



Natural Resources Conservation Service
CONSERVATION PRACTICE STANDARD
RANGE PLANTING

CODE 550

(ac)

DEFINITION

Establishment of adapted perennial vegetation such as grasses, forbs, legumes, shrubs, and trees.

PURPOSE

This practice is used to accomplish one or more of the following purposes—

- Restore a plant community similar to the Ecological Site Description reference state for the site or the desired plant community
- Provide or improve forages for livestock
- Provide or improve forage, browse or cover for wildlife
- Reduce erosion by wind and/or water
- Improve water quality and quantity
- Increase carbon sequestration

CONDITIONS WHERE PRACTICE APPLIES

On rangeland, native or naturalized pasture, grazed forest or other suitable locations where the principle goals and method of vegetation management is herbivore based. This practice shall be applied where desirable vegetation is below the acceptable level for natural reseeding to occur, or where the potential for enhancement of the vegetation by management is unsatisfactory.

CRITERIA

General Criteria Applicable to All Purposes

Specified seeding/plant material rates, methods of planting, date of planting and/or species selection shall be consistent with documented guidance cited by Plant Materials Program, research institutions or agency demonstration trials for achieving satisfactory establishment. See the introductory primer titled Basic Guidelines for Seeding Native Grasses in Arid and Semi-Arid Ecoregions (PDF; 160KB)

Species, cultivars or varieties selected for richness and or diversity, must be compatible with ecological site description(s), local laws and regulations, management objectives and adapted to climate conditions, soils, landform, or position, (e.g., aspect), and recommended seed transfer zones. Refer to **Range Tech Note 60** for guidance on selection of adapted species for various soil groups and Sub-Resource areas. This guidance is found in Tables 4, 5, and 6 of the tech note. Some species in this Tech Note are no longer recommended by NRCS. This would include Introduced species of lovegrass for example. Contact a specialist if you have questions. <http://www.nm.nrcs.usda.gov/technical/tech-notes/range/range60.pdf>

Where invasive plants are a known issue pre-planting treatments to control invasive plants in highly degraded areas is required for enduring management and restoration.

Recommended planting depths, hydrologic conditions, dates, seeding rates, soil amendments needed for establishment, minimum seed quality standards and management during the establishment period such as weed control and deferment from grazing shall be followed to enhance establishment success.

Range seeding in the Southern Desert, MLRA, or areas receiving less than 10 inches annual precipitation require special microclimate modifications to improve chances of success. Without modifying microclimatic conditions, seeding generally is not recommended. If seedings are to be undertaken, special techniques will be used to reduce soil temperature and/or increase soil moisture available for seedling establishment. Examples include pitting, contour furrowing, imprinting, mulching, or irrigation.

Origin of Seed

The success of range seeding is strongly influenced by the adaptation of the seed source to local climatic conditions. Released cultivars with known performance and adaptations should be used. When using native harvested seed, seed should not be moved from its geographic origin to its planting location more than 200 miles south, 300 miles north, 200 miles east and 100 miles west. Also, seed originating on sandy soils generally should not be used to seed heavy soils or vice-versa. Lastly, the elevation where the seeding occurs should not be greater than 2000 ft from the origin of the plant materials used. Introduced species need not meet these limits of adaptation. Certified seed of released cultivars is always recommended over uncertified or native harvested material. Seed certification is the only guarantee as to variety and quality.

Species, cultivars or varieties selected shall provide adequate cover to control erosion by wind and/or water within an acceptable period of time.

Seedbed preparation and planting methods will be suitable to meet any special needs for obtaining an acceptable establishment of planted materials.

Seeding rates will be based on 20 Pure Live Seeds (PLS) per square foot for grasses and forbs. Shrub seeding rates will vary depending on species and its density on reference sites. See Table-1 of this standard for seeding rates of select plant species. Planners can also reference **Range Technical Note 81: Seeding Rate Statistics for native and introduced species** as a reference in developing seeding recommendations to meet this standard.

<http://www.nm.nrcs.usda.gov/technical/tech-notes/range/range81.pdf>

Proper depth placement of seed is essential to good stands. Optimum depth of seeding is roughly proportional to seed size. Generally smaller sized seeds like blue grama are planted shallow and larger seeds like tall fescue can be planted deeper. Optimal seeding depth is also dependent on soil surface textures. The following is a general guideline;

- One-fourth to one-half inch deep on fine-to-medium textured soils.
- One-half to three-fourth inch deep on sandy loams or loamy sand soils.
- One-to-two inches deep where only Indian ricegrass is seeded. When seeding Indian ricegrass over one- inch deep, in a mixture, it will be necessary to use a separate seed box and plant other species at a shallower depth.

Filler Grasses

For broadcast or drilled seedings, up to one (1) pound of either green sprangletop, blue panicum, or sorghum alum, may be added to a full rate (100%) of a basic mixture of native grasses or a mixture in which most of the grasses are native. Use of filler grass should be considered when reseeding rangeland following mechanical brush control or other operations with complete soil disturbance.

Up to one (1) pound of Yellow sweet clover may be substituted for the filler grass. If Yellow sweet clover is used, the seed should be inoculated.

Areas disturbed by dozing or grubbing that are to be reseeded will be seeded by spot or broadcast using any method that will place the seed in the newly disturbed soil before rain crusts the soil surface. The disturbed area is usually relative to the degree of brush population. Seeding area will be adjusted in compensation for the expected natural grass recovery and the area of disturbance remaining after mechanical operations.

A variation of 25% above or below the recommended seeding rate is allowable. For planing purposes, the 100% PLS rate will be used.

Seeding rates will be calculated on a Pure Live Seed (PLS) basis.

Seed Quality

In calculating the PLS value of grass seed, the hard seed shown in the analysis will be included in the total germination figure; i.e., an analysis shows "Purity, 58.4%; Germination, 70.14%; Hard Seed, 6.09%; Total Germination, 76.23%." Use the total figure (76.23%) in determining the PLS value. Grass seed germination deteriorates rapidly with age, (some species such as indian ridgegrass require lengthy after-ripening before achieving acceptable germination percentages) for this reason seed analysis should be current—no more than one year old.

Planting Dates

Dates of seeding will correspond to the high probability (60 percent or more) of receiving effective precipitation (.6 to 1.0 inch during any three week period) for seedling establishment. During this period, the top 4 inches of the soil surface must remain moist to be successful. See TABLE 2 for planting dates by major land resource area.

Pure Stand Seedings and Mixtures

It shall be left to the producer and the planner to determine whether a pure stand or a mixture of grasses will be used. This will depend on the producer's objectives and upon the resource concerns to be addressed. The following will be considered in planning mixtures and/or pure stands:

1. Pure stands of native or introduced species may be seeded when it is known that this species will perform well (reestablish and increase) in providing cover and controlling erosion.
2. Mixtures of native grasses, or mixtures of native and introduced species may be made to establish a more balanced year round forage supply, and meet the criteria for preventing erosion and providing cover.

The following considerations should be studied when using mixtures:

- Use species that are closely compatible in palatability.
- Use only adapted species for the climate and site as identified on the ecological site description. These should generally be those species that have been shown to be reliable in the past.
- Normally, no more than 3 to 4 species are necessary in a mixture, especially if a filler grass is used. However, when seeding wildlands, species diversity often leads to improved stand sustainability because of the heterogeneity of the landscape. Species of the mix will often establish in micro sites where they are the most competitive or best adapted. When mixtures are used, the seeding rate will be adjusted proportionately. To determine the seeding rate for individual species used in a mixture, multiply the percent of each species in the mixture times the full seeding rate for that species. See Example 1.
- A single species or mixture of forbs or woody shrub seed (only a few shrub species are cost effective to direct seed (e.g., Fourwing saltbush, Winterfat) may be added to the total grass seed mixture at a rate of 1/4 to 2 pounds PLS broadcast. Caution should be exercised in determining the seeding rates in order to get a sufficient stand but not so thick a stand that

would have a weedy effect. It may be desirable to seed forbs or woody plants in strips. If the area is modified by the treatment to the extent that it needs complete seedbed preparation, the recommended seedbed preparation procedure and seeding rate will be used as follows:

Methods of Seeding and Seedbed Preparation

All seeding on rangeland will be drilled or broadcast by any feasible or proven method to ensure good distribution of seed and proper depth of seed burial.

Seeding will be done only when there has been sufficient soil disturbance for a seedbed and adequate but not excessive covering of the seed.

Seeding will be done only where weed competition is not severe or will be controlled during stand establishment.

On old cropland fields being seeded to grass or a mixture of grasses and other adapted species, it may be desirable to fertilize for establishment, based on a technical determination at the time of planting. Fertilizer may be applied at the time of planting or delayed until seedlings appear. Fertilize according to a current soils test or with 30 lbs. nitrogen and 30 lbs. phosphorus (P₂O₅) per acre. If a large weed seed bank is present in the soil, nitrogen fertilizer may favor weeds over desired species.

Seeding may be done in conjunction with range pitting, chiseling, or shallow contour furrowing. However, when using these treatments on coarse textured soils, exercise caution because these surface modifications may collapse which may deeply bury the seed, resulting in no seedling emergence. Rates should be adjusted according to ground disturbance.

Seeding may be done in conjunction with mechanical brush management, such as tree dozing, grubbing, or root plowing. Seeding rates will need to be adjusted on those areas to match recommendations for the practice Critical Area Planting (342). Seeding following root plowing may be delayed until the following year if adequate seedbed modification is applied at the time seeding is to be done. It is recommended that seedbed modification following root plowing be planned in all cases.

Modification may be done by roller chopping, raking, dragging, disking, or packing as needed. This operation may be applied as part of the seeding operation.

A seedbed for land out of cultivation that can be safely and feasibly tilled may be prepared by establishing a dead litter crop according to criteria for dead litter crop. When considering a dead litter crop be aware that tillage can favor weeds versus no-till drilling the dead litter crop.

Annual vegetation may be killed with contact herbicides to provide a suitable seedbed for the seeding of grasses.

When drilling or broadcasting seed on firm clean tilled seedbeds, the drill should be followed by press wheels or a packing implement to press the seed into the soil, such as a cultipacker.

Planning Range Seeding on Converted Land

Range seeding should be recommended and planned for converted land when:

- The present land use is cropland or pasture that cannot be maintained due to land characteristics.
- The land use is cropland or pastureland, and rangeland use is practical for a year-round forage producing program, or to prevent excessive erosion.
- The land can be established to grass by recognized methods and procedures that are practical, economically justifiable and where satisfactory results may be expected.
- The degree of erosion has not progressed beyond the ability of normal cultural methods that would be necessary for grass establishment.

Methods for Seedbed Preparation on Land Being Converted From Cropland to Rangeland

1. Establishment of a Dead Litter Crop in which to seed grass.

- a. Prepare land as is customary for planting the crop for harvest.
- b. Kind of sorghum to use - Forage- type of sorghum or sudan grass are usually preferred. Sudan, millet or broomcorn may also be used. See TABLE 3 for RECOMMENDED DEAD LITTER CROPS, SEEDING RATES, AND SEEDING DATES.
- c. The crop for dead litter will be protected from grazing. Mowing or shredding will be necessary to prevent seed from maturing, or to prevent excessive growth. (Should not be allowed to exceed 4-feet high.) When cut or shredded, leave 10-12" stubble height. A 10-12 inch stubble height should be maintained until grass is planted.
- d. Plant the grass at the appropriate time in the undisturbed stubble.
- e. Existing dead litter meeting the same requirements for spacing of adequate growth and density, and managed as above, may be utilized. Control competitive vegetation with herbicide or tillage before seeding. On fine-textured soils, existing small grain stubble after grain harvest may be used as a dead litter cover if properly managed. The small grain will be allowed to volunteer. Sweep the stubble as shallow as practicable, with large sweeps after harvest and subsequently to destroy volunteer small grain and weeds. Small grain and other annual vegetation may be killed with contact herbicide. The seedbed in this stubble needs to be firm before seeding.
- f. Mulching may be used in the place of a dead litter cover. Mulch material must be applied in accordance with the Standard and Specification for MULCHING which requires about 4,000 pounds per acre.
- g. Normally greater than 500 pounds of dead litter will be required on loamy soils and 1,000 pounds on loamy sands and sandy loams.
- h. A dead litter cover will be required for all seedings converting cropland to grass except when grass is irrigated for establishment.
- i. Terraces - Old field terraces, without maintenance, usually erode down and/or break due to livestock traffic. When unmaintained they pond water that "drowns out" many grasses, leaving bare or weedy areas. Terraces with breaks must either be repaired to work as designed, including adequate height and outlet, or they must be removed altogether. Terraces, if left, must be maintained as needed to serve the intended purpose. Removal of terraces is accomplished by smoothing to eliminate excess ponding and water concentrations caused by terraces.

Planting Methods

1. **Drilling.** (Applicable to all sites and methods of seedbed preparation except where terrain or obstructions prevent use of drill)
 - a. A grass drill equipped with double disks, depth bands, covering device, press wheels, seed agitator and a positive rate of speed is preferable.
 - b. A grain drill with press wheels can be used for cool season, smooth, heavy seed such as western wheatgrass, if it can be adjusted to deliver the correct amount of seed at the proper depth. CAUTION: This is not a suitable method for seeding r light fluffy seed such as blue grama, sideoats grama, and the bluestems.
 - c. Drill seeding is generally preferable to broadcast seeding. An inert seed filler such as rice hulls or cracked grain may be used to facilitate drilling and regulation of seeding rates.
2. **Broadcasting - Seeding**
 - a. When broadcasting is the only feasible method of seeding the following conditions will be met:
 - b. Broadcast uniformly and cover seed with drag or preferably cultipack. Cultipacking before and after broadcasting is desirable.
 - c. Where brush control was performed mechanically and drilling cannot be done, spot seed by broadcasting on disturbed areas before rain has settled the soil.
 - d. On burned areas, broadcast seed following burning before rain has settled the ashes.

- e. In anticipation of heavy seed predation double the normal seeding rate may be required.

Management Following Seeding

1. **Prescribed Grazing Following Range Seeding.** All seeded areas will be deferred until the seeded plants are well established. This will always be the first two growing season following planting unless special circumstances exist. Further extended growing season deferments may be necessary to establish or thicken the stand. Light grazing may be possible during the dormant season if plants are sufficiently established so that they will not be damaged. Seeded areas that are within highly intensive one herd grazing system will be excluded from the grazing cycle until the seeded plants have established. However, the planner should be alert for opportunities to utilize the livestock herd to aid in the establishment of the seeded areas, such as a short intense grazing to control a weed competition problem.
2. **Weed Control**
 - a. **Mechanical Control**
 - i. Cutter bar or rotary type mower. Weeds should be clipped prior to bloom stage. If desirable pollinator plants are present, mowing could be delayed until just before setting of viable seed.
 - ii. Cultivation -rotary hoes, or sweeps, are effective in controlling weeds on row plantings.
 - iii. Limited controlled grazing may be used to control broadleaf weeds and annual grasses in the second growing season. Livestock numbers should be sufficient to accomplish desired control. Remove livestock if seedling damage occurs.
 - b. **Chemical Control**
 - i. Federal, state and local laws govern the use of herbicides. These laws will be checked and complied with in each county.
 - ii. Generally, seedling grasses will not be sprayed with herbicides until they are past the four-to-five-leaf state except when current label instructions specifically allows for an earlier application.
 - iii. Generally, post emerged herbicide sprays will be applied to weeds when they are seedlings or in a succulent growth stage. Pre-emerged herbicides can be applied during the dormant season. Follow current label instructions.
 - iv. Grasses may be damaged if herbicides are applied when air temperature exceeds 95 degrees Fahrenheit.
 - v. The selection of herbicides and application will be based on current label instructions.
 - c. **Grazing Management** - Do not graze or cut for hay during the first two growing seasons or until stand is well established, unless limited controlled grazing will benefit the grass by removing competition. After establishment, standard and specifications for Prescribed Grazing (528) will be used to plan and implement a grazing system and manage the forage resource.

Treating Disturbed Areas on Rangelands

This is applicable to those areas that are disturbed by such activity as pipelines, road ditches, roads, surface mined areas and related activity. See Standards and Specifications for Critical Area Planting (342).

Additional Criteria to Restore a Plant Community Similar to Its Ecological Site Description Reference State or the Desired Plant Community

Selection of species or combination of species shall be designed to meet or move the site to the Ecological Site Description reference state or the desired plant community. See the appropriate ESD in section 2 of the Field Office technical Guide for reference and other community composition data.

Additional Criteria to Improve Forages for Livestock

Selection of a species or combination of species shall be designed to meet the desired nutritional requirements for the kind and class of livestock.

Selection of species or combination of species shall be designed to meet the desired season of use or grazing period.

Species planted as mixtures will exhibit compatible palatability to minimize selective grazing.

Additional Criteria for Improved Water Quality and Quantity

Select a species or combination of species that will maintain a stable soil surface and increase infiltration.

Species that have high evapotranspiration rates shall not be planted when watershed yields are the primary objective.

A mixture of functional groups inherent to the site's hydrologic zone(s) shall be planted when riparian area stream bank stability and water temperature criteria are important.

Additional Criteria for Improving Forage, Browse or Cover for Wildlife

Selection of planted species shall meet nectar, dietary and palatability requirements for the intended wildlife species.

Species will be selected and planted in a designed manner that will meet the cover and life history requirements of the wildlife species of concern.

Additional Criteria to Increase Carbon Sequestration

For optimal carbon storage, select species that increase site biomass.

Where carbon sequestration goals are at an appropriate spatial scale, deep rooted perennial species that will increase soil carbon storage will be selected.

Reduce the temporal frequency of carbon releases caused by non-historical repetition of wildfires on degraded sites by selecting less flammable perennial plants appropriate for the site.

CONSIDERATIONS

Planting materials selected should contribute to wildlife and aesthetics when opportunities exist.

Use of certified planting materials should be encouraged, however, distance and source limitations on seed and planting stock should be considered in terms of logistics and costs. However, when certified seed is not used there is no guaranty of the seed mix contains even if familiar cultivar names are used.

Any special handling requirements for planting materials need to be followed for best results, (e.g., beards or awns on seed, hard seed coats, and seed mixture ratios).

Where air quality concerns exist, site preparation techniques should be utilized that will minimize airborne particulate matter generation and transport.

Other practices such as Brush Management, Pest Management, Herbaceous Weed Control, or Grazing Land Mechanical Treatment may be used to promote a satisfactory site preparation to insure a successful range planting.

PLANS AND SPECIFICATIONS

For standard plantings, Conservation Practice Job Sheet 550 may be used to develop specifications and documentation. Plantings that require more detailed information may require additional site specific specification be prepared. Other practices may be required in support of range planting. Supporting practice specifications must also be prepared.

Organic producers: If this practice has the potential to effect land managed under the USDA standards for Organic production, then treatment alternatives must be included that meet standards for the National Organic Program (NOP):

<http://www.ams.usda.gov/AMSv1.0/nop>

Ultimately each Cooperator is responsible for selecting and implementing an alternative that meets management objectives, including adherence to NOP standards or other guidelines that may apply.

These plans and specifications shall be consistent with this standard and shall describe the requirement for applying the practice to achieve its intended purpose.

OPERATION AND MAINTENANCE

Operation

Identify any required items needed to assist in stand establishment such as mowing, burning, flash or target grazing, or herbicides to control weeds and vestige of invasive plants. Address insect and disease control needs where they are likely to create establishment problems. Focusing on the ecological mechanisms and processes that direct succession is central to successful stand establishment.

Maintenance

The cooperator has an understanding of the management required to maintain the resulting plant community. Any necessary replanting due to drought, insects or other uncontrollable event which prevented adequate stand establishment should be addressed. Recommendations may vary from complete re-establishment to over seeding or spot replanting. Thin stands may only need additional grazing deferment during the growing season.

REFERENCES

Association of Official Seed Certifying Agencies Native Plant Connection (2003) URL: <http://www.aosca.org/native%20plant%20restoration.htm> (accessed 14 Aug 2008)

Jones, TA. 2005. Genetic principles for the use of native seeds: just the FAQs, please, just the FAQs. *Native Plants Journal* 6:14- 18, 20-24.

Mangold, JM, et al. 2007. Revegetating Russian knapweed (*Acroptilon repens*) infestations using morphologically diverse species and seedbed preparation. *Rangeland Ecology and Management* 60:378-385.

Sheley, R.L., J.M. Mangold, and J.J. Anderson. 2006. Potential for successional theory to guide restoration of invasive plant dominated rangeland. *Ecological Monographs*. 76(3):365-379.

USDA-NRCS <http://www.plant-materials.nrcs.usda.gov/technical/publications/seedplant-pubs.html>

USDA-NRCS. Technical documents related to plant species community dynamics. The Ecological Site Information System (ESIS) is the repository for the data associated with the collection of forestland and rangeland plot data and the development of ecological site descriptions. [Online] <http://esis.sc.egov.usda.gov/>

Table 1. Species Table

Seed Characteristics and Seeding Rates								
Name	Seed/lbs (seeds/lbs)	Ave Pure (%)	Ave Germ (%)	Seeds/ft ² at 1lb/ac (# of seed)	Pounds of Seed @ 20 seeds per SQFT/AC LBS of SEED/ACRE	Native (N)	Type: Legume (L) Forb (F) Grass (G)	Plant Class
Bluegrass, Kentucky	2,150,000	100	100	49.4	0.4		G	Cool Grass
Bottlebrush Squirreltail (Tusas)	100,000	100	100	2.3	8.7	N	G	Cool Grass
Brome, Meadow	100,000	100	100	2.3	8.7		G	Cool Grass
Brome, Mountain	90,000	100	100	2.1	9.7	N	G	Cool Grass
Brome, Smooth	125,000	100	100	2.9	7.0		G	Cool Grass
Fescue, Arizona (Redondo)	500,000	100	100	11.5	1.7	N	G	Cool Grass
Fescue, Creeping Red	615,000	100	100	14.1	1.4		G	Cool Grass
Fescue, Hard	565,000	100	100	13.0	1.5		G	Cool Grass
Fescue, Sheep	680,000	100	100	15.6	1.3		G	Cool Grass
Indian Ricegrass (Paloma)	160,000	100	100	3.7	5.4	N	G	Cool Grass
Perennial Ryegrass	247,000	100	100	5.7	3.5		G	Cool Grass
Spike Muhly	1,635,000	100	100	37.5	0.5	N	G	Cool Grass
Streambank Wheatgrass	170,000	100	100	3.9	5.1	N	G	Cool Grass
Wheatgrass, Crested (Hycrest)	175,000	100	100	4.0	5.0		G	Cool Grass

Table 1. Species Table continued

Seed Characteristics and Seeding Rates								
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Wheatgrass, Crested (Nordan)	175,000	100	100	4.0	5.0		G	Cool Grass
Wheatgrass, Intermediate	88,000	100	100	2.0	9.9		G	Cool Grass
Wheatgrass, Pubescent	95,000	100	100	2.2	9.2		G	Cool Grass
Wheatgrass, Siberian	250,000	100	100	5.7	3.5		G	Cool Grass
Wheatgrass, Slender (Primar)	159,000	100	100	3.7	5.5	N	G	Cool Grass
Wheatgrass, Slender (San Luis)	160,000	100	100	3.7	5.4	N	G	Cool Grass
Wheatgrass, Tall (Jose)	79,000	100	100	1.8	11.0		G	Cool Grass
Wheatgrass, Thickspike (Crittana)	153,000	100	100	3.5	5.7	N	G	Cool Grass
Wheatgrass, Western (Arimba)	110,000	100	100	2.5	7.9	N	G	Cool Grass
Wheatgrass, Western (Barton)	110,000	100	100	2.5	7.9	N	G	Cool Grass
Wildrye, Great Basin (Magnar)	159,000	100	100	3.7	5.5	N	G	Cool Grass
Wildrye, Russian	162,000	100	100	3.7	5.4		G	Cool Grass
Alfalfa	225,000	100	100	5.2	3.9	N	L	Forb
Cicer Milkvetch	122,000	100	100	2.8	7.1		L	Forb
Clover, Sweet	262,000	100	100	6.0	3.3		L	Forb
Clover, White	800,000	100	100	18.4	1.1		L	Forb

Table 1. Species Table continued

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Flax, Blue	113,000	100	100	2.6	7.7		F	Forb
Globemallow	500,000	100	100	11.5	1.7	N	F	Forb
Lupine, Mountain	12,000	100	100	0.3	72.6	N	L	Forb
Penstemon, Firecracker	280,000	100	100	6.4	3.1	N	F	Forb
Penstemon, Narrowleaf (San Juan)	235,000	100	100	5.4	3.7	N	F	Forb
Penstemon, Palmer (Cedar)	500,000	100	100	11.5	1.7	N	F	Forb
Penstemon, Rocky Mtn. (Bandera)	500,000	100	100	11.5	1.7	N	F	Forb
Trefoil, Big	828,000	100	100	19.0	1.1		L	Forb
Trefoil, Birdsfoot	418,000	100	100	9.6	2.1		L	Forb
Chokecherry	4,000	100	100	0.1	217.8	N	S	Shrub
Elderberry, Blue	217,000	100	100	5.0	4.0	N	S	Shrub
Ephedra, Green	25,000	100	100	0.6	34.8	N	S	Shrub
Sagebrush, Big	2,500,000	100	100	57.4	0.3	N	S	Shrub
Saltbush, Fourwing (De-winged)	55,000	100	100	1.3	15.8	N	S	Shrub
Sumac, Skunkbush	19,000	100	100	0.4	45.9	N	S	Shrub
Winterfat (Hatch)	112,000	100	100	2.6	7.8	N	G	Shrub

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Seed Characteristics and Seeding Rates								
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Alkali Muhly (Westwater Germplasm)	3,000,000	100	100	68.9	0.3	N	G	Warm Grass
Alkali Sacaton (Salado)	1,750,000	100	100	40.2	0.5	N	G	Warm Grass
Blue Panic	650,000	100	100	14.9	1.3	N	G	Warm Grass
Bluestem, Big (Kaw)	165,000	100	100	3.8	5.3	N	G	Warm Grass
Bluestem, Cane (Grant)	500,000	100	100	11.5	1.7	N	G	Warm Grass
Bluestem, Little	260,000	100	100	6.0	3.4	N	G	Warm Grass
Bluestem, Sand	125,000	100	100	2.9	7.0	N	G	Warm Grass
Bluestem, Yellow	475,000	100	100	10.9	1.8	N	G	Warm Grass
Buffalograss Burs (Texoka)	55,000	100	100	1.3	15.8	N	G	Warm Grass
Buffalograss Burs (Texoka, hulled)	300,000	100	100	6.9	2.9	N	G	Warm Grass
Bush Muhly	1,500,000	100	100	34.4	0.6	N	G	Warm Grass
Galleta Canyopsis (Viva)	470,000	100	100	10.8	1.9	N	G	Warm Grass
Galleta, Floret (Viva)	159,000	100	100	3.7	5.5	N	G	Warm Grass
Gramma, Black (Nogai)	1,300,000	100	100	29.8	0.7	N	G	Warm Grass
Gramma, Blue (Alma)	750,000	100	100	17.2	1.2	N	G	Warm Grass
Gramma, Blue (Hachita)	750,000	100	100	17.2	1.2	N	G	Warm Grass

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Seed Characteristics and Seeding Rates								
Name	Seed/lbs (seeds/lbs)	Ave Pure (%)	Ave Germ (%)	Seeds/ft ² at 1lb/ac (# of seed)	Pounds of Seed @ 20 seeds per SOFT/AC LBS of SEED/ACRE	Native (N)	Type: Legume (L) Forb (F) Grass (G)	Plant Class
Gramma, Blue (Lovington)	750,000	100	100	17.2	1.2	N	G	Warm Grass
Gramma, Sidecoats	191,000	100	100	4.4	4.6	N	G	Warm Grass
Green Sprangletop (Marfa)	538,000	100	100	12.4	1.6	N	G	Warm Grass
Indiangrass (Llano)	175,000	100	100	4.0	5.0	N	G	Warm Grass
Kleingrass (Selection-75)	490,000	100	100	11.2	1.8		G	Warm Grass
Mesa Dropseed	3,545,000	100	100	81.4	0.2	N	G	Warm Grass
Plains Bristlegrass	293,000	100	100	6.7	3.0	N	G	Warm Grass
Sand, Mesa, Giant Dropseed	5,300,000	100	100	121.7	0.2	N	G	Warm Grass
Switchgrass (Alamo)	278,000	100	100	6.4	3.1	N	G	Warm Grass
Switchgrass (Blackwell)	278,000	100	100	6.4	3.1	N	G	Warm Grass
Vine Mesquite	143,000	100	100	3.3	6.1	N	G	Warm Grass

TABLE 2. PLANTING DATES BY MAJOR LAND RESOURCES AREA

1983 MLRA and LRU map for New Mexico http://www.nm.nrcs.usda.gov/technical/fotg/section-2/esd/mlra1983map.html	
Resource Area	Planting Date
HP-1, CP-1, HP-2 & 3	January 1 to August 1
CP-2, 3, 4, WP-1, 2, 3, RM-1, 2, AN-1, 2, 3, HIV-1, 2*,	January 1 to May 1, June 15 to August 1
ND, SD, 1, 2, 3	June 1 to August 3.

*Dormant fall cool season seedings (seeded late enough so seed does not germinate until spring) are satisfactory in WP-1 & 2, RM-1, RM-2, AN-1, 2, & 3, HIV-1, 2, and HP-1, & 2. Treatment of seed with a fungicide to prevent seed deterioration is recommended.

(See Range Technical Note No. 50, the attached New Mexico Map of Mean Monthly Temperature and Precipitation at selected stations, and bulletin "Probability of Selection Precipitation Amounts in New Mexico.")

If local conditions justify, the dates of planting may be adjusted by the State Rangeland Management Specialist.

Table 3. RECOMMENDED DEAD LITTER CROPS, SEEDING RATES, AND SEEDING DATES.

WEG = Wind Erodibility Group (see applicable soil survey)			
Crop & WEG		Rates lb/ac*	Date
Millets	All WEG	8	5/1 - 8/1
Forage Sorghum	All WEG	8	5/1 - 8/1
Milo	All WEG	8	5/1 - 8/1
Wheat	WEG 3 or Greater	40	8/1 - 10/15
Rye	WEG 3 or Greater	40	8/1 - 10/15
Barley	WEG 3 or Greater	50	8/1 - 10/15
Oats	WEG 3 or Greater	45	8/1 - 10/15

* A variation of 25% above or below the seeding rate is allowable. For Planning purposes, the 100% rate as shown will be used.

Planting methods: Drill in rows not to exceed 10 inches wide.

Fertilization: If fertility is known to be a problem, fertilize in accordance with soils test.

EXAMPLE 1

EXAMPLE FOR A SEEDING MIXTURE FOR LOAM ECOLOGICAL SITE PLANNED FOR SIDEOATS GRAMA, WESTERN WHEATGRASS AND BLUE GRAMA.

Sideoats Grama 4.6 lbs of seed per acre to get 20 seeds per SQFT.(From Table 1).

Client wants 40% of the mix to be Sideoats Grama; $(4.6 * 0.40) = 1.8$ lb. PLS

Western Wheatgrass 7.9 lb. of seed per acre to get 20 seeds per SQFT.(From Table 1).

Client wants 20% of the mix to be Western Wheatgrass $(7.9 * 0.20) = 1.6$ lb. PLS

Blue Grama 1.2 lb. seeding rate/per acre to get 20 seeds per SQFT.(From Table 1).

Client wants 40% of the mix to be Blue Grama $(1.2 * 0.40) = 0.5$ lb. PLS

TOTAL = $1.8 + 1.6 + 0.5 = 3.9$ pounds of PLS seed per acre to get 20 seeds/SQFT of the mix.

EXAMPLE PLS Adjustment**SAMPLE SEED LABEL**

Generic Seed Co. Blue Grama (Hachita)

Lot# 25-NM624

Pure seed		97.0%
Inert matter		2.4%
Other crop seed		0.4%
Weed seed		0.2%
Germination		92.0%
Test date		6/10
Free of noxious weeds		
	New Mexico Grown	

EXAMPLE Pure Live Seed (PLS) Calculation

First, find the percent germination. Then find the percent purity. Multiply them and divide the result by 100 to find the PLS. Here is the calculation from the example seed tag :

$$(92\% \text{ germ.} \times 97\% \text{ purity})/100 = 89\% \text{ PLS}$$

EXAMPLE of using PLS to adjust actual seeding rate;

With a calculated PLS of 89 percent. If the recommended rate for this seed is 10 pounds per acre the operator will need to apply 11.2 pounds to achieve the target rate of 10 pounds per acre PLS. Here is the calculation:

10 pounds /.89% calculated PLS = 11.2 pounds/acre measured when calibrating the drill or broadcast equipment.

For Drill Calibration Instructions and examples see the following ; TECHNICAL NOTE 7; USDA-NRCS PMC SPOKANE, WASHINGTON Titled: SEED QUALITY, SEED TECHNOLOGY AND DRILL CALIBRATION. Dated: FEBRUARY, 2005

http://www.wsu.edu/pmc_nrsc/Docs/Technical_Note_7_Seed_Tech_and_Drill_Calibration.pdf

Calibrating Drills and Broadcast Planters for Small-Seeded Forages at;

http://www.uaex.edu/Other_Areas/publications/PDF/FSA-3111.pdf