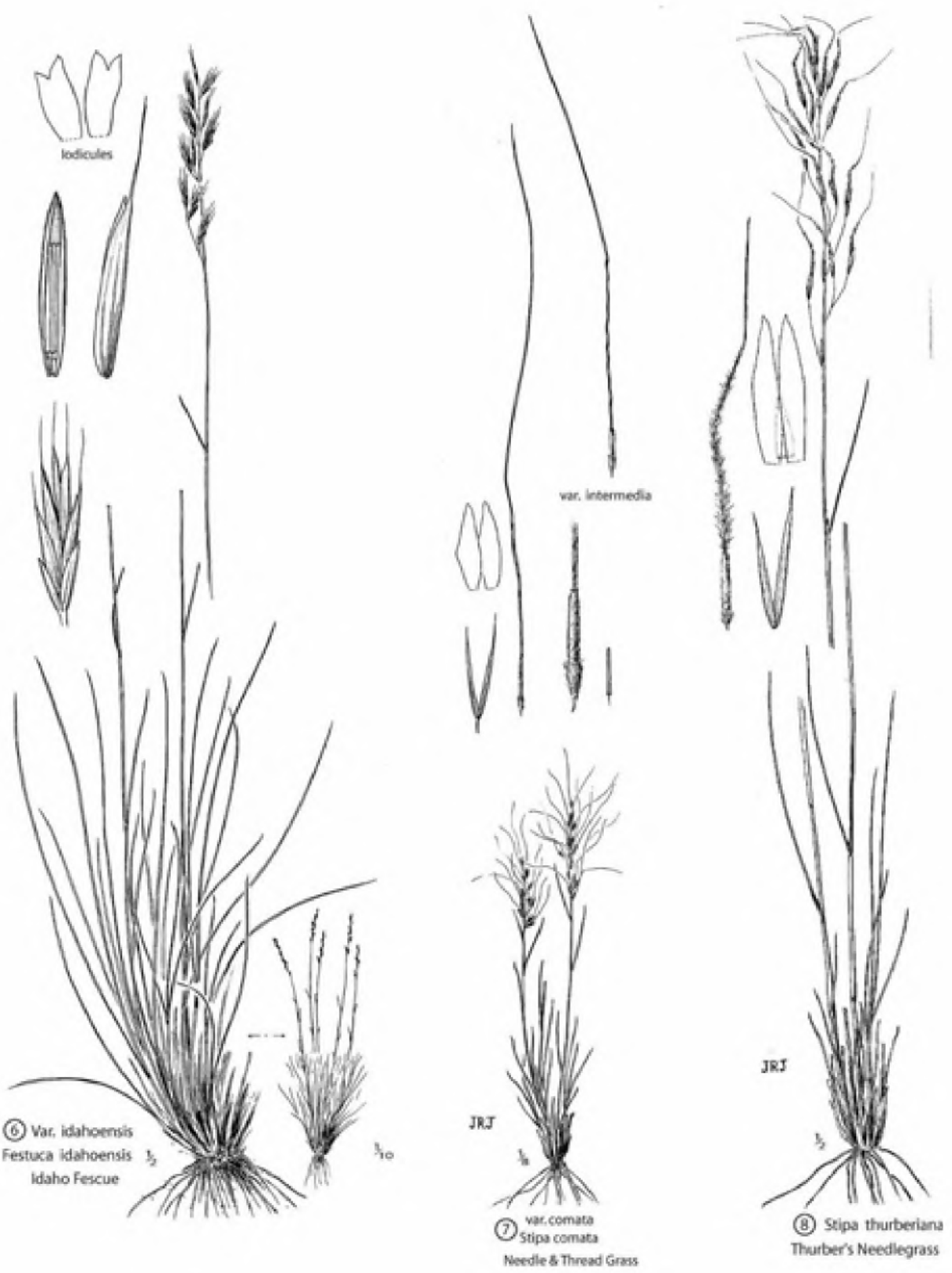
Forest Service Shrub Sciences Lab has provided seed to seed growers for field production. Source-identified seed may be available in limited quantities from commercial seed vendors.

Average number of seeds per pound: estimated at 150,000 seeds. 3.4 seeds/sq.ft./lb/acre.

Drill seeding rate: six pounds per acre, seed about ¼ to 1/2 inch into soil.

WESTERN NEEDLEGRASS (*Stipa occidentalis* Thurb. ex S. Wats.)

A native perennial bunchgrass indigenous to sagebrush steppe, grasslands and subalpine ridges in the western USA. Western needlegrass is similar in characteristics to Letterman's needlegrass (*Stipa lettermannii* Vasey) that naturally occurs in the same western states on sagebrush hills, benchland and subalpine ridges.



OATGRASS

CALIFORNIA OATGRASS (*Danthonia californica* Boland.)

A native perennial bunchgrass indigenous to the western USA and Canada in meadows, woodlands, hillsides, grasslands, coastal prairies, and along rocky mountain ridges. California oatgrass naturally occurs from sea level to over 5,000 feet in elevation. It is found on loam, silt loam, clay loam and serpentine or granitic-derived soils with 18 to 45 inches mean annual precipitation. It has moderate annual herbage production, easily overgrazed by domestic livestock, and usually low annual seed production. Ecoregions: Pacific Coast Range, Willamette Valley, Puget Lowlands, Columbia Plateau, Blue Mountains, Eastern Cascades, and Klamath Mountains. Cultivars/Varieties: Baskett Slough California oatgrass is a native germplasm selection released by USDA-NRCS, Corvallis, Oregon; the seed was originally collected from natural prairie in the Willamette Valley, Oregon. Seeding rate eight pounds per acre.

Other species of *Danthonia* native to the western USA include: one-spike oatgrass (*Danthonia unispicata* [Thurb.] Monroe ex Macoun), timber oatgrass (*Danthonia intermedia* Vasey), and Parry's oatgrass (*Danthonia parryi* Scribn.).

ORCHARDGRASS

ORCHARDGRASS [#9] (*Dactylis glomerata* L.)

A long-lived, introduced bunchgrass adapted to well-drained loam to silt loam soils where the mean annual precipitation exceeds 16 inches. Orchardgrass has high annual forage production; it is suited to pasture, hay, silage and erosion control. It is shade tolerant and can be grown on irrigated land or dryland where the effective moisture is greater than 16 inches per year. Cultivars are rated as to forage maturity: early, mid-season and late season. Late season orchardgrass varieties are used in pasture mixtures with alfalfa. Cultivars/Varieties of Orchardgrass used in the western states include: Early season forage: 'Hallmark', 'Potomac', and 'Sterling'. Mid-season forage: 'Napier', 'Paiute', 'Pennmead', and 'Akaroa'. Late season forage: 'Latar' and 'Pennlate'. Average number of seeds per pound: 450000. 10.5 seeds/sq.ft./lb/acre. Drill seeding rate: six pounds per acre usually seeded with alfalfa or similar legume.

PINEGRASS

BLUEJOINT REEDGRASS (*Calamagrostis canadensis* [Michx.] Beauv.)

A widespread native perennial grass commonly found in northern USA and Canada in marshes, mountain meadows, parklands, and subalpine areas, usually found on hydric soils. Reedgrass requires at least 24 inches of mean annual precipitation to establish. No commercial cultivar of any *Calamagrostis* species is available.

PINEGRASS (*Calamagrostis rubescens* Buckl.)

A perennial, moderately tall (24 to 40 inches), grass; culms in tufts, with rhizomes. Pinegrass is native to coniferous forests in the western USA, it naturally occurs from middle elevations to alpine zones in Cascade and Rocky Mountains. It makes a strong turf which resists heavy grazing and trampling; usually low seed production.

RICEGRASS

INDIAN RICEGRASS [#10] (*Oryzopsis hymenoides* [Roemer & J.A. Schultes] Ricker ex Piper)

A cool season, drought tolerant, perennial native bunchgrass commonly found on sands to sandy loam, aridic, soils in western USA; requires six to sixteen inches mean annual precipitation. It is tolerant of weak salinity and alkalinity, intolerant of shade. Indian ricegrass has good tolerance to fire when dormant. The seed has a very high protein and fat content, edible to humans as well as animals. Indian ricegrass has an indeterminate flowering habitat which causes seed maturation throughout the growing season. Seed of Indian ricegrass may stay dormant for two-three years after seeding. Seed may be scarified just prior to seed to speed up the germination process. It is a component of sage-grouse habitat. Ecoregions: Columbia Plateau, Eastern Cascades, Snake River Plain, Blue Mountains, and Northern Basin and Range. Cultivars/Varieties: ‘Nezpar’ Indian ricegrass was released by the USDA-NRCS, Aberdeen, Idaho for superior germination and seedling vigor for use in the Intermountain West. ‘Paloma’ released by USDA-NRCS, Los Lunas, New Mexico for use in the southwestern states. ‘Rimrock’ Indian ricegrass was released by USDA-ARS and NRCS in Montana is from a seed source in southern Alberta, Canada; it is intended for central and northern areas or higher elevations in the foothills and mountains.

Average number of seeds per pound: 205,000. 4.7 seeds/sq.ft./lb/acre.

Drill seeding rate: five pounds per acre; seeding depth of two to four inches in coarse sandy soil, one to three inches in silt loam or sandy loam soils.

RYEGRASS

ANNUAL RYEGRASS (*Lolium perenne* ssp. *multiflorum* [Lam.] Husnot)

A vigorous, winter-active annual grass adapted to wide range of soil and moisture conditions. Annual ryegrass can be grown under irrigation or on dryland where the effective mean annual precipitation is at least 15 inches. It has been seeded as winter cover crop, temporary cover or for erosion control on construction site and other disturbed areas. Annual ryegrass has a rapid rate of establishment from seed. It is very competitive with other herbaceous plants and retards establishment of perennial grasses and forbs if it is seeded at high rate in seed mixtures. *Annual ryegrass may be considered to be an invasive non-native plant when seeded in natural areas or with native plants* . Several commercial cultivars are available. Annual ryegrass usually acts as a perennial grass west of the Cascade Mountains, but is not cold hardy, and is annual grass in the interior western regions. Drill seeding rate for erosion control: three pounds per acre in a seed mixture.



Dactylis glomerata
 ⑨ Orchardgrass



⑩ *Oryzopsis hymenoides*
 Indian Ricegrass

PERENNIAL RYEGRASS (*Lolium perenne* ssp. *perenne* L.)

A relative short-lived, rapidly developing, vigorous bunchgrass adapted to a wide variety of soil conditions in the western USA. Perennial ryegrass can be grown under irrigation or other land where the effective annual precipitation exceeds fifteen inches. It has been used in grass-legume mixes for forage, and seeded singly for turf grass and erosion control. It retards the establishment of other perennials if seeded heavily in a mixture. *Perennial ryegrass may be considered to be an invasive non-native plant when seeded in natural areas or with native plants*. Turf varieties have been inoculated with an endophyte fungus for improved plant health; forage varieties do not have the endophyte fungus. Drill seeding rate for erosion control: three pounds per acre in a seed mixture.

TETRAPLOID RYEGRASS (*Lolium X L.*)

A perennial, hybrid ryegrass very similar in performance to perennial ryegrass with improved seedling vigor. Tetraploid ryegrass has been used with other forage grasses and legumes for pasture. *It is considered to be an invasive non-native plant in natural areas*. Seeding rate for erosion control: three pounds per acre in a seed mixture.

SALTGRASS

INLAND SALTGRASS (*Distichlis spicata* [L.] Greene)

A native, perennial, rhizomatous grass commonly found on alkaline and saline soils in the western USA. Inland saltgrass often occurs in plant associations with greasewood (*Sarcobatus vermiculatus*) and alkali sacaton (*Sporobolus airoides*). It is propagated by seed, but may be reproduced by vegetative tillers. Ecoregions: Pacific Coast Range, Eastern Cascades, Columbia Plateau, Snake River Plain, Northern Basin and Range. Average number of seeds per pound: 520,000. 11.9 seeds/sq.ft./lb/acre.

SQUIRRELTAIL

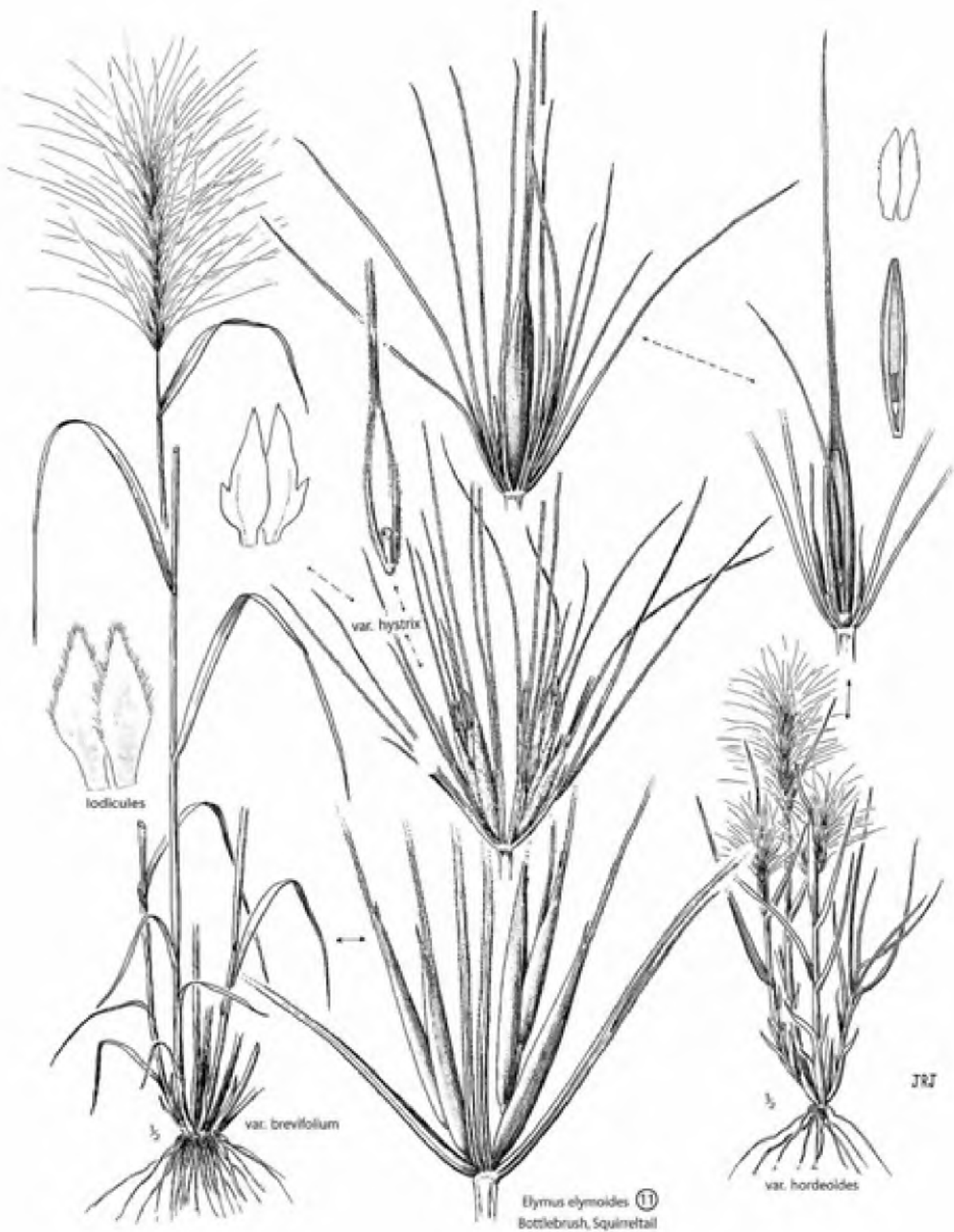
BIG SQUIRRELTAIL (*Elymus multisetus* [J.G. Smith] Burt-Davey)

A drought tolerant, cool season, native perennial bunchgrass found on aridlands in the Great Basin states of Idaho, Utah, Oregon, and Nevada where the mean annual precipitation is six to 14 inches. Soils: usually occurs on silt loam to sandy loam. Big squirreltail has similar morphological characteristics as bottlebrush squirreltail but is a moderately tall, tufted bunchgrass up to 36 inches in height. It was previously identified as *Elymus elymoides* (*Sitanion hystrix*). Ecoregions: Snake River Plains and Northern Basin and Range. **Cultivars/Varieties** : One selected native germplasm has been released by USDA-ARS, Logan, Utah: Sand Hollow big squirreltail, native source in Gem County, Idaho. Drill seeding rate: six pounds per acre.

BOTTLEBRUSH SQUIRRELTAIL [#11] (*Elymus elymoides* [Raf.] Swezey)

A drought-tolerant, cool season, native, perennial bunchgrass. Bottlebrush (former species name is *Sitanion hystrix*) is widespread in the interior regions of the western North America at mid to high elevation sites that receive six to 14 inches of mean annual precipitation. It is a short to medium size (12 to 26 inches tall), tufted bunchgrass, seed

with awns, greens up early in spring with moderate herbage production, dormant by early summer. It is a component of sage-grouse habitat. Several subspecies of squirreltail have been identified recently. Soils: sandy loam to silt loam. Ecoregions: Cascades, Eastern Cascades, Columbia Plateau, Snake River Plain, and Northern Basin and Range. Average number of seeds per pound: 190,000. 4.4 seeds/sq.ft./lb/acre. Drill seeding rate: six pounds per acre. Cultivars/Varieties: Two selected native germplasms released by USDA-ARS, Logan, Utah are Fish Creek bottlebrush squirreltail (*Elymus elymoides* ssp. *elymoides*), native source Blaine County, Idaho and Toe Jam Creek bottlebrush squirreltail (*Elymus elymoides* ssp. *californicus*), native source Elko County, Nevada. Other source-identified native squirreltail seed is available including: Mountain Home squirreltail germplasm, in an ARS research study, potential as a drought tolerant, lower elevation squirreltail seed for aridlands in the Northern Basin and Range.



THREE-AWN GRASS

THREE-AWN GRASS (*Aristida longiseta* Steud.)

A native, perennial bunchgrass found on arid grasslands of the western USA. It is propagated by seed. Ecoregions: Columbia Plateau, Snake River Plain, and Northern Basin and Range. Purple three-awn (*Aristida purpurea* Nutt.) a native, perennial grass occurs in the Great Basin region on dry, sandy sites.

WHEATGRASS

BEARDLESS BLUEBUNCH WHEATGRASS [#12] (*Pseudoroegneria spicata* ssp. *inermis* [Scrib. & J.G. Smith] A. Love).

A native, long-lived, awnless, cool-season bunchgrass, up to three feet tall at maturity. Beardless bluebunch wheatgrass naturally occurs on a wide range of prairie soils, loam, silt loam, and sometimes clay loam. It requires from 14 to 25 inches mean annual precipitation. It provides late spring herbage and cures well for native grass hay. It is very useful for erosion control, grassland rehabilitation, and wildlife habitat restoration. Beardless bluebunch wheatgrass is propagated by seed. Seed is harvested in late summer. It may take two to three years for establishment. Cultural significance: wheatgrass has been used as fodder for deer, elk, and domestic livestock; the leaves were brewed and applied to sore, arthritic limbs. It is a component of sage-grouse habitat. Ecoregions: Columbia Plateau, Northern Rocky Mountains, Blue Mountains, and Idaho Batholith. **Cultivar/Variety:** 'Whitmar' beardless bluebunch wheatgrass released by the Pullman Plant Materials Center, Washington (USDA NRC S) is the only commercially available cultivar. The original source of Whitmar was collected from a Palouse Prairie site near Colton, Washington.

Average number of seeds per pound: 125,000. 3.0 seeds/sq.ft./lb/acre.

Drill seeding rate: six pounds per acre for a single species seeding.

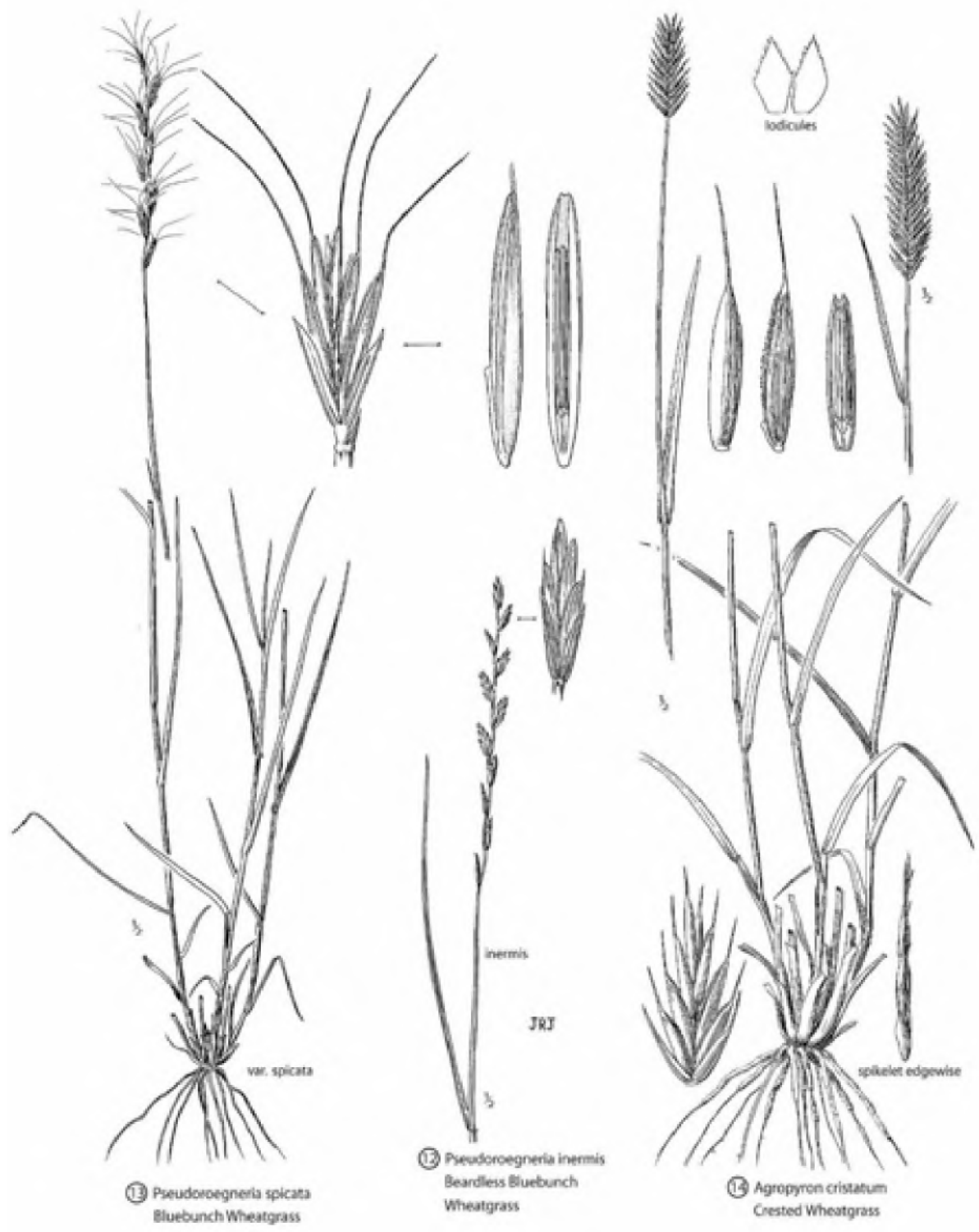
BLUEBUNCH WHEATGRASS [#13] (*Pseudoroegneria spicata* ssp. *spicata* [Pursh] A. Love)

A native, long-lived, awned, cool-season bunchgrass, up to three feet tall at maturity. It naturally occurs in grasslands, dry prairies, and shrub-steppe of the western North America, from western Canada south to California, east to Montana and New Mexico. Bluebunch wheatgrass is a major component of the sagebrush-grasslands of the northern Great Basin. Bluebunch wheatgrass has great morphological and genetic variation within the numerous ecotypes. New growth in the spring is earlier than most other native grasses. It is propagated by seed; seed is harvested in late summer. It is an important component of sage-grouse habitat. Soils: sandy loam to silt loam, well drained, neutral to very slightly basic pH. Mean annual precipitation range is eight to 30 inches. Cultural significance of bluebunch wheatgrass: the plants were harvested as forage for domestic livestock and native ungulates; wheatgrass leaves were brewed and the leaves, or tea, were applied to sores, arthritic joints and limbs. Ecoregions: Columbia Plateau, Blue Mountains, Eastern Cascades, Northern Rocky Mountains, Middle Rocky Mountains, Snake River Plain, portions of the Northern Basin and Range, and Wasatch Mountains.

Cultivars/Varieties: Anatone bluebunch wheatgrass, a source-identified prevarietal germplasm, was developed by the US Forest Service Shrub Sciences Lab; excellent drought tolerance; source was from an arid land site in Hell's Canyon near Lewiston, Idaho. 'Goldar', a native cultivar released by the Aberdeen Plant Materials Center (ID); source seed was collected from a Ponderosa pine-big sagebrush site near Anatone, Washington. Other native source-identified seed is commercially available including: Wahluke, a source-identified native germplasm from a very dry site near Hanford, Washington in the Columbia Basin. P7 bluebunch wheatgrass is a bulk composite of over 20 diverse ecotypes; it is a prevarietal germplasm release by ARS, Logan, Utah. Average number of seeds per pound: 120,000 to 150,000. 3.2 seeds per square foot for every one pound seeded per acre. Drill seeding rate: six pounds per acre, single species.

CRESTED WHEATGRASS [#14] (*Agroropyron cristatum* [L.] Gaertn.)

A perennial, non-native bunchgrass species that was introduced to western North America from the steppes and grasslands of Central Asia (Russia, Kazakhstan, and western China). Height at maturity is 24 inches; mean annual precipitation is seven to 14 inches. Cultivars/Varieties: Crested wheatgrass cultivars include 'Fairway', 'Ephraim', 'Douglas' and 'Roadcrest' developed from Eurasian germplasm by Utah-ARS. 'Nordan' is a cultivar of desert wheatgrass (*Agropyron desertorum* [Fisch. ex Link] J.A. Schultes) developed in North Dakota-Montana as livestock forage and soil stabilization. 'Hycrest' and CDII hybrid wheatgrass (*A. cristatum* X *A. desertorum*) were developed by Utah-ARS for improved seedling vigor and seed production. Average number of seeds per pound: 200,000. 4.5 seeds/sq.ft./lb/acre. Drill seeding rate: six pounds per acre for a single species.



INTERMEDIATE WHEATGRASS [#15] (*Elytrigia intermedia* [Host] Nevski)

A non-native perennial, bunchgrass species introduced from the former USSR (Central Asia area and southern Siberia). It may be slightly rhizomatous. Intermediate wheatgrass has been utilized as a pasture and forage grass in the western USA. It requires a minimum of 13 inches of annual rainfall to establish. Cultivars/Varieties of intermediate wheatgrass include: ‘Oahe’ (ND) and ‘Greenar’ (WA).

Average number of seeds per pound: 110,000. 2.5 seeds/sq.ft./lb/acre.

Drill seeding rate: eight pounds per acre for a single species.

PUBESCENT WHEATGRASS (*Elytrigia intermedia* [Host] Nevski)

Introduced bunchgrass species from Eurasian germplasm, same species as intermediate wheatgrass, a pubescent variety. It was developed for livestock forage and erosion control. It is more drought tolerant than intermediate wheatgrass, minimum of 11 inches of mean annual precipitation for survival. Cultivars/Varieties: Including ‘Luna’ (NM) and ‘Mandan’ (ND).

Average number of seeds per pound: 95,000. 2.2 seeds/sq.ft./lb/acre.

Drill seeding rate: eight pounds per acre for a single species.

SIBERIAN WHEATGRASS (*A. gropyron fragile* ssp. *sibericum* [Willd.] Melderis)

An introduced, perennial bunchgrass species from Central Asia and Russian seed sources. It performs best on sandy loam to sandy soils; mean annual precipitation of six to 12 inches is required for establishment. Cultivars/Varieties: ‘P27’ (ID) and ‘Vavilov’ (UT-ARS). Average number of seeds per pound: 220,000. 5.0 seeds/sq.ft./lb/acre.

Drill seeding rate: six pounds per acre for a single species.

SLENDER WHEATGRASS (*Elymus trachycaulus* [Link] Gould ex Shinners)

A native, short-lived, cool-season bunchgrass; naturally occurs on grasslands and open woodlands in western North America. Slender wheatgrass plants usually live for three to five years. It is an early seral grass with a rapid rate of establishment. Slender wheatgrass is shade tolerant and slightly alkali tolerant. Soils: loam to sandy loam soils at mid to high elevations that receive a minimum of 15 inches mean annual precipitation. It has also been used for short-term irrigated hay and pasture or as a “green manure” crop, often seeded with clover. Ecoregions where slender wheatgrass naturally occurs: Columbia Plateau (Palouse Prairie), Blue Mountains, Northern Rocky Mountains, Middle Rocky Mountains, and Wasatch Mountains. Cultivars/Varieties: First released native cultivar of slender wheatgrass was ‘Primar’; it is not currently in seed production.

‘Pryor’ released by the Bridger Plant Materials Center (MT), has improved seedling vigor and alkali tolerance. ‘San Luis’ was released by the Meeker Plant Center (CO) for high elevations and cold tolerance. ‘Revenue’ slender wheatgrass is a private release from Canadian sources with good seedling establishment, salinity tolerance, good herbage and seed production and high leaf to stem ratio. Average number of seeds per pound: 160,000. Averages 3.7 seeds/sq.ft./lb/acre. Drill seeding rate: seven pounds per acre, single species, or two pounds per acre in a seed mixture.

SNAKE RIVER WHEAT GRASS (*Elymus wawawaiensis* J. Carlson & M. Barkworth)

A native, long-lived, drought tolerant bunchgrass that is found along the canyons and tributaries of the Snake River from the Riggins, Idaho area to south west of Pasco,

Washington. Soils: well-drained, sandy loam to silt loam. Mean annual precipitation: seven to 16 inches. Ecoregions: Columbia Plateau and Blue Mountains.

Cultivars/Varieties: A native variety of Snake River wheatgrass is 'Secar', released by the Pullman Plant Materials Center (WA). The source seed was originally collected from an arid Palouse Prairie site on the old Lewiston Grade, near the Idaho-Washington border at 1800 to 2000 feet elevation on a sandy loam soil.

Average number of seeds per pound: 160,000. One pound of pure live seed (PLS) seed spread over one acre is 3.7 seeds per square foot. Drill seeding rate: six pounds per acre.

STREAMBANK WHEATGRASS (*Elymus lanceolatus* ssp. *psammophilus* [Gillett & Senn] A. Love)

A perennial, sod-forming grass that occurs on grasslands, prairies, and stream banks in the northwestern USA. Soils: clay loam to silt loam, annual precipitation from eleven to 25 inches. It has been used for site rehabilitation, erosion control, soil stabilization along roadsides and ditchbanks, and weed suppression. Streambank wheatgrass stays green from spring to mid-summer; therefore, it may have good potential for fire suppression. It withstands some animal and vehicle traffic; potential for low maintenance turf. It is propagated by seed, harvested late summer. Ecoregions: Eastern Cascades, Columbia Plateau, Blue Mountains, and Snake River Plain. Cultivars/Varieties: 'Sodar' streambank wheatgrass was released by the Aberdeen Plant Materials Center (ID). It has excellent seedling vigor. Seed source was originally collected from a shrub-steppe site in Grant County, located in central Oregon.

Average number of seeds per pound: 170,000. One pound of pure live seed (PLS) seed spread over one acre provides 3.9 seeds per square foot.

Drill seeding rate: six pounds per acre, single species for a single species or one to two pounds per acre in a seed mix.

TALL WHEATGRASS (*Elytrigia elongata* [Host] Nevski)

An introduced, non-native bunchgrass developed from Eurasian germplasm. Tall wheatgrass may exceed 60 inches in height at maturity. It requires a minimum of 13 inches of mean annual precipitation for establishment. Soils: Clay loam to silt loams. Cultivars/Varieties: 'Alkar' released by the Pullman Plant Materials Center (WA), for northern and central areas of the Great Basin, improved alkali tolerance. 'Jose' and 'Largo' were released by the Los Lunas Plant Materials Center (NM), recommended for use in the southwestern states. Average number of seeds per pound: 80,000.

1.8 seeds/sq.ft./lb/acre. Drill seeding rate: ten pounds per acre, single species.

THICKSPIKE WHEATGRASS [#16] (*Elymus lanceolatus* ssp. *lanceolatus* [Scribn. & J.G. Smith] Gould)

A native perennial, sod-forming, cool-season grass, up to 30 inches tall at maturity. Thickspike wheatgrass naturally occurs in the shrub-steppe and arid grasslands of the northwestern states. Soils: usually grows on coarse textured soils, such as sandy loams. Thickspike wheatgrass requires from seven to twenty inches of mean annual precipitation. The plants stay green long into summer and often appears to be fire tolerant. Thickspike wheatgrass is a component of sage-grouse habitat. Ecoregions: Columbia Plateau, Eastern Cascades, Snake River Plain, and areas in the Northern Basin and Range. Cultivars/Varieties: 'Bannock' thickspike wheatgrass was released by the Aberdeen Plant Materials Center (ID); it is a bulk composite consisting of several

ecotypes. 'Critana' is a low-growing cultivar with strong rhizomes released by the Bridger Plant Materials Center (MT); it was developed from a Montana seed source. 'Schwendimar' was released by the Pullman Plant Materials Center (WA); it is a native variety; original seed source was from one genotype collected from a natural stand near The Dalles, Oregon.

Average number of seeds per pound: 160,000. One pound of pure live seed (PLS) spread over one acre provides 3.6 seeds per square foot. Drill seeding rate: five pounds per acre. It is often used in a seeding mixture with other native grasses and forbs at the rate of two PLS pounds per acre.

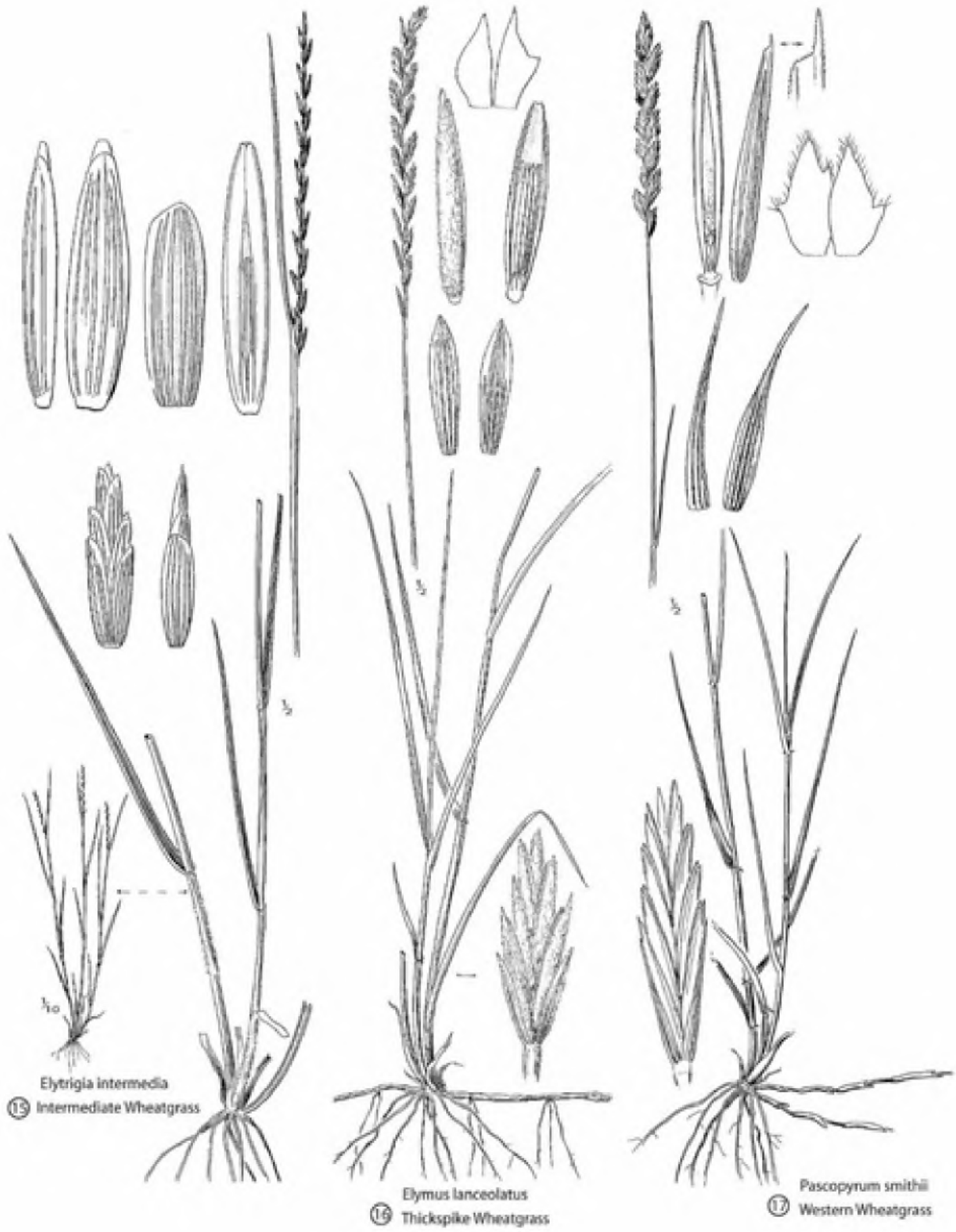
WESTERN WHEATGRASS [#17] (*Pascopyrum smithii* [Rydb.] A. Love)

A perennial, cool-season, sod-forming grass native to the western North America. Western wheatgrass is up to 24 inches in height at maturity with relatively coarse leaves. Soils: it is usually found heavy textured soils; clays to clay loams. It occurs on weakly to strongly saline soils; 11 to 24 inches of mean annual precipitation is required for establishment. Western wheatgrass is propagated by seed, harvested in mid-summer. Ecoregions: Northern Rocky Mountains, Middle Rocky Mountains, Snake River Plain, Northern Basin and Range, Central Basin and Range, and Wasatch Mountains.

Cultivars/Varieties: 'Arriba' western wheatgrass is a native cultivar released by the Los Lunas Plant Materials Center (NM) for use in the southwestern states. 'Rosana' was developed at the Bridger Plant Materials Center (MT) for northern areas. 'Barton' was developed for the use in the Great Plains states.

Average number of seeds per pound: 120,000. One pound pure live seed (PLS) spread over one acre provides 2.8 seed per square foot.

Drill seeding rate: seven pounds per acre, single species.



Elytrigia intermedia
 13 Intermediate Wheatgrass

Elymus lanceolatus
 14 Thickspike Wheatgrass

Pascopyrum smithii
 17 Western Wheatgrass

WILDRYE

BASIN WILDRYE [#18] (*Leymus cinereus* [Scribn. & Merr.] A. Love)

A native, cool-season, perennial grass with slightly spreading roots. Basin wildrye naturally occurs in grassland and shrub-steppe in the western North America. It requires 11 to 20 inches of mean annual precipitation. Basin wildrye is commonly found on well-drained bottomlands and foothills, and less frequently on alkaline sites. Soils: sandy loam to silt loams. It can reach six feet tall and three feet wide at maturity, with coarse, wide leaf blades. It is very long lived and has an extensive root system. Basin wildrye provides excellent wildlife cover, and is useful as livestock cover and as wind barriers. It is considered fair quality fodder for livestock and wildlife. Basin wildrye is native to most sites where tall wheatgrass has been planted for pasture and hayland. It stays green well into summer with adequate soil moisture, may provide some fore suppression. As is true for most grasses, it is propagated by seed. Basin wildrye is an important component of sage-grouse habitat. Ecoregions: Columbia Plateau, Eastern Cascades, Blue Mountains, Snake River Plain, Northern Basin and Range, and Central Basin and Range. **Cultivars/Varieties**: ‘Magnar’ was released by the Aberdeen Plant Material Center (ID); source of Magnar was from a shrub-steppe site south of Nelson, British Columbia. ‘Trailhead’ basin wildrye was released by the Bridger Plant Materials Center (MT), it has improved seedling vigor. Seed source of Trailhead was central Montana. Native source-identified seed of basin wildrye is available on request.

Average number of seeds per pound: 105,000 to 155,000, depending on cultivar or variety. One pound of pure live seed (PLS) spread over one acre provides about 3.0 seeds per square foot. Drill seeding rate: six pounds per acre, single species.

BLUE WILDRYE (*Elymus glaucus* Buckl.)

A native, fast-developing, short-lived perennial bunchgrass native to western North America. Blue wildrye is a common early seral plant species on sites where mean annual precipitation exceeds 16 inches. This widespread native grass has at least two distinct subspecies, with great genetic and morphological amplitude. Its typical natural habitat is open woods, prairies, shrub thickets, moist to dry hillsides from sea level to 6,000 feet in the Blue Mountains, Oregon. Soils: blue wildrye usually grows on sandy loam to silt loams. Important characteristics include a broad area of natural occurrence, high seed production, high seedling vigor, rapid establishment rate, a strong ability to reseed, provides soil protection quickly after fires or other disturbances, and is relatively compatible with coniferous tree establishment. Blue wildrye provides for wildlife habitat and has fair palatability for livestock. It is propagated by seed.

Ecoregions: Columbia Plateau (Palouse Prairie area), Cascades, Eastern Cascades, Blue Mountains, Northern Rocky Mountains, Middle Rocky Mountains, and Wasatch Mountains. **Cultivars/Varieties**: ‘Arlington’ and ‘Elkton’ are native varieties of blue wildrye released by the Corvallis Plant Materials Center for conservation and fire rehabilitation seedings in western Oregon and Washington. Other source-identified seed is also commercially available.

Average number of seeds per pound: 125,000 to 155,000. One pound pure live seed (PLS) spread across one acre provides about 3.1 seeds per square foot. Drill seeding rate: eight pounds per acre, single species.

CREEPING or SAND WILDRYE (*Leymus arenarius* [L.] Hochst.)

A native, perennial grass with strong rhizomes. Soils: Sands to sandy loams where annual precipitation exceeds eight inches.

AMERICAN DUNEGRASS (*Leymus mollis* ssp. *mollis* [Trin.] Hara)

A native, long-lived perennial grass that is sod-forming (rhizomatous). Soils: American dunegrass occurs on coastal sand dunes to sandy loams along the Pacific Coast, from British Columbia to southern California. It is propagated by seed or vegetative; no released cultivar; extremely limited quantity of commercial source-identified seed is available. Ecoregion: Pacific Coast Range. Drill seeding rate: ten pounds per acre.

MAMMOTH or GIANT WILDRYE [#19] (*Leymus giganteus* [Vahl] Pilger)

An Introduced grass species with strong rhizomes, from non-native Eurasian sources. A very tall, coarse grass up to six feet in height. It requires at least 12 inches of annual rainfall, usually on sandy soils. Giant wildrye is often propagated by planting the rhizomes. **Cultivar/Varieties**: ‘Volga’ released from the Plant Materials Center in Pullman, Washington.

Average number of seeds per pound: 75,000. 1.7 seeds/sq.ft./lb/acre.

RUSSIAN WILDRYE (*Psathrostachys juncea* [Fisch.] Nevski)

A non-native perennial bunchgrass introduced to the western USA from Russian and Central Asian seed sources. It requires at least ten inches of mean annual precipitation for establishment; usually does best with some summer rainfall. Soils: loam to silt loams.

Cultivars/Varieties: ‘Bozoisky’ Russian wildrye was developed by the Montana Plant Materials Center and ARS (USDA). ‘Vinall’ and ‘Mankota’ are cultivars developed by USDA in North Dakota. ‘Swift’ Russian wildrye was developed as a cultivar in Canada.

Average number of seeds per pound: 175,000. 4 seeds/sq.ft./lb/acre.

Drill seeding rate: seven pounds per acre, seeded as a single species.

YELLOW WILDRYE [#20] (*Leymus flavescens* [Scribn. & J.G. Smith] Pilger)

A native, perennial, cool-season, rhizomatous grass that occurs on coarse textured soils, primarily in the Columbia Plateau. Yellow wildrye requires at least eight inches of mean annual rainfall for establishment. It is propagated by seed or vegetative. No released cultivar or variety, but source-identified seed may be available. Ecoregions: Columbia Plateau and Eastern Cascades. Drill seeding rate: seven pounds per acre, seeded as a single species.

When purchasing seed of native grasses, forbs or shrubs, always request certified seed, “source-identified,” Native Cultivar or Cultivar of Non-Native or Introduced Species. “Source-identified” seed of plants from naturally occurring stands in the Great Basin region are available from private seed vendors for most of the native species mentioned in this guidebook.



GREAT BASIN FORBS

Wildflowers, including Herbaceous Legumes

AGOSERIS, ANNUAL (*Agoseris heterophylla* [Nutt.] Greene)

An annual composite forb, tap-rooted, with milky sap; up to 16 inches in height. Annual agoseris is native to dry prairies and grasslands, sometimes woodlands, in the foothills and lowlands in the western USA, including the Great Basin region. The *Agoseris* genus also includes perennial species that usually naturally occur in moist woodlands and meadows. Perennial native *Agoseris* species, such as pale agoseris (*Agoseris glauca* [Pursh] Raf.) are important botanical components of sage grouse habitat.

ALFALFA [#21] (*Medicago sativa* L.)

Introduced, herbaceous, perennial legume from Eurasian seed sources for hay and pastureland seedings in North America. Alfalfa has been utilized in the western USA as livestock forage and a nitrogen-fixation plant to improve soil health. Average number of seeds per pound: 230,000. **Cultivars/Varieties**: Alfalfa cultivars for use on aridlands in the Great Basin include 'Ladak', 'Ladak-65', 'Nomad', 'Spredor III' and other dryland alfalfa cultivars.

ASTER

At least 20 species of aster are native to the Great Basin region including the following species. *Aster* species are important components of sage grouse habitat.

ASTER, ALKALI (*Aster brachyactis* Blake), a perennial composite forb, native to arid alkali habitats in the interior western USA.

ASTER, CHILE (*Aster ascendens* Lindl.), a perennial composite forb with creeping rhizomes or branching roots; the most abundant aster in the Great Basin; it is native to wet to dry habitats from lowlands to 9,500 feet in the mountains.

ASTER, SHOWY (*Aster conspicuus* Lindl.), a perennial composite forb native to the western USA. Average number of seeds per pound: 1,000,000.

ASTER, SMOOTH (*Aster laevis* L.), a perennial composite forb native to the western USA. Smooth aster seed is harvested in the fall. Average number of seeds per pound: 1,100,000.

BALSAMROOT

BALSAMROOT, ARROWLEAF [#22] (*Balsamorhiza sagittata* [Pursh] Nutt.)

A perennial forb, with a woody taproot, native to the aridlands of the interior western USA, including the Northern and Central Basin and Range ecoregions. Arrowleaf balsamroot is often found in shrub-steppe (big sagebrush) plant communities. It is an

herbaceous member of the Composite (Sunflower) family. The wildland seed is harvested in mid-summer. Arrowleaf balsamroot is an important component of sage grouse habitat. Average number of seeds per pound: 55,000.

BALSAMROOT, CAREY'S (*Balsamorhiza careyana* Gray)

A perennial forb, with a woody taproot, native to the aridlands of the interior western USA, including the Northern and Central Basin and Range ecoregions. Carey's balsamroot is an herbaceous member of the Composite family.

BALSAMROOT, HOOKER'S (*Balsamorhiza hookeri* Nutt.)

A perennial forb, with a woody taproot, native to the aridlands of the interior western USA, including the Northern and Central Basin and Range ecoregions. It is an herbaceous member of the Composite family.

Average number of seeds per pound: 55,000.

BALSAMROOT, TOOTHED (*Balsamorhiza serrata* Nels. & Macbr.)

A perennial forb, with a woody taproot, native to the aridlands of the interior western USA, including the Northern Basin and Range ecoregion in Oregon. It is an herbaceous member of the Composite family. It is an important component of sage grouse habitat.

BEEPLANT

BEEPLANT, ROCKY MOUNTAIN (*Cleome serrulata* Pursh)

A perennial forb native to the mountainous regions of the interior western USA. Rocky Mountain beeplant usually occurs in middle to high elevations in the Great Basin region. Average number of seeds per pound: 65,000.

BEEPLANT, YELLOW [#23] (*Cleome lutea* Hook.)

A perennial forb native to the aridlands of the interior western USA, including the Northern and Central Basin and Range and the Colorado Plateau ecoregions.



Medicago sativa
 ② Alfalfa



② *Balsamorhiza sagittata*
 Arrowleaf Balsamroot



Cloeme lutea ②
 Yellow Beeplant

BISCUIT-ROOT/ DESERT-PARSLEY

LOMATIUM, BARE-STEM (*Lomatium nudicale* [Pursh] Coult. & Rose)

A perennial forb, with a woody taproot, native to the interior western USA, including portions of the Great Basin region. Bare-stem lomatium is an herbaceous member of the Carrot (Umbel) family. Cultural significance: important medicinal plant.

BISCUIT-ROOT, COUS' (*Lomatium cous* [Wats.] Coult. & Rose)

A perennial forb, with a woody taproot, native to the interior western USA. It is an herbaceous member of the Carrot family. Cultural significance: important medicinal plant.

LOMATIUM, DISSECTED-LEAF [#24] (*Lomatium dissectum* [Nutt.] Math. & Const.)

A perennial forb, with a woody taproot, native to the interior western USA on rocky slopes and dry meadows. It is an herbaceous member of the Carrot family. Cultural significance: important medicinal plant. It is an important component of sage grouse habitat. Average number of seeds per pound: 48,000.

DESERT-PARSLEY, GRAY'S (*Lomatium grayi* Coult. & Rose)

A perennial forb, with a woody taproot, native to the interior western USA. It is an herbaceous member of the Carrot family. Cultural significance: important medicinal plant. Gray's desert-parsley is an important component of sage grouse habitat. Average number of seeds per pound: 45,000.

LOMATIUM, NINE-LEAF (*Lomatium triternatum* [Pursh] Coult. & Rose)

A perennial forb with a woody taproot, native to the interior western USA on open slopes and meadows on dry to fairly moist soil, lowland to mid-montane sites. Nine-leaf lomatium is an herbaceous member of the Carrot family. It is an important component of sage grouse habitat. Average number of seeds per pound: 45,000.

DESERT-PARSLEY, SWALE (*Lomatium ambiguum* [Nutt.] Coult. & Rose)

A perennial forb, with a woody taproot, native to the interior western USA. It is an herbaceous member of the Carrot family. Cultural significance: important medicinal plant.

BLACK-EYED SUSAN

BLACK-EYED SUSAN (*Rudbeckia hirta* L.)

A perennial composite forb, a European species introduced to North America. Black-eyed susan is utilized as a wildflower in seeding mixtures in the western USA. It is a member of the Composite (Sunflower) family. Average number of seeds per pound: 1,500,000.

BLANKETFLOWER

BLANKETFLOWER [#25] (*Gaillardia aristata* Pursh)

A perennial composite forb native to aridlands the western USA, including the Great Basin region. Blanketflower is a member of the Composite (Sunflower) family. Average number of seeds per pound: 200,000.

BLAZING-STAR

BLAZING-STAR (*Mentzelia laevicaulis* [Dougl.] T. & G.)

A perennial forb native to desert valleys in the western USA, including the Great Basin. Average number of seeds per pound: 300,000.

SMALL BURNET

BURNET, SMALL [#26] (*Sanguisorba minor* Scop.)

A perennial composite forb, a European species introduced to North America, including the Great Basin area. Small burnet is an herbaceous member of the Rose family. It requires a minimum of 11 inches of annual precipitation for establishment. **Cultivar:** 'Delar' small burnet was released by the USDA NRCS Plant Materials Center, Aberdeen, Idaho. Average number of seeds per pound: 50,000. Seeding rate: One to two pounds of seed per acre in a seed mixture is sometimes recommended.

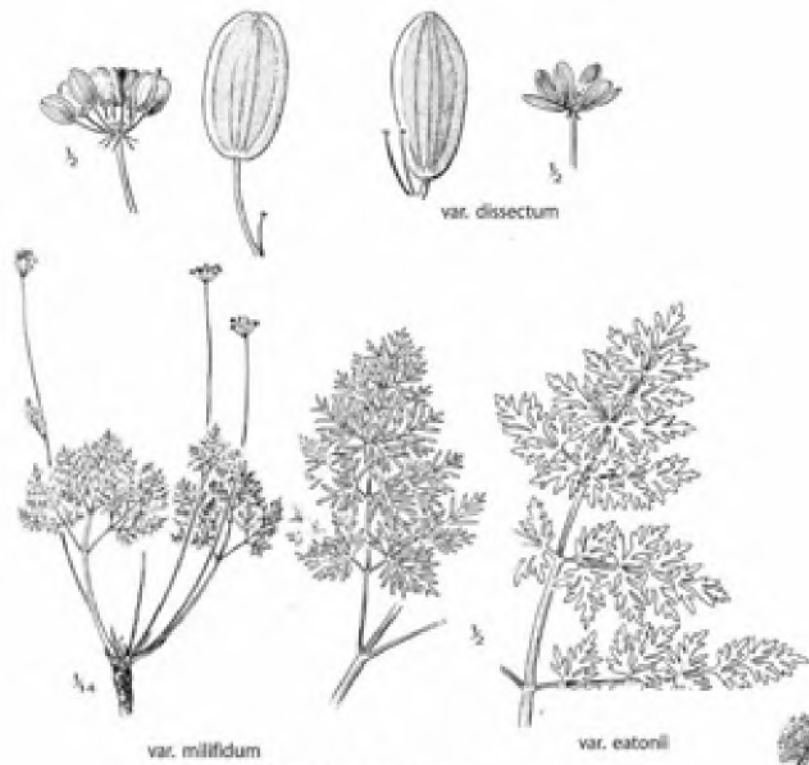
CAMAS

CAMAS, BLUE (*Camasia quamash* [Pursh] Greene)

A perennial forb native to moist meadows of western USA. Blue camas is a member of the Lily family. Cultural significance: Very important food plant, edible bulbs.

CAMAS, GREAT (*Camasia leichtlinii* [Baker] Wats.)

A perennial forb native to moist meadows of western Washington, Oregon and northern California. A member of the Lily family, a larger plant than blue camas. Cultural significance: Important food plant, edible bulbs.



24 *Lomatium dissectum*
Dissected Leaf Lomatium



Gaillardia aristata
25 Blanket flower



Sanguisorba minor
26 Small Burnet

CLOVER

The Clover genus (*Trifolium* sp.) includes native and non-native species. Unless otherwise stated, to maintain clovers on a site a *minimum of 16 inches of mean annual precipitation* is required. Native clovers have been identified as important forbs for sage grouse habitat.

CLOVER, LARGEHEAD [#27] (*Trifolium macrocephalum* [Pursh] Poiret)

A perennial herbaceous legume native to sagebrush desert, rocky site, and ponderosa pine woodlands in the western USA. A minimum of 14 inches annual rainfall is necessary for establishment.

CLOVER, SMALLHEAD [#28] (*Trifolium microcephalum* Pursh)

A perennial herbaceous legume native to moist meadows and dry hillsides in the western USA. A minimum of 14 inches annual rainfall is necessary for establishment.

CLOVER, WOOLLYHEAD (*Trifolium eriocephalum* Nutt.)

A perennial herbaceous legume native to meadows and dry hillsides in the western USA. A minimum of 12 inches annual rainfall is necessary for establishment.

CLOVER, ALSIKE (*Trifolium hybridum* L.)

A perennial herbaceous legume introduced from European sources. Alsike clover has been used in pasture seedings on alkali-saline soils.

Average number of seeds per pound: 680,000.

CLOVER, RED (*Trifolium pratense* L.)

A perennial herbaceous legume introduced from European sources to North America. Red clover has been used in pasture seedings in the western USA.

Average number of seeds per pound: 275,000.

CLOVER, WHITE (*Trifolium repens* L.)

A perennial herbaceous legume, stoloniferous, introduced from European sources to North America. Red clover has been used in pasture seedings in the western USA.

Average number of seeds per pound: 800,000.

CLOVER, THOMPSON'S (*Trifolium thompsonii* Morton)

A perennial herbaceous legume native to meadows and dry hillsides in the western USA. A minimum of 14 inches annual rainfall is necessary for establishment.

WOOLEY DAISY

DAISY, WOOLLY (*Eriophyllum lanatum* [Pursh] Forbes)

A perennial composite forb; the stems and leaves are covered with woolly hairs. It has a tap-root with a woody base; up to 24 inches in height. Woolly daisy is native to dry

prairies and grasslands, from the lowlands to above timberline in the mountains in the western USA, including the western portions of the Great Basin region. It is an important component of sage grouse habitat. Average number of seeds per pound: 810,000.

DUSTY-MAIDEN

DUSTY-MAIDEN (*Chaenactis douglasii* [Hook.] H. & A.)

A biennial or perennial forb, a member of the Composite family, up to 24 inches in height. It is native to dry grasslands and prairies, often sandy or rocky areas, chiefly in the plains and foothills in the western USA, including the Great Basin region.

Average number of seeds per pound: 350,000.

EVENING-PRIMROSE

EVENING-PRIMROSE, DESERT [#29] (*Oenothera caespitosa* Nutt.)

A perennial forb native to the interior western USA, including the Great Basin region. Desert evening-primrose is found on dry hillsides, rocky areas to ponderosa pine woodlands. Average number of seeds per pound: 1,200,000.

EVENING-PRIMROSE, HAIRY [#30] (*Oenothera deltoides* Torr. & Frem.)

A perennial forb native to the interior western USA, including the Great Basin region. It is found on dry hillsides and aridlands.



27 *Trifolium macrocephalum*
Largehead Clover



Oenothera deltoides 30
Hairy Evening - Primrose



Trifolium microcephalum
28 Smallhead Clover



var. marginata



Oenothera caespitosa 29
Desert Evening - Primrose

FLAX

FLAX, BLUE (*Linum perenne* L.)

A perennial forb introduced from European sources to North America.

Cultivars/Varieties: ‘Appar’ blue flax was released by the USDA, Aberdeen Plant Materials Center, Idaho. Seeding rate: One to two pounds of seed per acre in a seed mixture. Average number of seeds per pound: 295,000.

FLAX, LEWIS’ [#31] (*Linum lewisii* Pursh)

A perennial forb native to western North America. Lewis’ flax occurs in meadows and foothills. **Cultivars/Varieties**: the US Forest Service Shrub Sciences Lab is planning to release Maple Grove Lewis’ flax for commercial production next year; seed source is the foothills of the Wasatch Mountains in north-central Utah. Seeding rate: one-two pounds of seed per acre in a seed mixture. Average number of seeds per pound: 420,000.

FLEABANE

Over 70 species of fleabane (*Erigeron* sp.) naturally occur in the Great Basin region including the species identified below. Fleabanes are important components of sage grouse habitat.

FLEABANE, DESERT YELLOW (*Erigeron linearis* [Hook.] Piper)

A perennial forb, member of the Composite family, native to the interior western USA. It is found on dry plains, rocky areas, and foothills.

FLEABANE, DWARF YELLOW [#32] (*Erigeron chrysopsidis* Gray)

A perennial forb, member of the Composite family, native to the interior western USA. It is found on dry plains and foothills, often associated with big sagebrush.

FLEABANE, SHAGGY (*Erigeron pumilus* Nutt.)

A perennial forb, member of the Composite family. A widespread native fleabane that occurs in the interior western USA. Average number of seeds per pound: 1,800,000.

GERANIUM

GERANIUM, WHITE (*Geranium richardsonii* Fisch. & Trautv.)

A native perennial forb that occurs, in shady areas, on prairies and foothills in the interior western USA.

GERANIUM, STICKY (*Geranium viscosissimum* F. & M.)

A native perennial forb that occurs on prairies and foothills in the interior western USA. Average number of seeds per pound: 60,000.

GILIA

GILIA, PRICKLY (*Leptodactylon pungens* [Torr.] Nutt.)

A perennial native half-shrub that naturally occurs from the deserts to dry mountain slopes in the interior western USA. Seeds per pound: unknown.

GILIA, SCARLET (*Gilia aggregata* [Pursh] Spreng.)

A native perennial forb that occurs on prairies to open woodlands in the interior USA. It is a member of the Phlox family. Average number of seeds per pound: 950,000.

GLOBEMALLOW

GLOBEMALLOW, DESERT (*Sphaeralcea ambigua* Gray)

A perennial forb native to deserts and prairies of the southern Great Basin, Colorado Plateau, and Mohave-Sonoran regions. Desert globemallow occurs on aridlands at elevations from 100 feet to 4,500 feet. Average number of seeds per pound: 500,000.

GLOBEMALLOW, GOOSEBERRYLEAF [#33] (*Sphaeralcea grossulariifolia*. [H. & A.] Rydb.)

A perennial forb native to deserts, prairies, and lower mountains in the interior western USA, including the Northern Basin and Range ecoregion. It is an important plant component in big sagebrush communities. It is a component of sage grouse habitat. Average number of seeds per pound: 500,000.

GLOBEMALLOW, MUNRO'S [#34] (*Sphaeralcea munroana* [Dougl. Spach)

A perennial forb native to deserts, prairies, and lower mountains in the interior western USA, including the Great Basin region. Munro's globemallow is an important plant component in big sagebrush communities. It is a component of sage grouse habitat.

GLOBEMALLOW, SCARLET (*Sphaeralcea coccinea* [Pursh] Rydb.)

A perennial forb native to prairies and lower mountains in the interior western USA, including the Northern Basin and Range ecoregion. Scarlet globemallow is also found in Wyoming and Montana. It is a component of sage grouse habitat. Average number of seeds per pound: 500,000.

GLOBEMALLOW, SMALL-FLOWER (*Sphaeralcea parvifolia* A. Nels.)

A perennial forb native to deserts, prairies, and lower mountains in the interior western USA, including the Central Basin and Range ecoregion. Small-flower globemallow also occurs in the Colorado Plateau region.

GOLDENEYE

GOLDENEYE, SHOWY (*Viguiera multiflora* [Nutt.] Blake)

A perennial forb that is native to dry to moderately moist hillsides from 2500 to 9500 feet elevation in the Great Basin states. It is a member of Composite family. Showy goldeneye is up to 50 inches in height. Average number of seeds per pound: 1,050,000.

HAWKSBEARD

HAWKSBEARD, TAPERTIP [#35] (*Crepis acuminata* Nutt.)

A perennial, tap-rooted forb with milky sap, up to 28 inches in height. Tapertip hawksbeard is a member of the Composite family. It is native to dry prairies and foothills in the interior western USA. *Crepis* sp. are important components of sage grouse habitat, identified as an important native forb for seed development.

HOARY-ASTER

HOARY-ASTER (*Machaeranthera canescens* [Pursh] Gray)

A short-lived forb, member of the Composite family, a widespread native to sagebrush/grassland areas of the western USA, including the Great Basin region. Hoary-aster is an important component of sage grouse habitat.

LUPINE

LUPINE, BIG-LEAF (*Lupinus polyphyllus* Pursh)

A perennial, native, leguminous forb, with large leaves and showy blue pinnate flowers. Big-leaf lupine grows along streams and meadows, foothills and mountains, on shaded or open slopes, in the western USA, including the Great Basin region. Average number of seeds per pound: 70,000.

LUPINE, PRAIRIE (*Lupinus lepidus* Dougl.)

A perennial, native, leguminous forb that grows in prairies and foothills in the interior western USA.

LUPINE, RUSTY (*Lupinus pusillus* Pursh)

A perennial, native, leguminous forb that grows in sandy deserts of the western USA, including the Great Basin region.

LUPINE, SILKY [#36] (*Lupinus sericeus* Pursh)

A perennial, native, leguminous forb that occurs in sagebrush steppe to lower montane forests in the interior western USA. Average number of seeds per pound: 20,000.



Linum lewisii
 31 Lewis' Flax



32 *Erigeron chrysopsides*
 Dwarf Yellow Fleabane



Sphaeralcea grossulariaefolia
 33 Gooseberryleaf Globemallow



Sphaeralcea munroana
 Munro's Globemallow 34

LUPINE, SILVER (*Lupinus argenteus* Pursh)

A perennial, native, leguminous forb that occurs in sagebrush steppe to lower montane forests in the interior western USA. Average number of seeds per pound: 20,000.

LUPINE, TAILCUP (*Lupinus caudatus* Kell.)

A perennial, native, leguminous forb that occurs in sagebrush steppe to ponderosa pine forests in the interior western USA, including the Great Basin region.

Average number of seeds per pound: 25,000.

LUPINE, WOOLLY (*Lupinus leucophyllus* Dougl.)

A perennial, native, leguminous forb, also known as velvet lupine. It occurs on sites with sagebrush and ponderosa pine, also found on dry foothills in the Intermountain West, including the Great Basin region.

MARIPOSA-LILY

MARIPOSA-LILY, ELEGANT (*Calochortus elegans* Pursh)

A perennial forb, member of the Lily family, native to open grassy sites, prairies, and coniferous forests in the western USA.

MARIPOSA-LILY, SAGEBRUSH (*Calochortus macrocarpus* Dougl.)

A perennial forb, member of the Lily family, native to the sagebrush-steppe, prairies, and other dry places in the interior western USA. It is a component of sage grouse habitat.

MARIPOSA-LILY, BROAD-FRUIT (*Calochortus nitidus* Dougl.)

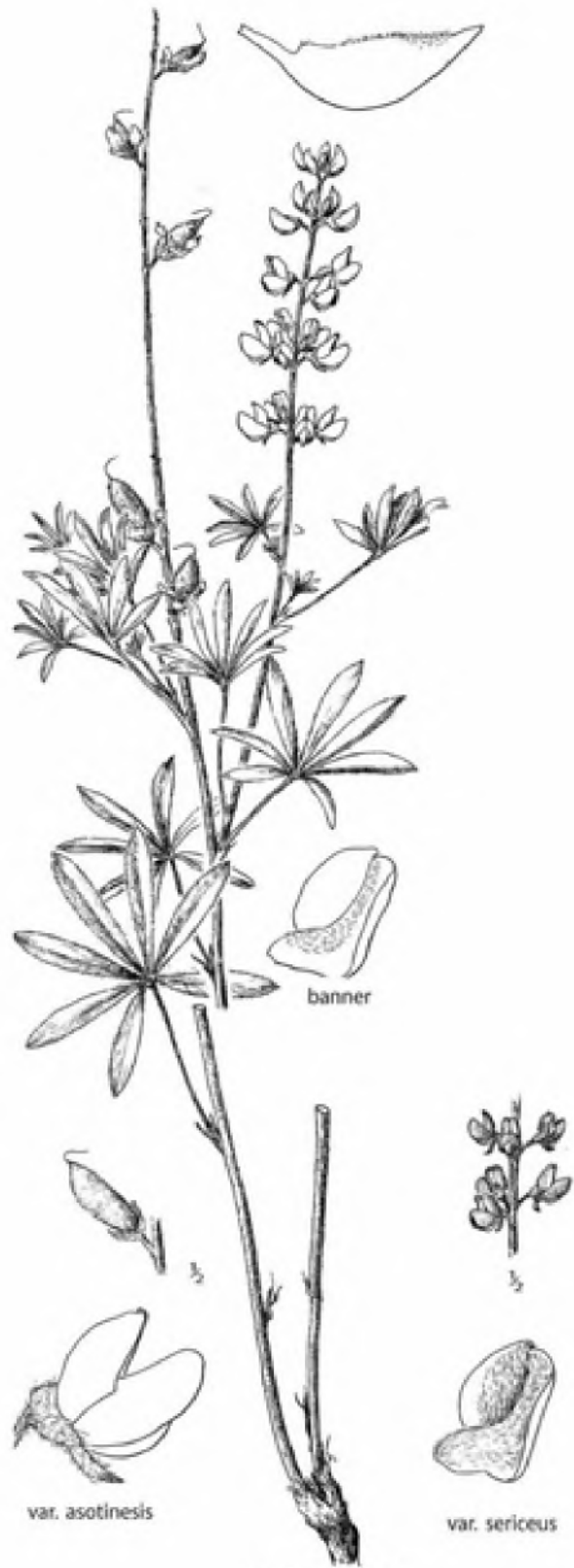
A perennial forb, member of the Lily family, native to open grassy sites and sagebrush plains, naturally occurs in the Great Basin states. *Calochortus* sp. have edible bulbs, an important food source for wildlife and humans. It is a component of sage grouse habitat.

SEGO-LILY, NUTTALL'S (*Calochortus nuttallii* T. & G.)

A perennial forb, member of the Lily family, native to open grassy sites and sagebrush plains, primarily in the Great Basin states. *Calochortus* sp. have edible bulbs, an important food source for wildlife and humans. It is a component of sage grouse habitat. Average number of seeds per pound: 190,000.



35 *Crepis acuminata*
Tapertip Hawksbeard



var. *asotinesis*

Lupinus sericeus
36 Silky Lupine

var. *sericeus*

MILKVETCH

MILKVETCH, BASALT [#37] (*Astragalus filipes* Torr.)

A perennial leguminous forb, also known as threadstalk milkvetch, is native to the sagebrush plains and foothills of the interior western USA. It is a component of sage grouse habitat. Average number of seeds per pound: 100,000.

MILKVETCH, CICER (*Astragalus cicer* L.)

A perennial, leguminous non-native forb introduced from Eurasian sources. It has been utilized for pasture and hayland in the USA. It requires at least 14 inches mean annual precipitation.

MILKVETCH, FRECKLED (*Astragalus lentiginosus* Dougl.)

A perennial leguminous forb; a widespread native milkvetch that is found on desert flats, sagebrush plains, foothills, and subalpine slopes of the interior western USA. It is a component of sage grouse habitat. Average number of seeds per pound: 95,000.

MILKVETCH, HERMIT (*Astragalus eremiticus* Sheld.)

A perennial leguminous forb native to the sagebrush desert to pinyon-juniper woodland of the interior western USA. Hermit milkvetch occurs from southeastern Oregon and southwestern Idaho to southwestern Utah and northwestern Arizona.

MILKVETCH, PULSE (*Astragalus tenellus* Pursh)

A perennial leguminous forb native to the sagebrush plains, prairies, and foothills of the interior western USA. It is a component of sage grouse habitat.

MILKVETCH, SILVER-LEAVED (*Astragalus argophyllus* Nutt.)

A perennial leguminous forb, alkali tolerant, native to the sagebrush plains and foothills of the interior western USA. It is a component of sage grouse habitat.

MILKVETCH, UTAH (*Astragalus utahensis* [Torr] T&G.)

A perennial leguminous forb with very showy pink-purple flowers. It is native to sagebrush-grasslands, pinyon pine – juniper, and mountain brush habitat in the Wasatch Mountains and portions of the eastern Great Basin region.

MILKVETCH, WOOLLYPOD (*Astragalus purshii* Dougl.)

A perennial leguminous forb native to the sagebrush plains, prairies, and foothills of the interior western USA. Woollypod milkvetch is a component of sage grouse habitat. Average number of seeds per pound: 110,000.

MILKWEED

MILKWEED, SHOWY (*Asclepias speciosa* Torr.)

A perennial forb native to loamy or sandy soils, usually moist, in the western USA. Showy milkweed requires a minimum of 12 inches of annual rainfall for establishment. It is a component of sage grouse habitat.

MICROSERIS

MICROSERIS, NODDING (*Microseris nutans* [Geyer] Schultz-Bip.)

A perennial forb, member of the Composite family, with milky sap. It is native to open, usually moist areas, lowlands to fairly high elevations in the mountains of the interior western USA. It is a component of sage grouse habitat.

ONION

ONION, TAPERTIP (*Allium acuminatum* Hook.)

A perennial native forb, member of the Lily family that naturally occurs in dry plains and flats to foothills of the interior western USA.

PEAVINE

PEAVINE, BONNEVILLE (*Lathyrus brachycalyx* Rydb.)

A perennial herbaceous legume that naturally occurs in grasslands and sagebrush prairies of the interior western USA.

PEAVINE, FEW-FLOWERED (*Lathyrus pauciflorus* Fern.)

A perennial herbaceous legume that naturally occurs in grasslands, sagebrush steppe and ponderosa pine woodlands of the interior western USA.

PENSTEMON

PENSTEMON, BEARDLIP (*Penstemon barbatus* [Cav.] Roth)

A perennial forb, also known as scarlet bugler, native to foothills and valleys in southern Utah, northern Arizona and southern Nevada.

Average number of seeds per pound: 550,000.

PENSTEMON, BLUE MOUNTAIN (*Penstemon venustus* Dougl. ex Lindl.)

A perennial forb, stout tap-root, shrubby at the base of the plant; the stems are up to 32 inches height at maturity, native to aridlands of the interior USA. The flowers are bright lavender to purple-violet. Venus' penstemon naturally occurs on open, rocky slopes, from valleys and foothills to middle elevations in the mountains of Idaho and eastern Oregon; also occurs in the Northern Basin and Range ecoregion. Cultivar: Clearwater was released by the NRCS Aberdeen Plant Materials Center located in eastern Idaho.

PENSTEMON, DARK BLUE (*Penstemon cyaneus* Pennell)

A perennial forb, up to 28 inches in height, weakly tap-rooted with several stout stems, and often associated with big sagebrush. Dark blue penstemon is native to the Snake River Plains and portions of the Northern Basin and Range in southern Idaho. It is a component of sage grouse habitat. Average number of seeds per pound: 180,000.

PENSTEMON, EATON'S (*Penstemon eatonii* Gray)

A perennial forb, with bright red flowers; up to 28 inches in height. It is native to aridlands, including big sagebrush sites, in the interior western USA, including portions of the Great Basin region. Cultivar: Richfield was released by the NRCS Plant Materials Center, Aberdeen, Idaho. Average number of seeds per pound: 600,000.

PENSTEMON, HOT-ROCK (*Penstemon deustus* Dougl.)

A perennial forb, more or less woody to a much branched base with seasonal stems, up to 24 inches in height. Hot-rock penstemon is native to aridlands of the interior USA. Flowers are whitish with purple lines. It naturally occurs on dry, open, often rocky places from low elevations to moderately high elevations in the mountains in the Great Basin. It is a component of sage grouse habitat.

PENSTEMON, PALMER'S (*Penstemon palmeri* Gray)

A perennial forb, with pinkish flowers, up to 30 inches in height, native to aridlands of the interior USA, including the southern Great Basin and Wasatch Plateau. Cultivar: 'Cedar' was released by NRCS Plant Materials Center, Los Lunas, New Mexico.

Average number of seeds per pound: 600,000.

PENSTEMON, ROCKY MOUNTAIN (*Penstemon strictus* Benth.)

A perennial forb, red-purple flowers, up to 28 inches in height, native to sites in the central to northern Rocky Mountains and the Wasatch Mountains (Utah). Cultivar: 'Bandera' Rocky Mountain penstemon was released by the NRCS Plant Materials Center, Los Lunas, New Mexico. Average number of seeds per pound: 520,000.

PENSTEMON, RYDBERG'S [#38] (*Penstemon rydbergii* A. Nels.)

A perennial forb, tufted with loose or compact, surficial woody rhizomes, up to 30 inches in height. Rydberg's penstemon is native to aridlands of the interior USA. It is often found in meadows and moist open slopes, occasionally on dry slopes with big sagebrush, usually occurs in foothills and mountains in the Great Basin. It is a component of sage grouse habitat.

PENSTEMON, SHOWY or SAGEBRUSH [#39] (*Penstemon speciosus* Dougl.)

A perennial forb, up to 36 inches height at maturity, with several stout stems arising from a compact, branched root crown. Flowers are blue-purple. Showy or sagebrush penstemon is native to aridlands of the interior USA. It naturally occurs on dry, open or sparsely wooded slopes, often associated with big sagebrush, juniper or ponderosa pine habitats, usually in low elevations and foothills in the Great Basin. It is a component of sage grouse habitat.



37 *Astragalus filipes*
Basalt Milkvetch



38 *Penstemon rydbergii*
Rydberg's Penstemon



39 *Penstemon speciosus*
Sagebrush Penstemon

PENSTEMON, SAND-DUNE [#40] (*Penstemon acuminata* Dougl.)

A perennial forb, stout stems from a short root crown (caudex), glabrous, up to 24 inches height at maturity, native to aridlands of the interior USA. The flowers (corolla) are bright blue. Sand-dune penstemon occurs on dry, open, sandy areas at low elevations, often on dunes from eastern Oregon to south central Idaho, south to Nevada. It is a component of sage grouse habitat.

PENSTEMON, WHIPPLE'S (*Penstemon whippleanus* Gray)

A perennial forb, plants tufted, up to 24 inches height at maturity, native to aridlands of the interior USA. It has variable flower color, from blue, violet to lavender or whitish. Whipple's penstemon naturally occurs on dry meadows, open or lightly wooded areas, often on rocky slopes into the mountains in southeastern Idaho, Utah and portions of Nevada. It is a component of sage grouse habitat.

PHACELIA

PHACELIA, IVES' (*Phacelia ivesiana* Torr.)

An annual forb native to dry, sandy grasslands and prairies. It commonly occurs with big sagebrush in the interior western USA, including portions of the Great Basin region.

PHACELIA, SILVERLEAF (*Phacelia hastata* Dougl. ex Lehm.)

A perennial forb with a stout tap-root and may be shrubby at the base of the plant; up to 24 inches in height. It is native to dry prairies and grasslands in the interior western USA, including the Great Basin region. Silverleaf phacelia, also known as scorpionweed, may be found at all elevations and often occurs on sands or sandy loam soils. It is a component of sage grouse habitat.

PHLOX

PHLOX, HOOD'S (*Phlox hoodii* Rich.)

A perennial tap-rooted forb, compact and mat-forming, it is native to the western USA. Hood's phlox naturally occurs on dry, open sites in foothills, valleys, and plains, commonly associated with big sagebrush in the Great Basin. It is a component of sage grouse habitat.

PHLOX, LONGLEAF [#41] (*Phlox longifolia* Nutt.)

A perennial forb, often branched with creeping roots, eventually forms a tap-root, it is native to the western USA. Longleaf phlox is found on dry, open rocky places, from low elevations to moderately high elevations in the mountains widespread in the Great Basin. It is a component of sage grouse habitat.

PHLOX, SHOWY (*Phlox speciosa* Pursh)

A perennial forb with a woody tap-root, up to 16 inches in height at maturity, it is native to the western USA. Showy phlox is found on big sagebrush and ponderosa pine sites into the northern Great Basin. It is a component of sage grouse habitat.

SLENDER PHLOX (*Phlox gracilis* [Hook.] Greene)

A slender, much-branched perennial forb, up to 12 inches in height. Slender phlox (also known as *Microsteris gracilis*) is native to the western USA. It naturally occurs in dry to moderately moist grasslands and prairies, usually in the lowlands and foothills in the Great Basin region.

PHLOX, SPINY (*Phlox aculeata* A. Nels.)

A perennial, compact forb with a woody tap-root, up to 14 inches in height at maturity, it is native to the western USA. Spiny phlox is found on big sagebrush and ponderosa pine sites in the northern Great Basin and Snake River Plains.

PRARIECLOVER

PRAIRIECLOVER, WESTERN (*Dalea ornata* [Dougl. ex Hook] Eat. & J. Wright)

A perennial, native leguminous forb, with pink to rose colored flowers, occurs on sandy or rocky sites, often associated with big sagebrush. Western prairie clover is also known as *Petalostemon ornatum*. Ecoregions: Columbia Plateau, Blue Mountains, Snake River Plain, and portions of the Northern Basin and Range. It is a component of sage grouse habitat. Average number of seeds per pound: 440,000.

PRARIE-SMOKE

PRAIRIE-SMOKE (*Geum triflorum* Pursh)

A native, perennial forb, up to 24 inches in height. It is an herbaceous member of the Rose family. Prairie-smoke, also known as “old-man’s whiskers”, naturally occurs in moister areas of the sagebrush plains and foothills to sub alpine ridges in the western USA, including the Great Basin region. Average number of seeds per pound: 690,000.

PRINCE’S-PLUME

PRINCE’S-PLUME (*Stanleya pinnata* [Pursh] Britt.)

A perennial forb, a member of Mustard family. Prince’s-plume naturally occurs, widespread, from dry plains to lower mountains of the interior western USA.

PUCCOON

PUCCOON (*Lithospermum ruderale* Dougl. ex Lehm.)

A perennial forb with a woody taproot, up to 24 inches in height. It is a member of the Borage family. Puccoon, also known as western gromwell, is native to fairly dry prairies and grasslands from the foothills and adjacent lowlands to moderate elevations in the mountains of the western USA, including the Great Basin region.

SAINFOIN

SAINFOIN [#42] (*Onobrychis viciaefolia* Scop.)

A perennial, leguminous non-native forb introduced from Eurasian sources. Sainfoin is adapted to dryland areas of the western USA. Cultivars including 'Eski' and 'Renumex' are available for use in the Great Basin. Average number of seeds per pound: 28,000.

STARFLOWER

STARFLOWER, BULBOUS (*Lithophragma bulbifera* Rydb.)

A perennial forb with noticeable bulblets, native to grassy hillsides, sagebrush communities to ponderosa pine sites in the western USA, including the Great Basin area. It is a member of the Saxifrage family. An important component of sage grouse habitat.

STARFLOWER, PRAIRIE (*Lithophragma parviflora* [Hook.] Nutt.)

A perennial forb, native to prairies, grasslands, sagebrush deserts to lower montane habitats in the western USA, including the Great Basin area. It is a member of the Saxifrage family. Prairie starflower is an important component of sage grouse habitat.

SUNFLOWER

SUNFLOWER, ANNUAL (*Helianthus annuus* L.)

An annual forb, member of Composite family. Annual sunflower occurs, widespread, across a variety of dry to moist habitats in North America. Average number of seeds per pound: 45,000.

SCURF-PEA

SCURF-PEA (*Psoralea lanceolata* Pursh)

A perennial leguminous forb that occurs on sandy soils, often associated with sagebrush communities, in the western USA. Ecoregions: Eastern Cascades, Columbia Plateau, Blue Mountains, and Northern Basin and Range.

SWEETCLOVER

SWEETCLOVER, YELLOW (*Melilotus officinalis* [L.] Lam.)

A short-lived non-native forb introduced from European sources. It is a member of the legume family. Yellow sweetclover has been utilized in the western USA as livestock forage and a temporary nitrogen-fixation plant to improve soil health.

Average number of seeds per pound: 230,000.

SWEETVETCH

SWEET VETCH, NORTHERN (*Hedysarum borealis* Nutt.)

A perennial leguminous forb that is native to meadows and mid-elevation slopes of the intermountain western USA. Average number of seeds per pound: 90,000. **Cultivar:** 'Timp', seed source from the Wasatch Mountains in Utah, is a public release commercially available in limited quantities.

TREFOIL

DEERVETCH, BIG (*Lotus crassifolius* [Benth.] Greene)

A perennial leguminous forb that is native to lowland to montane sites from northwestern Washington to southern California. Average seeds per pound: 250,000.

TREFOIL, BIRDSFOOT (*Lotus corniculatus* L.)

A perennial leguminous forb introduced to North America from European sources. Birdsfoot trefoil has been used in pasture plantings and has escaped in moist areas of the western USA. *Birdsfoot trefoil may be invasive in riparian areas, wet meadows, and wetlands.* Average number of seeds per pound: 450,000.

DEERVETCH, MEADOW (*Lotus denticulatus* [Drew] Greene)

A perennial leguminous forb that is native to sandy soils primarily restricted to sites in Oregon and California.

DEERVETCH, NEVADA (*Lotus nevadensis* [Wats.] Greene)

A perennial leguminous forb that is native to sandy or rocky soils of the western USA.

VETCH

VETCH, AMERICAN (*Vicia americana* Muhl.)

A perennial leguminous forb that is native to generally moist sites in North America. Average number of seeds per pound: 30,000.

VETCH, HAIRY (*Vicia hirsuta* [L.] S.F. Gray)

A perennial leguminous forb introduced to North America, from European seed sources. Hairy vetch has been utilized in pasture and hayland seedings in the western United States. Average number of seeds per pound: 17,000.

VIOLET

VIOLET, SAGEBRUSH (*Viola nuttallii* var. *vallicola* [A. Nels.] St. John)

A perennial forb that grows from short, erect rootstalks. The petals are yellow and brownish-purple backed. Sagebrush violet is native to sagebrush communities and sagebrush-ponderosa pine benchlands in the interior western USA. It is a component of sage grouse habitat.

WALLFLOWER

WALLFLOWER, WESTERN [#43] (*Erysimum occidentale* [Wats.] Robins)

A biennial forb that is native to sagebrush steppe and desert valleys in the interior western USA. Western wallflower is a member of the Mustard family. Average number of seeds per pound: 3,000,000.

WYETHIA

WYETHIA, MULE'S-EAR (*Wyethia amplexicaulis* Nutt.)

A perennial forb that is native to open slopes and dry meadows from foothills to mid-elevations in mountains of the interior western USA. Mule's-ear Wyethia is a member of Composite family. It is a component of sage grouse habitat. Average number of seeds per pound: 25,000.

YAMPAH

YAMPAH, BOLANDER'S (*Perideridea bolanderi* [Gray] Nels. & Macbr.)

A perennial forb, member of the Carrot family that is native to dry hillsides, foothills and high plains in the western USA, including the Great Basin region. Cultural significance: the fleshy taproot of yampah is an important food source for wildlife and humans.

YAMPAH, GAIRDNER'S (*Perideridea gairdneri* [H. & A.] Math.)

A perennial forb, member of the Carrot family that is native to meadows and woodlands in the western USA, including the Great Basin region. Cultural significance: the fleshy taproot of yampah is an important food source for wildlife and humans.



40 *Penstemon acuminatus*
Sand-Dune Penstemon



42 *Onobrychis viciaefolia*
Sainfoin



43 *Achillea millefolium*
Western yarrow



Phlox longifolia 41
Longleaf Phlox

YARROW

YARROW, WESTERN (*Achillea millifolium* var. *occidentalis* DC)

A perennial, white-flowered forb that is native to the western USA. It is a member of the Composite family. Western white yarrow is not be confused with other invasive introduced yarrows of European or New Zealand origin that have been used in ornamental gardens. *The potentially invasive non-native yarrows are often referred to as "Summer Pastel" varieties due to their light blue, pink, or yellow flowers* . Cultural significance: western yarrow has some importance as a traditional medicinal plant. Average number of seeds per pound: 2,700,000.

YUCCA

YUCCA, SOAPWELL (*Yucca glauca* Nutt.)

A perennial forb, member of the Lily family that is native to prairies and open woodlands of the Rocky Mountains and eastward in the USA. Average number of seeds per pound: 25,000.

A General Rule to Diversify a Seed Mixture With Forb Seed:

Add one pound of seed per forb species per acre (or less, if seed cost and availability is a concern). Always request certified seed, source-identified or cultivars to verify quality and species.

Note: The plant species included in this guidebook are available from commercial seed vendors in very limited to good quantities.

GREAT BASIN SHRUBS

ROSE

ALMOND, DESERT (*Prunus fasciculata* [Torr.] Gray)

A spiny, divergent-branching, deciduous shrub up to 12 feet tall. Desert almond is a member of the Rose family. It is native to western portions of the Great Basin, in California, Nevada, Oregon and Idaho. Desert almond root sprouts after fire or cutting. It occurs on desert foothills and valleys, sometimes associated with pinyon-juniper and mountain shrub communities; at 3,200 to 6,000 feet in elevation.

PEACH, DESERT (*Prunus andersonii* Gray)

A deciduous, spreading, low shrub up to 6 feet tall; it is diffusely branched and thorny. The fruit resembles a small, fuzzy peach. Desert peach is a member of the Rose family. It is native to east slope of the Sierra Nevada and western portions of the Great Basin, in California and Nevada.

BITTERBRUSH [#44] (*Purshia tridentata* [Pursh] DC)

An evergreen shrub up to 14 feet tall, may be upright or somewhat prostrate in growth form. Some ecotypes of bitterbrush are fire intolerant; they do not recover after wildfire occurs. It is a member of the Rose family. It is native to interior western USA, including the Central Basin and Range, Northern Basin and Range, Snake River Plain, Blue Mountains, East Slope of Cascade Mountains, and Columbia Plateau Ecoregions. Bitterbrush naturally occurs in well-drained sandy, gravelly, or rocky soils throughout the big sagebrush, pinyon pine/juniper, ponderosa pine, and lodgepole pine communities from lowlands to high elevations. It grows best at nine to 18 inches annual precipitation. Average number of seeds per pound: 15,000.

CHOCKECHERRY, WESTERN (*Prunus virginiana* ssp. *demissa* [Nutt.] Torr.)

An erect, deciduous shrub or small tree up to 18 feet tall. It is a member of the Rose family. Western chokecherry is native to the western USA, including portions of the Great Basin region. It occurs on grasslands and with sagebrush, mainly along watercourse, also found on lower mountain slopes to ponderosa pine forests; up to about 8,200 feet in elevation. It requires 15 inches of annual rainfall for establishment. Western chokecherry is shallow-rooted and naturally spreads by rhizomes. It often sprouts from the rhizomes after wildfire or other disturbances. The red to purple-black berries are edible to wildlife and humans. Average number of seeds per pound: 2,000.

CLIFFROSE (*Cowania stansburiana* [Torr.] Hendrickson)

A much-branched, evergreen shrub, three to 20 feet tall, often resinous. The stems of cliffrose are erect, rather stiff, and have gray, shreddy bark. Cliffrose is a member of the Rose family. It is native to the Central Basin and Range and Colorado Plateau Ecoregions. It naturally occurs on dry, rocky foothills and mesas, frequently associated with pinyon pine/juniper, big sagebrush and salt desert shrub communities. It grows best on sites that receive eight to 16 inches annual rainfall.

Average number of cliffrose seeds per pound: 65,000.

FERNBUSH (*Chamaebatiaria millefolium* [Torr.] Maxim.)

An upright, multistemmed, aromatic shrub that is up to seven feet tall. Fernbush is a member of the Rose family. It is evergreen in the southern areas of its range. It is native to the Great Basin, Colorado Plateau and surrounding areas in the western United States that receive from 11 to 18 inches of mean annual precipitation. Fernbush grows in rock outcrops and cliffs, and on well-drained soils of dry, rocky, and gravelly canyons and lower mountain slopes. It may root sprout after fire or cutting.

Average number of seeds per pound: 1,700,000.

INDIAN-APPLE [#45] (*Peraphyllum ramosissimum* Nutt.)

An intricately branched, deciduous shrub up to seven tall, with simple, nearly sessile leaves clustered at the ends of short branchlets. Indian-apple is native to the interior western USA from California to Colorado, including much of the Great Basin region. It is often associated with mountain brush and big sagebrush communities.

Average number of seeds per pound: 24,000.

MOUNTAIN-MAHOGANY, BIRCHLEAF (*Cercocarpus betuloides* Nutt.)

A deciduous shrub up to 12 feet tall, a member of the Rose family. It is native to moderate elevations, usually mid-montane sites, in the Great Basin region.

MOUNTAIN-MAHOGANY, CURL-LEAF [#46] (*Cercocarpus ledifolius* Nutt.)

An erect, evergreen shrub or small tree up to 23 feet tall, the leathery leaves are elliptic to lanceolate, the leaves are somewhat resinous and glabrous above. It is a member of the Rose family. Curl-leaf mountain-mahogany is native to the interior western USA, including the Great Basin region. It naturally occurs on dry, rocky ridges usually on southern or western aspects at moderate elevations (6,000-9,000 feet).

Average number of seeds per pound: 50,000.

MOUNTAIN-MAHOGANY, LITTLE-LEAF (*Cercocarpus intricatus* S. Wats.)

An intricately branched, evergreen shrub up to 14 feet tall, with narrowly linear and strongly revolute leaves. Little-leaf mountain-mahogany is a member of the Rose family. It is native to the Great Basin regions of Utah and Nevada, associated with black sagebrush and other desert shrub communities.

Average number of seeds per pound: 50,000.

MOUNTAIN-MAHOGANY, TRUE [#47] (*Cercocarpus montanus* Raf.)

A deciduous evergreen shrub to 13 feet tall, a member of the Rose family. True mountain-mahogany is native to western USA, including the Great Basin region. It occurs on coarse, shallow soil on south- or west-facing slopes and ridges, but is also common in moist, fertile, loamy soils of canyon bottoms and on north slopes at lower elevations. It is found from 4,000 to 10,000 feet elevations, associated with pinyon pine/juniper, ponderosa pine, bitterbrush and sagebrush communities.

Average number of seeds per pound: 60,000.

SERVICEBERRY, UTAH [#48] (*Amelanchier utahensis* Koehne)

A deciduous shrub two to 15 feet tall at maturity, with numerous branched, pubescent, ash-gray twigs. The leaves are somewhat leathery at maturity, grayish green to dark green. Utah serviceberry is a member of the Rose family. It is native to foothills, dry slopes, and is associated with big sagebrush, pinyon pine/juniper, and ponderosa pine communities in the Great Basin region. It grows best sites that receive greater than 14 inches annual rainfall. The purplish, dark blue fruit is edible to humans, wildlife and livestock. Average number of Utah serviceberry seeds per pound: 25,000.



Purshia tridentata
Bitterbrush ④



Peraphyllum ramosissimum
④ Indian-Apple



④ *Cercocarpus montanus*
True Mountain-Mahogany



var. *ledifolius*
var. *intercedens*
④ *Cercocarpus ledifolius*
Curleaf Mountain-Mahogany



Amelanchier utahensis
④ Utah Serviceberry

BUCKWHEAT

BUCKWHEAT, ARROW-LEAF [#49] (*Eriogonum compositum* Dougl. ex Benth.)

A low-growing sub-shrub up to two feet tall and may form a prostrate or mat-like clump. It has a strong woody taproot and is often herbaceous above. Arrow-leaf buckwheat is a member of the Polygonum family. It is native to the western USA, including the northern portions of the Great Basin region. Arrow-leaf buckwheat naturally occurs on talus slopes, cliffs and open rocky sites.

BUCKWHEAT, CUSHION (*Eriogonum ovalifolium* Nutt.)

A caespitose sub-shrub, forming mats up to 1.5 feet broad. Cushion buckwheat is native the Great Basin region. It is associated with the sagebrush steppe, pinyon pine/juniper, and ponderosa pine communities, and may also occur on alpine ridges and talus slopes above timberline.

BUCKWHEAT, DESERT (*Eriogonum cernuum* Nutt.)

An annual plant that is up to 1.5 feet tall. Desert buckwheat is a member of the Polygonum family. It is native to the area from the south-central Oregon to the Rocky Mountains, including the northern portions of the Great Basin region. It naturally occurs on sandy desert hills and valleys.

BUCKWHEAT, SNOW (*Eriogonum niveum* Dougl. ex Benth.)

A sub-shrub up to 1.5 feet tall, with a thick woody taproot and freely branched crown. It is a member of the Polygonum family. The cream-white flowers appear in late summer and seed is ripe in the fall months. Snow buckwheat is native to the Columbia Plateau, including eastern Oregon and south-western Idaho. It naturally occurs in the sagebrush steppe to the ponderosa pine woodlands. It requires eight to 18 inches of annual rainfall for establishment.

BUCKWHEAT, SULFUR-FLOWER (*Eriogonum umbellatum* Torr.)

A sub-shrub with a strong taproot and freely branching crown, usually forming flat mats. Sulfur-flower buckwheat may be up to 1.5 feet tall. It is native to the interior western USA, including the Great Basin region. It occurs in varied habitats from the sagebrush steppe and foothills to alpine ridge, talus slopes and rock crevices.

JOINTFIR

JOINTFIR, NEVADA (*Ephedra nevadensis* S. Wats.)

A shrub with jointed, ridged gray-green stems, up to three feet tall. The plants are usually dioecious, male and female occur on separate plants. Nevada Jointfir appears nearly leafless; the leaves are scale-like, 2 to 3 per node. The yellow to whitish flowers occur in the spring. It is native to southern and central portions of the Great Basin region, often found on sandy soils at low to moderate elevations.

Average number of Nevada jointfir seeds per pound: 20,000.

MORMON-TEA, EPHEDRA (*Ephedra viridis* Coville)

A shrub with jointed, ridged green stems, up to four feet tall. The plants are usually dioecious, male and female occur on separate plants. Mormon-tea, also known as green ephedra, appears nearly leafless; the leaves are scale-like with 2 to 3 per node. The yellow to whitish flowers occur in the spring. It may be associated with sagebrush steppe and salt desert shrub communities. Mormon-tea (Ephedra) is the most common native Ephedra in the Great Basin region.

Average number of green ephedra seeds per pound: 20,000.

KINNIKINNICK

KINNIKINNICK (*Arctostaphylos uva-ursa* [L.] Spreng.)

A prostrate, evergreen shrub up to eight inches tall, with trailing and rooting stems sometimes forming mats up to ten feet broad. It is a member of the Heather (Erica) family. Kinnikinnick, also known as bearberry, is native to the western USA and across the northern latitudes through Eurasia. It occurs on sandy soils from the sagebrush steppe to ponderosa pine woodlands and other forested habitats.

SALTBUSH

GREASE WOOD, BLACK (*Sarcobatus vermiculatus* [Hook.] Torr.)

An erect, spiny-branched, usually deciduous shrub up to ten feet tall. The leaves are bright green, 1 to 4 cm long and narrowly linear. It is a member of the Chenopod family. Black greasewood is native to the western USA, including the Great Basin region. It is found at middle elevations on slight to moderate saline areas, often low-lying sites. It may be associated with other salt desert shrubs, rabbitbrush, and sagebrush dominated communities.

Average number of black greasewood seeds per pound: 285,000.

HOPSAGE, SPINY (*Grayia spinosa* [Hook.] Moq.)

An erect, diffusely branched, deciduous shrub up to four feet tall. It is a member of the Chenopod family. Spiny hopsage is native to the interior western USA, including the Great Basin region. It occurs over a wide range of desert soils, on plains and foothills. The soils are typically high in calcium and strongly basic, but in some areas, it grows on neutral pH soils. Spiny hopsage often grows in association with big sagebrush.

Average number of seeds per pound: 165,000.

SALTBUSH, FOURWING [#50] (*Atriplex canescens* [Pursh] Nutt.)

A freely branching, evergreen shrub up to eight feet tall. It is usually dioecious, male and female flowers occur on separate plants. It is a member of the Chenopod family. Fourwing saltbush is native to the interior western USA, including the Great Basin region. It is one of the most widespread western shrubs on arid, sandy lands. It occurs on well-drained sandy to silt loam soils, but also grows on clay soils; eight to 16 inches of

annual rainfall is required. Fourwing saltbush is frequently found growing with other salt desert shrubs, basin big sagebrush and sometimes with black sagebrush.

Average number of seeds per pound: 55,000.

SALTBUSH, GARDNER'S (*Atriplex gardneri* [Moq.] D.Dietr.)

A low-growing shrub, woody at the base but herbaceous above. Gardner's saltbush is dioecious, male and female flowers occur on separate plants. It is a member of the Chenopod family. Gardner's saltbush is native to portions of the Great Basin, restricted to northern Utah and southern Idaho. It more commonly occurs in Wyoming, Montana, and Colorado. It occurs on "badland" clay soils with a fairly high concentration of soluble salts. Average number of seeds per pound: 75,000.

SHADSCALE [#51] (*Atriplex confertifolia* [Torr. & Frem.] S. Wats.)

A compact, spiny, usually evergreen shrub up to 2.5 feet tall. It is a member of the Chenopod family. Shadscale is native to the interior western USA, including the Great Basin region. It usually occurs on heavier textured (clayey) soils, but may occur on sandy loam soil as well. The soils it thrives on are often highly alkaline and may be high in soluble salts, seven to 14 inches of mean annual precipitation. Shadscale is associated with other salt desert shrubs and bud sagebrush.

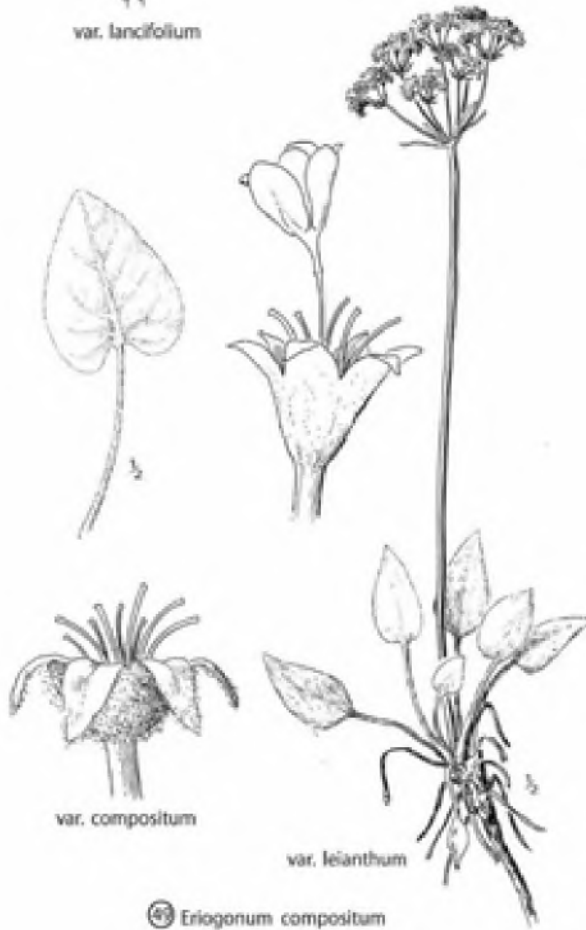
Average number of seeds per pound: 65,000.



var. lancifolium



Atriplex canescens
Fourwing Saltbush 50



var. compositum

var. leianthum

51 *Eriogonum compositum*
Arrow-Leaf Buckwheat



52 *Atriplex confertifolia*
Shadscale

WINTERFAT [#52] (*Krasheninnikovia lanata* [Pursh] Guldenstaedt)

An erect or spreading, evergreen sub shrub up to five feet tall. The branches and leaves are covered with a dense coating of stellate and simple hairs that are white when young, but become rust colored with age. It is a member of the Chenopod family. Winterfat is native to the interior western USA, including the Great Basin region. It occurs on lower foothills, plains and valleys, often with dry sub-alkaline soils. It requires from eight to 16 inches of annual rainfall. Winterfat may grow in association with other salt desert shrubs, sagebrush or pinyon pine/juniper. Average number of seeds per pound: 110,000; the seed is harvested in the fall months. Caution: Winterfat seed is very short-lived and moderately fragile. The seed must be stored in cold storage (<38° F.) and <25% R.H.). It is recommended to use seed within six months to one year of harvest.

KOCHIA, FORAGE (*Kochia prostrata* [L.] Schrad.)

An evergreen, low growing non-native shrub up to four feet tall. Forage kochia, also known as prostrate kochia, originated in central Asia and was introduced to the western USA by USDA to improve forage production for domestic livestock and fire control (greenstripping) on arid lands. It is a member of the Chenopod family. Cultivar: 'Immigrant' forage kochia is a public released variety by the USDA NRCS Plant Materials Center, Aberdeen, Idaho and Agricultural Research Service, Logan, Utah. Average number of seeds per pound: 115,000. Caution: forage kochia seed is very short-lived. The seed must be stored in cold storage (<38° F. and <25% R.H.). It is recommended to use seed within one to two years of harvest. The recommended seeding rate in a mixture is ¼ to 1/2 lb/acre.

HORSEBRUSH

HORSEBRUSH, GRAY [#53] (*Tetradymia canescens* DC)

A low-growing, evergreen shrub up to three feet tall. The leaves and stems are very tomentous, wooly streaks that provide the characteristic gray-green color to this shrub. Gray horsebrush is a member of the Sunflower (Composite) family. It is native to the Great Basin and adjacent areas. It is found on dry plains, hills, and ridges, often well-drained sandy soils, between 1,300 and 10,000 feet in elevation, associated with big sagebrush, pinyon pine/juniper, and ponderosa pine communities. Average number of gray horsebrush seeds per pound: 140,000. Three other horsebrush species are native to sites in the Great Basin region.

RABBITBRUSH

RABBITBRUSH, GREEN or LOW (*Chrysothamnus viscidiflorus* [Hook.] Nutt.)

An evergreen shrub up to three feet tall, with dark green leaves. Green rabbitbrush is a member of the Sunflower (Composite) family. It is native to the interior western USA, including the Great Basin region. There are several distinct subspecies of green rabbitbrush, some are valuable browse plants. Average number of seeds per pound: 780,000.

RABBITBRUSH, PARRY (*Chrysothamnus parryi* [Gray] Greene)

A low-growing evergreen shrub up to 28 inches tall, with numerous spreading to erect flexible branches. The branches are covered with a felt-like white to green hairs. Parry rabbitbrush is intermediate in height, growth habit, and stem and leaf hairs between rubber rabbitbrush and green rabbitbrush. It is a member of the Sunflower (Composite) family. Parry rabbitbrush is a diverse group with 12 subspecies. It is native to the western USA including the Great Basin region. Parry rabbitbrush grows on dry, open foothills, sagebrush steppe, and lower mountains. It is not as commonly found as the other native rabbitbrush species.

RABBITBRUSH, RUBBER (Gray) [#54] (*Chrysothamnus nauseosus* [Pallas ex Pursh] Britt)

An evergreen shrub up to 7 feet tall, with gray stems and gray-green leaves. Rubber rabbitbrush is a member of the Sunflower (Composite) family. It is native to the interior western USA, including the Great Basin region. It is naturally found in association with big sagebrush, pinyon pine/juniper, and ponderosa pine communities. Rubber rabbitbrush vigorously re-sprouts after fire or other disturbances. It grows on sites with sandy, gravelly, or clay-alkaline soils where the annual rainfall is between eight and 18 inches. There are several distinct subspecies of rubber rabbitbrush. Average number of seeds per pound: 695,000; the ripe seed is harvested in the fall months.

SAGEBRUSH

SAGEBRUSH, BASIN BIG [#55] (*Artemisia tridentata* ssp. *tridentata* Nutt.)

An evergreen shrub up to 14 feet tall, five to eight wide. Basin big sagebrush is erect, spreading, heavily branched, with an uneven top. It is a member of the Sunflower (Composite) family. It is native to the interior western USA, including the Great Basin region. Basin big sagebrush is found on well-drained, moderately deep to deep loam or silt loam soils, up to 9,500 feet in elevation. Basin big sagebrush is the most abundant shrub in western USA aridlands; it may sometimes be interspersed with Wyoming big sagebrush, and may also occur in riparian sites. It is generally fire intolerant. Moisture regime: semi-dry; nine to 18 inches annual rainfall.

Average number of seeds per pound: 2,500,000; the seed is harvested in the late fall months. The drill seeding rate for big sagebrush is 0.1 to 0.2 pounds PLS per acre in a seed mixture. The seed should be planted very shallow (1/16 inch deep). Caution: Basin big sagebrush seed is very short-lived and may be fragile. The seed must be stored in cold storage (<38° F. and <25% R.H.). It is recommended to use seed within one to two years of harvest.



52 *Krasheninnikovia lanata*
Winterfat

JRJ



53 *Tetradymia canescens*
Gray Horsebrush



Chrysothamnus nauseosus
54 Rubber Rabbitbrush



55 *Artemisia tridentata*
Basin Big Sagebrush

SAGEBRUSH, MOUNTAIN BIG (*Artemisia tridentata* ssp. *vaseyana* [Rydb.] Beetle)

An evergreen shrub up to nine feet tall. Mountain big sagebrush is spreading and even topped. It is a member of the Sunflower (Composite) family. Mountain big sagebrush is native to the interior western USA, including the Great Basin region. It occurs on soils that are deep and well-drained with pH usually about 7.0. It naturally found in association with mountain shrub plant communities from moderate to high elevations, up to 10,000 feet. Mountain big sagebrush often recovers after wildfire from seed in the soil bank or layered roots. Moisture regime: semi-dry, at least 12 inches mean annual precipitation. Average number of seeds per pound: 2,250,000; the seed is usually harvested in the early fall months. The drill seeding rate for big sagebrush is 0.1 to 0.2 pounds PLS per acre in a seed mixture. The seed should be planted very shallow (1/16 inch deep). Cultivar: 'Hobble Creek' is a native cultivar released by the US Forest Service Shrub Lab, Provo, Utah. Caution: mountain big sagebrush seed is very short-lived and may be fragile. The seed must be stored in cold storage (<38° F. and <25%R.H.). It is recommended to use seed within one to two years of harvest.

SAGEBRUSH, WYOMING BIG (*Artemisia tridentata* ssp. *wyomingensis* Beetle & Young)

An evergreen shrub up to three feet tall, usually up to three to four wide at maturity. Wyoming big sagebrush is basally branched rounded in form with an uneven top. It is a member of the Sunflower (Composite) family. Wyoming big sagebrush is native to the interior western USA, including the Great Basin region. It is found on shallow, gravelly, sandy to silt-clay loam soils at elevations from 2,500 to 7,000 feet. Wyoming big sagebrush does not re-sprout after wildfire. Moisture regime: dry, seven to 14 inches annual rainfall. Average number of seeds per pound: 2,500,000; the seed is harvested in the late fall months. Cultivar: 'Gordon Creek' Wyoming big sagebrush, origin Carbon County, Utah, was released by the US Forest Service Shrub Sciences Laboratory, Provo, Utah. Currently there is no seed production of Gordon Creek; source-identified seed collected from wildland sources is available from seed vendors. The drill seeding rate for Wyoming big sagebrush is 0.1 to 0.2 pounds PLS per acre in a seed mixture. The seed should be planted very shallow (1/16 inch deep). Caution: Wyoming big sagebrush seed is very short-lived and may be fragile. The seed must be stored in cold storage (<38° F. and <25%R.H.). It is recommended to use seed within one to two years of harvest.

SAGEBRUSH, BLACK (*Artemisia nova* A. Nels.)

An evergreen, spreading, aromatic shrub up to three feet tall with numerous erect branches arising from a spreading base. Black sagebrush appears darker in color than big sagebrush and low sagebrush. It is native to the interior western USA, including the Great Basin region. Black sagebrush usually occurs on dry, shallow, calcareous, often stony soil, pH between 6.5 and 7.5 at elevations between 4,500 and 8,900 feet. It is a member of the Sunflower (Composite) family. Moisture regime: dry; seven to 14 inches mean annual precipitation. Average number of seeds per pound: 900,000.

SAGEBRUSH, BUD [#56] (*Artemisia spinescens* D.C. Eat.)

A low, pungent, rounded, usually deciduous shrub up to 20 inches tall. Bud sagebrush is profusely branched from the base and has white-tomentose hairs on young twigs and leaves. The pubescence on older branches is grayish and stiff. It is a member of the Sunflower (Composite) family. Bud sagebrush is native to the western USA, including

the Great Basin region. It is well adapted to xeric conditions. It occurs on dry, often saline, limestone, or volcanic derived soils in plains and hills, and in arid deserts. It occurs on soils that are moderately deep with fine to coarse texture, pH is 7.0 to 8.5. Bud sagebrush grows in association with salt desert shrub, black sagebrush and basin big sagebrush communities at 3,000 to 8,000 feet in elevation. Moisture regime: dry to very dry. Bud sagebrush will reproduce from stem layers or seed.

Average number of seeds per pound: 2,000,000. The drill seeding rate for bud sagebrush is 0.1 to 0.2 pounds PLS per acre in a seed mixture. The seed should be planted very shallow (1/16 inch deep). Caution: bud sagebrush seed is very short-lived and may be fragile. The seed must be stored in cold storage (<38° F. and <25 % R.H.). It is recommended to use seed within one to two years of harvest.

SAGEBRUSH, LOW [#57] (*Artemisia arbuscula* Nutt.)

A low, spreading, irregularly branched, evergreen shrub up to 20 inches tall and up to 30 inches wide. The leaves are green to dark green in color. Low sagebrush is a member of the Sunflower (Composite) family. It is native to the interior western USA, including the Great Basin region. It occurs on dry, sterile or infertile, rocky, sometimes volcanic, often alkaline soils between 3,000 and 11,500 feet. Normally, low sagebrush sites are drier and rockier than those on which big sagebrush subspecies occur. Low sagebrush is fire intolerant. Moisture regime: dry to semi-dry.

Average number of seeds per pound: 980,000.

SAGEBRUSH, SILVER [#58] (*Artemisia cana* Pursh)

An erect, freely branched, rounded, evergreen shrub up to six feet tall. Silver sagebrush is erect, rounded or spreading, and freely to thickly branched. It readily re-sprouts from root suckers after fire and other disturbances. It is a member of the Sunflower (Composite) family. Silver sagebrush is native to the western USA, including the Great Basin region. It occurs in valleys, plains, playas, foothills and mountains up to 10,000 feet in elevation. Silver sagebrush is found on soils that are deep, well-drained, loamy to sandy, with pH of 6.5 to 8.5. Bolander's silver sagebrush (*Artemisia cana bolanderi*) occurs on extremely clayey, alkaline, granitic soils. Moisture regime: semi-dry to moist. Average number of seeds per pound: 2,250,000.

SAGEBRUSH, THREE-TIP (*Artemisia tripartita* Rydb.) (N)

A rounded, evergreen shrub up to seven feet tall. Three-tip sagebrush leaves are typically deeply divided into three linear or narrowly linear-lanceolate lobes. It is a member of the Sunflower (Composite) family. It is native to the interior western USA, including the Great Basin region. Three-tip sagebrush is found on shallow to deep, well-drained, loamy, sandy or gravelly soils. It usually occurs on sites that are moister with cooler summer temperatures than basin big sagebrush sites; and that are drier and warmer than mountain big sagebrush sites. Three-tip sagebrush reproduces by root sprouts, stem layers, or seed. Moisture regime: semi-dry.

Average number of seeds per pound: 2,500,000. Seeding rate for three-tip sagebrush is 0.1 to 0.2 pounds PLS per acre in a seed mixture. The seed should be planted very shallow (1/16 inch deep). Caution: three-tip sagebrush seed is very short-lived and may be fragile. The seed must be stored in cold storage (<38° F. and < 25% R.H.). It is recommended to use seed within one-two years of harvest.

SNAKEWEED

SNAKEWEED, BROOM (*Gutierrezia sarothrae* [Pursh] Britt. & Rusby)

A low-growing shrub, usually evergreen, is up to 28 inches tall. Broom snakeweed, also known as matchbrush, is a member of the Composite family. The root systems are fairly shallow, unusual for shrubs in aridlands. It is native to the interior western USA including the Great Basin region. Broom snakeweed naturally occurs in dry, open areas in the lower foothills, valleys, and plains, and may occur at higher elevations. It is found in plant associations on desert grasslands, sagebrush steppe, pinyon pine-juniper and Ponderosa pine woodlands. Snakeweed grows best on sandy loam soils, but it may also thrive on well-drained loams to clay loams.

MINT

SAGE, PURPLE [#59] (*Salvia doriae ssp. doriae* [Kellogg] Abrams)

An evergreen shrub up to eight feet tall. Purple sage is a member of the Mint family. It is native to the western interior USA, including portions of the Great Basin region. It is naturally found in association with big sagebrush and desert shrub communities, grows best on sandy to silt loam soils where the annual rainfall is between nine and 16 inches.

ELM

HACKBERRY, NETLEAF (*Celtis reticulata* Torr.)

A deciduous shrub or small tree up to 25 feet tall. Netleaf hackberry is native to the western USA, including the Great Basin region. It occurs on open slopes and rocky bluffs, along present or ancient riparian areas and river courses, especially the Snake River and tributaries. Average number of Netleaf hackberry seeds per pound: 4,800.

SUMAC

LEMONADE BUSH [#60] (*Rhus trilobata* Nutt.)

A dense deciduous shrub up to 12 feet tall. Lemonade bush, also known as oak-leaf sumac or skunkbush/, is native to the western USA, including portions of the Great Basin. It grows best on rocky, gravelly, well-drained soils. It is moderately tolerant of alkalinity where drainage is good. Lemonade bush requires at least ten inches of annual precipitation for establishment. Average number of seeds per pound: 20,000.

HYDRANGEA

MOCKORANGE [#61] (*Philadelphus lewisii* Pursh) (N)

A deciduous shrub up to 16 feet tall. It is native to the western USA, including portions of the Great Basin region. It often occurs on rocky slopes and foothills where annual precipitation exceeds 14 inches.

Average number of mockorange seeds per pound: 4,500,000.

Note: An (I) after a plant name means the plant is Introduced (I) to western North America and is considered to be a non-native species. An (N) after a plant name means the plant is Native (N) to a specified geographic area in western North America prior to the year 1800. All of the shrubs described above are considered to be native species in western North America, except forage kochia, which is a non-native (introduced) species to North America.

Recommendation: seeding of shrub seed on aridlands (twelve inches or less annual rainfall) is to be completed in winter (dormant) or very early spring depending on presence of sufficient soil moisture conditions to germinate and establish plants



56 *Artemisia spinescens*
Bud Sagebrush



57 *Artemisia arbuscula*
Low Sagebrush



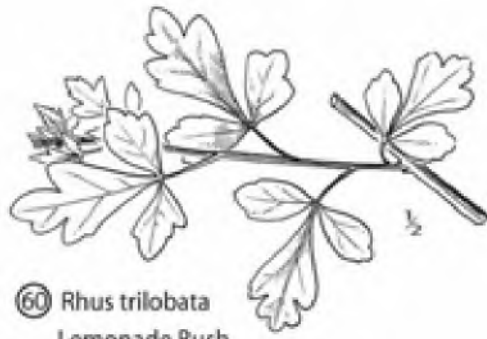
58 *Artemisia cana*
Silver Sagebrush



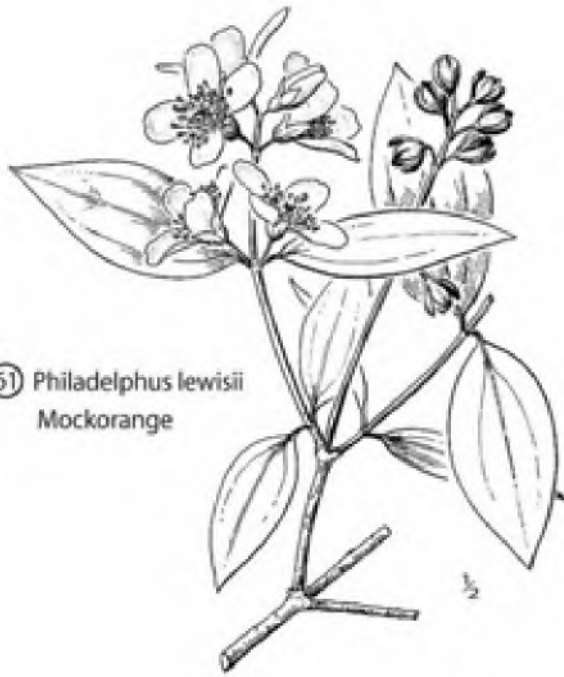
59 *Salvia dorrii* var. *carnososa*
Purple Sage



fruit



⑥0 *Rhus trilobata*
Lemonade Bush



⑥1 *Philadelphus lewisii*
Mockorange

APPENDICES

Table A: Grasses			
Great Basin Plant Species showing Nativity, Soils Adapted to, Average Plant Height at Maturity, and Seed Placement Depth in Soil			
<u>GRASS SPECIES</u>	<u>SOILS</u>	<u>PLANT HT</u> (Inches)	<u>Seed Depth</u> (Inches)
Alkali Bluegrass (N)	sil, alkali	26	1/8
Big Bluegrass (N)	l, sil	24	1/8
Canada Bluegrass (I)	l	16	1/8
Canby's Bluegrass (N)	l, sil	20	1/8
Cusick's Bluegrass (N)	sil, sl	16	1/8
Muttongrass (N)	l, sil	20	1/8
Nevada Bluegrass (N)	sil, sl	30	1/8
Sandberg's Bluegrass (N)	l, sil	16	1/8
Meadow Brome (I)	l, deep	42	1/4-1/2
Mountain Brome (N)	l, sil, deep	48	1/4-1/2
Smooth Brome (I)	l, sil, deep	48	1/4-1/2
Sand Dropseed (N)	s, sl	30	1/8
Alkali Sacaton (N)	l, sl	36	1/8
Creeping Red Fescue (I)	l, sil, acidic	24	1/4
Hard Fescue (I)	l, sil	18	1/4
Idaho Fescue (N)	cl, sil	32	1/4
Roemer's fescue (N)	cl, sil, (W.OR)	30	1/4
Sheep Fescue (I)	l, sil	14	1/4
Six-weeks Fescue (N)	annual sil	12	1/4
Western Fescue (N)	sil	24	1/4
Galleta Grass (N)	cl, l	18	1/4
Blue Grama (N)	cl, sl	16	1/8-1/4
Sideoats Grama (N)	sil, sl	30	1/4
Tufted Hairgrass (N)	cl, sil, acidic	24	1/8
Prairie Junegrass (N)	sil, sl	24	1/8
Desert Needlegrass (N)	sl	30	1/2
Green Needlegrass (N)	cl, shale-derived	40	1/2
Needle-&-thread Grass (N)	s, sl	30	1/2
Thurber's Needlegrass (N)	sil, sl, shallow, rocky	30	1/2
Annual Oatgrass (N)	cl, sil	24	1/4
California Oatgrass (N)	l, cl, sil	32	1/4-1/2
Intermediate Oatgrass (N)	sl, l	24	1/2
Orchardgrass (I)	l, sil	48	1/4-1/2
Indian Ricegrass (N)	s, sl	28	2-8
Saltgrass, Inland (N)	cl, sil, alkali	16	1/8-1/4
Bottlebrush (N)	sil, sl	24	1/4
Big Squirreltail (N)	sil, sl	28	1/4
Purple Three-awn (N)	sil, sl	16	1/4-1/2
Beardless Bluebunch Wheatgrass (N)	sil	40	1/4-1/2
Bluebunch Wheatgrass (N)	sil	40	1/4-1/2

<u>SPECIES</u>	<u>SOILS</u>	<u>PLANT HT</u> (Inches)	<u>Seed Depth</u> (Inches)
Crested Wheatgrass (I)	l, sil	36	1/4-1/2
Intermediate Wheatgrass (I)	sil	48	1/4-1/2
Pubescent Wheatgrass (I)	sil, sl	42	1/4-1/2
RS Hybrid Wheatgrass (I)	sil	36	1/4-1/2
Siberian Wheatgrass (I)	sl	30	1/4-1/2
Slender Wheatgrass (N)	l, sl, saline	40	1/4-1/2
Snake River Wheatgrass (N)	sl, sil	36	1/4-1/2
Streambank Wheatgrass (N)	l, sil	36	1/4-1/2
Tall Wheatgrass (I)	l, sil	60	1/4-1/2
Thickspike Wheatgrass (N)	s, sil	36	1/4-1/2
Western Wheatgrass (N)	cl, l	36	1/4-1/2
Basin Wildrye (N)	sil, sl	60	1/4-1/2
Beardless Wildrye (I)	sl	40	1/2
Creeping Wildrye (N)	sl, s	40	1/2
Blue Wildrye (N)	l, sil	36	1/4-1/2
Mammoth Wildrye (I)	s	40	1/2
Russian Wildrye (I)	sil, sl	32	1/4-1/2

KEY to Soil abbreviations: s = sands, sl = sandy loam, sil = silt loam, cl = clay loam, l = loam

(N) = Species native to western USA

(I) = Species introduced, origin is from outside western USA

Table A: Forbs			
Wildflowers including Herbaceous Legumes			
<u>SPECIES</u>	<u>SOILS</u>	<u>PLANT HT</u> (Inches)	<u>SEED DEPTH</u> (Inches)
Alfalfa (I)	sl, sil, l	36	1/4-1/2
Pacific Aster (N)	sl, sil, l	36	1/4-1/2
Showy Aster (N)	sl, sil, l	36	1/4-1/2
Arrowroot Balsamroot (N)	sil, sl	48	1/2
Carey's Balsamroot (N)	sil, sl	46	1/2
Hooker's Balsamroot (N)	sil	42	1/2
Rocky Mtn. Beeplant (N)	sil, l	36	1/4
Yellow Beeplant (N)	sil, sl	28	1/4
Biscuit-root & Desert-Parsley (N)	sil, sl	36	1/8-1/4
Cous' Biscuit-root (N)	sil, sl	36	1/8-1/4
Fernleaf lomatium	sil	30	1/8-1/4
Gray's lomatium	sil	30	1/8-1/4
Black-eyed Susan (N)	sil, l	24	1/4
Blanketflower (N)	sil, l	24	1/4
Blazing-star (N)	sl	36	1/4
Small Burnet (I)	sil, sl	28	1/2
Blue Camas (N)	sil, l, cl	24	1/4-1/2
Clovers (N & I)	sil, sl	30	1/4-1/2
Evening Primrose (N)	sl, sil, s	28	1/4
Blue Flax (I)	sl, sil	30	1/4
Lewis' Flax (N)	sil, sl	28	1/4
Desert Yellow Fleabane (N)	sil, sl	12	1/4
Dwarf Yellow Fleabane (N)	sil, sl	10	1/4
Shaggy Fleabane (N)	sil	20	1/4
Sticky Geranium (N)	sil	24	1/8
Prickly Gilia (N)	sil, sl	24	1/4
Scarlet Gilia (N)	sil, sl	36	1/4
Gooseberryleaf Globemallow (N)	sil, sl	28	1/4
Munroe's Globemallow (N)	sil, sl	32	1/4
Scarlet Globemallow (N)	sil	10	1/4
Showy Goldeneye (N)	sil	48	1/4
Tapertip Hawksbeard (N)	sil, sl	28	1/4
Silky Lupine (N)	sl, sil	18	1/4-1/2
Silver Lupine (N)	sl, sil	18	1/4-1/2
Sagebrush Mariposa-lily (N)	sl, sil	18	1/4
Gunnison's Segolily (N)	sl, sil	18	1/4
Microseris, Nodding (N)	sil, sl	16	1/4
Basalt Milkvetch (N)	sil, sl	36	1/4-1/2
Cicer Milkvetch (I)	sil, sl	36	1/4-1/2
Freckled Milkvetch (N)	sil, sl, cl	16	1/4
Pulse Milkvetch (N)	sil, sl	24	1/4
Silver Milkvetch (N)	sil, sl	12	1/4

<u>SPECIES</u>	<u>SOILS</u>	<u>PLANT HT</u> (Inches)	<u>SEED DEPTH</u> (Inches)
Woolly Milkvetch (N)	sil, l	20	1/2
Milkweed (N)	sil, sl	36	1/2
Tapertip Onion (N)	sil, l	24	1/4-1/2
Bonneville Peavine (N)	sil	24	1/4-1/2
Dark Blue Penstemon (N)	sil, sl	28	1/4
Eaton's Penstemon (N)	sil, sl	28	1/4
Hot-rock Penstemon (N)	sil	24	1/4
Palmer's Penstemon (N)	sil, l	30	1/4
Rocky Mtn Penstemon (N)	sil, l	36	1/4
Rydberg's Penstemon (N)	sil	32	1/4
Sagebrush Penstemon (N)	sil	36	1/4
Sand Penstemon (N)	sl	24	1/4
Whipple's Penstemon (N)	sil	24	1/4
Hood's Phlox (N)	sil	8	1/8
Longleaf Phlox (N)	sil, sl, shallow	20	1/8
Showy Phlox (N)	sil, sl	16	1/8
Spiny Phlox (N)	sil, sl, cl	6	1/8
Western Prairieclover (N)	sl	30	1/4-1/2
Sainfoin (I)	sl, sil	24	1/4-1/2
Annual Sunflower (N)	sl, sil	60	1/4-1/2
Yellow Sweetclover (I)	sil, sl	48	1/4
Northern Sweetvetch (N)	sil	30	1/4
Big Deervetch (N)	sil, sl	24	1/4-1/2
Birdsfoot Trefoil (I)	sil, cl, l	18	1/4
Meadow Deervetch (N)	sil	20	1/4
Nevada Deervetch (N)	sl, shallow	20	1/4
American Vetch (N)	sil	30	1/4
Hairy Vetch (I)	sil, l	30	1/4
Wyethia, Mule's-ear (N)	sil, cl	36	1/2
Western Yarrow (N)	sil, l	24	1/8-1/4
Soapwell Yucca (N)	sl, sil	48	1/4-1/2

Table A: Shrubs			
<u>SHRUB SPECIES</u>	<u>SOILS</u>	<u>PLANT HT</u> (Feet)	<u>SEED DEPTH</u> (Feet)
Wyo. Big Sagebrush (N)	sl, sil, shallow	3 feet	1/16
Basin Big Sagebrush (N)	sl, sil, l	14	1/16
Mtn. Big Sagebrush (N)	sil, cl, l	9	1/16

KEY to Soil abbreviations: s = sands, sl = sandy loam, sil = silt loam, cl = clay loam, l = loam

NOTE: An (I) or (N) after the plant's name means the plant is Introduced, Non-native (I) to western North America. Or Native (N) to a specified geographic area in western North America.

Table B: Grasses

Approximate Adaptability for Rehabilitation/ Conservation in the Great Basin

EFFECTIVE ANNUAL PRECIPITATION

	5-9 in.	9-12 in.	12-15 in.	15-18 in.	18-25 in.	25-40 in.	40-60 in.	Over 60 in.
GRASSES								
Bottlebrush/squirreltail (N)	█							
SnakeRiver wheatgrass (N)	█							
Thurber's needlegrass (N)	█							
Needle&thread (N)	█							
Sandberg's bluegrass (N)	█							
Sand dropseed (N)	█							
Siberian wheatgrass (I)	█	█						
Indian ricegrass (N)	█	█						
Thickspike wheatgrass (N)	█	█	█					
Crested wheatgrass (I)	█	█						
Big bluegrass (N)		█	█	█				
Six weeks fescue (N)		█	█	█	█			
Prairie junegrass (N)		█	█	█	█			
Nevada bluegrass (N)		█	█	█	█			
Basin wildrye (N)		█	█	█	█			
Bluebunch wheatgrass (N)		█	█	█	█			
Russian wildrye (I)		█	█	█	█			
Canby bluegrass (N)		█	█	█	█	█		
Beardless wheatgrass (N)		█	█	█	█	█		
Sheep fescue (I)		█	█	█	█	█		
Idaho fescue (N)		█	█	█	█	█		
Mammoth wildrye (I)		█	█	█	█	█		
Streambank wheatgrass (N)		█	█	█	█	█		
Tall wheatgrass (I)		█	█	█	█	█		
Pubescent wheatgrass (I)		█	█	█	█	█		
Intermediate wheatgrass		█	█	█	█	█		
Muttongrass (N)		█	█	█	█	█		
Hard fescue (I)		█	█	█	█	█		
Annual ryegrass (I)		█	█	█	█	█		
Perennial ryegrass (I)		█	█	█	█	█		
Smooth brome (I)		█	█	█	█	█		
Creeping red fescue (I)		█	█	█	█	█		
Tall fescue (I)		█	█	█	█	█		
Orchardgrass (I)		█	█	█	█	█		
Timothy (I)		█	█	█	█	█		
Slender wheatgrass (N)		█	█	█	█	█		
Mountain brome (N)		█	█	█	█	█		
Foxtail millet (I)		█	█	█	█	█		
Proso millet (I)		█	█	█	█	█		
Blue wildrye (N)		█	█	█	█	█		
Bentgrass		█	█	█	█	█		
Redtop		█	█	█	█	█		
American dunegrass (N)		█	█	█	█	█		

Table B: Forbs and Legumes
Approximate Adaptability for Rehabilitation/Conservation in the Great Basin

	EFFECTIVE ANNUAL PRECIPITATION							
	5-9 in.	9-12 in.	12-15 in.	15-18 in.	18-25 in.	25-40 in.	40-60 in.	Over 60 in.
FORBS AND LEGUMES								
Lupines (N)								
Native milkvetch (N)								
Penstemon sp. (N)								
Globemallow (N)								
Sainfoin (I)								
Blue flax (I)								
Ann. Sunflower (N)								
Alfalfa (I)								
Small Burnet (I)								
Sweetclover (I)								
Western yarrow (N)								
Showy goldeneye (N)								
American vetch (N)								
Common vetch (I)								
Hairy vetch (I)								
White clover (I)								
Sub clover (I)								
Alsike clover (I)								
Hungarian vetch (I)								
Field peas (I)								
Strawberry clover(I)								
Rose clover (I)								
Red clover (I)								
Birdsfoot trefoil (I)								
Smartweed (N)								
Geyer sedge (N)								
Elk sedge (N)								
Nebraska sedge (N)								
Alkali bulrush (N)								
Hardstem bulrush (N)								

Table B: Woody Plants

Approximate Adaptability for Rehabilitation/ Conservation in the Great Basin

EFFECTIVE ANNUAL PRECIPITATION

	5-9 in.	9-12 in.	12-15 in.	15-18 in.	18-25 in.	25-40 in.	40-60 in.	Over 60 in.
WOODY PLANTS								
Fourwing-saltbrush (N)								
Shadscale (N)								
Spiny hopsage (N)								
Rubber rabbitbrush (N)								
Snow buckwheat (N)								
Big sagebrush (N)								
Bitterbrush (N)								
Western juniper (N)								
Western clematis (N)								
Netleaf hackberry (N)								
Rocky Mountain juniper (N)								
Green rabbitbrush (N)								
Pinyon pine (N)								
Mountain-mahogany (N)								
Caragana (I)								
Scotch pine (I)								
Ponderosa pine (N)								
Lilac (I)								
Austrian pine (I)								
Serviceberry (N)								
Douglas hawthorn (N)								
Mockorange (N)								
Bitter cherry (N)								
Mallow ninebark (N)								
Oceanspray (N)								
Western chokecherry (N)								
Common snowberry (N)								
Snowbrush ceanothus (N)								
Blue elderberry (N)								
Arborvitae (I)								
Western white pine (N)								
Blue spruce (N)								
Black twinberry (N)								
Evergreen huckleberry (N)								
Mountain ash, Sitka (N)								
Douglas-fir (N)								
Redosier dogwood (N)								
Mountain maple (N)								
Red alder (N)								
Grand fir (N)								
Vine maple (N)								
Incense cedar (N)								
Western red cedar (N)								
Norway Spruce (I)								
Coyote willow (N)								
Quaking aspen (N)								
Black cottonwood (N)								
Fremont cottonwood (N)								

Table B: Woody Plants

Approximate Adaptability for Rehabilitation/ Conservation in the Great Basin

EFFECTIVE ANNUAL PRECIPITATION

	5-9 in.	9-12 in.	12-15 in.	15-18 in.	18-25 in.	25-40 in.	40-60 in.	Over 60 in.
WOODY PLANTS								
Lodgepole pine (N)								
Pacific willow (N)								
Lemmon's willow (N)								
Drummond's willow (N)								
Mackenzie's willow (N)								
Sitka willow (N)								
Hooker willow (N)								
Douglas spirea (N)								
Western hemlock (N)								
Sitka spruce (N)								

Table C: Seed Characteristics for Grasses Used for Rehabilitation and Conservation Seeding

Common Name	Scientific Name	Seeds Per Pound	PLS Seeds/ sq.ft./lb/ac 1/	PLS Seeds/lin. Ft 6 in. spacing 2/	Single Species seeding rate lbs/acre
Grasses					
Bentgrass, redtop (I)	<i>Agrostis gigantea</i>	4,990,000	115	58	1
Bentgrass, spike (N)	<i>Agrostis exarata</i>	3,900,000	89.5	45	1.5
Bluegrass, big (N)	<i>Poa secunda ssp. ampla</i>	917,000	21	11	3
Bluegrass, Canby's (N)	<i>Poa secunda ssp. canbyi</i>	930,000	21.3	11	3
Bluegrass, Sandberg's (N)	<i>Poa secunda ssp. secunda</i>	950,000	21.8	10.9	3
Bottlebrush, squirreltail (N)	<i>Sitanion hystrix</i>	220,000	5.1	2.6	5
Brome, mountain (N)	<i>Bromus marginatus</i>	140,000	3.2	1.6	8
Brome, smooth (I)	<i>Bromus inermis</i>	125,000	2.9	1.5	8
Dropseed, sand (N)	<i>Sporobolus cryptandrus</i>	5,000,000	115	57.5	1
Alkali sacaton (N)	<i>Sporobolus airoides</i>	1,750,000	40	20	2
Fescue, creeping red (I)	<i>Festuca rubra</i>	615,000	14.1	7.1	N/A
Fescue, hard (I)	<i>Festuca trachyphylla</i>	565,000	13	6.5	4
Fescue, Idaho (N)	<i>Festuca idahoensis</i>	450,000	10.3	5.1	4
Fescue, sheep (I)	<i>Festuca ovina</i>	680,000	15.6	7.8	4
Fescue, tall (I)	<i>Festuca arundinacea</i>	225,000	5.2	2.6	N/A
Fescue, western (N)	<i>Festuca occidentalis</i>	350,000	8	4	7
Galleta grass (N)	<i>Hilaria jamesii</i>	170,000	3.9	1.9	6
Hairgrass, tufted (N)	<i>Deschampsia caespitosa</i>	2,500,000	57.8	28.9	2
Junegrass, prairie (N)	<i>Koeleria macrantha</i>	2,200,000	50.5	25.2	2
Needlegrass, green (N)	<i>Stipa viridula</i>	180,000	4.1	2	6
Needle and Thread (N)	<i>Stipa comata</i>	150,000	3.4	1.7	6
Needlegrass, Thurber's (N)	<i>Stipa thurberiana</i>	150,000	3.4	1.7	6
Oatgrass, California (N)	<i>Danthonia californica</i>	125,000	2.9	1.5	8
Orchardgrass (I)	<i>Dactylis glomerata</i>	450,000	10.5	5.2	6
Ricegrass, Indian (N)	<i>Oryzopsis hymenoides</i>	205,000	4.7	2.3	5
Ryegrass, annual (I)	<i>Lolium multiflorum</i>	190,000	4.4	2.2	6
Ryegrass, perennial (I)	<i>Lolium perenne</i>	225,000	5.2	2.6	N/A
Saltgrass, inland (N)	<i>Distichlis spicata</i>	520,000	11.9	6	4
Squirreltail, bottlebrush (N)	<i>Elymus elymoides</i>	190,000	4.4	2.2	6
Timothy (I)	<i>Phleum pratense</i>	1,300,000	30	15	N/A

Table C: Seed Characteristics for Grasses Used for Rehabilitation and Conservation Seeding

Common Name	Scientific Name	Seeds Per Pound	PLS Seeds/ sq.ft./lb/ac <u>1/</u>	PLS Seeds/lin. Ft 6 in. spacing <u>2/</u>	Single Species seeding rate lbs/acre
Wheatgrass, beardless (N)	<i>Pseudoroegneria spicata in</i>	125,000	3	1.5	6
Wheatgrass, bluebunch (N)	<i>Pseudoroegneria spicata sp</i>	140,000	3.2	1.6	6
Wheatgrass, crested (I)	<i>Agropyron cristatum</i>	200,000	4.6	2.3	5
Wheatgrass, intermediate (I)	<i>Elytrigia intermedia</i>	110,000	2.5	1.2	8
Wheatgrass, pubescent (I)	<i>Elytrigia intermedia</i>	95,000	2.2	1.1	8
Wheatgrass, Siberian (I)	<i>Agropyron fragile ssp. siber</i>	220,000	5.1	2.5	5
Wheatgrass, slender (N)	<i>Elymus trachycaulus</i>	160,000	3.7	1.8	6
Wheatgrass, Snake River (N)	<i>Elymus waiwaiensis</i>	170,000	3.9	2	6
Wheatgrass, streambank (N)	<i>Elymus lanceolatus</i>	170,000	3.9	2	6
Wheatgrass, tall (I)	<i>Elytrigia elongatum</i>	80,000	1.8	0.9	8
Wheatgrass, thickspike (N)	<i>Elymus lanceolatus</i>	160,000	3.6	1.8	5
Wheatgrass, western (N)	<i>Pascopyrum smithii</i>	120,000	2.8	1.4	7
Wildrye, basin (N)	<i>Leymus cinereus</i>	150,000	3.4	1.7	6
Wildrye, blue (N)	<i>Elymus glaucus</i>	130,000	3	1.5	8
Wildrye, mammoth (I)	<i>Leymus giganteus</i>	75,000	1.7	0.9	8
Wildrye, Russian, (I)	<i>Psathrostachys juncea</i>	175,000	4	2	6

N/A Not Applicable for BLM seeding

1/ 1 lb/ac seeding rate

2/ 1 lb/ac seeding rate with 6 inch drill width - typical rangeland drill row spacing

3/ Seed data for some species contained in this guide are unavailable and not included in this table

Note: Seed mixtures are usually based on the desired percent of each species/ cultivar.

The single species seeding rates for forb and shrub seed are not applicable for BLM seedings.

Table C: Seed Characteristics for Cereals and Legumes Used for Rehabilitation and Conservation Seeding

Common Name	Scientific Name	Seeds Per Pound	PLS Seeds/ sq.ft./lb/ac 1/	PLS Seeds/in. ft 6 in. spacing 2/	Single Species seeding rate, lbs/acre
Cereals					
Oats (I)	<i>Avena sativa</i>	16,000	0.4	0.2	20
Barley (I)	<i>Hordeum vulgare</i>	13,600	0.3	0.15	20
Wheat (I)	<i>Triticum aestivum</i>	11,400	0.3	0.15	20
Legumes					
					N/A
Alfalfa (I)	<i>Medicago sativa</i>	230,000	5.3	2.6	
Clover, alsike (I)	<i>Trifolium hybridum</i>	680,000	15.7	7.9	
Clover, crimson (I)	<i>Trifolium incarnatum</i>	179,000	4.1	2.1	
Clover, red (I)	<i>Trifolium pratense</i>	275,000	6.5	3.3	
Clover, rose (I)	<i>Trifolium hirtum</i>	140,000	3.2	1.6	
Clover, strawberry (I)	<i>Trifolium fragiferum</i>	288,000	6.6	3.3	
Clover, subterranean (I)	<i>Trifolium subterranean</i>	60,000	1.4	0.7	
Clover, white (I)	<i>Trifolium repens</i>	800,000	18.4	9.2	
Flatpea (I)	<i>Lathyrus sylvestrus</i>	15,000	0.3	0.15	
Lupine, big-leaf	<i>Lupinus polyphyllus</i>	70,000	1.6	0.8	
Lupine, pine (N)	<i>Lupinus albicaulus</i>	25,000	0.6	0.3	
Lupine, silky (N)	<i>Lupinus sericeus</i>	20,000	0.5	0.25	
Lupine, silver (N)	<i>Lupinus argenteus</i>	20,000	0.5	0.25	
Lupine, tailcup (N)	<i>Lupinus caudatus</i>	25,000	0.6	0.3	
Milkvetch, basalt (N)	<i>Astragalus filipes</i>	100,000	2.3	1.1	
Milkvetch, freckled (N)	<i>Astragalus lentiginosus</i>	95,000	2.2	1.1	
Milkvetch, woollypod (N)	<i>Astragalus purshii</i>	110,000	2.5	1.2	
Peas, field (I)	<i>Pisum sativum</i>	18,000	0.4	0.2	
Prairieclover, western (N)	<i>Dalea ornata</i>	440,000	10.1	5	
Sainfoin (I)	<i>Onobrychis viciaefolia</i>	28,000	0.6	0.3	
Sweetclover, yellow (I)	<i>Melilotus officinalis</i>	230,000	5.3	2.7	
Sweetvetch, northern (N)	<i>Hedysarum boreale</i>	90,000	2.1	1	
Deervetch, big (N)	<i>Lotus crassifolius</i>	250,000	5.7	2.8	
Trefoil, birdsfoot (I)	<i>Lotus corniculatus</i>	450,000	10.3	5.1	
Vetch, American (N)	<i>Vicia americana</i>	30,000	0.7	0.4	
Vetch, common (I)	<i>Vicia sativa</i>	8,300	0.2	0.1	
Vetch, hairy (I)	<i>Vicia villosa</i>	17,000	0.4	0.2	
Vetch, Hungarian (I)	<i>Vicia pannonica</i>	11,000	0.3	0.15	
Vetch, winter (I)	<i>Vicia villosa varia</i>	11,000	0.3	0.15	

Table C: Seed Characteristics for Forbs Used for Rehabilitation and Conservation Seeding

Common Name	Scientific Name	Seeds Per Pound	PLS Seeds/ sq.ft./lb/ac	PLS Seeds/lin. ft 6 in. spacing	Single Species seeding rate, lbs/acre
Wildflowers/Forbs					N/A
Balsamroot, arrowleaf (N)	<i>Balsamorhiza sagittata</i>	55,000	1.3	0.6	
Balsamroot, Hooker's (N)	<i>Balsamorhiza hookeri</i>	55,000	1.3	0.6	
Beeplant, Rocky Mtn. (N)	<i>Cleome serrulata</i>	65,000	1.5	0.75	
Black-eyed Susan	<i>Rudbeckia hirta</i>	1,500,000	34.4	17.2	
Blanketflower (N)	<i>Gaillardia aristata</i>	200,000	4.6	2.3	
Blazing-star (N)	<i>Mentzelia laevicaulis</i>	300,000	6.9	3.5	
Burnet, small (l)	<i>Sanguisorba minor</i>	50,000	1.2	0.6	
Daisy, woolly (N)	<i>Eriophyllum lanatum</i>	810,000	18.5	9.2	
Desert-parsley, Gray's (N)	<i>Lomatium grayi</i>	45,000	1	0.5	
Desert-parsley, nine-leaf (N)	<i>Lomatium tritermatum</i>	45,000	1	0.5	
Dusty-maiden (N)	<i>Chaenactis douglasii</i>	350,000	8	4	
Evening Primrose, desert (N)	<i>Oenothera caespitosa</i>	1,200,000	27.5	13.75	
Flax, blue (l)	<i>Linum perenne</i>	295,000	7	3.5	
Flax, Lewis' (N)	<i>Linum lewisii</i>	420,000	9.6	4.8	
Fleabane, shaggy (N)	<i>Erigeron pumilus</i>	1,800,000	41.3	20.6	
Geranium, sticky (N)	<i>Geranium viscosissimum</i>	60,000	1.4	0.7	
Gilia, scarlet (N)	<i>Gilia aggregata</i>	950,000	21.8	10.9	
Globemallow, desert (N)	<i>Sphaeralcea ambigua</i>	500,000	11.4	5.7	
Globemallow, gooseberryleaf (N)	<i>Sphaeralcea grossulariifolia</i>	500,000	11.4	5.7	
Globemallow, scarlet (N)	<i>Sphaeralcea coccinea</i>	500,000	11.4	5.7	
Goldeneye, showy (N)	<i>Viguiera multiflora</i>	1,050,000	24.1	12	
Lomatium, dissected-leaf (N)	<i>Lomatium dissectum</i>	48,000	1.1	0.55	
Penstemon, beardlip (N)	<i>Penstemon barbatus</i>	550,000	12.6	6.3	
Penstemon, dark-blue (N)	<i>Penstemon cyaneus</i>	180,000	4.1	2	
Penstemon, Eaton's (N)	<i>Penstemon eatonii</i>	600,000	13.7	6.8	
Penstemon, Palmer's (N)	<i>Penstemon palmeri</i>	600,000	13.8	6.9	
Penstemon, Rocky Mtn. (N)	<i>Penstemon strictus</i>	520,000	11.9	5.9	
Prairie-smoke (N)	<i>Geum triflorum</i>	690,000	15.8	7.9	
Sego-lily, Nuttall's (N)	<i>Calochortus nuttallii</i>	190,000	4.3	2.1	
Sunflower, annual (N)	<i>Helianthus annuus</i>	45,000	1	0.5	
Wallflower, western (N)	<i>Erysimum occidentale</i>	3,000,000	68.8	34.4	
Wyethia, mule's-ear (N)	<i>Wyethia amplexicaulis</i>	25,000	0.6	0.3	
Yarrow, western (N)	<i>Achillea millefolium</i> var. <i>occidentale</i>	2,700,000	62	31	
Yucca, soapwell (N)	<i>Yucca glauca</i>	25,000	0.6	0.3	

1/ @1 lb/ac seeding rate

2/ @ 1lb seeding rate with 6 inch drill width - Typical rangeland drill row spacing

Forb and Shrub seed are used in mixtures with other species, adjust the seeding rate based on the required seeds per area and cost of seed.

The single species seeding rates for forb and shrub seed are not applicable for BLM seedings.

Table C: Seed Characteristics for Shrubs Used for Rehabilitation and Conservation Seeding

Common Name	Scientific Name	Seeds Per Pound	PLS Seeds/ sq.ft./lb/ac	PLS Seeds/lin. ft 6 in. spacing	Single Species seeding rate, lbs/acre
Shrubs				N/A	N/A
Bitterbrush (N)	<i>Purshia tridentata</i>	15,000	0.3		
Chokecherry, western (N)	<i>Prunus virginiana ssp. demissa</i>	2,000	0.05		
Cliffrose (N)	<i>Cowania stansburiana</i>	65,000	1.5		
Fernbush (N)	<i>Chamaebatiaria millefolium</i>	1,700,000	39		
Indian-apple (N)	<i>Peraphyllum ramossissimum</i>	24,000	0.5		
Mountain-mahogany, curl-leaf N	<i>Cercocarpus ledifolius</i>	50,000	1.1		
Mountain-mahogany, little-leaf N	<i>Cercocarpus intricatus</i>	50,000	1.1		
Mountain-mahogany, True (N)	<i>Cercocarpus montanus</i>	60,000	1.4		
Serviceberry, Utah (N)	<i>Amelanchier utahensis</i>	25,000	0.6		
Jointfir, Nevada (N)	<i>Ephedra nevadensis</i>	20,000	0.5		
Mormon-tea, Ephedra (N)	<i>Ephedra viridis</i>	20,000	0.5		
Greasewood, Black (N)	<i>Sarcobatus vermiculatus</i>	285,000	6.5		
Hopsage, spiny (N)	<i>Grayia spinosa</i>	165,000	3.8		
Saltbush, Fourwing (N)	<i>Atriplex canescens</i>	55,000	1.3		
Saltbush, Gardner's (N)	<i>Atriplex gardneri</i>	70,000	1.6		
Shadscale (N)	<i>Atriplex confertifolia</i>	65,000	1.5		
Winterfat (N)	<i>Krashennikovia lanata</i>	110,000	2.5		
Kochia, forage (I)	<i>Kochia prostrata</i>	115,000	1.6		
Horsebrush, gray (N)	<i>Tetradymia canescens</i>	140,000	3.2		
Rabbitbrush, green (N)	<i>Chrysothamnus viscidiflorus</i>	780,000	18		
Rabbitbrush, rubber (N)	<i>Chrysothamnus nauseosus</i>	695,000	16		
Big sagebrush, Basin (N)	<i>Artemisia tridentata ssp. tridentata</i>	2,500,000	57		
Big sagebrush, Mountain (N)	<i>Artemisia tridentata ssp. vaseyan</i>	2,250,000	51		
Big sagebrush, Wyoming (N)	<i>Artemisia tridentata ssp. wyoming</i>	2,500,000	57		
Sagebrush, black (N)	<i>Artemisia nova</i>	900,000	21		
Sagebrush, bud (N)	<i>Artemisia spinescens</i>	2,000,000	45.9		
Sagebrush, low (N)	<i>Artemisia arbuscula</i>	980,000	22		
Sagebrush, silver (N)	<i>Artemisia cana</i>	2,250,000	51		
Sagebrush, Three-tip (N)	<i>Artemisia tripartita</i>	2,500,000	57		
Hackberry, netleaf (N)	<i>Celtis reticulata</i>	4,800	0.1		
Lemonade bush (N)	<i>Rhus trilobata</i>	20,000	0.5		
Mockorange (N)	<i>Philadelphus lewisii</i>	4,500,000	103.3		

The single species seeding rates for forb and shrub seed are not applicable for BLM seedings.

Forb and Shrub seed are used in mixtures with other species, adjust the seeding rate based on the required seeds per area and cost of seed.

Table D: BLM Minimum PLS & Average Seed Costs/LB

SEED NAME/VAR./SC SYMBOL	NATIVE/INTRO	Seed Source	EST. COST/LB	Min.Pur-Germ-PLS
Crested whtgr, Hycrest/ AGCR	Introduced Grass	Central Asia	\$0.52	0.95/ 0.85/ 0.8075
Crested whtgr, Nordan/AGDE	I	Central Asia	\$0.77	0.95/ 0.85/ 0.8075
Crested whtgr,Ephraim/ AGCR	I	Central Asia	\$0.82	0.95/ 0.85/ 0.8075
Crested whtgr, Fairway/ AGCR	I	Central Asia	1.09	0.95/ 0.85/ 0.8075
Crested whtgr, Douglas/ AGCR	I	Central Asia	1.22	0.95/ 0.85/ 0.8075
Crested whtgr, CDII/ AGCR	I	Central Asia	1.09	0.95/ 0.85/ 0.8075
Siberian whtgr, P27/ AGFRS	I	Central Asia	\$0.53	0.95/ 0/85/ 0/8075
Vavilov Siberian whtgr/AGFRS	I	Central Asia	\$0.53	0.95/ 0.85/ 0/8075
Int whtgr, Oahe/ ELIN	I	Central Asia	\$0.98	0.95/ 0/85/ 0.8075
Pubescent whtgr, Luna/ ELIN	I	Central Asia	1.99	0.95/ 0.85/ 0.8075
Tall whtgr, Alkar/ ELEL	I	Central Asia	1.98	0.95/ 0/85/ 0.8075
Sheep fescue, Covar/ FEOV	I	Mid-East (Turkey)	3.25	0.95/ 0.80/ 0.7600
Russian wildrye, Bozoky/ PSJU	I	Russia-Kazakhstan	4.24	0.90/ 0.85/ 0.7650
Sodar streambank whtgr, Sodar/ ELLAF	Native Grass	Grant Co. OR	3.99	0.95/ 0.85/ 0.8075
Snake River whtgr, Secar/ ELWA	N	nr. Lewiston ID	\$2.51	0.90/ 0.85/ 0.7650
Bluebunch whtgr, Anatone/ PSSP	N	Hells Cyn ID	7.31	0.90/ 0.85/ 0.7650
Bluebunch whtgr, Goldar/ PSSP	N	Anatone WA	\$4.99	0.90/ 0.85/ 0.7650
Bluebunch whtgr, P7/ PSSP	N	Bulk composite	4.92	0.90/ 0.85/ 0.7650
Beardless whtgr, Whitmar/ PSSPI	N	nr. Colton WA	6.22	0.90/ 0.85/ 0.7650
Thickspike wht, Critana/ ELLA	N	Central MT	1.61	0.90/ 0.85/ 0.7650
Thickspike WG, Schwendimar/ ELLA	N	nr. The Dalles, OR	2.55	0.90/ 0.85/ 0.7650
Thickspike wht, Bannock/ ELLA	N	Bulk composite	2.47	0.90/ 0.85/ 0.7650
Western whtgr, Arriba/ PASM	N	northern NM	1.79	0.90/ 0.85/ 0.7650
Western whtgr, Rosana/ PASM	N	MT	1.75	0.90/ 0.85/ 0.7650
Slender whtgr, Pryor/ ELTR	N	Southcent. MT	2.72	0.90/ 0.85/ 0.7650
Slender whtgr, San Luis/ ELTR	N	SanLuis val CO	2.41	0.90/ 0.85/ 0.7650
Basin wildrye, Magnar/ LECI	N	Southern BC	\$5.50	0.90/ 0.85/ 0.7650
Basin wildrye, Trailhead/ LECI	N	MT	5.69	0.90/ 0.85/ 0.7650
Sandberg's bluegrass/ POSE	N	Western USA	4.25	0.90/ 0.80/ 0.7200
Sandberg's bluegrass/ POSE	N	Elmore Co. ID	6.41	0.90/ 0.80/ 0.7200
Canby's bluegrass, Canbar/ POCA	N	Blue Mtns, OR	2.92	0.90/ 0.70/ 0.6300
Big bluegrass, Sherman/ POAM	N	Sherman Co, OR	1.49	0.90/ 0.70/ 0.6300
Big squirreltail,SandHollow/ ELCA	N	Gem Co. ID	\$23.50	0.90/ 0.75/ 0.6750
Bottlebrush squirreltail/ ELEL	N	Western USA	21.95	0.90/ 0.80/ 0.7200
Indian ricegrass, Nezpar/ ORHY	N	Eastern ID	\$3.89	0.95/ 0.80/ 0.7600
Indian ricegrass, Rimrock/ ORHY	Native Grass	Northern MT	\$3.39	0.95/ 0.80/ 0.7600

Table D: BLM Minimum PLS & Average Seed Costs/LB

SEED NAME/VAR/SC SYMBO	NATIVE/INTRO	Seed Source	EST. COST/LB	Min.Pur-Germ-PLS
Needle&thread grass/ STCO	Native Grass-W. USA	S/I	\$25.99	0.90/ 0.50/ 0.4500
Thurber's needlegrass/ STTH	N-W. USA	S/I	N/A	0.90/ 0.50/ 0.4500
Alkali sacaton,Salado/ SPAI	N-W. USA	NM		0.95/ 0.70/ 0.6650
Sand dropseed grass/ SPCR	N-W. USA	S/I	4.22	0.95/ 0.85/ 0.8075
Idaho fescue grass/ FEID	N-W. USA	Northwest USA	\$12.24	0.95/ 0.90/ 0.8550
Galleta grass/ HIJA	N-SW. USA	S/I	\$12.50	0.60/ 0.70/ 0.4200
Blue Grama/ BOGR	N-SW. USA	AZ, CO, NM	\$3.15	0.80/0.60/0.4800
Sideoats Grama/ BOCU	N-SW. USA	AZ, CO, NM	\$3.75	0.80/0.60/0.4800
Alfalfa, Ladak/ MESA	Introduced Forb	Eurasia	\$1.25	0.95/ 0.85/ 0.8075
Alfalfa, Spredor III/ MESA	I	Eurasia	2.34	0.95/ 0.85/ 0.8075
Sainfoin, Esk/ ONVI	I	Eurasia	\$1.30	0.95/ 0.85/ 0.8075
Small bumet, Delar/ SAMI	I	Europe	1.21	0.95/ 0.80/ 0.7600
Blue flax, Appar/ LIPE	I	Europe	3.25	0.98/ 0.80/ 0.7840
Lewis flax, Maple grove/ LILE	Native Forb	Central UT	N/A	0.98/ 0.80/ 0.7840
western yarrow/ ACMIL	N	S/I	4.95	0.99/ 0.85/ 0.8415
Globemallow, gooseberryleaf/ SPGR	N	S/I	\$48.01	0.90/ 0.75/ 0.6750
Globemallow, Munroe/ SPMU	N	S/I	\$48.01	0.90/ 0.75/ 0.6750
Globemallow, scarlet/ SPCO	N	S/I	49.24	0.90/ 0.75/ 0.6750
showy goldeneye/ VIMU	N	S/I	19.95	0.90/ 0.85/ 0.7650
northern sweetvetch/ HEBO	N	S/I	\$30.00	0.90/ 0.80/ 0.7200
American vetch/ VIAM	N	S/I	33.31	0.95/ 0.80/ 0.7600
silky lupine/ LUSE	N	S/I	\$49.98	0.90/ 0.80/ 0.7200
Palmer's penstemon/ PEPAL	N	S/I	41.99	0.90/ 0.85/ 0.7650
RockyMtn penstemon/ PEST	N	S/I	25.01	0.90/ 0.85/ 0.7650
sagebrush penstemon/ PESP	N	S/I	\$42.59	0.90/ 0.85/ 0.7650
Forage kochia/ KOPR	Introduced Shrub	Central Asia	3.98	0.85/ 0.60/ 0.5100
Basin big sagebrush/ ARTRT	Native Shrub	S/I	4.99	0.14/ 0.80/ 0.1120
Mountain big sagebrush/ ARTRV	N	S/I	\$6.14	0.25/ 0.80/ 0.2000
Wyoming big sagebrush/ ARTRW	N	S/I	4.79	0.14/ 0.80/ 0.1120
Black sagebrush/ ARNO	N	S/I	12.75	0.14/ 0.80/ 0.1120
Rubber Rabbitbrush/ CHNA	N	S/I	\$15.00	0.15/0.75/0.1125
Winterfat/ KRLA	N	S/I	13.25	0.60/ 0.50/ 0.3000
Fourwing saltbush/ ATCA	N	S/I	8.38	0.90/ 0.35/ 0.3150
Shadscale/ ATCO	N	S/I	6.25	0.90/ 0.35/ 0.3150
Spiny hopsage/ GRSP	N	S/I	24.01	0.90/ 0.35/ 0.3150
Antelope bitterbrush/ PUTR	N	S/I	15.12	0.95/ 0.90/ 0.8550
Cliffrose/ COST	N	S/I	25.01	0.90/ 0.60/ 0.6300
Mountain-mahogany/ CERCO	Native Shrub	S/I	24.01	0.90/ 0.60/ 0.6300

I = introduced plant, non-native to the western USA

N = native plant to the western USA

Level III Ecoregions of the Conterminous United States



Native Plant Species by Ecoregion, Level III (EPA)

(GREAT BASIN STATES)

SPECIES	SC. NAME SYMBOL	CP-10	NR-15	EC-9	BM-11	IB-16	SRP-12	NBR-80	CBR-13	MR-17	WUM-19	MBR-14
Bluegrass, alkali	POJU	X		X			X	X	X			
Bluegrass, big	POAM	X		X	X		X	X				
Bluegrass, Canby's	POCA	X	X		X							
Bluegrass, Cusick's	POCU	X	X	X	X							
Muttongrass	POFE		X		X	X				X	X	
Bluegrass, Nevada	PONE						X	X	X			X
Bluegrass, Sandberg's	POSE	X		X	X	X	X	X	X			X
Brome, Mountain	BRMA	X	X	X	X	X				X	X	
Dropseed, Sand	SPCR	X		X			X	X	X		X	X
Sacaton, alkali	SPAI	X					X	X	X			
Fescue, Idaho	FEID	X	X	X	X	X		X		X		
Fescue, six-weeks	VUOC	X		X	X	X	X	X	X		X	X
Galleta grass	HIJA								X		X	X
Gramma, blue	BOGR								X		X	
Gramma, sideoats	BOCU								X		X	
Hairgrass, tufted	DECE		X		X	X				X	X	
Junegrass, prairie	KOMA	X	X	X	X	X		X		X	X	
Needlegrass, Thurber's	STTH	X		X			X	X	X			
Needle & thread	STCO	X		X			X	X	X			X
Oatgrass, California	DACA	X	X	X	X	X				X	X	
Ricegrass, Indian	ORHY	X		X	X		X	X	X			
Saltgrass, inland	DIST	X		X			X	X	X		X	X
Bottlebrush-squirreltail	ELEL	X		X		X	X	X	X			X
Three-awn, purple	ARPU	X			X		X	X	X			
Wheatgrass, beardless	PSSPI	X	X	X	X	X						
Wheatgrass, bluebunch	PSSP	X		X	X	X	X	X		X	X	
Wheatgrass, Snake River	ELWA	X			X	X	X					
Wheatgrass, slender	ELTR	X	X	X	X	X				X	X	
Wheatgrass, thickspike	ELLA	X		X	X		X	X				
Wheatgrass, western	PASM		X		X		X	X	X	X	X	

LEGEND: X = Occurs in Ecoregion, CP-10 = COLUMBIA PLATEAU Ecoregion, NR-15 = NORTHERN ROCKY MTNS, EC = EAST SLOPE -CASCADES, BM-11 = BLUE MTNS, IB-16 = IDAHO BATHOLITH, SRP-12 = SNAKE RIVER PLAIN, NBR-80 = NORTHERN BASIN AND RANGE, CBR-13 = CENTRAL BASIN AND RANGE, MR-17 = MIDDLE ROCKY MTNS, WUM-19 = WASATCH AND UINTA MTNS, MBR-14 = MOHAVE BASIN AND RANGE

Native Plant Species by Ecoregion, Level III (EPA) (GREAT BASIN STATES)

SPECIES		CP-10	NR-15	EC-9	BM-11	IB-16	SRP-12	NBR-80	CBR-13	MR-17	WUM-19	MBR-14
Needlegrass, desert	STSP								X	X		X
Wheatgrass, streambank	ELLAP	X		X	X							
Wildrye, basin	LECI	X		X	X		X	X	X		X	
Wildrye, blue	ELGL	X	X	X	X	X				X	X	
Scratchgrass	MURI						X	X	X			X
Muhly, mat	MUHLE						X	X	X			
Sedge, elk	CAGE	X			X		X	X				
Agoseris, pale	AGOSER	X	X				X	X	X			
Balsamroot, arrowleaf	BASA	X	X	X	X	X	X	X	X	X	X	
Beeplant, Rocky Mtn	CLSE					X			X	X	X	
Beeplant, yellow	CLLU						X	X	X		X	
Blanketflower	GAAR	X			X		X	X	X			
Blue-eyed Mary	COPA	X		X			X	X	X		X	
Buckwheat, cushion	ERIOG	X						X	X			
Chaenactis, Douglas'	CHDO	X		X			X	X	X			
Clover, largehead	TRMA	X		X				X				
Flax, Lewis'	LILE	X		X	X	X		X		X	X	
Fleabane, desert	ERIGE						X	X	X			
Fleabane, threadleaf	ERIGE	X		X			X	X	X			
Globemallow, gooseberryleaf	SPGR	X		X			X	X	X		X	X
Globemallow, Munro's	SPMU							X	X			
Globemallow, scarlet	SPCO	X					X	X				
Goldeneye, showy	VIGUER							X		X	X	
Hawksbeard, tapertip	CRAC	X					X	X	X		X	
Lomatium, Gray's	LOGR						X	X				
Lomatium, dissected-leaf	LODI	X					X	X				
Lomatium, Nevada	LONE							X				
Lomatium, nineleaf	LOTR	X		X			X	X				
Lupine, silver	LUAR	X					X	X				
Lupine, tailcup	LULE							X	X			
Lupine, wooly	LUSE	X		X			X	X				
Microseris, nodding	MICRO						X	X	X			
Milkvetch, basalt	ASFI						X	X			X	
Milkvetch, freckled	ASTRAG	X					X	X				
Milkvetch, woolypod	ASTRAG	X						X	X			

Native Plant Species by Ecoregion, Level III (EPA)

(GREAT BASIN STATES)

SPECIES		CP-10	NR-15	EC-9	BM-11	IB-16	SRP-12	NBR-80	CBR-13	MR-17	WUM-19	MBR-14
Onion, Lemmon's	ALLE							X				
Onion, tapertip	ALAC	X		X			X	X				
Penstemon, dark blue	PECY				X		X	X				
Penstemon, sharpleaf	PEAC						X	X	X			
Penstemon, sagebrush	PESP						X	X	X			
Phlox, longleaf	PHLO	X					X	X	X			
Phlox, slender	PHLOX							X				
Phlox, spiny	PHLOX	X					X	X	X			
Princesplume, desert	STPI							X	X		X	
Pussytoes, low	ANTEN	X		X			X	X	X			
Sego-lily	CALOCH	X					X	X	X			
Vetch, American	VIAM							X		X	X	
Wallflower	CHIER	X						X	X			
Yarrow, western	ACMIL	X		X	X	X	X	X	X			

LEGEND: X = Occurs in Ecoregion, CP-10 = COLUMBIA PLATEAU Ecoregion, NR-15 = NORTHERN ROCKY MTNS, EC = EAST SLOPE -CASCADES, BM-11 = BLUE MTNS, IB-16 = IDAHO BATHOLITH, SRP-12 = SNAKE RIVER PLAIN, NBR-80 = NORTHERN BASIN AND RANGE, CBR- 13 = CENTRAL BASIN AND RANGE, MR-17 = MIDDLE ROCKY MTNS, WUM-19 = WASATCH AND UINTA MTNS,

Determining a Seed Mixture for BLM Seeding Projects

To plan and design a seeding project, gather information on seeds, ecological sites, and seeding purpose from this guidebook and other sources such as land use plans (LUP), seeding guides, and websites. An excellent database for plants, called VegSpec (Vegetation Specifications), is located at a USDA website <http://plants.usda.gov/>.

The VegSpec database may be useful to assist with species selection for a restoration site, determine the appropriate seed mixture, and seeding rates. VegSpec is most easily accessed as a web link on the PLANTS Home Page (the Web address is included above). VegSpec is a web-based decision support system that assists land managers in the planning and design of vegetative establishment practices.

VegSpec utilizes soil, plant, and climate data to select plant species that are (1) site specifically adapted, (2) suitable for the selected practice, and (3) appropriate for the purposes and objectives for which the planting is intended.

The VegSpec application has the ability to determine site specific adaptability of plant species in the United States.

Checklist of Potential Causes for Seeding Problems or Failure

The seed doesn't grow when initially planted.

1. The seed selected was not appropriate to the given environment. This problem may be due to inaccurate seeding specifications or inadequate seed availability. In many native species, a local seed source may be preferable to the seed available from sources farther away in distance and elevation from the seeding project location. The seed from non-local collections or seed production fields may be less well adapted to the restoration site. Seed not adapted to the site may have no or low percent of seed able to germinate.

2. The seed may remain dormant in the soil for varying periods of time. Most seed planted in late fall or early winter will germinate the following spring. Some seed, such as hard-coated ones like Indian ricegrass, may take several years under normal conditions before initiation of seed germination.

3. Poor seed storage conditions prior to seeding. In general, seed stored for more than two weeks must be held in climate-controlled warehouse with temperatures not to exceed 80° F. and 30% R.H. Seeds of some plants, such as big sagebrush, are very short-lived unless held in cold storage at <38° F. and <25% R.H.

4. The seed delivered was not viable, this may be caused by low seed germination or low percent pure live seed (PLS). To overcome this potential problem: arrange for a certified seed sampler to confirm or deny the original seed tag information, supplied by the vendor, by drawing seed samples of the seed lots prior to mixing. Then have the seed samples sent to a certified seed lab for purity, germination or TZ test and noxious weeds seed analysis. Do not accept seed lots with low germination rates or unacceptable PLS. Acceptable germination rates or PLS percent should be determined by the responsible agency or by the Seed Certification standards for the seed type or species. An example of the Certified seed standard minimum set for bluebunch wheatgrass are 85% pure seed, 80% germination, and 68% PLS.

5. The seed delivered was not viable or had reduced vigor, this may also be caused by high seed moisture content (usually >12%). High moisture content in the seed of many plant species, such as big sagebrush and winterfat, can be the cause for reduction in seed vigor and increase of fungal diseases. The high moisture content can be the reason for increased seed or seedling mortality. To prevent the high moisture problem, visually inspect the seed as it arrives at your receiving facility for indications of excessive seed moisture. If the seed appears to be damp or moist, request a seed sample be tested for moisture content (%) at a certified seed lab. At the same lab, have the seed sample tested for purity, germination and noxious weed seeds. Do not accept seed that exceeds the maximum allowable moisture content set for the species.

6. The seed was planted at too great a depth in soil. Be sure that all seed drills and other equipment are set to install the seed in the soil correctly before you start the seeding operation.

7. The seed was damaged during application. Some damage to seed may occur with rough handling, transportation of seed to the field site, or during hydro-seed applications.

8. If mulch is also applied, it may not be capable of sustaining seed germination. Some temporary mulch, especially the ones made of recycled newsprint, can contain inks and metals that are toxic to the newly germinated seedlings.

9. The time of seeding was past the season for that species (natural dormancy). This problem can vary between species. Some species will actually germinate under snow cover during the winter, while others will break seed dormancy and germinate the following spring or summer.

The seed has germinated and later dies off.

1. There is insufficient soil nutrients/moisture to sustain seedling growth.
2. The soil is not capable of sustaining seed germination/development.
3. Diseases, like damping off (a fungal disease), may kill seedlings soon after germination.

Environmental conditions at time of seeding may cause additional stress to prevent seedling establishment.

1. Conditions that may increase seedling mortality include drought, excessive heat or cold spells, wind, flood, early frost, or late frost.
2. Competing vegetation, especially weeds such as cheatgrass (*Bromus tectorum*), will cause seedling mortality in less competitive plant species. Control of competing weeds may be essential to the desired seedling establishment.
3. After seeding it was found that the seeding mix contained some weed seeds – they germinated and took over the site. To overcome this problem: arrange for all seed lots to be tested by a certified seed lab for noxious and other weed seeds prior to mixing. Do not accept seed lots with unacceptable weed seeds on the seed lab analysis.
4. Seed/seedling predation by animals and insects. You may need to provide some manner of protection to emerging seedlings. Seedlings of native plants, including big sagebrush, should be protected from grazing for at least three to five years to allow time for the desired shrubs, forbs and grasses to be established.
5. The soil may lack the microorganisms and fungal mycorrhizae necessary for seedling establishment. Inoculation of seed or soil with the beneficial microorganisms may be necessary for plant growth.

Invasive Non-native Plants of Concern in the Great Basin States

The following partial list of non-native (introduced) plants includes those species considered to be moderately to highly invasive in natural ecosystems by the Exotic Pest Plant Councils, U.S. Fish and Wildlife Service, National Invasive Species Council and Executive Order No.13112 concerning Invasive Species. The Nature Conservancy website through Nature Serve maintains a database categorizing invasive plant species.

Some of these non-native plants have been seeded in BLM projects. It is recommended to utilize seed of acceptable non-native or native plants when restoring or rehabilitating natural ecosystems. Certain non-native plants, such as alfalfa, Siberian wheatgrass and tall wheatgrass, are generally considered non-invasive plants when seeded on eroded or burned-over arid lands.

This is a partial list of invasive non-native plants. It does not include those species previously identified as weeds, such as downy brome, medusahead rye, knapweeds, Russian thistle, and field bindweed.

Grasses

Cereal rye (*Secale cereale*) – Highly invasive in rangelands and croplands.

Creeping bentgrass (*Agrostis stolonifera*) – Highly invasive in meadows and wetlands.

Kentucky bluegrass (*Poa pratensis*) - Highly invasive in meadows and wetlands.

Smooth brome (*Bromus inermis*) – Moderate to highly invasive in prairies and shrublands where precipitation is greater than 12 inches annually.

Tall fescue (*Festuca arundinacea*) – Moderate to highly invasive in prairies and shrublands where precipitation is greater than 12 inches annually. It is highly invasive in riparian areas also.

Orchardgrass (*Dactylis glomerata*) – Moderately invasive in meadows and prairies.

Timothy (*Phleum pratense*) – Moderately invasive in meadows and wetlands.

Intermediate wheatgrass (*Elytrigia intermedia*) – Moderately invasive in rangelands where precipitation exceeds 12 inches annually.

Forbs

Batchelor's button or cornflower (*Centaurea cyanus*) – Highly invasive in the USA..

Birdsfoot trefoil (*Lotus corniculatus*) – Highly invasive where precipitation exceeds 16 inches annually.

Crownvetch (*Coronilla* sp.) – Highly invasive in areas where rainfall exceeds 16 inches.

White clover (*Trifolium repens*) – Moderately invasive in meadows and wetlands.

Yellow sweetclover (*Melilotus officinalis*) – Moderately invasive.

Shrubs

Honeysuckle, Amur (*Lonicera maackii*) – Moderately invasive in the United States.

Honeysuckle, Tatarian (*Lonicera tatarica*) – Highly invasive in the United States..

Russian-olive (*Elaeagnus angustifolia*) - Highly invasive in or adjacent to riparian areas and wetlands.

Seed Vendors (Partial List), Updated October 2004

NAME AND ADDRESS	PHONE #	FAX NUMBER	E-MAIL ADDRESS
Applewood Seed Co. Norm Poppe 5380 Vivian St. Arvada, CO 80002	(303) 431-7333	(303) 467-7886	dwilson@applewoodseed.com
Arkansas Valley Seeds Research Seeds Inc. Thomas C. Hatfield/ Dustin Terrell 4625 Colorado Blvd. Denver, CO 80216	(303) 320-7500 Dustin at: (970) 535-4481	(303) 320-7516	terrell@avseeds.com
Barnert Seed Co. Pat Durbin Route 3, Box 1120 1897 CR 1018 Muleshoe, TX 79347	(806) 272-5506 (800)-262-9892	(806) 272-3114	natives@bamertseeds.com
Big Sky Wholesale Seeds Jay Hould/Arnold POB 852 Shelby, MT 59474	(406) 434-5011	(406) 434-5014	seeds@bigskyseeds.com
Black Canyon Seed Jim Frisbee 1475 W. Central Rd. Emmett, ID 83617	(208) 365-3851	(208) 398-7662	seedman@bigsky.net
Barton Seed Russell Barton 222 E. Union Street Manti UT 84642	(435) 835-9200 Cell: (435) 851-2347	(435) 835-9200	
BFI Native Seeds Jerry Benson 1145 S. Jefferson Moses Lake WA 98837	(509) 765-6348 Cell: (509) 750-1789	(509) 764-9978	jbenson@bfinative-seeds.com
ConservaSeed Scott Stewart Redding CA			stewartseed@citlink.net
Cedera Seed, Inc. Delbert F. Winterfield POB 97, 118 St. Hwy. 31 Swan Valley, ID 83449	(208) 483-3683	(435) 483-3684	delbert684@cs.com
Central Utah Seed Bob Clark 826 N. 400 E. Ephraim, UT 84627	(435) 340-0686	(435) 340-0686	

Seed Vendors (Partial List), Updated October 2004

NAME AND ADDRESS	PHONE #	FAX NUMBER	E-MAIL ADDRESS
Chapman Farms John Chapman 17648 Northside Blvd. Nampa, ID 83687	(208) 466-8289 (208) 880-0905	(208) 466-3958	johnchapman@velocitus.net
Circle S Seeds of Mt., Inc. Stephen P. McDonnell POB 130 Three Forks, MT 59752	(406) 285-3269	(406) 285-3260	circles@imt.net
Comstock Seed Ed Kleiner 917 Hwy 88 Gardnerville, NV 89410	(775) 746-3681 (775) 265-0090	(775) 265-0040	ed@comstockseed.com
Curtis & Curtis Seed Inc. Tye Curtis Star Route Box 8A Clovis NM 88101	(505) 762-4759		
Environmental Seed Producers Jack Bodger POB 2709 Lompoc, CA 92438	(805) 735-8888	(805) 735-8798	esp@espseeds.com
Ford Seed Ken/Kelsey Ford 2918 Woody Dr. Boise, ID 83703	(208) 342-8088	(208) 342-4996	
Fremont Trading Co. S. Lloyd Stevens 450 S. 50 E., Ephraim, UT 84627	(435) 283-4701 (800) 671-5323	(435) 283-6872	maplelf@cut.net
Geertson Seed Farms Phil/ Marilyn Geertson 1665 Burroughs Road Adrian, OR 97901	(541) 339-3768	(541) 339-7990	geertsonseedfarms@starband.net
Gooding Seed Co. Larry Simis POB 57 Gooding, ID 83330	(208) 934-8441	(208) 934-8584	mrrgsc@northrim.net
Granite Seed Don Bermant/ Bill Agnew 1697 W. 2100 North Lehi, UT 84043	(801) 768-4422 (800) 992-5040	(801) 768-3967	donb@graniteseed.com
Grassland West Don Baune/Brad Styner 908 Port Drive Clarkston, WA 99403	(509) 758-9100	(509) 758-6601	styner@hibek.net

Seed Vendors (Partial List), Updated October 2004

NAME AND ADDRESS	PHONE #	FAX NUMBER	E-MAIL ADDRESS
Harvest Moon Seed Co. Jimmy B. Goble POB 532 Richfield, UT 84701	(435) 979-8549 (435) 896-6129	(435) 896-1762	
Idaho Grimm Growers Alan Degiulio POB 276 Blackfoot, ID 83221	(208) 785-0830	(208) 785-0841	idgrimm@ida.net
Intermountain Seed Co. Eric Christensen Box 62, 370 W. 300 N. Ephraim, UT 84627	(435) 283-4703 (435) 283-4383	(435) 283-4388	
L&H Seeds, Inc. Paul Herrman 4765 West Highway 260 Connell, WA 99326	(509) 234-4433	(509) 234-0202	lhseeds@aol.com
Landmark Seed Co. Mark Musto/ Orlin Reinbold N. 120 Wall St. Ste. 400 POB 200897 Spokane, WA 99201	(800) 268-0180 (509) 835-4967	(509) 835-4969	landmark@landmarkseed.com
Maughan Seed Brad Maughan POB 72 700 West 2100 South Manti, UT 84642-0072	(435) 835-0401 (435) 835-0404	(435) 835-0405	
McClintick Farms, Inc. Rick Mc Clintick POB 129 Orovada, NV 89425	(775) 272-3374 X3284	(775) 272-3294	
David R. Mosman Ranch 3160 Mosman Road Rt. 2 Box43 Craigmont, Idaho 83523	(208) 937-2552	(208) 937-2552	mosman@camasnet.com
Mountain West Seed Co. Jeremy Andreasen 19 N. 100 W. Ephraim, UT 84627	(435) 283-4704 cell phone (435) 340-1381	(435) 283-4704	mtnwseed@cut.net
Native Seed Company (Kyle Wagstaff or Justin Dean - partner) 7361 Pineridge Drive Park City, UT 84098	(435) 640-0557 or Justin at (801) 554-5796	(435) 655-0299	

Seed Vendors (Partial List), Updated October 2004

NAME AND ADDRESS	PHONE #	FAX NUMBER	E-MAIL ADDRESS
NP Seed Co. James R. / Jason Rhodes 206 E. 300 S. Manti, UT 84642	(435) 835-8301	(435) 835-8301	
Oregon Wholesale Seed Angela Rose POB 885 Silverton, OR 97381	(503) 874-8221	(503) 873-8861	seed@teleport.com
Owyhee Trail Seed Linda Kurtz 737 Enterprise Ave. Nyssa, OR 97913	(541) 372-5523	(541) 372-2166	
Pacific Coast Seed David Gilpin 6144A Industrial Way Livermore, CA 94550	(925) 373-4417	(925) 373-6855	
Pacific Northwest Natives Craig Edminster 1525 Laurel Hts. Dr. NW Albany OR 97321	(541) 928-8239	(541) 924-8855	cwe@proaxis.com
Paul Seed Co. Glen Broadhead P.O. Box 156 Paul, Idaho 83347	(208) 438-5858	(208) 438-5858	elkmastr@pmt.org
Pawnee Buttes Seed, Inc. Don Hajar/Mike Otto 605 25 th . St. Greeley, CO 80631	(970) 356-7002	(970) 356-7263	pawneeseed@ctos.com
Plummer Seed Co., Inc. Mark Plummer POB 70 Ephraim, UT 84627	(435) 283-4844	(435) 283-4030	mark@plummerseedco.com or debbie@plummerseedco.com
Rainier Seeds, Inc. Eric Coulter/Mike Ingham POB 1549 Port Orchard, WA 98367	(800) 828-8873 Or Eltopia Warehouse: (509) 297-4545	(509) 725-7015	mingham@rainierseeds.com or sreinbold@rainierseeds.com
James Reneau Seed Co. James Reneau POB 40, 119 S. Main Shamrock, TX 79079	(806) 256-3216	(806) 256-5335	

Seed Vendors (Partial List), Updated October 2004

NAME AND ADDRESS	PHONE #	FAX NUMBER	E-MAIL ADDRESS
Richardson Agco Wayne Richardson POB 206 1500 W. Vega Blvd. Vega, TX 79092	(806) 267-2459	(806) 267-2997	agco@1s.net
Rocky Mountain Seed Co. Jeff Hallows POB 355 Aurora, UT 84620	(435) 529-7318	(435) 529-6457	jhallows@mstar2.net
S&S Seeds, LLC Jake Lamp POB 947 Albany, OR 97321-0354	(541) 928-5868	(541) 928-5581	ssjake@proaxis.com
Seed-Rite, Inc. Keith R. Schafer POB 496 Odessa, WA 99159	(509) 982-2454 (509) 988-0206	(509) 982-2454	
Sharp Bros. Seed Co. Daniel / Gail E. Sharp 2001 S. Sycamore Healy, KS 67850	(620) 398-2231	(620) 398-2220	buffalo@st-tel.net
Jonathan Skinner 5000 NW 1 st Avenue New Plymouth ID 83655	(208) 278-3789		jskinner261@msn.com
Southern Utah Seed Edith Morrison Junction Utah	(435) 577-2142		emorrison@piute.state.ut.us
Seedyco Wayne Snavelly 7550 Elmore Fruitland ID 83619	(208) 452-4614		
Southwest Seed Inc. Walter Henes/Doug Lard 13260 Road 29 Delores, CO 81323	(970) 565-8722	(970) 565-2576	swseed@fone.net
Stevenson Intermountain Seed Ron Stevenson POB 2 Ephraim, UT 84627	(435) 283-6639	(435) 283-4155	ron@stevensonintermountainseed.com

Seed Vendors (Partial List), Updated October 2004

NAME AND ADDRESS	PHONE #	FAX NUMBER	E-MAIL ADDRESS
Treasure State Seed, Inc. Donald L. Becker POB 698 6 1 st . St. SW Fairfield, MT 59436	(406) 467-2557 (800) 572-4769	(406) 467-3377	treasure@3rivers.net
Wagstaff Seed Fred J. Wagstaff 1900 E. Oakhill Lane POB 68 Wallsburg, UT 84082	(435) 654-3439	(435) 654-9403	
Westland Seed Inc. Kenneth M. Sagmiller 1308 Round Butte Rd. Ronan, MT 59864	(406) 676-4100	(406) 676-4101	westland@ronan.net
Wheatland West Seed Orson Boyce POB 513 1780 N. Hwy 69 Brigham City, UT 84302	(435) 734-2371 (800) 676-0191	(435) 723-1903	oboyce@wheatlandseed.com
Willow Creek Allan Stevens 593 E. 900 S. 79-16 Ephraim, UT 84627	(435) 283-4701	(435) 283-6872	
Wind River Seed Clair/Rick Dunne Russ H. 3075 Lane 51 2 Manderson, WY 82432	(307) 568-3361	(307) 568-3364	claire@windriverseed.com

Official State Seed Laboratories, Updated July 2004				
NAME AND ADDRESS	PHONE	FAX	EMAIL	WEBSITE
Arizona State Seed Laboratory Kathleen Willey, Manager 2422 W. Holly Phoenix, AZ 85009	(602) 744-4911	(602) 253-2247	kathleenw@sal.ah.state.az.us.com	
Plant and Pest Diagnostics Branch California Dept. of Food & Agriculture Lab Supervisor 3294 Meadowview Rd. Sacramento, CA 95832	(916) 262-1100 Voice Mail: (916) 262-1190	(916) 262-1190	ppeterson@cdfa.ca.gov	WWW.CDFA.GOV
Colorado Seed Laboratory Colorado State University Ethan Waltermire, Manager E-10 Plant Sciences Blvd. Ft. Collins, CO 80523	(970) 491-6406	(970) 491-1173 Attn: Colo. Seed Lab		WWW.COLOSTATE.EDU
Idaho State Seed Laboratory Richard C. Lawson, Manager 2240 Kellogg Lane Boise, Idaho 83712	(208) 332-8630	(208) 334-3482		WWW.AGRI.STATE.ID.US
Montana State Seed Laboratory Harold Armstrong, Manager P.O. Box 173120-3120 Bozeman, MT 59717	(406) 994-2141	(406) 994-3786		WWW.MONTANA.EDU
Nevada State Division of Agriculture Terry Dunfield 350 Capitol Hill Ave. Reno, Nevada 89502	(775) 688-1180	(775) 688-1178		
Oregon State Seed Lab Oregon State University Adriel Garay, Manager Corvallis, Oregon 97331-3801	(541) 737-4464	(541) 737-2126	adriel.garay@orst.edu	WWW.CSS.ORSET.EDU

Official State Seed Laboratories, Updated July 2004				
NAME AND ADDRESS	PHONE	FAX	EMAIL	WEBSITE
Utah Department of Agriculture (USDA) Stephen T. Burningham, Lab Supervisor P.O. Box 146500 Salt Lake City, Utah 84114-6500	(801) 538-7100 x7182 Stan Akagi	(801)538-7189		WWW.AG.STATE.UT.US
Washington State Seed Lab Program Manager 21N 1 st Ave. #203 Yakima, Washington 98902	(509) 225-2630 Joyce Little or Nancy Hartshorn	(509)454-4395		
Wyoming State Seed Laboratory 749 Road 9 Powell, Wyoming 82435	(307) 754-4750 G. Waibel, mgr.	(307) 754-4932		WWW.PUREHARVEST.COM
North Dakota State Seed Laboratory University Station Fargo, ND 58105	(701) 231-5400	(701) 231-5401	mhafdahl@state-seed.ndsu.nodak.edu	
South Dakota State University Seed Testing Lab, Box 2207A, Agri. Hall 242 Brookings, SD 57007-1096	(605) 688-4589	(605) 688-4013	sdsu_seedlab1@sdstate.edu	
AV Seed Testing 4333 Highway 66 Longmont CO 80504	(970) 535-4680 Richard	(970) 535-4593	ragnew@seedsolutions.com	
Agri-Quality Testing Inc. 1900 Fowler St. Suite G Richland WA 99352	(509) 736-6330	(509) 736-5303	agt@agriqualitytesting.com	
Agri-Seed Testing Services 1930 Davcor Ct. SE Salem OR 97302	(503) 585-1440 Jeanie or Sharon	(503) 588-0733	agriseedtesting@aol.com	

Official State Seed Laboratories, Updated July 2004				
NAME AND ADDRESS	PHONE	FAX	EMAIL	WEBSITE
Mid-West Seed Services 236 32 nd Ave. Brookings, SD 57006	(605) 692-7611	(605) 6692-0977	micheller@mwseed.com	WWW.MWSEED.COM

Project Seed Request Form (Send completed form to: Scott Lambert, ID State Office, ID-931, Phone 208.373.3894, Fax # 208.373.3805)

Requestor (Print/Sign): _____ Phone No. _____ State: _____

Dist/Field Office: _____ Office Address: _____ Delivery Address: _____

Seed COR (must be COR certified and have completed the Seed Processing Workshop) Required Delivery Date: _____

Name: _____ Title: _____ Phone: _____ Mail Code: _____ PROJECT NAME: _____

Charge code: _____ APPROVED BY: (Print) _____ (Sign) _____

(Every Line above must be filled in or the Seed Warehouse-Boise will consider the order void.)

Species	Bulk pounds ¹	Est. Price/lb	Species	Bulk pounds ¹	Est. Price/lb
Crested Wheatgrass-Hycrest (I)			Needle & Thread Grass (N)		
Crested Wheatgrass-Nordan (I)			Thurber's Needlegrass (N)		
Crested Wheatgrass-Fairway (I)			Galleta Grass-Viva (N)		
Crested Wheatgrass-Ephraim (I)			Green Needlegrass-Lodorm (N)		
Crested Wheatgrass-Douglas (I)			Prairie Junegrass (N)		
Crested Wheatgrass-CDII (I)			Triticale, Grass (I)		
Siberian Wheatgrass -P27 (I)					
Siberian Wheatgrass-Vavilov (I)			Alfalfa, Inoculated-Ladak/Ladak 65 (I)		
Intermediate Wheatgrass-Oahe (I)			Alfalfa, Inoculated (Specify Variety) (I)		
Pubescent Wheatgrass-Luna (I)			Yellow Sweetclover-Madrid (I)		
Tall Wheatgrass-Alkar (I)			Sanfoin-Eski (I)		
Streambank Wheatgrass-Sodar (N)			Sanfoin-Remont (I)		
Thickspike Wheatgrass-Critana (N)			Blue Flax-Appar (I)		
Thickspike Wheatgrass-Bannock (N)			Small Burnett-Delar (I)		
Thickspike Wheatgrass Schwendimar (N)			Western Yarrow (N)		
Slender Wheatgrass-San Luis/Pryor (N)			Globemallow (Specify Variety/Species) (N)		
Western Wheatgrass-Arriba/Rosana (N)			Milkvetch (Specify Variety/Species) (N)		
SnakeRiver Wheatgrass-Secar (N)			Penstemon (Specify Variety/Species) (N)		
Bluebunch Wheatgrass-Anatone (N)			Lupine (Specify Species) (N)		
Bluebunch Wheatgrass-P7					
Bluebunch Wheatgrass-Goldar (N)			Shadscale, Shrub (N)		
Beardless Wheatgrass-Whitmar (N)			Bitterbrush-Antelope (N)		
Basin Wildrye Grass-Magnar (N)			Big Sagebrush-Wyoming (N)		
Basin Wildrye Grass-Trailhead (N)			Big Sagebrush-Basin (N)		
Russian Wildrye Grass-Bozoiisky (N)			Big Sagebrush-Mountain (N)		
Smooth Brome Grass-Manchar (I)			Sagebrush-Black (N)		
Mountain Brome Grass-Bromar (N)			Sagebrush-Low (N)		
Idaho Fescue Grass(Specify Variety) (N)			Spiny Hopsage, Shrub (N)		
Sheep Fescue Grass-Covar (I)			Rabbitbrush (Specify Variety/Species) (N)		
Orchardgrass-Paiute (I)			Winterfat, Shrub (N)		
Bluegrass, Sandberg's (N)			Cliffrose, Shrub (N)		
Bluegrass, Sandberg's-Mtn. Home (N)			Mountain Mahogany (Specify Species) (N)		
Bluegrass, Canby's-Canbar (N)			Forage Kochia-Immigrant (I)		
Bluegrass, Big-Sherman (N)			Fourwing Saltbush (N)		
Bottlebrush Squirreltail, Grass (N)					
Squirreltail, Big-SandHollow, Grass(N)			Other Species/Variety:		
Indian Ricegrass-Nezpar (N)					
Indian Ricegrass-Rimrock (N)					
Alkali Sacaton, Grass-Salado (N)					
Sand Dropseed (N)					

I = Introduced plant to USA. N = Native plant to USA.

¹ For minimum PLS rating refer to the BLM Regional Warehouse inventory spreadsheet

Complete List of Plant Drawings:

- [#1] CANBY'S BLUEGRASS (*Poa secunda* J. Presl) (Formerly: *Poa canbyi*)
- [#2] SANDBERG'S BLUEGRASS (*Poa secunda* J. Presl) Nevada Bluegrass
- [#3] NEVADA BLUEGRASS (*Poa nevadensis*)
- [#4] MOUNTAIN BROME (*Bromus marginatus* Nees. ex Steud.)
- [#5] DROPSEED, SAND (*Sporobolus cryptandrus* [Torr.] Gray)
- [#6] IDAHO FESCUE (*Festuca idahoensis* Elmer)
- [#7] NEEDLE and THREAD GRASS (*Stipa comata* Trin. & Rupr.)
- [#8] THURBER'S NEEDLEGRASS (*Stipa thurberiana* Piper)
- [#9] ORCHARDGRASS (*Dactylis glomerata* L.)
- [#10] INDIAN RICEGRASS (*Oryzopsis hymenoides*)
- [#11] BOTTLEBRUSH SQUIRRELTAIL (*Elymus elymoides* [Raf.] Swezey)
- [#12] BEARDLESS BLUEBUNCH WHEATGRASS (*Pseudoroegneria spicata* ssp. *iner.mis*)
- [#13] BLUEBUNCH WHEATGRASS (*Pseudoroegneria spicata* ssp. *spicata*)
- [#14] CRESTED WHEATGRASS (*Agropyron cristatum* [L.] Gaertn.)
- [#15] INTERMEDIATE WHEATGRASS (*Elytrigia intermedia*)
- [#16] THICKSPIKE WHEATGRASS (*Elymus lanceolatus* ssp. *lanceolatus*)
- [#17] WESTERN WHEATGRASS (*Pascopyrum smithii* [Rydb.] A. Love)
- [#18] BASIN WILDRYE (*Leymus cinereus* [Scribn. & Merr.] A. Love)
- [#19] MAMMOTH or GIANT WILDRYE (*Leymus giganteus* [Vahl] Pilger)
- [#20] YELLOW WILDRYE (*Leymus flavescens* [Scribn. & J.G. Smith] Pilger)
- [#21] ALFALFA (*Medicago sativa* L.)
- [#22] BALSAMROOT, ARROWLEAF (*Balsamorhiza sagittata* [Pursh] Nutt.)
- [#23] BEEPLANT, YELLOW (*Cleome lutea* Hook.)
- [#24] LOMATIUM, DISSECTED-LEAF (*Lomatium dissectum* [Nutt.]
- [#25] BLANKETFLOWER (*Gaillardia aristata* Pursh)
- [#26] BURNET, SMALL (*Sanguisorba minor* Scop.)
- [#27] CLOVER, LARGEHEAD (*Trifolium macrocephalum* [Pursh] Poiret)
- [#28] CLOVER, SMALLHEAD (*Trifolium microcephalum* Pursh)
- [#29] EVENING-PRIMROSE, DESERT (*Oenothera caespitosa* Nutt.)
- [#30] EVENING-PRIMROSE, HAIR (*Oenothera deltoides* Torr. & Frem.)
- [#31] FLAX, LEWIS' (*Linum lewisii* Pursh)
- [#32] FLEABANE, DWARF YELLOW (*Erigeron chrysopsidis* Gray)
- [#33] GLOBEMALLOW, GOOSEBERRYLEAF (*Sphaeralcea grossulariifolia* Rydb.)
- [#34] GLOBEMALLOW, MUNRO'S (*Sphaeralcea munroana* [Dougl. Spach)
- [#35] HAWKSBEARD, TAPERTIP (*Crepis acuminata* Nutt.)
- [#36] LUPINE, SILKY (*Lupinus sericeus* Pursh)
- [#37] MILKVETCH, BASALT (*Astragalus filipes* Torr.)
- [#38] PENSTEMON, RYDBERG'S (*Penstemon rydbergii* A. Nels.)
- [#39] PENSTEMON, SHOWY or SAGEBRUSH (*Penstemon speciosus* Dougl.)
- [#40] PENSTEMON, SAND-DUNE (*Penstemon acuminata* Dougl.)
- [#41] PHLOX, LONGLEAF (*Phlox longifolia* Nutt.)
- [#42] SAINFOIN (*Onobrychis viciaefolia* Scop.)
- [#43] WALLFLOWER, WESTERN (*Erysimum occidentale* [Wats.] Robins)
- [#44] BITTERBRUSH (*Purshia tridentata* [Pursh] DC)

- [#45] INDIAN-APPLE (*Peraphyllum ramossissimum* Nutt.)
- [#46] MOUNTAIN-MAHOGANY, CURL-LEAF (*Cercocarpus ledifolius* Nutt.)
- [#47] MOUNTAIN-MAHOGANY, TRUE (*Cercocarpus montanus* Raf.)
- [#48] SERVICEBERRY, UTAH (*Amelanchier utahensis* Koehne)
- [#49] BUCKWHEAT, ARROW-LEAF (*Eriogonum compositum* Dougl. ex Benth.)
- [#50] SALTBUSH, FOURWING (*Atriplex canescens* [Pursh] Nutt.)
- [#51] SHADSCALE (*Atriplex confertifolia* [Torr. & Frem.] S. Wats.)
- [#52] WINTERFAT (*Krasheninnikovia lanata* [Pursh] Guldenstaedt)
- [#53] HORSEBRUSH, GRAY (*Tetradymia canescens* DC)
- [#54] RABBITBRUSH, RUBBER (Gray) (*Chrysothamnus nauseosus*)
- [#55] SAGEBRUSH, BASIN BIG (*Artemisia tridentata* ssp. *tridentata* Nutt.)
- [#56] SAGEBRUSH, BUD (*Artemisia spinescens* D.C. Eat.)
- [#57] SAGEBRUSH, LOW (*Artemisia arbuscula* Nutt.)
- [#58] SAGEBRUSH, SILVER (*Artemisia cana* Pursh)
- [#59] SAGE, PURPLE (*Salvia dorii* ssp. *dorii*)
- [#60] LEMONADE BUSH (*Rhus trilobata* Nutt.)
- [#61] MOCKORANGE (*Philadelphus lewisii* Pursh)

REFERENCES FOR PLANT/ SEED : **Idaho, Oregon, Nevada, Utah, California, and Washington**

Alderson, J. and W.C. Sharp. 1994. *Grass Varieties in the United States*. USDA Agric. Handbook No. 170. US Government Printing Office. Washington, DC. 296p.

Anderson, B.A. Undated. *Desert Plants of Utah*. EC376. Cooperative Extension Service, Utah State University. Logan, Utah. 146p.

Anderson, W.E., M.M. Borman, and W.C. Krueger. 1998. *The Ecological Provinces of Oregon*: a treatise on the basic ecological geography of the state. Oregon State University, Agricultural Experiment Station. Corvallis, Oregon. 138p.

Bailey, L.H. 1976. *Hortus Third: A Concise Dictionary of Plants Cultivated in the United States and Canada*. McMillan Publishing Company. New York, NY. 1290p.

Bailey, R.G. 1996. *Ecosystem Geography*. Springer-Verlag. New York, NY. 204p.

Baskin, C.C. and J. M. Baskin. 2001. *Seeds: Ecology, Biogeography, and Evolution of Dormancy and Germination*. Academic Press. San Diego, California. 666p.

Blaisdell, J.P. 1958. *Seasonal development and yield of native plants on the upper Snake River plains and their relation to certain climatic factors*. Technical Bulletin No. 1190. United States Department of Agriculture. Washington, DC. 68p.

Blaisdell, J.P. and R.C. Holmgren. 1984. *Managing Intermountain rangelands – salt-desert shrub ranges*. GTR INT-163. U. S. Forest Service, Intermountain Forest and Range Experiment Station. Ogden, Utah. 52p.

Blauer, C.A., A.P. Plummer, E.D. McArthur, R. Stevens, and B.C. Giunta. 1975. *Characteristics and hybridization of important Intermountain shrubs, I. Rose family*. INT- 169. U.S. Forest Service, Intermountain Forest and Range Experiment Station. Ogden, Utah. 36p.

Blauer, C.A., A.P. Plummer, E.D. McArthur, R. Stevens, and B.C. Giunta. 1976. *Characteristics and hybridization of important Intermountain shrubs, II. Chenopod family*. INT- 177. U.S. Forest Service, Intermountain Forest and Range Experiment Station. Ogden, Utah. 42p.

Bossard, C.C., J.M. Randall, and M.C. Hoshovsky. 2000. *Invasive Plants of California's Wildlands*. University of California Press. Berkeley, California. 360p.

Boule, M., K. Brunner, J. Malek, F. Weinmann, and V. Yoshino. Undated. *Wetland Plants of the Pacific Northwest*. U.S. Army Corps of Engineers, Seattle District. Seattle, Washington. 85p.

Brenzel, K.N., Editor. 1999. *Sunset Western Garden Book*. Sunset Publishing Company. Menlo Park, California.

Brunsfeld, S.J. and F.D. Johnson. 1985. *Field Guide to the Willows of East-Central Idaho. Bulletin Number 39*. University of Idaho Press. Forest, Wildlife, and Range Experiment Station. Moscow, Idaho. 95p.

Conrad, C.E. 1987. *Common Shrubs of Chaparral and Associated Ecosystems of Southern California*. Gen. Tech. Rep. PSW-99. Berkeley, CA. Pacific Southwest Forest and Range Experiment Station, Forest Service, U.S. Department of Agriculture. 86p.

Craighead, J.J., F.C. Craighead, and R.J. Davis. 1963. *A Field Guide to Rocky Mountain Wildflowers*. Houghton Mifflin Co. Boston, Massachusetts. 277p.

Cronquist, A., A.H. Holmgren, N.H. Holmgren, and J.L. Reveal. 1972-1977. *Intermountain Flora*, Volumes 1-6. Hafner Publishing Co. and Columbia University Press. New York, NY.

Crowe, E.A. and R.R. Clausnitzer. 1997. *Mid-montane Wetland Plant Associations of the Malheur, Umatilla and Wallow-Whitman National Forests*. U.S. Department of Agriculture, Forest Service, Pacific Northwest Region. Technical Paper R6-NR-ECOL-TP-22-97. Portland, Oregon. 299p.

Daubenmire, R.F. 1959. *Plants and Environment: A Textbook of Plant Autecology*. John Wiley & Sons, Inc. New York, NY. 422p.

Daubenmire, R. 1968. *Plant Communities*. Harper & Row, Publishers. New York, NY. 300p.

Daubenmire, R. 1970. *Steppe Vegetation of Washington and Northern Idaho*. Washington State University, Cooperative Extension Publications. Pullman, Washington. 131p.

Daubenmire, R. and J.B. Daubenmire. 1968. *Forest Vegetation of Eastern Washington and Northern Idaho*. Washington State University, Cooperative Extension Publications. Pullman, Washington. 104p.

Daubenmire, R. 1978. *Plant Geography* (with special reference to North America). Academic Press. San Diego, California. 338p.

Davis, R.J. 1952. *Flora of Idaho*. Brigham Young University Press. Provo, Utah. 836p.

Dayton, W.A. 1937. *Range Plant Handbook*. U.S. Department of Agriculture, Forest Service. USGPO. Washington, DC.

Dayton, W.A. 1960. *Notes on Western Range Forbs*. Agricultural Handbook Number 161. U.S. Department of Agriculture, Forest Service. USGPO. Washington, DC. 254p.

- Dramstad, W.E., J.D. Olson, and R.T.T. Forman. 1996. *Landscape Ecology Principles in Landscape Architecture and Land-use Planning*. Island Press. Washington, DC. 80p.
- Driscoll, R.S. 1964. *Vegetation-Soil units in the central Oregon juniper zone*. U.S. Forest Service Research Paper, PNW-19. Portland, Oregon. 60p.
- Dunmire, W.W. and G.D. Tierney. 1997. *Wild Plants and Native Peoples of the Four Corners*. Museum of New Mexico Press. Santa Fe, New Mexico. 312p.
- Earle, S.A. 2001. *Idaho Mountain Wildflowers*. Larkspur Books. Sun Valley, Idaho. 224p.
- Eastman, D.C. 1990. *Rare and Endangered Plants of Oregon*. Beautiful America Publishing Company. Wilsonville, Oregon. 194p.
- Elias, T. S. and P.A. Dykeman. 1990. *Edible Wild Plants. a North American Field Guide*. Sterling Publishing Co. (Outdoor Life Books). New York, NY. 286p.
- Eliot, D.B. 1976. *Roots. An Underground Botany and Forager's Guide*. The Chatham Press. Old Greenwich, Connecticut. 128p.
- Elmore, F.H. 1976. *Shrubs and Trees of the Southwest Uplands*. Southwest Parks and Monuments Association. Tucson, Arizona. 214p.
- Erwin, S. and W. Owens. 1996. *Guide to using Idaho wildflowers in the home landscape*. U.S. Department of Agriculture, Forest Service, Intermountain Region. Boise, Idaho.
- Faber, P.M. and R.F. Holland. 1988. *Common Riparian Plants of California*. Pickleweed Press. Mill Valley, California. 140p.
- Fagan, D. 1998. *Canyon Country Wildflowers*. Falcon Publishing Co. Helena, Montana. 148p.
- Federal Highway Administration, Office of Natural Environment, Water and Ecosystems Team (Bonnie Harper-Lore, Editor). 1999. *Roadside Use of Native Plants, United States*. Publication Number FHWA-EP-99-014. U.S. Department of Transportation, Federal Highway Administration. Washington, DC. 665p.
- Foster, S. and C. Hobbs. 2002. *Western Medicinal Plants and Herbs*. Peterson Field Guides. Houghton Mifflin Company. New York, NY. 442p.
- Franklin, J.F. and C.T. Dyrness. 1984. *Natural Vegetation of Oregon and Washington*. Oregon State University Press. Corvallis, Oregon. 452p.
- Francis, J.K. 2004. *Wildland Shrubs of the United States and its Territories. Thamnic descriptions: Volume 1*. General Technical Report IITF-GTR-26. US Forest Service. Fort Collins, Colorado. 830p.

- Gaines, X.M. and D.G. Savan. 1972. *Weeds of Eastern Washington and Adjacent Areas* . C.W. Hill Printers. Spokane, Washington. 349p.
- Garrison, G.S., A.J. Bjugstad, D.A. Duncan, M.E. Lewis, and D.R. Smith. 1977. *Vegetation and environmental features of forest and range ecosystems* . U.S. Department of Agriculture, Agriculture Handbook 475. USGPO. Washington, DC. 68p.
- Gilkey, H.M. and L.J. Dennis. 1975. *Handbook of Northwest Plants* . Oregon State University Press. Corvallis, Oregon. 505p.
- Gray, D.H. and A.T. Leister. 1982. *Biotechnical Slope Protection and Erosion Control*. Van Nostrand Reinhold Company. New York, NY. 271p.
- Guard, B.J. 1995. *Wetland Plants of Oregon and Washington* . Lone Pine Press. Renton, Washington. 239p.
- Gunther, E. 1992 (Reprint of 1941 edition). *Ethnobotany of Western Washington : the knowledge and use of indigenous plants of North America*. University of Washington Press. Seattle, Washington. 71p.
- Hafenrichter, A.L., J.L. Schwendiman, H.L. Harris, R.S. MacLauchlan, and H.W. Miller. 1979. *Grasses and legumes for soil conservation in the Pacific Northwest and Great Basin states* . Agricultural Handbook 339. Soil Conservation Service, U.S. Department of Agriculture. Washington, DC. 69p.
- Harrington, H.D. 1967. *Edible Plants of the Rocky Mountains* . University of New Mexico Press. Albuquerque, New Mexico. 392p.
- Harrison, R.D., N.J. Chatterton, R.J. Page, M. Curto, K.H. Asay, K.B. Jensen, and W.H. Horton. 1996. *Competition, biodiversity, invasion, and wildlife useage of selected introduced grasses in the Columbia and Great Basins* . Research Report 155. Utah Agricultural Experiment Station, Utah State University. Logan, Utah. 84p.
- Harrison, R.D., N.J. Chatterton, B.L. Waldron, B.W. Davenport, A.J. Palazzo, W.H. Horton, and K.H. Asay. 2000. *Forage kochia: Its compatibility and potential aggressiveness on intermountain rangelands* . Research Report 162. Utah Agricultural Experiment Station, Utah State University. Logan, Utah. 66p.
- Hawkes, J.G. 1983. *The Diversity of Crop plants* . Harvard University Press. Cambridge, Massachusetts. 184p.
- Hays, D.W. and G.A Garrison. 1960. *Key to Important Woody Plants of Wastern Oregon and Washington* . U.S. Department of Agriculture, Agricultural Handbook Number 148. USGPO. Washington, DC. 227p.

- Hermann, F.J. 1966. *Notes on Western Range Forbs* . Agricultural Handbook Number 293. Department of Agriculture, Forest Service. USGPO. Washington, DC. 365p.
- Hickman, J.C., editor. 1993. *The Jepson Manual: Higher Plants of California*. University of California Press. Berkeley and Los Angeles, California. 1400p. (First published as “Manual of the flowering plants of California”, 1925 by W.L. Jepson.)
- Hitchcock, A.L. and A. Cronquist. 1976. *Flora of the Pacific Northwest* . University of Washington Press. Seattle, Washington. 730p.
- Hitchcock, A.S. and A. Chase. 1951. *Manual of the Grasses of the United States*. USGPO. Washington, DC.
- Holmgren, A.H. 1958. *Weeds of Utah* . Special Report 12. Utah Agricultural Experiment Station. Utah State University. Logan, Utah. 85p.
- Hurd, E.G., S. Goodrich, and N.L Shaw. 1994. *Field Guide to Intermountain Rushes* . General Technical Report INT-306. U.S. Department of Agriculture, Forest Service, Intermountain Research Station. Ogden, Utah. 56p.
- Hurd, E.G., N.L. Shaw, J. Mastroguiseppe, L.C. Smithman, S. Goodrich. 1998. *Field Guide to the Intermountain Sedges* . RMRS-GTR-10. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. Ogden, Utah. 282p.
- Jaeger, E.C. 1969. *Desert Wildflowers* . Stanford University Press. Palo Alto, California. 322p.
- Jensen, K., H. Horton, R. Reed and R. Whitesides. 2001. *Intermountain Planting Guide* . USDA-ARS, Forage and Range Research Lab and Utah State University Extension Publications, AG 510. Logan, Utah. 104p.
- Johnson, C.G. 1993. *Common Plants of the Inland Pacific Northwest* . U.S. Department of Agriculture, Forest Service, Pacific Northwest Region. R6-ERW-TP051-93. USGPO. Washington, DC.
- Johnson, C.M. 1970. *Common Native Trees of Utah* . Special Report 22. Utah Agricultural Experiment Station. Utah State University. Logan, Utah. 109p.
- Johnson, F.D. 1999. *Native Trees of Idaho* . University of Idaho Publications. Moscow, Idaho.
- Jolley, R. 1988. *Wildflowers of the Columbia Gorge* . Oregon Historical Society Press. Portland, Oregon. 331p.
- Kershaw, L., A. Mackinnon, and J. Pojar. 1998. *Plants of the Rocky Mountains* . Lone Pine Publishing. Redmond, Washington. 384p.

- Kershaw, L.J. 2000. *Edible and Medicinal Plants of the Rockies* . Lone Pine Publishing. Renton, Washington. 270p.
- Kindscher, K. 1987. *Edible Plants of the Prairie* . University of Kansas Press. Lawrence, Kansas. 276p.
- Kozloff, E.N. 1976. *Plants and Animals of the Pacific Northwest* . University of Washington Press. Seattle, Washington. 264p.
- Kruckeberg, A.R. 1996. *Gardening with Native Plants of the Pacific Northwest* , Second Edition. University of Washington Press. Seattle, Washington. 282p.
- Lambert, S.M. 2000. *Oregon and Washington Guide for Conservation Seedlings and Plantings* . U.S. Department of Agriculture, Natural Resources Conservation Service. Portland, Oregon. 126p.
- Langer, R.H.M. and G.D. Hill. 1985. *Agricultural Plants* . Cambridge University Press. Cambridge, England. 344p.
- Layser, E.F. 1980. *Flora of Pend Oreille County, Washington* . Washington State University, Cooperative Extension. Pullman, Washington.
- Lillybridge, T.R., B.L. Kovalchik, C.K. Williams, and B.G. Smith. 1995. *Field Guide for Forested Plant Associations of the Wenatchee National Forest* . PNW-GTR-3 59. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. Portland, Oregon. 335p.
- Link, R. 1999. *Landscaping for Wildlife in the Pacific Northwest* . University of Washington Press, in cooperation with Washington Department of Fish and Wildlife. Seattle, Washington. 320p.
- Lyons, C.P. 1956 (reprinted 1998). *Trees, Shrubs, and flowers to Know in Washington* . Lone Pine Publishing. Renton, Washington. 21 1p.
- Lyons, C.P. 1997. *Wildflowers of Washington* . Lone Pine Publishing. Renton, Washington. 192p.
- Macdonald, B. 1986. *Practical Woody Plant Propagation for Nursery Growers* , Volume 1. Timber Press. Portland, Oregon. 669p.
- Martin, A.C., H.S. Zim, and A.L. Nelson. 1951. *American Wildlife and Plants: A Guide to Wildlife Food Habits* . Dover Publications, Inc. New York, NY. 500p.
- McArthur, E.D., A.C. Blauer, A.P. Plummer, and R. Stevens. 1979. *Characteristics and hybridization of important Intermountain shrubs, III. Sunflower family* . INT-220. U.S. Forest Service, Intermountain Forest and Range Experiment Station. Ogden, Utah. 82p.

- McGrath, C.L., A.J. Woods, and J.M. Omernik. 2001. *Ecoregions of Idaho* (Map with text, tables, and photographs). U.S. Geological Survey. Reston, Virginia.
- McKean, W.T. 1976. *Winter Guide to Central Rocky Mountain Shrubs*. State of Colorado, Division of Wildlife and U.S. Forest Service. Denver, Colorado. 274p.
- McMinn, H.E. and E. Maino. 1981. *Manual of Pacific Coast Trees*. University of California Press. Berkeley, California. 413p.
- Medsger, O.P. 1972. *Edible Wild Plants*. Macmillan Publishing Co. New York, NY. 323p.
- Moermann, D.E. 1998. *North American Ethnobotany*. Timber Press. Portland, Oregon. 927p.
- Moore, M. 1979. *Medicinal Plants of the Mountain West*. Museum of New Mexico Press. Santa Fe, New Mexico. 200p.
- Moore, M. 1993. *Medicinal Plants of the Pacific West*. Red Crane Books. Santa Fe, New Mexico. 359p.
- Mozinga, H. 1987. *Great Basin Shrubs*. University of Nevada-Reno Press. Reno, Nevada.
- Munz, P. 1969. *A California Flora*. University of California Press. Berkeley, California.
- Musil, A.F. 1963. *Identification of Crop and Weed Seeds*. Agricultural Handbook Number 219. U.S. Department of Agriculture, Agricultural Marketing Service. USGPO. Washington, DC. 214p.
- Native Plants Journal (Editor: Kas Dumroese). 2004. Native Plants Journal and propagation protocol database website: <http://nativeplants.for.uidaho.edu/>.
- Native Seed Network. 2004. Plant search and ecoregions locator Website: <http://www.nativeseednetwork.org/>.
- Niehaus, T.F. and C.L. Ripper. 1976. *A Field Guide to Pacific State Wildflowers*. Houghton Mifflin Company. Boston, Massachusetts. 432p.
- Parker, K.G., L.R. Mason, J.F. Vallentine. Undated. *Utah Grasses*. Cooperative Extension Service. Utah State University. Logan, Utah. 69p.
- Parkinson, H., A. DeBolt, R. Rosentreter, and V. Geertson. 2003. *Landscaping with native plants of the Intermountain region*. Technical Reference #1730-3. US Department Interior, Bureau of Land Management. Boise, Idaho. 47p.
- Parish, R., R. Coupe, and D. Lloyd. 1996. *Plants of Southern Interior British Columbia*. Lone Pine Publishing. Vancouver, B.C., Canada and Redmond, Washington. 463p.

- Patterson, P.A., K.E., and J.R. Tonn. 1985. *Field Guide to Forest Plants of Northern Idaho*. General Technical Report INT-180. U. S. Department of Agriculture, Forest Service, Intermountain Research Station. Ogden, Utah. 246p.
- Peattie, D.C. 1991 (Reprint of 1950 edition). *A Natural History of Western Trees*. Houghton Mifflin Company. Boston, Massachusetts. 751p.
- Peck, M.E. 1961. *Manual of the Higher Plants of Oregon*, Second Edition. Binford & Mort. (Oregon State University Press). Portland, Oregon. 936p.
- Phillips, H.W. 2003. *Plants of the Lewis and Clark Expedition*. Mountain Press Publishing Company. Missoula, Montana. 277p.
- Plummer, A.P., D.R. Christensen, and S.B. Monsen. 1968. *Restoring Big Game Range in Utah*. Publication No. 68-3. Utah Department of Fish and Game. Salt Lake City, Utah. 183p.
- Pojar, J. and A. Mackinnon. 1994. *Plants of the Pacific Northwest Coast*. Lone Pine Publishing. Redmond, Washington. 526p.
- Randall, W.R., R.F. Keniston, D.N. Bever, and E.C. Jensen. 1994. *Manual of Oregon Trees and Shrubs*. Oregon State University Bookstores Inc. Corvallis, Oregon. 305p.
- Reichard, S. 1997. *Non-native pest plants of the greatest concern in Oregon and Washington*. Pacific Northwest Exotic Pest Plant Council. University of Washington. Seattle, Washington. 8p.
- Ritter, S.A. 2002. *Lewis and Clark's Mountain Wildlands: A Site Guide to the Plants and Animals They Encountered*. University of Idaho Press. Moscow, Idaho. 315p.
- Rose, R., C.E.C. Chachulski, and D.L. Haase. 1998. *Propagation of Pacific Northwest Native Plants*. Oregon State University Press. Corvallis, Oregon. 248p.
- Schiechtel, H. 1980. *Bioengineering for Land Reclamation and Conservation*. University of Alberta Press. Edmonton, Alberta, Canada. 404p.
- Schopmeyer, C. S., Editor for the U. S. Forest Service. 1974. *Seeds of Woody Plants in the United States*. Agricultural Handbook Number 450. U.S. Department of Agriculture, Forest Service. USGPO. Washington, DC. 883p. (Revised Edition available at web site: www.wpsm.net).
- Schmidt, M.G. 1980. *Growing California Native Plants*. University of California Press. Berkeley, California. 366p.
- Smith, D.S. and P.C. Hellmund. 1993. *Ecology of Greenways*. University of Minnesota Press. Minneapolis, Minnesota. 222p.

- Smith, Jr., J.P. 1977. *Vascular Plant Families* . Mad River Press Inc. Eureka, California. 320p.
- St. John, H. 1963. *Flora of Southeastern Washington* . Outdoor Pictures, Inc. Escondido, California. 583p.
- Stechman, J.V. 1986. *Common Western Range Plants: Their Fundamental Structure, Growth, Value, and Management*, Third Edition. Vocation Education Productions, California Polytechnic State University. San Luis Obispo, California. 123p.
- Strickler, D. 1993. *Wayside Wildflowers of the Pacific Northwest*. The Flower Press. Columbia Falls, Montana. 272p.
- Taylor, R.J. and R.W. Valum. 1992. *Sagebrush Country, a Wildflower Sanctuary* . Mountain Press Publishing. Missoula, Montana. 139p.
- Taylor, R.J. 1990. *Northwest Weeds*. Mountain Press Publishing. Missoula, Montana. 177p.
- Taylor, R.J. and G.W. Douglas. 1995. *Mountain Plants of the Pacific Northwest*. Mountain Press Publishing. Missoula, Montana. 437p.
- Taylor, R.J. 2002. *Rocky Mountain Wildflowers*, Third Edition. The Mountaineers Books. Seattle, Washington. 101p.
- Taylor, T.M.C. 1974. *The Lily Family of British Columbia* . B.C. Handbook Number 25. British Columbia Provincial Museum. Victoria, B.C., Canada. 109p.
- Tilford, G.L. 1997. *Edible and Medicinal Plants of the West*. Mountain Press Publishing. Missoula, Montana. 239p.
- Turner, N.J. 1995. *Food Plants of the Coastal First Peoples* . University of British Columbia Press. Vancouver, B.C., Canada. 164p.
- Turner, N.J. 1997. *Food Plants of the Interior First Peoples*. University of British Columbia Press. Vancouver, B.C., Canada. 215p.
- Turner, N.J., R. Bouchard, and D.I.D. Kennedy. 1980. *Ethnobotany of the Okanagan-Colville Indians of British Columbia and Washington* . Occasional Paper Number 21. British Columbia Provincial Museum. Victoria, B.C., Canada. 179p.
- Turner, N.J., L.C. Thompson, M.T. Thompson, and A.Z. York. 1990. *Thompson Ethnobotany*. Memoir Number 3. Royal British Columbia Museum. Victoria, B.C. Canada. 335p.
- USDA, Agricultural Research Service. 2001. *Intermountain Planting Guide* . AG 510. USDA-ARS Forage and Range Research Lab, in conjunction with Utah State University Extension. Logan, Utah. 104p.

U.S. Environmental Protection Agency (J.M. Omernik). 1986. *Ecoregions of the Pacific Northwest*. EPA/600/3-86/033, July, 1986. U.S. Environmental Protection Agency. Corvallis, Oregon. 39p and map.

USDA, Forest Service (Compilers: S.B. Monsen, R. Stevens, and N.L. Shaw). 2004. *Restoring Western Ranges and Wildlands. Volumes 1-3* . General Technical Report RMRS-GTR-136-Vols. 1,2,3. US Forest Service, Rocky Mountain Research Station. Fort Collins, Colorado.

USDA, Natural Resource Conservation Service. 2004. *PLANTS* web site:
<http://plants.usda.gov/plants>

USDA, Natural Resource Conservation Service. 2004. *Technical Notes* on plant/cultivar descriptions and recommendations. Available via the [PLANTS.usda.gov](http://plants.usda.gov) website.

USDA, Natural Resources Conservation Service, US Army Corps of Engineers (CERL), and USGS Biological Resources Division. 2004. VegSpec web site is available as a Link in <http://plants.usda.gov/plants>

USDA, Soil Conservation Service. 1981. *Land Resource Regions and Major Land Resource Areas of the United States*. Agricultural Handbook 296. USGPO. Washington, DC. 156p.

Vance, N.C., M. Borsting, D. Pilz, and J. Freed. 2001. *Special Forest Products: Species Information Guide for the Pacific Northwest* . General Technical Report PNW-GTR-513. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. Portland, Oregon. 169p.

Van Dersal, W.R. 1939. *Native Woody Plants of the United States* : their erosion control and wildlife values. U.S. Department of Agriculture. USGPO. Washington, DC. 362p, plus maps.

Vitt, D.H., J.E. Marsh, and R.B. Bovey. 1988. *Mosses, Lichens, and Ferns of Northwest North America*. Lone Pine Publishing. Redmond, Washington. 296p.

Welch, B.L., E.D. Nelson, S.A. Young, A.R. Sands, F.J. Wagstaff, and D.L. Nelson. 1992. *'Gordon Creek' – a superior, tested germplasm of Wyoming big sagebrush* . Research Paper INT-461. Intermountain Research Station, Forest Service. U.S. Department of Agriculture. Ogden, Utah. 7p.

Welsh, S.L., N.D. Atwood, S. Goodrich, and L.C. Higgins. 1987. *A Utah Flora*. Great Basin Naturalist Memoirs, No. 9. BYU Press. Provo, Utah. 894p. (Third edition is currently available.)

Westbrooks, R. 1998. *Invasive Plants, Changing the Landscape of America*: fact book. Federal Interagency Committee for the management of Noxious and Exotic Weeds (FICMNEW). Washington, DC. 109p.

Whitson, T.D., Editor. 1991. *Weeds of the West*. University of Wyoming and Pioneer of Jackson Hole. Jackson, Wyoming. 630p.

Williams, C.K. and T.R. Lillybridge. 1987. *Major Indicator Shrubs and Herbs on National Forests of Eastern Washington*. R6-TM-TP-304-87. U. S. Department of Agriculture, Forest Service, Pacific Northwest Region. Portland, Oregon.

Williams, C.K., B.F. Kelley, B.G. Smith, and T.R. Lillybridge. 1995. *Forested Plant Associations of the Colville National Forest*. PNW-GTR-360. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. Portland, Oregon. 375p.

Young, J.A. and C.G. Young. 1986. *Collecting, Processing, and Germinating Seeds of Wildland Plants*. Timber Press. Portland, Oregon. 236p.