

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD AND SPECIFICATION**

PASTURE AND HAY PLANTING

(Acre)
CODE 512

DEFINITION

Establishing native or introduced forage species.

PURPOSES

This practice may be applied as part of a conservation system to accomplish one or more of the following purposes:

- Establish adapted and compatible forage species, varieties, or cultivars.
- Improve or maintain animal well being by providing adequate nutrition and shelter.
- Extend the length of the grazing season.
- Provide emergency forage production.
- Reduce soil erosion by wind and/or water.

CONDITION WHERE PRACTICE APPLIES

This practice may be applied on cropland, hayland, pastureland, and other agricultural lands where forage production is feasible and desired.

CRITERIA

General criteria applicable to all purposes stated above.

Plant species and cultivars shall be selected based upon:

- Climatic conditions, such as annual rainfall, seasonal rainfall, growing season length, humidity levels,

temperature extremes and USDA Plant Hardiness Zones.

- Soil condition and position attributes such as pH, available water holding capacity, aspect, drainage class, inherent fertility, salinity and alkalinity, flooding/ponding, and levels of toxic elements that may be present such as selenium and aluminum.
- Resistance to disease and insects common to the site or location.
- Compatibility with other forage species and selected cultivar(s) as to rate of establishment and growth habit when seeded together as a forage mixture (see TABLE 2).

Provide a firm, weed-free seedbed that ensures seed will contact soil/moisture uniformly, facilitates seedling emergence, and provides a medium that does not restrict or allow roots to become dry.

All seed and planting materials shall be labeled and meet state seed quality law standards.

Legume seed shall be inoculated with the proper, viable rhizobia before planting.

Seeding rates will be calculated on a pure live seed (PLS) basis using JS-AGRON-25 or the current Missouri Seed Rate Program.

Soil fertility level will be amended to meet recommendations for establishment as determined by an approved testing laboratory from soil samples collected in the field to be seeded and satisfying needs of the specific plant species planned.

Additional criteria to improve or maintain animal well being by providing adequate nutrition and shelter.

Forage species must be capable of meeting minimum daily requirement for the kind and class of the animal being fed or sheltered.

Forage species selected to be planted in mixtures having similar growth curves, should have similar palatability, so that spot or selective grazing is minimized. Species that have different growth periods do not compete as resolutely for available nutrients, moisture, sunlight or grazing use.

Additional criteria for extending the grazing season.

Forage species selected for establishment should fulfill a recognized dietary deficiency within the year-long forage management program.

Additional criteria to provide emergency forage production.

Plants should have the ability to provide grazeable growth or aftermath during a period when current on-farm forages are unavailable to meet livestock needs.

Additional criteria for reducing erosion by wind and/or water.

Plants shall have the ability to provide adequate ground cover, canopy cover, root mass, and vegetal retardants to wind forces and water flows either alone or in combination with other forage species when site conditions require erosion protection.

CONSIDERATIONS

Prescribed Burning (338), Forage Harvest Management (511) and Prescribed Grazing (528A) may be used in combination with Pasture and Hayland Planting.

Where wildlife is the primary or secondary land use objective, the food and cover value of the planting can be enhanced by

using an approved habitat evaluating procedure (MO-WHAG) to aid in selecting plant species and providing for other habitat requirements necessary to achieve the objective.

There is strong evidence that alfalfa has an autotoxicity effect toward its own seedlings. Trying to thicken thin strands by seeding directly into them has not been successful. It is recommended to rotate out of alfalfa for one full year prior to reestablishment.

It is often erroneously assumed that once a pasture planting is established the erosion problem is solved. This is not necessarily the case. It is important to protect the field from erosion both during and after establishment.

PLANS AND SPECIFICATIONS

Specifications for the establishment of pasture and hay plantings shall be prepared for each site or management unit according to the Criteria, Considerations, Operations and Maintenance described in this standard, and shall be recorded on JS-AGRON-25 or the current Missouri Seed Rate Software.

OPERATION AND MAINTENANCE

Growth of seedlings or sprigs shall be monitored for water stress. Water stress may require reducing weeds, harvesting of companion crops early, irrigating when possible, or replanting failed stands, depending on the stress level.

Invasion by undesirable plants shall be controlled by cutting, using a selective herbicide, or by grazing management.

Damage due to insects and diseases shall be controlled. If an infestation threatens stand survival, timely corrective action must be applied.

GENERAL SPECIFICATIONS

Procedures, technical details and other information listed in this section provides guidance for carrying out the Pasture and Hay Planting.

Seed Bed Preparation

On soils with EIs greater than 8, particular attention to seed bed preparation and/or to the use of companion crops for protection during the relatively short erosive establishment period is encouraged.

Conventional Tillage: Where erosion is not a problem, a clean tilled seedbed may be used. The seedbed will be made firm by rolling or cultipacking prior to seeding. The seedbed is firm if you can walk on it without sinking in more than ½ inch.

Conservation Tillage: Where erosion is of moderate concern, use minimum tillage and/or chemicals, leaving at least 30% ground cover after planting. The seedbed will be made firm by cultipacking or rolling prior to seeding. The seedbed is firm if you can walk on it without sinking in more than ½ inch.

No-Till: Where erosion is of primary concern or for economic reasons, a no-till establishment procedure should be used. Where tillage is not used, it may be necessary to apply herbicide to control existing vegetation and suppress weed competition. Always follow label instructions.

For no-till seeding into an existing pasture or hayland field burning, herbicides, grazing, mowing or some combination of these will be used to weaken the existing stand, control weedy species, and/or prevent seed production during the growing season prior to seeding. Timing of herbicide application should be based on growth stage of the species being controlled. Time for decomposition of root crowns should be provided so that good soil to seed contact can be attained.

When planning a no-till seeding into heavy crop residue, remove some of the residue prior to planting. This may be accomplished by grazing or baling; if that is not possible, shredding the residue shortly after harvest will put more of it in contact with the soil surface which speeds up decomposition. Drills equipped with trash plows or coulters will be helpful in heavy residue situations.

Residues can have an allelopathic effect that makes it difficult for seedlings of some forage species to become established. The literature is inconsistent as to the severity of this problem, which makes it difficult to provide solid guidance in this area. However, three things can be safely said: 1) the more abundant the residue the greater is the risk; 2) the fresher the residue the more likely problems will occur; and 3) the allelopathic effect is reduced with tillage.

Soil Fertility Requirement

Apply lime and fertilizer according to a current (less than 4 years old but since it was last amended) soil test recommendation for establishment. The per acre soil test requirements for N, P₂, O₅, and K₂O may be waived when the soil test calls for individual per acre requirements of less than 25 pounds and the total amount of fertilizer to be applied is less than 50 pounds. Lime requirements of less than 600 pounds ENM may be waived.

On warm-season grass and legume plantings where 0 pounds of (N) nitrogen is the recommendation and where the vendor cannot provide a 0 (N) fertilizer blend, up to 30 pounds per acre of nitrogen may be applied.

If lime or fertilizer is needed, it should be applied prior to and then incorporated during tillage operations. Where tillage is not available for incorporation and soil tests show pH (salt) is less than 5.7, lime should be applied at least 6 months prior to the seeding date. This allows time for the movement of some neutralizing material into the rooting zone. Lime in excess of 4 tons per acre can be applied in two split applications, with the second application being applied within 2 years of planting.

Formulating Mixtures

Mixtures should be planned that will properly address identified resource needs. Where the primary use is for grazing, legumes should not exceed 50% of the mixture. If the primary planned use

is hay production, the mixture should not exceed 75% legume. Mixtures of grasses and legumes have been shown to produce more total pounds of protein, as well as more total pounds of forage per acre, than do single species plantings.

When formulating mixtures, it is necessary to select species that are compatible to the Pasture Suitability Group(s) found in the field where the planting is planned (see TABLE 1), and also compatible to the other species in the mixture (see TABLE 2). Use JS-AGRON-25 or Missouri Seed Rate Program to develop seeding plans.

On soils with EIs greater than 15, long term erosion can often occur even under established stands. On the more erosive soils, careful thought must be given when selecting species for the mixture; select species that will produce a durable sod capable of providing long term protection (see footnote 2 / TABLE 1).

The management established stands receive directly impacts erosion rates. When formulating mixtures it is important to use those species that will be consistent with the soils where they are to be planted, as well the management they will receive after establishment.

Seeding Rates

Seeding rates are based on the optimum amount of seed necessary to produce a productive stand, in a reasonable amount of time, when the planting is performed in a conscientious manner. This base rate is used when making single specie plantings and provides equity between species when formulating mixtures. These rates are used without adjustment unless otherwise stated below.

The base rates will be used without adjustment when the seeding method used is likely to provide "good" seedling establishment by: uniformly metering the seed across the field, placing seed at the proper depth, and firming the soil around the seed to provide good soil to seed contact (see column 1, TABLE 3).

When the seeding method used is likely to provide "fair" seedling establishment due to a deficiency in seedbed preparation, seed metering, seed placement or seed to soil contact, the base seeding rates are increased by 25% (see column 2, TABLE 3).

To enhance the quality of an existing forage resource base, grasses may be drilled and legumes may be drilled or broadcast into existing partial stands. For these plantings, the "% wanted in the mixture," column of JS-AGRON-25 will total 25-50% for the species being added, depending on the density of the partial stand. If the existing stand has deteriorated to where more than 50% enhancement seems necessary, then a complete renovation should be planned.

Seeding Method

For prepared seedbeds, when planting grass and/or legumes, properly place and firm the soil around the seed, using a grass drill, grain drill with press wheels or cultipacker seeder. If broadcast, the field should be rolled, cultipacked, or dragged before and after broadcasting.

On no-till seedbeds, when planting grass and/or legumes, properly place and firm the soil around the seed, using a no-till drill. On clay soils, drilling should not be done when the soil is too wet. As the soil dries, cracks can develop along the drill marks allowing the seedling's root system to dry out.

Legumes may be broadcast, onto fields having existing grassy vegetation during the winter dormant seeding dates, at the base rate (see column 1, Table 3). Grass seed will be drilled on non-prepared seedbeds.

Fields that are too rocky, steep or for some other reason a proper seeding method can not be used, the site most likely falls into the Generally Not Suited (GNS) for pasture designation and should be seeded using the Critical Area Planting (342) Standard and Specification.

Drills should be capable of properly metering and placing the kind of seed being planted. Seeding depths should generally be from ¼ to ½ inch. Use shallower depths for smaller seeds and heavier soils; larger seeds and sandier soils need deeper planting depths.

Companion crops can be used where erosion cannot be adequately controlled with a seedbed preparation option. A companion crop not to exceed 20 pounds per acre close sown (10 inch or less row spacing) small grain and/or 1 pound of redbud per acre, may be used in addition to the planned seeding rate with either spring or fall seedings.

Using spring grains like oats, barley or spring wheat with fall plantings will provide protection yet will not need to be controlled since they will be winter killed. Fall planted grains like winter wheat, rye, or triticale planted in the spring at the suggested rates should not become overly competitive and will not produce viable seed that requires controlling.

Companion crops that would become competitive will be controlled prior to competition occurring; see weed control section.

Seeding Dates

Cool-season Grasses and Legumes:

Northern ½ State

Optimum: 3/15-5/1 & 8/15-9/15
Acceptable: 3/15-5/15 & 8/1-10/1
Dormant: 12/15-3/15

Southern ½ of State

Optimum: 3/1-4/15 & 9/1-10/1
Acceptable: 3/1-5/1 & 8/15-10/15
Dormant: 1/1-3/1

Warm-Season Grasses:

Northern ½ of State

Optimum: 4/15-6/15
Acceptable: 4/15-7/1
Dormant: 11/15-3/15

Southern ½ of State

Optimum: 4/1-6/1
Acceptable: 4/1-6/15
Dormant: 12/1-3/1

The Northern ½ of State are all counties north of Bates, Henry, Benton, Morgan, Moniteau, Cole, Osage, Gasconade, Franklin and St. Louis Counties. The Southern ½ of State are all counties including and south of those listed above.

Seed

Seeding mixtures will be developed from the list found in TABLES 3. Seeding rates are based on Pure Live Seed (PLS) as determined from a current seed test. A current seed test will be within 10 months of the date of use.

Inoculation

All legume seeds will be inoculated with the appropriate inoculant. Pre-inoculated seed shall be planted prior to the expiration date on the inoculum tag or be reinoculated within 24 hours prior to seeding.

Weed Control

Weeds and companion crops will be controlled by spraying, clipping or controlled grazing prior to their becoming competitive with the species planted.

Generally, competing species should be controlled depending upon their density, before they become 6-12 inches tall, but always before viable seed set. Control procedures will be performed as often as necessary to insure that stands are not lost to excessive competition.

For further information, refer to UMC publication "Weed And Brush Control Guide for Forages, Pasture and Non-Cropland in Missouri" (MP581) by Michael S. DeFelice.

Eastern Gamagrass may be planted with a companion crop of corn, grain sorghum or a sorghum-sudan hybrid to provide erosion and weed control. Plant corn at a rate of 8,000 to 12,000 plants per acre, grain sorghum at the rate of 4-7 pounds of seed per acre. Use herbicides labeled for the companion crop for weed control. Corn and grain sorghum may be harvested for

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silage or grain. Sorghum-sudan hybrids should be cut for hay. For further information, refer to UMC Publication "Eastern Gamagrass" (G4671).

Post Establishment Management

On more erosive soils, burning may not be a good management option, or the frequency of the burns may need to be reduced. Burn plans must be written so that adequate surface residues remain following the burn to provide protection. Grazing strategies should be planned that will encourage the formation of dense stands will provide effective cover of both live plants and their residues. If hayed, it is better to use a haybine or swather to cut the hay on erosive soils. These machines will leave the residue on the soil surface unlike a hay rake that gathers the residue into the windrow with the hay.

TABLE 1: SPECIES COMPATIBILITY TO PASTURE SUITABILITY GROUPS (PSG) FOR PASTURE AND HAYLAND PLANTING

Species	(PSG) 1/	WLB	WCB	WCU	WLO	LyO	LyU	CyU	GrU	MDU	WtP	LyP	SyO	GrO	GrP	ShU	GNS
Legumes:																	3/
Alfalfa	2/	-	-	-	-	E	E	E	G	G	-	F	F	F	P	P	
Alsike Clover		E	E	E	E	E	E	E	-	G	G	F	P	-	-	P	
Annual Lespedeza	2/	-	-	F	E	E	E	E	G	G	-	G	G	F	F	F	
Birdsfoot Trefoil		G	G	G	E	E	E	E	E	E	G	G	F	F	F	P	
Crownvetch		-	-	-	G	E	E	E	E	G	G	G	F	F	F	P	
Ladino Clover		G	G	E	E	E	E	E	G	G	E	G	F	P	P	P	
Red Clover		-	-	P	E	E	E	E	G	G	-	F	F	P	F	P	
Sweetclover	2/	F	F	G	G	E	E	E	G	G	G	F	F	P	P	P	
Cool Season Grasses:																	
Canada Wildrye	2/	E	E	E	E	E	E	E	G	G	G	F	F	P	P	-	
Kentucky Bluegrass		E	E	E	E	E	E	E	G	G	G	F	F	-	-	P	
Orchardgrass	2/	E	E	E	E	E	E	E	G	G	G	G	F	P	P	-	
Redtop		E	E	E	E	E	G	G	G	G	G	F	F	F	F	F	
Reed Canarygrass		E	E	E	E	E	E	E	G	G	E	G	F	P	P	P	
Smooth Bromegrass		E	E	E	E	E	E	E	G	G	E	G	F	P	F	P	
Tall Fescue		E	E	E	E	E	E	E	G	G	E	G	F	F	F	F	
Timothy	2/	E	E	E	E	E	E	E	G	G	E	G	F	-	-	-	
Western Wheatgrass		E	E	E	E	E	G	E	F	F	G	F	-	-	-	P	
Warm Season Grasses:																	
Bermudagrass		E	E	E	E	E	E	E	G	G	G	G	G	F	F	F	
Big Bluestem	2/	E	E	E	E	E	E	E	E	E	E	G	F	F	F	P	
Oldworld Bluestem		-	-	P	-	E	E	E	E	G	P	G	F	F	F	F	
Eastern Gamagrass	2/	E	E	E	E	E	E	E	G	G	G	G	F	F	P	P	
Indiangrass	2/	E	E	E	E	E	E	E	G	G	E	G	F	F	F	P	
Little Bluestem	2/	-	-	-	E	E	E	E	E	E	-	G	G	F	F	F	
Sideoats Grama	2/	-	-	-	E	E	E	E	G	G	-	F	F	F	F	F	
Switchgrass	2/	E	E	E	E	E	E	E	G	G	G	G	F	F	P	P	

1/ Pasture Suitability Groups are described in Section II-(iii)-G of the MO-FOTG. SECTION II-(iii)-G-2

2/ When planted alone, these species provide poor erosion control and should be used in mixtures with species exhibiting better erosion control, when site and planned management dictates. For more clarification, see paragraphs 3 and 4 of the FORMULATING MIXTURES section.

3/ Herbaceous plantings necessary for sites designated GNS will be planned using the Critical Area Planting (342) Standard and Specification.

[E] Excellent, [G] Good, [F] Fair, [P] Poor, [-] Generally Not Used. Species designated [E] or [G] can be used without restriction. A species designated [F] should compose no more than 25% of a mixture. A species with [P] compatibility should not exceed 10% of the mixture. Species having the [-] designation should generally not be used on that site.

TABLE 2: COMPATIBILITY OF SPECIES, COMMONLY USED FOR PASTURE AND HAYLAND PLANTING IN MISSOURI

SPECIES	SYMBOL	LEGUMES									C/S GRASSES									W/S GRASSES						Number of Seeds per Pound	
		alfa	alsi	anle	bitr	crow	lacl	recl	swcl	cawi	kebl	orch	redt	reca	smbr	tafe	timo	wewh	berm	bibl	cabl	eaga	indi	libl	sigr		swit
Legumes:																											
Alfalfa	alfa	G	F	F	G	P	G	F	G	F	P	G	P	F	G	F	G	F	P	F	F	F	F	F	F	F	200,00
Alsike Clover	alsi	F	G	F	F	P	F	G	F	G	G	G	G	F	G	G	G	F	P	P	P	F	P	P	P	F	700,00
Annual Lespedeza	anle	F	F	G	F	P	F	F	F	F	G	F	G	P	F	G	G	F	F	P	F	P	P	F	F	P	207,500
Birdsfoot Trefoil	bitr	G	F	F	G	F	G	F	F	F	F	G	F	P	G	G	G	F	F	G	F	G	G	G	G	G	375,000
Crownvetch	crow	P	P	P	F	G	F	P	P	F	F	G	F	P	F	F	G	F	P	F	P	F	F	F	F	F	110,000
Ladino Clover	lacl	G	F	F	G	F	G	G	G	F	G	G	G	F	G	G	G	F	F	F	P	F	F	F	F	F	800,000
Red Clover	recl	F	G	F	F	P	G	G	F	F	G	G	G	F	G	G	G	F	P	P	P	P	P	P	P	P	275,000
Sweet Clover	swcl	G	F	F	F	P	G	F	G	G	G	F	G	P	F	F	F	G	P	F	P	F	F	F	F	F	260,000
Cool Season Grasses:																											
Canada Wildrye	cawi	F	G	F	F	F	F	F	G	G	P	P	F	F	P	P	F	G	P	G	P	G	G	G	G	G	115,000
Kentucky Bluegrass	kebl	P	G	G	F	F	G	G	G	P	G	P	F	P	F	P	F	F	P	P	P	P	P	P	P	P	2,177,000
Orchardgrass	orch	G	G	F	G	G	G	G	F	P	P	G	F	P	G	G	G	F	P	F	P	F	F	F	F	F	657,000
Redtop	redt	P	G	G	F	F	G	G	G	F	F	F	G	P	F	F	F	F	P	G	F	G	G	G	G	G	4,990,000
Reed Canarygrass	reca	F	F	P	P	P	F	F	P	F	P	P	P	G	P	P	P	P	P	P	P	P	P	P	P	P	533,000
Smooth Bromegrass	smbr	G	G	F	G	F	G	G	F	P	F	G	F	P	G	F	G	P	P	P	P	P	P	P	P	P	136,000
Tall Fescue	tafe	F	G	G	G	F	G	G	F	P	P	G	F	P	F	G	G	P	F	P	F	P	P	P	P	P	227,000
Timothy	timo	G	G	G	G	G	G	G	F	F	F	G	F	P	G	G	G	F	P	G	P	G	G	F	F	G	1,230,000
Western Wheatgrass	wewh	F	F	F	F	F	F	F	G	G	F	F	F	P	P	P	F	G	P	G	P	G	G	G	G	G	110,000
Warm Season Grasses:																											
Bermudagrass	berm	P	P	F	F	P	F	P	P	P	P	P	P	P	P	F	P	P	G	P	F	P	P	P	P	P	1,787,000
Big Bluestem	bibl	F	P	P	G	F	F	P	F	G	P	F	G	P	P	P	G	G	P	G	P	G	G	G	G	G	165,000
Oldworld Bluestem	cabl	F	P	F	F	P	P	P	P	P	P	F	P	P	F	P	P	F	P	G	P	P	P	P	P	P	1,072,000
Eastern Gamagrass	eaga	F	F	P	G	F	F	P	F	G	P	F	G	P	P	P	G	G	P	G	P	G	G	G	G	G	7,280
Indiangrass	indi	F	P	P	G	F	F	P	F	G	P	F	G	P	P	P	G	G	P	G	P	G	G	G	G	G	175,000
Little Bluestem	libl	F	P	F	G	F	F	P	F	G	P	F	G	P	P	P	F	G	P	G	P	G	G	G	G	G	260,000
Sideoats Grama	sigr	F	P	F	G	F	F	P	F	G	P	F	G	P	P	P	F	G	P	G	P	G	G	G	G	G	191,000
Switchgrass	swit	F	F	P	G	F	F	P	F	G	P	F	G	P	P	P	G	G	P	G	P	G	G	G	G	G	389,000

Good (G), Fair (F), or Poor (P)-Species with Good [G] compatibility can be included in mixtures without restriction and should be the species of choice if they are also compatible with Pasture Suitability Group. If a species compatibility is Fair [F], it should make up no more than 25% of the mixture. Species with Poor [P] compatibility should not be planned in the planting.

TABLE 3: FULL "SINGLE SPECIES" SEEDING RATES:

SPECIES	"FULL SPECIES RATE" PER METHOD	
	Good 1/ PLS #/Ac	Fair 2/ PLS #/Ac
Legumes:		
Alfalfa	9.4	11.8
Alsike Clover	4.0	5.0
Annual Lespedeza 3/	9.5	11.9
Birdsfoot Trefoil	6.2	7.8
Crownvetch	10.0	12.5
Ladino Clover	3.7	4.6
Red Clover 4/	7.6	9.5
Sweet Clover	7.9	9.9
Cool Season Grasses:		
Canada Wildrye	10.0	12.5
Kentucky Bluegrass	2.7	3.4
Orchardgrass	5.2	6.5
Redtop	2.1	2.6
Reed Canarygrass	6.0	7.5
Smooth Bromegrass	10.0	12.5
Tall Fescue	10.0	12.5
Timothy	3.9	4.9
Western Wheatgrass	10.0	12.5
Warm Season Grasses:		
Bermudagrass (sprigged)	20 bu./ac.	25 bu./ac.
(seeded)	2.6	3.2
Big Bluestem	10.0	12.5
Oldworld Bluestem	3.1	3.9
Eastern Gamagrass	10.0	12.5
Indiangrass	9.8	12.2
Little Bluestem	8.0	10.0
Sideoats Grama	9.4	11.8
Switchgrass	5.9	7.4

1/ Good – This seeding method will provide the best chance for good seedling establishment; see seeding rates for description.

2/ Fair – This seeding method is expected to provide a fair level of seedling establishment; see seeding rates for description.

3/ Annual lepedeza should not be planted during the fall seeding period, and annual lepedeza and redclover should not exceed 35% of the mixture.