

**NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATIONS**

FORAGE AND BIOMASS PLANTING

GENERAL SPECIFICATIONS

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

1. Seedbed

Proper seedbed preparation is second in importance only to favorable weather in pasture, hay, and biomass establishment.

Use any method of preparation that will result in a friable, firm seedbed. The seedbed should be without excessive weedy competition, herbicide residue carry over, or soil compaction layers (plow pan 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 pasture, hay, or biomass 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 (plow pan 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, pasture, and hay planting will be delayed until an acceptable seedbed is prepared.

2. Cover Crop

A standing cover or surface mulch is essential for the success of any seeding in the Central and Western Zones. Cover crop and surface mulch 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.

Small grains are excluded as a standing cover crop option on soils with an "I" value greater than 86.

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.

Forage sorghum—Seed forage sorghum (includes sudangrass) during the summer prior to planting the perennial pasture or hay species. Row spacing shall not exceed 20 inches. The seeding rate will be 6 to 12 pounds per acre.

Grain sorghum—Seed grain sorghum during the summer prior to planting the perennial pasture or hay species. 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. Sorghum 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.

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

Oats—Oats may be planted until September 15 in the fall prior to planting the perennial pasture or hay species. Row spacing shall 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 pasture and hay species.

Winter wheat—Seed winter wheat in the fall prior to planting the perennial pasture or hay species. Row spacing shall 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 boot stage, and prior to the emergence of the seeded pasture and hay species.

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.

Rye—Rye or hybrids of rye are not approved for use as a cover crop due to the potential allelopathic effects.

- c. Surface mulch.**

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.

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.)

- d. Nurse crop.** A nurse crop of small grains may be seeded along with the pasture and hay species in the fall to provide more adequate cover to reduce frost heaving of the grass seedlings. The nurse crop will be controlled as necessary the following year to allow the grass stand to develop. Do not use nurse crops with spring seedings because of competition with planned forage crop seedlings.

Oats—Oats may be planted along with early fall seeding of grass. The seeding rate will be 20 to 30 pounds per acre.

Wheat—Wheat may be used on seedings made in late September and early October. The seeding rate will be 20 to 30 pounds per acre.

3. Clean Tilled Seedbeds

Standing cover crop or surface mulch is not required in MLRAs 76, 84A, 106, 107, and 112 for any seeding on soils where erosion or moisture conservation is not a concern.

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.** A soil test is required to determine lime needs. Most grasses will grow on moderately 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 as possible.
- b. **Nitrogen.** A soil test is required to determine nitrogen needs. The nitrogen management strategy that favors the dominant species in the mix should be used.

Warm-season native grasses—Nitrogen is not needed for establishment of warm-season native 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.

Cool-season grasses—Cool-season grass seedlings, including natives, are generally more responsive to nitrogen.

- c. **Phosphorous and potassium.** In areas of known phosphate and potassium deficiencies, apply the amount recommended locally for agriculture production, or the amount recommended by a soil test. Generally, hay fields require additional applications of phosphorus and potassium to maintain productive stands and ensure subsequent growth.

5. Origin of Seed

- a. **Approved varieties.** Many named varieties of adapted grasses and legumes have been developed and released and should be used when available. For information on adaptation areas of named varieties, refer to Kansas Plant Materials Technical Note KS-1.
- b. **Native harvest.** 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.

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 seed 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 Notes KS-21 and KS-2 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 weed content in excess of that permitted by the state seed law will not be allowed for use.

- b. **Pure live seed (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*

<u>Species</u>	<u>PLS</u>	<u>Species</u>	<u>PLS</u>
Big bluestem	15	Sand lovegrass	50
Sand bluestem	15	Sideoats grama	15
Indiangrass	15	Western wheatgrass	40
Switchgrass	25	Tall wheatgrass	50

*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. **Area of adaption.** Determine suitable species for the soils based on the adaptability rating as indicated in the Field Office Technical Guide, Section II, Forage Suitability Groups, Pasture and Hay Land Suitability Group determined by MLRA. Use species with adaptability rating of “7” or higher.

Refer to Table 1-Seeding Rates, for minimum and maximum seeding rates for individual species.

All seeding rates and references to mixtures are on a PLS basis unless otherwise indicated.

Table 1: Seeding Rates

Species	Full Rate PLS Lbs. per Acre	
	<u>Minimum</u>	<u>Maximum</u>
<u>Cool Season Grasses</u>		
Creeping foxtail	3	4
Intermediate wheatgrass	12	15
Meadow brome	12	16
Orchardgrass	3	4
Smooth brome	10	12
Tall fescue	12	15
Tall wheatgrass	14	17
Western wheatgrass	10	12
<u>Warm-season Grasses</u>		
Alkali sacaton	1.5	2
Big bluestem	8	10
Bermudagrass (seed)	3	5
Bermudagrass (sprigs)	15 bushels	20 bushels
Eastern gamagrass ¹	8	10
Indiangrass	8	10
Prairie sandreed	4	5
Sand bluestem	8	10
Sand lovegrass	1	2
Sideoats grama	8	10
Switchgrass	5	6
<u>Legumes</u> ²		
Alfalfa	6	8
Birdsfoot trefoil	5	6
Ladino clover	2	3
Red clover	5	7

¹Refer to Kansas Agronomy Technical Notice KS-24 for special planting and management instructions.

²Refer to Kansas Conservation Practice Standard 550, [Range Planting, Table 2: Native and Introduced Forbs/Legumes](#), for inclusion of native forbs and legumes to meet wildlife considerations. For native forbs and legumes, follow all planting, seed mix, and seeding rate pls/lb/ac requirements under Wildlife Habitat Mixes of Range Planting when designing mixes.

- b. Grass mixtures.** It is permissible to use mixtures of compatible grass species. For ease of management, grass mixtures should consist of species having similar growth habits, palatability, and seasons of growth. When 2 or more grass species are used in a mixture, the amount of seed will be proportionate to the percentage of that species to be used in the mix.

Example: 50 percent Indiangrass and 50 percent Big bluestem; thus, the amount of seed for each species would be 50 percent of the full seeding rate specified for each species.

- c. Legume mixtures.** It is permissible to mix legumes with cool-season grass species. **It is permissible to mix native forbs and legumes with grass species to accomplish wildlife considerations (refer to Kansas Conservation Practice Standard 550, Range Planting, Construction Specifications, Table 2-Native and Introduced Forbs/Legumes, for additional species.** When forbs and legumes are planted in a base mixture of grasses, use 30 to 50 percent of the legume's full seeding rate.

Legumes, when used in a base mixture of grasses, will not decrease the grass seeding rate requirements. Use an optimum planting date for all species included in the mix.

<u>Example:</u>	Smooth Bromegrass mixed with Alfalfa
	Smooth Bromegrass 10 to 12 lbs. per acre
	<u>Alfalfa</u> 3 to 4 lbs. per acre
	Full Seeding Rate is 13 to 16 pounds per acre

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

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.

a. Drilling.

Fluffy grass seed—Native grasses and other fluffy grass 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 to 1/2 inch deep.

Free flowing grasses—Free flowing grass seed (i.e., wheatgrasses, fescue) can be seeded with a small-grain drill with appropriate press wheels provided proper seeding depth and placement can be maintained. Seed should be planted 1/8 to 1/2 inch deep.

Legumes and small seed species—Legumes and other species with small seed can be planted through a legume seed box designed for planting small seed species (i.e., reed canarygrass, alfalfa, clover).

- 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 to 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, with the exception of the small acreages, can only be used with the prior approval of the responsible technician.
- c. Sprigging.** Sprig during March 1 to May 15. The local conservationist may grant an extension of 15 days where optimum soil and moisture conditions exist. Sprigs will be planted in rows and firmly covered 1 to 3 inches deep. Row spacing will not exceed 42 inches. Sprigs will be well distributed but not over 18 inches apart within rows. Sprigs will be healthy, uninjured, live stems, stolons, and rhizomes. Sprigs should not be cut or chopped. Sprigs will be kept moist until planted. Protect sprigs from sun and hot drying winds. Plant sprigs within 24 hours of when they are dug.

9. Planting Date (Statewide)

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

- a. Warm-season grasses.** December 1 to May 15
- b. Cool-season grasses.** December 1 to April 15 and August 15 to October 1
- c. Legumes.** December 1 to April 15 and August 15 to October 1

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 Kansas Conservation Practice Standard 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 may 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 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 certain 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 Kansas Conservation Practice Standard 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 on warm-season grasses to manipulate the plant community, control excessive weed competition, and to eliminate litter buildup. Prescribed burning is not generally recommended for cool-season grasses and legumes. Burn only when there is adequate soil moisture and seedlings are well rooted. Use Kansas Conservation Practice Standard 338, Prescribed Burning.

11. Determining Stand Establishment

Pasture and hay plantings should be evaluated at the end of the first growing season following planting. Procedures for determining stand adequacy are outlined in Kansas Agronomy Technical Note KS-27.

- Native grasses.** Native grasses and legumes 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.
- Introduced grasses.** Introduced grasses and legumes are usually established within the first growing season. An introduced grass and legume stand should be evaluated for stand establishment at the end of the first or second growing season.

Acceptable—An acceptable stand are those with an average of more than two plants in a standard (24 inch x 11.5 inch) range clipping frame.

Questionable—Stands or areas within a stand with an average of 1/2 to 2 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 1/2 plant per standard range clipping frame will require reapplication.