

NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATIONS

RANGE PLANTING

GENERAL SPECIFICATIONS

Procedures, technical details, and other information listed below provide additional guidance for carrying out selected components of the Conservation Practice Standard 550, Range Planting.

1. Seedbed

Proper seedbed preparation is second in importance only to favorable weather in grass establishment. A firm, but not hard, seedbed will be provided.

The seedbed will be prepared by any method that will result in a friable, firm seedbed without excessive weedy competition and without any herbicide residue carry over of soil compaction layers (plowpan or hardpan).

- a. **Herbicide residue.** The planning technician will determine if herbicide residues are suspected to exist in the field that would impair stand establishment of either the cover crop or the desired plant community. The cover crop and range planting will be delayed if detrimental herbicide residues are suspected to exist in the field.
- b. **Soil compaction layers.** The planning technician will determine if soil compaction layers (plowpan or hardpan) exist in the field that would impair production or stand establishment of either the cover crop or the desired plant community. The cover crop and range planting will be delayed until an acceptable seedbed is prepared.

2. Cover Crop

A standing cover or surface mulch is important for the success of any seeding in Central and Western Zones. Cover crop residue helps maintain surface soil moisture that is critical to seed germination and permanent root system development.

A standing cover crop or surface mulch is required for any seeding on soils where erosion or moisture conservation is a concern.

A standing cover crop or surface mulch is required for Major Land Resource Areas (MLRAs) 72, 73, 74, 75, 77, 78, 79, and 80A.

- a. **Standing cover crop.** The cover crop should be managed to prevent the production of viable seed.

Maintain a minimum of 12-inch stubble height. A cover crop with growth exceeding 12 inches may be removed by mowing, haying, or grazing.
- b. **Sorghums.** Sorghums may be planted as late as August 1 where sufficient moisture exists to establish a quick stand. Sorghum seed formation can be limited or controlled by use of male sterile (non self-pollinating) hybrids and by planting late so that sorghums are not able to mature and form seed.
 - (1) **Forage sorghum** - Seed forage sorghum (includes sudangrass) during the summer prior to the planting of the range planting mix. Row spacing shall not exceed 20 inches. The seeding rate will be 6 to 12 pounds per acre.

- (2) **Grain sorghum** – Seed grain sorghum the summer prior to planting the range planting mix. Row spacing will not exceed 30 inches. The seeding rate will be 3 to 8 pounds per acre.

Exception: Forage and grain sorghum in 40-inch rows may be used on sandy soils in MLRAs 72, 73, 77, 78, and 79 where conditions do not permit the establishment of narrower row spacings. To have adequate cover of forage and grain sorghums, the following actual residue amounts are required at seeding time. The “I” factor from the Wind Erodibility Index is used to determine minimum residue levels.

<u>“I” Soil Factor</u>	<u>Minimum Lbs. Residue/Acre at Seeding Time</u>
56 or lower	1,750
86	2,000
134	2,250
220 and higher	2,250*

*If adequate sorghum residue cannot be produced or maintained, additional mulch will be applied until the listed minimum amounts are achieved.

- c. **Small grain.** A minimum residue amount of 1,500 pounds per acre of flat small grain equivalent will be present at range planting time. If adequate flat small grain equivalent residue cannot be produced or maintained, additional mulch will be applied until the 1,500 pounds is achieved. Small grains are excluded as a standing cover crop option on soils with an “I” value greater than 86.

- (1) **Oats** - Oats may be planted until September 15 in the fall prior to planting the range planting mix. Row spacing will not exceed 20 inches. The seeding rate will be 40 to 60 pounds per acre.

Cover crops of oats will be killed, using the Surface Mulch, Chemical method, from the fifth or sixth leaf stage until boot stage and prior to the emergence of the seeded range planting mix.

- (2) **Winter wheat** - Seed winter wheat in the fall prior to planting the range planting mix. Row spacing will not exceed 20 inches. The seeding rate will be 40 to 60 pounds per acre.

Wheat cover crops will be killed, using the Surface Mulch, Chemical method, from the fifth or sixth leaf stage until the boot stage and prior to the emergence of the seeded range planting mix.

Seeding into growing wheat that will be grazed out by May 1 is an acceptable method. Do not graze when fields are wet and subject to compaction.

- (3) **Rye** - Rye or rye hybrids are not approved for use as a cover crop due to the potential allelopathic effects.

d. **Surface mulch.**

- (1) **Tillage** - Prepare a seedbed by use of tillage operations that leaves a seedbed free of growing vegetation with crop stubble, weeds, or other vegetative material left on the surface. No inversion type of tillage operation is allowed. It may be necessary to repack the soil surface after this tillage operation to provide a firm seedbed.

- (2) **Chemical** - Prepare a seedbed by use of herbicides that suppress existing vegetation and leave mulch which will be seeded into without additional tillage. (Chemicals used must be federally and locally registered and must be applied strictly in accordance with registered uses, directions on label, and other federal or state policies and requirements.)

3. **Clean Tilled Seedbeds** (A standing cover crop or surface mulch is not required in MLRA's 76, 84A, 106, 107, and 112, for any seeding on soils where erosion or moisture conservation is not a concern.)

Clean tilled - Just prior to planting, the seedbed shall be prepared by using tillage implements, which penetrate the soil surface 2 to 3 inches and leave a firm but friable seedbed. It may be necessary to repack the soil surface after this tillage operation to provide a firm seedbed.

4. Lime and Fertilizer Requirements

A soil test is essential to determine nutrient requirements. A soil test should be taken well ahead of planting to determine lime and fertilizer needs. Needed lime and phosphate should be incorporated into the seedbed prior to planting the cover crop.

- a. **Lime.** In areas where low pH conditions are known to exist, a soil test is required to determine lime needs. Native grass mixes will grow on slightly acidic soils, but do best on near neutral pH soils. The lime should be thoroughly mixed to a soil depth of 6 inches. The lime application should be as far in advance of seeding the cover crop as possible.
- b. **Nitrogen.** Nitrogen is not needed for establishment of most warm-season grasses. Warm-season native grass species in the seedling stage are not highly responsive to soil nitrogen. Nitrogen fertilization prior to seeding native warm-season grasses may actually be detrimental since it increases the competitive growth of weeds while having little or no benefit to native grass seedlings. Cover crops that reduce the amount of carry over nitrogen are preferred for native warm-season grass establishment.
- c. **Phosphorous and potassium.** In areas of known phosphate and potassium deficiencies, apply the amount recommended locally for agricultural production or the amount recommended by a soils test. Generally, hay fields require additional applications of phosphorus and potassium to maintain productive stands and ensure subsequent growth. Grazing recycles the nutrients and generally does not require additional applications.

5. Origin of Seed

- a. **Approved strains.** Many named varieties of adapted native grasses and forbs have been developed and released and should be used when available. For information on adaptation areas of named strains, refer to Kansas Plant Materials Technical Note KS-1 (Rev. 6), *Grass and Forb/Legume Varieties Approved for Use in Kansas*.
- b. **Native source.** Where named or numbered varieties are not available, use seed from a source as near the area being seeded as possible. The distance from where the seed will be sown to the source of native harvest seed should not be more than:
 - South - 250 to 400 miles (seed from a southern source will be given preference over seed from a northern source).
 - North - 100 to 150 miles.
 - Elevation increase - 1,500 feet.
 - Seed sources must be identified to the state and county level in order to certify mileage and elevation adequacy.
- c. **Bluestem mixture.** When seed of separate native species is not available, native mixed bluestem may be used as a substitute. Sufficient seed must be used to provide the amount of PLS of each species for which it is used as a substitute.

6. Seed Quality and Definitions

- a. **Seed analysis.** All seed analyses will be conducted in accordance with rules and regulations as prescribed by the Association of Official Seed Analysts (AOSA) and Kansas law. The Kansas Seed Law specifies the kind and amount of weed seed permitted; the requirement for a current analysis report; and labeling of all seed to show its purity, germination, date of last germination test, and weed seed content. Refer to Kansas Plant Materials Technical Note KS-2 and KS-21 for additional information.

Kansas seed law - The germination test is valid for 9 months after the end of the month the test was made so long as the seed remains in Kansas.

Federal seed law - For seed shipped across state lines, the germination test is valid for 5 months after the end of the month the test was made.

Interpretation of current analysis report - For seed purchased during the valid period of the germination test, the analysis report may be considered current for the full seeding period in effect at the time of purchase. (If seed is purchased March 1 and the valid date expires March 31, the analysis report may be considered current if the seed is planted by May 15, which is the end of the spring seeding period. If the seed is to be planted during a later seeding season, a new germination test will be obtained.)

A cooperator who raises and/or harvests seed for personal use must furnish a current seed analysis. The seed analysis shall show germination, purity, and weed content. Seed with a weed content in excess of that permitted by the state seed law will not be allowed for use.

- b. **PLS.** Compute by adding percentage germination and firm seed. Multiply this sum by purity. Divide the product by 100 for percent PLS:

$$\frac{(\% \text{ Germ.} + \% \text{ Firm Seed}) \times \text{Purity}}{100} = \text{Percent PLS}$$

Cleaning and conditioning of seed must result in a product that is of sufficient quality to meet or exceed minimum standards. The product must also be clean enough to plant using existing drilling equipment without further processing.

Minimum PLS % Requirements for Seed by Species*

Species	PLS	Species	PLS
Big bluestem	15	Blue grama	15
Sand bluestem	15	Buffalograss	25
Indiangrass	15	Sand lovegrass	50
Switchgrass	25	Western wheatgrass	40
Little bluestem	12	Tall wheatgrass	50
Sideoats grama	15		

*Species not listed have no minimum standard. Native harvest seed containing 2 or more species must have a combined minimum PLS of 20.

- c. **Bulk Seed Determination.** Determine the amount of bulk seed to be seeded based on PLS requirements and the following formula:

$$\text{PLS Lbs./Acre} \div \text{Percent PLS} = \text{Bulk Lbs.} \times \text{Acres} = \text{Total Bulk Lbs.}$$

7. Seeding Rates and Mixtures

- a. **Grasses.** All plantings will be mixtures of 5 or more grass species.

Limits are set as minimum and maximum percentage for each species on each site. Refer to appropriate table for minimum and maximum seeding rates and allowable percentages in mixes of individual species.

The maximum or minimum percentage for individual species may be exceeded, only in special situations, through a variance request with the concurrence of the state resource conservationist.

All mixtures will total 100 percent.

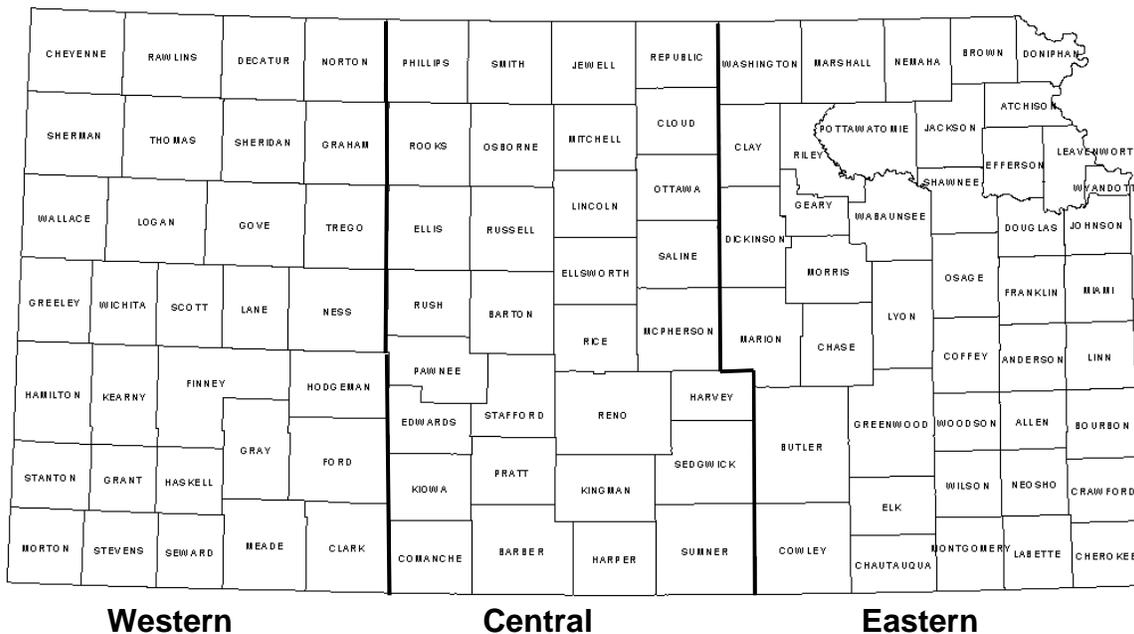
- b. Forbs and Legumes.** Mixtures of forbs and legumes may also be included in the seeding mix (refer to Table C).

Total quantity of forbs and legumes added will not exceed one bulk pound per acre or 1/2 PLS pound per acre. A maximum of 1/4 bulk pound is allowed for each species except Maximilian sunflower, which has a maximum seeding rate of 1/10 bulk pound per acre.

Forbs and legumes, when used in a base mixture of grasses, will not decrease the grass seeding rate requirements.

Legume seed should be inoculated with the proper culture just prior to seeding.

Figure 1. Kansas Seeding Zone Delineation



The following is an example of how a seeding mixture can be figured for a loamy upland site in the Eastern Zone.

Example:

Table A - Sample Mix for Loamy Upland - Eastern Zone

Species (Sample Mixture)	(a) <u>1/</u> PLS Lbs. Per Ac.	(b) <u>1/</u> Percent of Mixture	(c) <u>1/</u> PLS Lbs. per Ac. in Mix	(d) <u>1/</u> Ac. to Be Seeded	(e) <u>1/</u> PLS Lbs. in Mix	(f) <u>1/</u> Percent PLS	(g) <u>1/</u> Bulk Lbs. Per Ac.	(h) <u>1/</u> Total Bulk Lbs. Per Species
Big bluestem	6.0	30	1.8	50	90	48	3.75	187 <u>2/</u>
Little bluestem	4.0	25	1.0	50	50	52	1.92	96
Indiangrass	6.0	15	0.9	50	45	40	2.25	112 <u>2/</u>
Switchgrass	3.0	10	0.3	50	15	80	.37	18 <u>2/</u>
Sideoats grama	6.0	10	0.6	50	30	60	1.00	50
Western wheatgrass	10.0	<u>10</u>	<u>1.0</u>	<u>50</u>	50	50	<u>2.00</u>	<u>100</u>
Total		100	5.6	50			11.29	563

- 1/ (a) From seeding table, page 6.
- (b) Select species from percentage range in table (species having minimum rates must be used).
- (c) $a \times b = c$
- (d) Total acres to be seeded.
- (e) $c \times d = e$. This is the PLS pounds to be ordered from the seed dealer.
- (f) As listed on tags on seed sacks.
- (g) $c \div f = g$. Total of (g) is to be used for setting drill. If small seedbox is used, the small seed and fluffy seed must be figured separately.
- (h) $d \times g = h$. Use to check total pounds of seed received for seeding.

2/ Total bulk lbs. per species may be rounded to the nearest whole number.

Table B - Range Seeding Rates and Mixtures**1. Loamy, Limy, and Clay Range Sites**

Species	PLS Lbs. Per <u>1/</u> Acre <u>2/</u>	Allowable Species' Percentage					
		WESTERN <u>7/8/</u>		CENTRAL <u>7/8/</u>		EASTERN <u>7/8/</u>	
		Min.	Max.	Min.	Max.	Min.	Max.
Big bluestem	6.0	0	15	10	25	15	35
Little bluestem	4.0	0	20	10	20	15	30
Indiangrass	6.0	0	15	0	25	10	25
Switchgrass <u>6/</u>	3.0	10	20	10	20	5	20
Sideoats grama	6.0	10	30	10	20	0	20
Blue grama	2.0	20	30	0	20	--	15 <u>3/</u>
Buffalograss	5.0	0	15	0	10	--	--
Western wheatgrass	10.0	0	15	0	15	0	15

2. Sandy, Sands, Choppy Sands, and Sandy Lowland Range Sites

Species	PLS Lbs. Per <u>1/</u> Acre <u>2/</u>	Allowable Species' Percentage					
		WESTERN <u>7/8/</u>		CENTRAL <u>7/8/</u>		EASTERN <u>7/8/</u>	
		Min.	Max.	Min.	Max.	Min.	Max.
Big bluestem or Sand bluestem	6.0	10	20	15	25	15	30
Little bluestem	4.0	10	20	10	20	10	25
Indiangrass	6.0	10	20	15	25	15	30
Switchgrass <u>6/</u>	3.0	10	20	10	20	10	20
Sand lovegrass	2.0	10	25	0	20	0	10
Sideoats grama	6.0	0	10	0	10	0	10
Blue grama	2.0	0	15	0	15	--	--
Prairie sandreed <u>4/</u>	4.0	0	20	0	10	--	--
Giant sandreed <u>5/</u>	4.0	0	20	0	10	--	--

3. Subirrigated, Loamy Lowland, and Clay Lowland Range Sites

(See Eastern Mix in Table B-1)

1/ Based on a full seeding rate for the species involved. For planning purposes, the rates shown will be used. A variation of 10 percent above or below the planned rate for each species is allowable.

2/ Up to 1 lb. per acre of adapted native forbs may be added.

3/ Clay sites only.

4/ Northern counties. See Kansas Plant Materials Technical Note KS-1 (Rev. 6).

5/ Southern counties. See Kansas Plant Materials Technical Note KS-1 (Rev. 6) for North-South boundary.

6/ Use maximum percentage for wildlife plantings.

7/ See Figure 1. Kansas Seeding Zone Delineation.

8/ A minimum of 5 species will be included in all mixtures.

Table B (Continued) - Range Seeding Rates and Mixtures

Species	PLS Lbs. Per <u>1/</u> Acre <u>2/</u>	Allowable Species' Percentage					
		WESTERN <u>7/8/</u>		CENTRAL <u>7/8/</u>		EASTERN <u>7/8/</u>	
		Min.	Max.	Min.	Max.	Min.	Max.
Indiangrass	6.0	0	15	15	30		
Sideoats grama	6.0	20	40	10	20		
Switchgrass <u>5/</u>	3.0	10	20	20	40		
Blue grama	2.0	10	20	0	20		
Buffalograss	5.0	0	10	0	15		
Western wheatgrass	10.0	0	25	0	25		
Alkali sacaton	1.0	0	50	0	50		
Tall wheatgrass	12.0	0	<u>3/</u>	0	<u>3/</u>		

5. Furrow Method 4/ 6/ 7/

Species	PLS Lbs. Per <u>1/</u> Acre <u>2/</u>	Allowable Species' Percentage			
		Loamy, Limy, and Clay Range Sites <u>8/</u>		Sandy, Sands, and Choppy Sands Range Sites <u>8/</u>	
		Min.	Max.	Min.	Max.
Big bluestem or Sand bluestem	3.0	0	25	10	25
Little bluestem	2.0	15	30	20	40
Indiangrass	3.0	0	15	10	25
Switchgrass <u>5/</u>	1.5	15	30	15	30
Sideoats grama	3.0	10	20	0	20
Blue grama	1.0	15	30	0	20
Sand lovegrass	1.0	--	--	0	20
Western wheatgrass	5.0	0	10	0	10

1/ Based on a full seeding rate for the species involved. For planning purposes, the rates shown will be used. A variation of 10 percent above or below the planned rate is allowable.

2/ Up to 1 lb. per acre of adapted native forbs may be added.

3/ To be substituted for up to 50 percent of Western wheatgrass only.

4/ Furrow width should be 12 to 14 inches and 2 to 4 inches deep. Furrows should not be spaced more than 42 inches apart.

5/ Use maximum percentage for wildlife plantings.

6/ Western Zone only.

7/ See Figure 1. Kansas Seeding Zone Delineation.

8/ A minimum of 5 species will be included in all mixtures.

Table C. Listing of Additional Native Forbs/Legumes

NATIVE FORB / LEGUME SPECIES *	LEGUME	GROWTH HABIT	AREA OF ADAPTATION		
			EAST	CENTRAL	WEST
Black sampson - <i>Echinacea angustifolia</i>		PERENNIAL	x	x	x
Blackeyed susan - <i>Rudbeckia hirta</i>		PERENNIAL	x	x	
Butterfly milkweed - <i>Asclepias tuberosa</i>		PERENNIAL	x	x	
Clasping coneflower - <i>Rudbeckia amplexicaulis</i>		ANNUAL	x		
Dotted gayfeather - <i>Liatris punctata</i>		PERENNIAL	x	x	x
Englemann's daisy - <i>Engelmannia pinnatifida</i>		PERENNIAL	x	x	x
False sunflower - <i>Helopsis helianthoides</i>		PERENNIAL	x	x	
Grayhead prairieconeflower - <i>Ratibida pinnata</i>		PERENNIAL	x		
Illinois bundleflower - <i>Desmanthus illioensis</i>	x	PERENNIAL	x	x	x
Indian blanket - <i>Gaillardia pulchella</i>		ANNUAL	x	x	x
Lance-leaf coreopsis - <i>Coreopsis lanceolata</i>		PERENNIAL	x		
Leadplant - <i>Amorpha canescens</i>	x	PERENNIAL	x	x	x
Maximilian sunflower - <i>Helianthus maximiliani</i>		PERENNIAL	x	x	x
Missouri primrose - <i>Oenothera missouriensis</i>		PERENNIAL	x	x	
New England aster - <i>Aster novae angliae</i>		PERENNIAL	x		
Pale echinacea - <i>Echinacea pallida</i>		PERENNIAL	x		
Pitcher sage - <i>Salvia azurea</i>		PERENNIAL	x	x	x
Plains coreopsis - <i>Coreopsis tinctoria</i>		ANNUAL	x	x	x
Prairie aster - <i>Aster patens</i>		PERENNIAL	x		
Purple prairiedover - <i>Dalea purpurea</i>	x	PERENNIAL	x	x	x
Roundhead lespedeza - <i>Lepedeza capitata</i>	x	PERENNIAL	x	x	
Shellleaf beardtongue - <i>Penstemon grandiflorus</i>		PERENNIAL	x	x	
Showy partridge pea - <i>Chamaecrista fasciculata</i>	x	ANNUAL	x	x	x
Thickspike gayfeather - <i>Liatris pycnostachya</i>		PERENNIAL	x		
Upright coneflower - <i>Ratibida columnifera</i>		PERENNIAL	x	x	x
White prairieclover - <i>Dalea candidum</i>	x	PERENNIAL	x	x	

* Forb/legume species and varieties must be adapted to the site. For guidance on the suitability of species not listed, refer to the electronic Field Office Technical Guide Committee (eFOTG) Section II, information.

8. Seeding Method

All seeding operations should result in the seed being placed in contact with mineral soil, in a firm seedbed, and in non-competitive cover. Methods other than those listed will be limited to special conditions and require prior variance approval by the state resource conservationist.

a. Drilling.

Fluffy grass seed - Native grasses and other fluffy seed will be seeded with a grass drill equipped with double disc or coulter furrow openers with depth bands and press wheels, cultipacker, or drag chains. (Press wheels or cultipacking is preferred.) Seed should be planted 1/8 - 1/2-inch deep.

Forbs, legumes, and small seed species – Forbs, legumes, and other small seed species can be planted through a legume seed box designed for planting small seed species.

- ### b. Broadcasting.
- Broadcasting will be used only on small acreage where drilling is not physically feasible. Where broadcasting is used in lieu of drilling, the seed will be covered 1/8 - 1/2-inch deep by a single disk pulled straight, rotary hoe pulled backwards, cultipacker, or other similar equipment. Cultipacker-type equipment that flattens stubble shall not be used where seeding is made in a standing cover crop or surface mulch seedbed. Broadcast seeding can only be used with the prior approval of the responsible technician.

9. Planting Date (Statewide)

The responsible technician may extend the seeding dates two weeks where justified by climatic conditions.

March 15 to May 15 (Optimum)
December 1 to May 15 (Maximum)

10. Management During Establishment

Unless grazing is needed to control competing grasses and weeds, do not graze the planted stand until plants reach the minimum height listed in Conservation Practice Standard and Construction Specifications 528, Prescribed Grazing. Native grass seedlings should not be grazed the first year following seeding and should be deferred during the growing season until a satisfactory stand is established, except where flash grazing is used for weed control.

During establishment, excessive amounts of competitive weeds can be controlled by the use of one or more of the following methods:

- **Herbicides** - Herbicide applications for weed control should be considered when weeds create more than 50 percent or more of the canopy. Chemicals used must be federally and locally registered and must be applied in accordance with authorized registered uses, directions on label, and other federal or state policies and requirements.
- **Mowing** - Weeds should be mowed when they reach a height of 6 to 8 inches. **Mowing should be above the height of seeded grasses.** Mowing should not be done when daily maximum air temperature exceeds 95 degrees and the humidity is below 30 percent to prevent dehydration of the young seeded plants. Generally, mowing should not be used later than July 15, except when abnormal summer moisture promotes excessive weed production.
- **Grazing** - Flash grazing by livestock may be used to control palatable but undesirable annual grasses and forbs. This method will not be used later than July 15, except when abnormal summer moisture promotes excessive weed production. Flash grazing will not be used when the soil is wet and animal impact will damage desirable plants. Use Conservation Practice Standard and Construction Specifications 528, Prescribed Grazing.

Flash grazing is the use of livestock to harvest palatable competition in a short period of time.

Should there be significant use or damage to seeded plants, the grazing should cease immediately. In cases where additional applications are needed, the procedure should be repeated soon enough to prevent the weedy vegetation from becoming tough or unpalatable.

- **Prescribed Burning** - Prescribed burning may be used to manipulate the plant community, control excessive weed competition, and to eliminate litter buildup. Burn only when there is adequate soil moisture and seedlings are well rooted. Use Conservation Practice Standard and Construction Specifications 338, Prescribed Burning.

11. Determining Stand Establishment

Procedures for determining stand adequacy are outlined in Kansas Agronomy Technical Note KS-27.

Native grasses mixtures may require more than one season to establish. A native grass stand is usually not considered a failure until after the second or third growing season. A native grass stand should be evaluated for stand establishment at the end of each growing season until a determination of stand adequacy is made.

- **Acceptable** - An acceptable stand are those with an average of more than 2 plants in a standard (24 inch x 11.5 inch) range clipping frame.
- **Questionable** - Stands or areas, within a stand of less than an average of .5 to 2.0 plants per standard range clipping frame, may need to be reseeded. The factors to consider are potential of existing plants to spread, vigor of existing plants, extent of competition, quickness of stand desired, economics, etc. The final decision will ultimately require professional judgement by the responsible technician.
- **Failure** - Stands or areas within a stand with less than .5 plants per standard range clipping frame will require reapplication.