

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

CRITICAL AREA PLANTING

(Acres)
CODE 342

DEFINITION

Planting vegetation such as trees, shrubs, vines, grasses, or legumes on highly erodible or critically eroding areas.

PURPOSES

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

- * Stabilize the soil resource.
- * Improve water quality.
- * Reduce damage from sediment and runoff to downstream areas.
- * Improve wildlife habitat and aesthetic resources.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to those areas that usually cannot be stabilized by ordinary conservation treatment and management and if left untreated can cause severe erosion or sediment damage. Examples of applicable areas are dams, dikes, grassed waterways, sideslopes of terraces, mine spoil, levees, cuts, fills, surface-mined areas, and denuded or eroded areas where vegetation is difficult to establish by normal planting methods.

CRITERIA

General Criteria Applicable to All Purposes

Plant species and cultivars shall be selected based upon:

1. Climatic conditions such as annual rainfall, seasonal rainfall, growing season length,

humidity levels, temperature extremes, and the USDA Plant Hardiness Zones.

2. Soil condition and position attributes such as pH, percent slope, available water holding capacity, aspect, drainage class, inherent fertility, salinity and alkalinity, flooding and ponding, and levels of toxic elements that may be present.
3. Plant characteristics such as season of growth, vigor, ease of establishment, longevity of the species, adaptation to soil conditions, growth habit, and conservation value.
4. Resistance to diseases and insects common to the site or location.
5. Compatibility with other plant species and selected cultivars in rate of establishment and growth habit when seeded together as a mixture (refer to Table 3).

All critical area plantings will contain a companion crop, will be mulched according to the MULCHING (484) standard, or will be planted with no-till equipment into existing residue cover adequate to stabilize the soil resource.

Mulching by hand operations if necessary will be required on steep slopes of more than 4(H):1(V) where mowing of a companion crop or applying mulch by mechanical means may be difficult or dangerous.

Species will be suited for the planned purpose. Species will be selected from Table 2 of this standard to be planted as a monoculture or in a mixture. Any species listed in Table 2 and included in a mixture will comprise a minimum of 10 percent of the desired stand.

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version, contact the Natural Resources Conservation Service.

Recommendations for the appropriate planting period will be based on the species availability, species characteristics, site preparation needs, and potential for erosion to occur.

Acceptable planting dates shall be used. These dates are listed on Table 1 of this standard.

Livestock will be excluded from the area except where managed grazing is used to perpetuate an established stand and erosion is no longer a concern. USDA programs may restrict the use of grazing as a management option.

Temporary cover or mulching will be established on sites where construction delays or shutdowns occur if the delay or shutdown will last more than 30 days.

Seeding Rates

Seeding rates are based on the optimum amount of seed necessary to provide vegetative cover in a reasonable length of time. The base seeding rates in Table 2 of this standard are the minimum rates for planting a single species into a well-prepared seedbed with good planting equipment. The base rates are decreased as a percentage of the desired stand when used in a mixture of two or more species.

Calculate seeding rates per species on a pure live seed (PLS) basis using either the manual form (JS-AGRON-25) or the Missouri SeedRate Program in an automated version.

Rate Adjustments

The base rates will be used without adjustment when the seeding method used is likely to provide **good** seedling establishment due to: uniformly metering the seed; placing the seed at the required depth of 1/4 to 1/2 inch; and firming the soil around the seed to provide seed to soil contact. Refer to Table 2, Column 1 for the base seeding rates.

*Planting on a prepared seedbed with drills or planters that have a seed delivery system designed for and adequate to handle the types of seed being planted meet this definition. Air-flow fertilizer spreaders uniformly applying seed over bare soil or light residue (less than or equal to 20 percent ground cover) and no-till drills specifically designed to handle grass or legume seeds and constructed to cut a seed slot through the surface residue also meet this definition of **good** conditions for seed placement.*

Increase the base seeding rates 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. Refer to Table 2, Column 2 for the adjusted base rate due to a **fair** condition.

*Broadcast seeding methods such as all cyclone style spreaders or air-flow fertilizer spreaders used for seed distribution over heavier residues (exceeding 20 percent ground cover) and no-till plantings with drills not totally adapted to plant the desired species meet this definition of **fair** conditions for seed placement.*

When cool-season grasses are included in mixtures with legumes and planted at the same time, the cool-season grass seeding rates will be increased according to Table 2 of this standard. Use Table 2, Columns 3 and 4 for fall plantings of grass with legumes and Columns 5 and 6 for all dormant season and spring plantings of grass with legumes.

Seed Quality

Only viable, high quality and adapted seed will be used. All seed and planting materials shall be labeled and meet State seed quality law standards. Seed must be clean and relatively free of weed seed and other contaminants. Seed that has become wet, moldy, or otherwise damaged in transit or storage is not acceptable.

Legume seed shall be inoculated with the proper, viable *Rhizobium* bacteria species prior to planting. *Rhizobium* strains are specific to a group of legumes or a specific legume species. Pre-inoculated seed shall be planted prior to the expiration date on the inoculum tag or be re-inoculated with the appropriate inoculum within 24 hours prior to seeding.

Seedbed Preparation

Necessary shaping and smoothing will be completed prior to seedbed preparation. Shape the site sufficiently to permit the use of tillage and seeding equipment on flatter slopes and to permit future maintenance.

Site preparation shall be sufficient for establishment and growth of selected species. 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 root development or allow roots to become dry. Use a roller, culti-packer, or similar tool to make a firm seedbed prior to a broadcast seeding. Prepare a seedbed, incorporate lime and fertilizer, and plant or cover seed with mechanical operations on slopes where it is safe to operate equipment. Consider innovative methods to prepare a seedbed, control weeds, incorporate fertilizer, and achieve seed to soil contact of the permanent seeding or temporary cover where slopes are too steep for safe vehicle operation. All slopes must be smooth and free of rills or gullies.

Cover fine textured soils (greater than 40% clay) and coarse textured soils (sands, loamy sands) with a minimum of six (6) inches of topsoil after construction is complete. Topsoil shall be the highest quality surface soil available at the site. Topsoil shall be free of brush, rocky material and toxic substances to the extent that it is not detrimental to the establishment and maintenance of desired plants. Soil materials from drained ponds or surface material from an erosive area will not be used.

If available topsoil material is no better than the material to be covered, do not apply topsoil.

Soil Fertility and Lime

Soil fertility and pH level will be amended to satisfy the needs of the specific plant species planned. Recommendations for establishment will be determined by an approved testing laboratory from soil samples collected in the area to be seeded. In lieu of soil sampling, an all-inclusive fertilizer or lime recommendation may be used.

The all-inclusive fertilizer recommendation will depend on the type of grasses and legumes to be planted. If no soil test is available, apply the following minimum amounts of fertilizer (pounds per acre):

	N	P ₂ O ₅	K ₂ O
Cool Season (CS) Grass	60	90	90
CS Grass & Legumes and Warm Season Grass	30	90	90

Apply lime to bring soil pH to a range suitable for the planned species. Liming may be omitted where soil test requirements indicate less than 600 pounds per acre of effective neutralizing material (ENM) is needed. If a current soil test is not available, apply a minimum of 1000 pounds per acre ENM north of the Missouri River and a

minimum of 1500 pounds per acre ENM south of the river. The lime requirement may be waived if the site is less than one-tenth acre, the pH of the entire soil profile exceeds 5.0, and the soil condition is suited for the planned seeding. Pemiscot and New Madrid Counties are exempt from applying lime.

Apply all or a portion of the nitrogen requirement immediately prior to or during seeding. Rates of 10 to 20 pounds per acre for grass and legume mixtures and 20 to 40 pounds per acre for grasses are desired at planting. If a split application of nitrogen (N) is used to reduce weed pressure, apply the remainder of the N by topdressing after the planting is established.

Lime, phosphate (P₂O₅) and potash (K₂O) will be incorporated to a depth of 3 to 6 inches on flatter slopes. Lime and fertilizer may be broadcast without incorporation on slopes too steep for safe operation of tillage equipment or where surface obstructions hinder tillage operations.

For efficient use of lime and fertilizer, newly constructed terraces (narrow base and grass back) may be limed and fertilized based on soil test recommendations for the next crop to be planted in the field. If the cropland is not normally fertilized for the next crop, use the all-inclusive rates or soil test.

Temporary Cover

Apply fertilizer according to a current soil test or the following minimum amounts to meet the needs of establishing the temporary cover:

- * Nitrogen (N) 30 lb./acre
- * Phosphate (P₂O₅) 25 lb./acre
- * Potash (K₂O) 25 lb./acre

Apply lime at the rates required for permanent cover establishment based on the blanket recommendation of this standard or according to a soil test.

Prepare a firm, weed-free seedbed to a depth of 3 inches and incorporate fertilizer and lime on slopes where equipment may be operated safely. Select a grass or grain from the COVER AND GREEN MANURE CROP (340) standard as a temporary cover crop.

Plant the selected temporary cover seed uniformly with a drill or planter to the appropriate depth. If a broadcast planting method is used, cover the seed

with a roller, culti-packer, or similar tool except where it is too steep for safe vehicle operation.

On slopes where mechanical operations are restricted, increase the temporary cover seed by 50 percent and broadcast on the soil surface. A mechanical operation to cover the seed will not be required.

Seeding

Plant with a grassland drill, grain drill, or culti-packer seeder at the proper depth of planting or broadcast the seed uniformly and firm the seedbed immediately with a culti-packer, roller or similar tool. Seed may be broadcast on the soil surface without a mechanical operation to cover the seed where it is too steep for safe vehicle operation or where surface obstructions hinder mechanical operations.

Conventional Seeding:

- 1) Apply seed uniformly at a depth of 1/8 to less than 1/2 inch by an approved seeding method.
- 2) Apply mulch if a companion crop is not being used.

Hydroseeding:

- 1) Select a suitable seeding mixture and rate to add to the mulch material.
- 2) The seedbed should be slightly rougher than a normal seedbed. Harrowing across slope or bulldozer tracking up and down the slope prior to seeding is recommended.
- 3) Seed and fertilizer may be applied in the same operation; however, separate operations may be desirable to avoid possible "burning" of the seed by the fertilizer.

Dormant Seeding:

- 1) Follow proper agronomic procedures to prepare a seedbed and plant seed with acceptable equipment at depths less than 1/2 inch. Broadcast seeding methods are acceptable.
- 2) Apply mulch if a companion crop or existing cover is not being used.

Seeding into Temporary Cover:

- 1) Prepare a seedbed and establish the temporary cover.
- 2) Apply herbicides to kill or suppress the cover crop and weeds if actively growing at planting time. Follow herbicide label

recommendations.

- 3) For no-till plantings into temporary cover:
 - a) Place seed using a grassland drill, grain drill with press wheels or similar tool or use a broadcast method.
 - b) Broadcast seed into temporary cover only during the dormant seeding period. Select a seeding rate based on fair potential for establishment from Table 2.

Seeding into Mulch:

- 1) Seeding into existing mulch will be used when construction is completed and for some reason it is desirable to delay the permanent seeding for more than 30 days.
- 2) Follow proper agronomic procedures to prepare an adequate seedbed prior to applying the mulch material.
- 3) When the recommended seeding date arrives, seed by broadcasting the seed uniformly over the mulch or use no-till equipment to plant through the mulch.

Companion Crops

Companion crops may be used with plantings completed during the spring, summer, or fall planting periods. Seed spring oats at 25 to 30 pounds per acre during any of these planting periods. Winter wheat and rye may be planted in the spring at a rate of 25 pounds per acre. Winter wheat may be used as a fall or winter companion crop planted at 25 pounds per acre only where topsoil has been removed and vegetation is being established on subsoils. **These seeding rates for companion crops are the maximum rates to be used.**

Companion crops will be selected that minimize competition with the permanent seeding. Mow companion crops when 8 to 12 inches tall or before heading. Mow high enough to avoid damage to the permanent seeding and as often as necessary to keep canopy from becoming competitive with the planted species and to prevent seed set of the companion crop.

Sod Establishment

Apply fertilizer and lime according to a current soil test. Incorporate lime and fertilizer to a depth of 2 or 3 inches and firm the site with a culti-packer, roller, or similar tool. The site must be relatively smooth to apply sod.

Only moist, fresh sod shall be used. Lay sod as soon as possible after delivery to the site. Wet

soil to a depth of 2 inches or more prior to laying the sod.

Lay the sod from the lower end of the slope. On steep slopes, the use of ladders will speed up the laying and prevent damage to the sod.

Sod strips shall be laid at right angles to the flow of water; stagger joints. Fill any open joints with loose soil. Tamp or roll laid sod to insure a solid contact of the sod rootmass to the soil surface.

On severely steep sites or when anticipating overland flow, sod shall be held in place by woven wire, wooden pegs, wire staples, or similar material. Pegs or staples will be a minimum of 10 inches long.

Recently laid sod should be irrigated until moisture penetrates the soil layer beneath the sod.

Apply sod no later than October 1.

Sprigs and Cuttings

Planting sprigs, rhizomes, stolons, or cuttings of bermudagrass and reed canarygrass may provide quicker and easier cover than planting seed. The planting rate will be 20 bushels of sprigs per acre. The steps to follow are:

1. Plant only in moist, fertile weed-free soil.
2. Plant reed canarygrass in the spring and bermudagrass either in the spring or summer but early enough to take advantage of available precipitation and the growing season.
3. Plant pure live sprigs as soon as possible after harvesting.
4. Plant sprigs at least 2 inches deep to ensure continued soil moisture, but leave tips above ground.
5. Firm soil around the sprigs to keep them moist.
6. Control weeds with selective herbicides applied immediately after planting.
7. Fertilize to hasten ground coverage as soon as new stolons or rhizomes are evident.

Tree and Shrub Plantings

Trees and shrubs will be planted, established, and

maintained according to the TREE/SHRUB ESTABLISHMENT (612) standard.

Apply mulch according to the MULCHING (484) standard.

Additional Criteria to Stabilize the Soil Resource

Plants shall provide adequate ground cover, canopy cover, root mass, and vegetative retardance to wind and water forces. When used either alone or in combination with other forage species, plants must provide effective treatment when site conditions require erosion protection.

Planted species will contain no less than 60 percent perennial grasses based on pure live seed rated good to excellent for erosion control in Table 2 of this standard. No more than 10 percent of the desired stand will be comprised of species rated poor for erosion control.

Temporary protection of construction sites is often required when conditions are unfavorable for seeding such as in late fall or when soil moisture is very low. Refer to the MULCHING (484) standard for an alternative method of stabilization.

Stabilization of Deep Layers of Sandy Loam and Sandy Outwash

The year before the permanent seeding is to be established begin the stabilization process by planting a temporary cover of a warm-season annual forage such as pearl millet or sudangrass. All operations must occur on moist sands for some stability of the soil aiding equipment travel. Plant the temporary cover at a depth of 2 inches and early enough in the summer months to obtain a height of 12 inches prior to frost. Clip seed heads to prevent seed set of weeds and the temporary cover crop. The planting rate shall be 60 pounds per acre with all planting operations performed perpendicular to the predominant erosive winds.

Establish the permanent seeding as a spring planting the following year while the site is still moist from winter and spring precipitation. Apply herbicides as needed to control weed competition prior to planting. Fertilizer is not recommended at establishment due to the potential of leaching from these sites. When the organic matter accumulates to one percent or higher, fertilize annually at a maximum rate of 30 - 30 - 30 (N - P₂O₅ - K₂O) pounds per acre.

Perennial grasses will be established into the temporary cover without tillage. Use no-till drills to plant immediately after a rain for a firm seedbed. Acceptable seeding dates are from April 1 to May 15. Planting on loose sands will typically be earlier than planting on developed soils.

Planting depth of the permanent grasses and legumes on sandy sites will be 1 1/2 to 2 1/2 inches. This planting depth is necessary to place the seed in moisture and does not interfere with emergence. Sands with clay or silt lenses require a shallower seeding depth.

Species selection and seeding rates for a planting mixture are to be based on Table 4 of this standard. A mixture dominated by 45 to 100 percent warm season grasses is desired. No cool season grass species should exceed 25 percent of the mixture. Legumes should occupy up to 20 percent of the mixture while forbs should occupy up to 10 percent.

The planting mixture will be comprised of no less than three species of grasses, legumes or forbs. No single species of warm season grass will make up more than 50 percent of the mixture.

Determine the planting rate of the individual species based on the 100 percent seeding rate listed in Table 4. Adjust the planting rate for each species selected by the percentage of the mixture that species will occupy.

Additional Criteria to Improve Water Quality

Select plant species and varieties with specific growth characteristics that achieve the desired purpose of the planting. Planted species will contain no less than 60 percent perennial grasses based on pure live seed.

Additional Criteria to Reduce Damage from Sediment and Runoff to Down-stream Areas.

For streambank stabilization with grass or grass legume mixtures, no slope shall be steeper than 3:1 (horizontal to vertical).

Planted species will contain no less than 60 percent perennial grasses based on pure live seed rated good to excellent for erosion control in Table 2 of this standard. No more than 10 percent of the desired stand will be comprised of species rated poor for erosion control.

On ditch banks, where seeding will be done as construction progresses, apply lime and fertilizer within 24 hours after final shaping and incorporate, where practical.

Small Grassed Waterways. Critical area planting may be used for small concentrated flow areas. Alternative design methods will be used according to the GRASSED WATERWAY (412) standard when any of the following criteria cannot be met:

1. The contributing watershed area is five acres or less in size.
2. The watercourse requires minimal shaping to create a suitable seedbed. Minimal is defined as a maximum total depth of 1.5 feet.
3. The planner is assured there is an adequate cross section for conveying runoff. This cross section shall have minimum dimensions of 20 feet wide and 0.8 feet deep.
4. No concentrated flow erosion shall be present at the time of planting.
5. The minimum dimensions stated above and any additional area affected by concentrated flows must be seeded and maintained in permanent vegetative cover.
6. Seeding and establishment will be based on the CRITERIA and OPERATION AND MAINTENANCE sections of this standard.

Additional Criteria to Improve Wildlife Habitat and Aesthetic Resources

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 (Wildlife Habitat Appraisal Guide). This procedure will aid in selecting plant species and providing habitat requirements necessary to achieve the objective.

Select species for wildlife plantings that create an open structure that allows increased forb production and wildlife movement.

Grasses, forbs, and legumes will be planted in mixtures to encourage maximum plant diversity.

Maximize plant and animal diversity by using prescribed burning or mechanical, biological, or chemical cultural methods, or a combination of the four.

Maintenance practices and activities are not to disturb cover during the primary avian nesting period from May 1 through July 15 for grassland species. Mowing may occur during the avian nesting period only in the establishment year. To benefit insect food sources for grassland nesting birds, spraying or other control of noxious weeds will be done on a "spot" basis to protect forbs and legumes that benefit native pollinators and other wildlife.

Annual mowing of permanent vegetation for generic weed control is not recommended. Annual mowing will be discouraged since it greatly reduces residual cover for next year's nesting. Mowing between July 15 and August 15 is recommended to protect nesting birds.

CONSIDERATIONS

The long term objectives of the land user are important considerations in the selection of vegetative cover.

All tillage operations should be done as near to a contour as possible on slopes steeper than 2 percent. Perform tillage, planting and mulching operations across the slope.

Hydroseeding is recommended on slopes too steep for normal field equipment or where the use of equipment is not feasible.

Certified seed is preferred.

This practice may be used to promote the conservation of declining species, including threatened and endangered species. The food and cover value of the planting can be enhanced by using a habitat evaluation procedure to aid in selecting plant species and providing and managing for necessary habitat requirements to achieve the objective.

The use of native species (grasses, forbs, legumes, shrubs, and trees) should be encouraged. If a native plant cover develops other than those planted and meets the intended purpose, the cover may be considered adequate.

When selecting a planting mix with a secondary benefit for wildlife, the mix should contain multiple species with 60 percent or more of the species having an excellent wildlife rating.

Rhizobium bacteria inoculum does not readily adhere to seed. Use a sugar-water solution as a sticking agent. Do not use carbonated beverages as the low pH of these products may be hazardous to the bacteria.

Fertilizer spreaders may be used to broadcast seed along with the required lime and fertilizer. Inert materials such as cracked corn or rice hulls may also be used as bulk material to aid in seed dispersal. Adequate seed dispersal is required if this method of seeding is used.

Nitrogen losses will occur due to leaching, volatilization, and denitrification. The addition of nitrification or urease inhibitors should be considered when nitrogen is not applied in split applications to meet the needs of the establishing vegetation.

Allelopathy and autotoxicity effects have been documented with certain cereal grains used as temporary cover. These crops produce chemical substances that inhibit the growth or establishment of following crops. Tillage is often used to reduce allelopathy prior to seeding permanent cover.

When planting sandy sites, native species have exhibited a higher success than introduced species although the natives are generally slower to establish. Mixtures of three or more species of warm season grasses are best. Short lived species such as sand dropseed (*Sporobolus cryptandrus*) may be included in the mixture for quick cover and erosion protection.

Selection of species and varieties that have developed on sandy sites is preferred when sands are deeper than 48 inches. If the sand deposition is less than 48 inches, switchgrass (*Panicum virgatum*) and coastal panicgrass (*Panicum amarum*) may perform better than other species. These two species have established and produced excellent growth in field trials on shallower sand sites in Missouri.

PLANS AND SPECIFICATIONS

Site specifications for establishment and maintenance of this practice shall be prepared for

each treatment unit according to the Criteria, Considerations, and Operation and Maintenance described in this standard.

Site specifications shall be recorded using approved specification sheets, job sheets, narrative statements in the conservation plan, or other acceptable documentation.

OPERATION AND MAINTENANCE

Growth of seedlings, sod, sprigs, and woody materials shall be monitored for water stress.

Water stress may require reducing weeds, early harvest of companion crops, irrigation when possible, or replanting failed stands.

Mow, clip or use approved chemicals as often as necessary to control noxious weeds and undesirable plants during the seedling year. Mow high enough to prevent damage to the permanent seedlings.

After the seedling year, use spot mowing, chemical treatment based on pest scouting, or patch burning according to the PRESCRIBED BURNING (338) standard to control noxious weeds and other undesirable plants rather than treating the entire area. The minimum height for mowing cool season and introduced warm season grasses (bermudagrass and Caucasian bluestem) is 3 inches. The minimum height for mowing native warm season grasses is 8 inches. Burning will be used no more than once every three years.

Maintain soil pH and fertility at levels necessary to meet landuse objectives. Re-establish permanent cover as needed to provide adequate ground cover for erosion control.

Applications of lime, N, P₂O₅, and K₂O may be necessary to maintain productivity and adequate ground cover. Apply soil amendments as needed based on a current soil test to maintain the permanent vegetative cover. A current soil test is any analysis made since the site preparation was completed and less than three years old.

Occasional grazing and/or haying may benefit the stand. If grazing or haying is to be used as a management tool, develop specific management guidelines that stimulate the health and vigor of the vegetation without reducing the erosion control benefits.

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

Burning, mowing, or livestock grazing is not recommended for sandy sites. These sites are fragile and require special management to maintain the desired plant cover.

TABLE 1: PLANTING DATES

Plantings with:	Planting Date		
	Spring	Summer/Fall <u>2/</u>	Dormant
Cool Season Grasses in: <u>1/</u>			
Northern Missouri	3/16 - 5/31	8/01 - 9/30	12/01 - 3/15
Southern Missouri	3/01 - 5/15	8/16 - 10/15	12/16 - 2/29
Warm Season Grasses in: <u>1/</u>			
Northern Missouri	4/01 - 6/30		11/16 - 3/31
Southern Missouri	4/01 - 6/15		11/16 - 3/31

1/ Planting dates are based on plant suitability zones. Northern Missouri is all counties north of Bates, Henry, Benton, Morgan, Moniteau, Cole, Osage, Gasconade, Franklin, and St. Louis Counties. Southern Missouri is all counties including and south of those listed.

2/ Mixtures containing legumes will be planted by September 15 statewide except as a dormant seeding.

NOTE: Cool season grass mixtures may be planted from June 1 through July 31 in northern Missouri and May 16 through August 15 in southern Missouri if:

- a) soil moisture is at field capacity at time of seeding;
- b) seeding rates are increased by 50 percent;
- c) an adequate seedbed has been prepared and the seed is planted with a grassland drill or similar seeding equipment; and
- d) mulch is applied according to the MULCHING (484) standard.

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TABLE 2: MONOCULTURE (SINGLE SPECIES) SEEDING RATES BASED ON PLANTNG METHOD AND PERIOD
(POUNDS PURE LIVE SEED PER ACRE)

Species	Erosion Control Rating*	Wildlife Rating*	Base Rate with Planting Conditions		Adjusted Rates if Fall Planting w/ Legumes		Adjusted Rates of all Dormant and Spring Plant w/ Legumes	
			Good	Fair	Good	Fair	Good	Fair
Cool Season Legumes:			(1)	(2)	(3)	(4)	(5)	(6)
Birdsfoot Trefoil	F	F	10.0	15.0	10.0	15.0	10.0	15.0
Alsike Clover	G	G	6.4	9.6	6.4	9.6	6.4	9.6
Ladino Clover	G	F	6.0	9.0	6.0	9.0	6.0	9.0
Red Clover	F	F	12.2	18.2	12.2	18.2	12.2	18.2
Warm Season Legumes:								
Alfalfa	F	E	15.0	22.4	15.0	22.4	15.0	22.4
Common Lespedeza**	P	E	15.0	22.4	NA	NA	15.0	22.4
Crownvetch	G	P	16.0	24.0	16.0	24.0	16.0	24.0
Sweetclover	P	F	12.6	19.0	12.6	19.0	12.6	19.0
Cool Season Grasses:								
Canada or Virginia Wildrye	F	E	16.0	24.0	20.0	28.0	24.0	32.0
Kentucky Bluegrass	G	G	4.4	6.6	5.4	7.6	6.6	8.8
Orchard Grass	F	E	8.4	12.6	10.4	14.6	12.6	16.8
Redtop	G	G	3.4	5.0	4.2	6.0	5.0	6.8
Reed Canarygrass	E	P	9.6	14.4	12.0	16.8	14.4	19.2
Smooth Brome	E	F	16.0	24.0	20.0	28.0	24.0	32.0
Tall Fescue	E	P	16.0	24.0	20.0	28.0	24.0	32.0
Timothy	G	E	6.2	9.2	7.8	10.8	9.2	12.4
Western Wheatgrass	G	F	16.0	24.0	20.0	28.0	24.0	32.0
Warm Season Grasses:								
Bermudagrass	E	P	4.2	6.2	NA	NA	4.2	6.2
Big Bluestem	F	G	16.0	24.0	NA	NA	16.0	24.0
Caucasian Bluestem	G	P	4.8	7.2	NA	NA	4.8	7.2
Eastern Gamagrass	P	G	16.0	24.0	NA	NA	16.0	24.0
Indiangrass	F	E	15.6	23.4	NA	NA	15.6	23.4
Little Bluestem	G	E	12.8	19.2	NA	NA	12.8	19.2
Side-oats Grama	G	E	15.0	22.4	NA	NA	15.0	22.4
Switchgrass	G	G	9.4	14.0	NA	NA	9.4	14.0

Columns 1&2: Select the proper planting rate depending on the method of seeding (good or fair chance of seedling establishment).

Columns 3&4: Seeding rates are to be adjusted if cool-season grasses are fall planted with legumes.

Columns 5&6: Seeding rates are to be adjusted if cool-season grasses are dormant or spring planted with legumes.

*Wildlife and Erosion Control Ratings of E - Excellent, G - Good, F - Fair, and P - Poor.

**Common lespedeza may be seeded dormant or spring planted only.

TABLE 3: SPECIES COMPATIBILITY FOR CRITICAL AREA PLANTING

SPECIES	SYMBOL	LEGUMES								C/S GRASSES								W/S GRASSES									
		bitr	alsi	lacl	recl	alfa	cole	crow	swcl	cawi	kebl	orch	redt	reca	smbr	tafe	timo	wewh	berm	bibl	cabl	eaga	indi	libl	sigr	swit	
Cool Season Legumes:																											
Birdsfoot Trefoil	bitr	G	F	G	F	G	F	F	G	F	F	G	F	P	G	G	G	F	F	G	F	G	G	G	G	G	G
Alsike Clover	alsi	F	G	F	G	F	F	P	F	G	G	G	G	F	G	G	G	F	P	P	P	F	P	P	P	P	F
Ladino Clover	lacl	G	F	G	G	G	F	F	G	F	G	G	G	F	G	G	G	F	F	F	P	F	F	F	F	F	F
Red Clover	recl	F	G	G	G	F	F	P	F	F	G	G	G	F	G	G	G	F	P	P	P	P	P	P	P	P	P
Warm Season Legumes:																											
Alfalfa	alfa	G	F	G	F	G	F	P	G	F	P	G	P	F	G	F	G	F	P	F	F	F	F	F	F	F	F
Common Lespedeza	cole	F	G	F	F	F	G	P	F	F	G	F	G	P	F	G	G	F	F	P	F	P	P	F	F	P	P
Crownvetch	crow	F	P	G	P	P	P	G	P	F	F	G	F	P	F	F	G	F	P	F	P	F	F	F	F	F	F
Sweetclover	swcl	F	F	G	F	G	F	P	G	G	G	F	G	P	F	F	F	G	P	F	P	F	F	F	F	F	F
Cool Season Grasses:																											
Canada or Virginia 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	G
Kentucky Bluegrass	kebl	F	G	G	G	P	G	F	G	P	G	P	F	P	F	P	F	F	P	P	P	P	P	P	P	P	P
Orchard Grass	orch	G	G	G	G	G	F	G	F	P	P	G	F	P	G	G	G	F	P	F	P	F	F	F	F	F	F
Redtop	redt	F	G	G	G	P	G	F	G	F	F	F	G	P	F	F	F	F	P	G	F	G	G	G	G	G	G
Reed Canarygrass	reca	P	F	F	F	F	P	P	P	F	P	P	P	G	P	P	P	P	P	P	P	P	P	P	P	P	P
Smooth Brome	smbr	G	G	G	G	G	F	F	F	P	F	G	F	P	G	F	G	P	P	P	P	P	P	P	P	P	P
Tall Fescue	tafe	G	G	G	G	F	G	F	F	P	P	G	F	P	F	G	G	P	F	P	F	P	P	P	P	P	P
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	G
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	G
Warm Season Grasses:																											
Bermudagrass	berm	F	P	P	P	P	F	P	P	P	P	P	P	P	P	F	P	P	G	P	P	P	P	P	P	P	P
Big Bluestem	bibl	G	P	F	P	F	P	F	F	G	P	F	G	P	P	P	G	G	P	G	P	G	G	G	G	G	G
Caucasian Bluestem	cabl	F	P	P	P	F	F	P	P	P	P	P	F	P	P	F	P	P	F	P	G	P	P	P	P	P	P
Eastern Gamagrass	eaga	G	F	F	P	F	P	F	F	G	P	F	G	P	P	P	G	G	P	G	P	G	G	G	G	G	G
Indiangrass	indi	G	P	F	P	F	P	F	F	G	P	F	G	P	P	P	G	G	P	G	P	G	G	G	G	G	G
Little Bluestem	libl	G	P	F	P	F	F	F	F	G	P	F	G	P	P	P	F	G	P	G	P	G	G	G	G	G	G
Side-oats Grama	sigr	G	P	F	P	F	F	F	F	G	P	F	G	P	P	P	F	G	P	G	P	G	G	G	G	G	G
Switchgrass	swit	G	F	F	P	F	P	F	F	G	P	F	G	P	P	P	G	G	P	G	P	G	G	G	G	G	G

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

TABLE 4 - SPECIES, VARIETY, AND SEEDING RATE FOR SAND PLANTINGS

Species	Variety ^{1/}	Seeding Rate (PLS lb./ac.)	Notes
Warm Season Grasses			
Sand bluestem	Garden*, Gold Strike*	20	native, sod-former
Prairie sandreed	Pronghorn*, Goshen	12.7	native, sod-former
Big bluestem	Champ	16	
Switchgrass	Cave-In-Rock, Kanlow, Alamo	9.4	
Little bluestem	Cimmaron	12.8	
Sand lovegrass	Common	2.7	native, bunch grass
Sand dropseed	Common	0.7	native, bunchgrass
Coastal panicgrass	Atlantic	10	native, bunchgrass
Cool Season Grasses			
Canada wildrye	S. Iowa Ecotype	16	
Forbs			
Maximillian sunflower	Common	23	
Legumes			
Showy partridge pea	Common	32	
Alfalfa	Cody	15	

^{1/} Species and varieties were tested with the best ones listed in Table 4. Although sand dropseed was not a planted species, it occurred naturally on field trials. Within each broad plant category, the species are listed from the best suited to least suited on true deep sands. A single asterisk (*) indicates the grass varieties that performed the best in trials only on the deep sands.

NOTE: Other species that were tested but are not recommended for Sand Plantings in Missouri are:

Legumes: Illinois bundleflower, Birdsfoot trefoil, Crownvetch, Flatpea, and Medium red clover;

Warm Season Grasses: Indiangrass, Sideoats grama, and Buffalograss; and

Cool Season Grasses: Mammoth wildrye, Intermediate wheatgrass, Tall fescue, Reed canarygrass, Smooth brome grass, and Dune wildrye.