

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

CRITICAL AREA PLANTING

(Ac.)

CODE 342

DEFINITION

The establishing of permanent vegetation on sites that have or are expected to have high erosion rates, and on sites that have physical, chemical or biological conditions that prevent the establishment of vegetation with normal practices.

PURPOSE

- Stabilize areas with existing or expected high rates of soil erosion by water.
- Stabilize areas with existing or expected high rates of soil erosion by wind.
- Rehabilitate and revegetate degraded sites that cannot be stabilized through normal farming practices.
- Stabilize coastal areas, such as sand dunes and riparian areas.
- Vegetating grassed waterways.

CONDITIONS WHERE PRACTICE APPLIES

The practice applies to highly disturbed areas such as active or abandoned mined lands, urban conservation sites, road construction areas, conservation practice construction sites, areas needing stabilization before or after natural disasters such as floods, hurricanes, tornados and wildfires and other areas degraded by human activities or natural events.

The practice also applies to vegetating concentrated flow channels such as natural and constructed waterways. Refer to Salinity and Sodic Soil Management (Practice Code 610) for treatment of sites affected by salts and/or sodium.

CRITERIA

General Criteria Applicable To All Purposes

A site investigation shall be conducted to identify any physical, chemical or biological conditions that could affect the successful establishment of vegetation. Typical critical area site assessments will include evaluations of:

- soil characteristics
- aspect
- slope
- sunlight exposure or degree of shade
- proximity to natural plant communities
- site history
- soil fertility and pH
- previous herbicide applications

Species selected for seeding or planting shall be suited to current site conditions and intended uses. Common critical area conditions are presented in Table 3, Site Groupings.

No plants on the State of Illinois noxious weeds list shall be planted.

Selected species will have the capacity to achieve adequate density and vigor within an appropriate period to stabilize the site sufficiently to permit suited uses with ordinary management activities.

Species, rates of seeding or planting, minimum quality of planting stock, such as pure live seed (PLS) or stem caliper, method of seedbed preparation, and method of establishment shall be specified before application. Only viable, high quality seed or planting stock will be used.

Seeding or planting shall be done at a time and in a manner that best ensures establishment and growth of the selected species. Refer to Table 1 for seeding periods. The seeding dates may be extended on a site-specific basis by two weeks based on current and forecasted weather. What constitutes successful establishment, e.g. minimum percent ground/canopy cover, percent survival, stand density, etc. shall be specified before application.

Apply soil amendments (e.g. lime, fertilizer, compost) at rates necessary to ensure stand establishment.

Plantings shall be protected from pests (e.g. weeds, insects, diseases, livestock, and wildlife) as necessary to ensure stand establishment. Specific measures shall conform to the recommendations provided by the University of Illinois.

The amount of plant biomass and cover needed to reduce wind and water erosion to the planned soil loss objective shall be determined using the current approved wind and/or water erosion prediction technology.

Additional Criteria for Vegetating Natural or Constructed Waterways

To stabilize ephemeral and gully erosion in areas of concentrated water flow, the area to be planted must be shaped to meet the criteria of Conservation Practice Standard 412 – Grassed Waterway. To stabilize banks of streams or constructed channels, the area to be planted must be protected in accordance with the criteria of Conservation Practice Standard 580 – Streambank and Shoreline Protection.

Additional Criteria to Restore Degraded Sites

Gullies and/or deep rills, if present, will be filled and the soil surface will be shaped to ensure proper site and seedbed preparation and, if feasible, to allow for future farm equipment operation.

Soil amendments will be added as necessary to ameliorate or eliminate physical or chemical conditions that inhibit plant establishment and growth. Fertilizer requirements will be determined based on

Table 5 or a soil test. Where soil tests are used to plan the required fertilizers, the recommendations will be based on the recommended soil test levels in the Illinois Agronomy Handbook for the species that will provide the permanent vegetative cover. The need for amendments such as compost and/or manure to add organic matter and improve soil structure and water holding capacity will be determined by the planner. Agricultural limestone to increase the pH of acid soils or elemental sulfur to lower the pH of alkaline soils will be determined by soil tests or published soil surveys. All fertilizer, pH adjusting materials, and organic amendments shall be included in site plans that specify amounts, timing, and method of application.

Additional Criteria to Restore Sand Dunes and Coastal Sites

Plants for sand dunes and coastal sites must be able to survive being buried by blowing sand, sand blasting, salt spray, salt water flooding, drought, heat, and low nutrient supply.

Local plant lists including appropriate species shall be developed and utilized.

Sand trapping devices such as sand fences or brush matting shall be included in the revegetation/stabilization plans where applicable.

CONSIDERATIONS

Species or mixes that are adapted to the site and have multiple values should be considered. Native species should be considered when appropriate to site treatment.

Avoid species that may harbor pests. Species diversity should be considered to avoid loss of function due to species-specific pests.

Plans should be in compliance with the Migratory Bird Treaty Act.

Planning and installation of other conservation practices such as Diversions, Land Smoothing, Obstruction Removal, Surface and Subsurface Drains or Underground Outlets may be necessary to prepare a critical area for planting.

If mulching is needed, follow the Mulching (484) standard.

PLANS AND SPECIFICATIONS

Prepare plans and specifications for each field or management unit according to the criteria and operation and maintenance sections of this standard. Specifications shall describe the requirements for applying this practice to meet the intended purpose.

Record practice specifications using approved specification sheets, job sheets or other acceptable documentation.

The following elements shall be addressed in the plan, as applicable, to meet the intended purpose.

- Site Preparation
- Topsoil
- Fertilizer Application
- Seedbed/Planting Bed Preparation
- Methods of Seeding/Planting
- Time of Seeding/Planting
- Selection of Species
- Seed/Plant Source
- Seed Analysis
- Rates of Seeding
- Mulching
- Planting Trees, Shrubs and Vines
- Supplemental Water for Plant Establishment
- Protection of Plantings

Specifications for applying this practice shall be prepared for each site. Information will be recorded using the approved specification sheets or narrative statements and filed in the conservation plan.

Seed

All seed shall be of high quality and comply with Illinois Seed and Weed Laws; and originate from the United States or Canada.

Seed quality shall not drop below 70% Pure Live Seed (PLS) for bromegrass and 80% for other cool season grass and legume species.

$$PLS = \frac{(\% \text{ germination} + \% \text{ dormant seed}) \times \% \text{ purity}}{100}$$

Grass and legume seeding rates are expressed in PLS pounds/acre in the tables. Minimum germination percent for warm season grasses shall be as follows:

Switchgrass - 75%,
Indiangrass - 60%,
Big Bluestem - 60%, and
Eastern Gamagrass - 50%.

Germination tests are required for all warm and cool season grasses and legumes (excluding companion crops). Germination tests may not be older than 12 months at time of seeding, excluding the month of testing.

Approved seeding mixtures and rates are found in Tables 2 and 4.

Legume Inoculation

Legume seeds shall be treated with a pure culture of nitrogen fixing bacteria prepared specifically for the species to be seeded. Where more than one legume is included in the seed mixture, inoculate each species separately. A sticker, as recommended by the inoculant manufacturer, will be used to secure the bacteria to the seed. Refer to Illinois Agronomy Technical Note Number 20 for guidance.

Uncoated seed pre-inoculated greater than 60 days will be re-inoculated. Pre-inoculated seed that has been coated must be seeded within 12 months of inoculation, otherwise re-inoculate. In no cases shall inoculum be used after the expiration date including inoculum that is included with the seed as a pre-treatment.

Legumes not pre-inoculated will be inoculated within 24 hours of seeding.

Inoculant rates will be tripled when seed is applied with hydroseeding methods.

Lime and Fertilizer

Agricultural limestone will be applied to adjust soil pH levels as necessary for the species to be established. Limestone application rates will be calculated according to the guidelines contained in the Illinois Agronomy Handbook. Fertilizer will be applied according to soil tests or per Table 5. Organic amendments may be used in lieu of commercial fertilizers. Nutrient content of organic amendments may be determined by laboratory analysis or estimated based on "book" values.

Site preparation**Construction sites**

The seedbed shall be suitable for root growth of at least one foot in depth after construction is completed. Where necessary to restore or maintain productivity, spread topsoil over areas disturbed by construction. If specified by the designer, spread a minimum of 6 inches of topsoil on the area to be seeded, bringing the area to the final specified grade.

Seedbed preparation for temporary seedings on construction sites shall be performed according to the following guidelines:

- Seedings applied within 24 hours of final grading may be performed with no seedbed preparation.
- Fertilizer and lime are not required where seedings are planned to provide 90 days or less protection.
- Temporary cover seedings planned to provide 90 days or greater protection will be limed and fertilized as needed. Amendments will be incorporated to a depth of 3 inches. Seedbed preparation may be limited to the extent required to incorporate soil amendments.
- Temporary seedings expected to last more than one year will be applied with conventional seedbed preparation methods.
- See Table 5 for approved temporary covers. For additional cover crops, refer to the Cover Crop Practice Standard and Specifications (Practice Code 340).

Seedbed Preparation and Establishment Methods for Permanent Vegetation**Conventional Method**

Incorporate required amendments to depth of 3 inches, leaving a firm seedbed free of large clods, stones, and debris larger than 6 inches in diameter. Seedbed must be firmed with a cultipacker/cultimulcher, harrow, or similar tool designed to break clods, level, and firm the seedbed. Seedbeds are considered firm when footprints leave no more than a 1/2 inch deep depression. Apply seed uniformly at a depth of 1/4-1/2 inch with a drill or cultipacker type seeder. Broadcast methods are acceptable where the seed will be applied uniformly and covered 1/4-1/2 inch deep with a cultipacker/cultimulcher, harrow, or similar tool designed to break clods, level, and firm the seedbed.

Dormant Seedings

Prepare a conventional seedbed when soils are conducive to tillage. Apply and anchor mulch according to the Mulching Practice Standard and Specifications (Practice Code 484). Apply seed using the broadcast or hydroseed method during the dormant seeding period.

Hydroseeding

Seed, fertilizer, lime, and mulch may be applied together. Hydrated lime may not be used in the slurry mix. Slurry mixes will have no more than 125 pounds of solids per 100 gallons of water. The pH of the slurry shall be a minimum of 6.0 when inoculated legumes are included in the seed mixture.

Legumes to be hydroseeded will be inoculated at triple the rate recommended by the manufacturer. When inoculant is added to the fertilizer and lime mixture, begin slurry application within 30 minutes. Re-inoculate slurry if mixture is not completely applied within one hour.

Hydroseeded slurries shall be applied to a moist soil surface.

Mulching

Mulching is beneficial to the establishment of new seedings to stabilize earthwork on engineering practices and other Critical Area seedings. Table 5 lists mulching requirements for the various categories of Critical Area Planting sites.

Apply mulch according to the Mulching Practice Standard and Specifications (Practice Code 484).

Establishing Sod

Grade area(s) to a slope of 2:1 or flatter. Smooth area to remove rills and gullies. Remove all debris that would prevent contact between the soil and sod roots. Use of ladders on steep slopes will speed sod installation, prevent disruption of the seedbed, and avoid damage to the sod. Sodding must be complete by October 1.

Lime and fertilize according to soil tests. Where soil tests are unavailable, apply 120 lbs. /ac each of N-P₂O₅-K₂O. Incorporate required soil amendments 3 inches deep and prepare a conventional seedbed.

Moisten soil to a depth of 2 inches.

Use only moist, freshly cut sod cut uniformly 1/2-1 inch in thickness.

Start laying sod on the lower end of slopes and perpendicular to the flow of runoff. Stagger joints and fill them with loose soil and compact after sod strips are laid. Tamp or roll installed sod to ensure uniform and complete contact between the soil and sod roots. Irrigate installed sod with sufficient volume to percolate to the soil layer under the sod.

VEGETATING ACID MINE SPOIL MATERIAL

Slurry and Gob Material

Divert surface runoff from surrounding land where applicable. Smooth the surface to fill rills and gullies.

Slope lengths greater than 100 feet will require terraces and/or diversions.

Apply a minimum of 10 tons/acre of limestone.

Top dress gob or slurry material uniformly with a minimum of 6 inches of suitable soil material. Scarify the surface before applying the soil material. Remove debris such as stones greater than 4 inches in diameter that will interfere with seeding operations.

Apply limestone to the cover material to correct soil pH to a minimum of 6.0. Apply and

incorporate fertilizer that will provide 120-300-180 pounds per acre of N-P₂O₅-K₂O.

Prepare a firm, conventional seedbed. Use seed mixtures found in Table 4. Apply mulch according to the specifications contained in the Mulching practice standard and specifications (Practice Code 484).

Acid Overburden Material

Limestone requirements will be determined using the Acid Base Accounting Method.

Limestone must have a Calcium Carbonate Equivalent of 80%. The particle size distribution must have at least 10% larger than 8-mesh screen; 30% pass 8-mesh and are held on a 30-mesh screen; 30% pass 30-mesh screen and are held on a 60-mesh screen; and 30% pass a 60-mesh screen.

Limestone shall not be applied in a single application greater than 25 tons/acre. Sites requiring greater than 25 tons/acre will be limed at 2/3 the calculated rate. Limestone will be incorporated to a depth of 6 inches. The remaining limestone shall be applied within 2 years of the initial seeding.

Delay seeding for 2-4 weeks to allow for some acid neutralization.

Apply and incorporate 60-120-120 lbs./acre of N-P₂O₅-K₂O to a depth of 6 inches.

Establish a green manure crop according to the Cover Crop practice standards and specifications (Practice Code 340). The green manure will be managed according to the guidelines listed under the criteria to increase organic matter content. The permanent cover will be established during the next seeding period following green manure incorporation.

The overburden material will be re-tested prior to the permanent seeding using the Acid Base Accounting Method to determine the extent the pH has been corrected and calculate if additional lime required is needed.

Permanent cover will be established using seed mixtures contained in Table 4. Apply and incorporate 50-180-60 lbs./acre of N-P₂O₅-K₂O and additional lime to a depth of 3 inches and prepare a conventional seedbed.

All seedings will be mulched according to the guidelines found in the Mulching practice standard and specifications (Practice Code 484).

Seedings may be established with a nurse crop if mulching is not feasible.

Tree and Shrub Plantings

Trees and shrubs may be used to vegetate acid mine spoils. Tree spacing and site preparation shall be performed according to the Tree/Shrub Establishment practice standard and specifications (Practice Code 612).

VEGETATING NATURAL OR CONSTRUCTED WATERWAYS

The constructed channel and adjacent areas disturbed during construction where vegetation is needed for proper functioning of the waterway shall be vegetated.

When shaping and grading is complete, remove roots, limbs, rocks, or other debris that would interfere with seeding and maintenance activities.

Prior to seedbed preparation, apply 120 lbs./acre each (N-P₂O₅-K₂O). Apply limestone if necessary for the species to be grown.

Prepare the seedbed as specified in the "Seedbed Preparation and Establishment Methods for Permanent Vegetation" Section.

Select a suitable seed mixture from Table 2. Grade stabilization structures constructed to stabilize grassed waterway outlets may be seeded with the grassed water way seed mixture. Companion legumes seeded at rates in the table below **may** be added to seed mixtures listed in Table 2.

Legume	PLS/acre
Alfalfa or, Red Clover or, Alsike Clover	8
Birdsfoot Trefoil	12

Drill seeding and seed covering operations will be completed perpendicular to flow of water.

Seeding will be completed within the seeding periods specified in Table 1. Late summer

dates can be extended by 14 days if soil moisture and temperatures favor the establishment of the seeding.

Seed a companion crop of oats at 32 lbs./ac for spring seedings or 20 lbs./ac of either wheat or cereal rye for late summer seedings.

Where temporary vegetative cover is necessary to stabilize a waterway during the midsummer period, establish one of the following covers;

Cover Crop	Rate lbs./acre
Sudangrass	20
Shelled corn	250
Oats	100

Where temporary vegetative cover is necessary to stabilize a waterway after the fall seeding period has passed, establish one of the following cool season covers:

Wheat or cereal rye 150 lbs./ac

Fall temporary cover can be seeded until the following dates after which temporary cover must be provided by mulching:

- Plant Suitability Zone 1 October 21
- Plant Suitability Zone 2 November 3
- Plant Suitability Zone 3 November 11

OPERATION AND MAINTENANCE

Use of the area shall be managed as long as necessary to stabilize the site and achieve the intended purpose.

Control or exclude pests that will interfere with the timely establishment of vegetation.

Inspections, reseeding or replanting, fertilization, and pest control may be needed to insure that this practice functions as intended throughout its expected life.

Protect grassed waterways from damage by farm equipment, vehicular traffic, and livestock.

Repair and re-seed any damaged or scoured areas as soon as possible

REFERENCES

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Daniels, W.L., B. Stewart, D. Dove. 1996. Reclamation of Coal Refuse Disposal Areas. Virginia Cooperative Extension Service Publication Number 460-131.

Illinois Agronomy Handbook, University of Illinois- Urbana-Champaign, College of Agricultural, Consumer and Environmental Sciences, Department of Crop Sciences, University of Illinois Extension, Circular 1360.

Skousen, J., W.L., C.E. Zipper. 1997. Revegetation Species and Practices. Virginia Cooperative Extension Publication Number 460-122.

USDA, NRCS. 2001. The PLANTS Database, Version 3.1 (<http://plants.usda.gov>). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

Wolf, D.D., R.D. Morse, J.L. Neal. 1985. Legume Inoculum Survival in Hydroseeder Slurries. Virginia Cooperative Extension Service Publication Number 460-105.

Table 1. Acceptable Planting Dates by Plant Suitability Zones

TYPE OF SEEDING	PLANT SUITABILITY ZONE	COOL SEASON SPECIES	WARM SEASON SPECIES ²
Spring	I	Late Winter - June 1	Late Winter - June 15
	II	Late Winter - May 15	Late Winter - June 5
	III	Late Winter - May 15	Late Winter - June 1
Late Summer	I	August 1 - September 1	Not Recommended
	II	August 1 - September 10	Not Recommended
	III	August 1 - September 20	Not Recommended
Dormant	I	November 1 - Freeze-up	November 1 - Freeze-up
	II	November 15 - Freeze up	November 15 - Freeze up
	III	November 15 - Freeze up	November 15 - Freeze up
Frost	I	February 1 - March 15	February 1- March 15
	II	February 1 - March 1	February 1 -March 1
	III	February 1 - March 1	February 1 -March 1

¹ - Refer to the "Plant Suitability Zones" map locate in Section I, IL-FOTG-Climatic Data

² - Dates to be used when warm and cool season natives are planted in mixture.

Table 2. Seed Mixtures for Grassed Waterways***

Seed Mixture*	Seeding Rate PLS lbs./acre	SITE SUITABILITY		Remarks	Retardance Height Range, inches				
		Well Drained	Poorly Drained		Unmowed Retardance	B	C	D**	E**
Smooth Bromegrass and Redtop or Timothy	20 and 4 or 4	X			B	16-33	7-16	3-7	0-3
Smooth Bromegrass and Tall Fescue	8 and 16	X	X		B	16-33	7-16	3-7	0-3
Tall Fescue	20	X	X		B	16-33	7-16	3-7	0-3
Smooth Bromegrass and Perennial Ryegrass	10 and 10	X	X		B	16-30	7-16	3-7	0-3
Tall Fescue and Redtop or Timothy	16 and 4 or 4	X	X		B	16-30	7-16	3-7	0-3
Kentucky Bluegrass	35	X		Suitable for areas where close mowing is desired.	C	---	5-12	2-5	0-2
Kentucky Bluegrass and Red Fescue	4 and 20	X	X	Suitable for areas where close mowing is desired. Adapted to shady sites.	C	---	6-12	2-6	0-2
Redtop	8		X		B	16-30	7-16	3-7	0-3
Canada Wildrye and Western Wheatgrass	10 and 10	X	X		B	16-30	7-16	3-7	0-3
Tall Fescue and Perennial Ryegrass	12 and 10	X			B	16-27	7-16	3-7	0-3
Kentucky Bluegrass and	20 and 10	X	X	Suitable for areas where close mowing is	C	---	6-13	2-6	0-2

Perennial Ryegrass				desired.					
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* Use planting dates for cool season species for all mixtures in Table 2.

** D and E retardance for all mixes (except the three with Kentucky bluegrass) shall be used for stability design purposes ONLY. Maintenance at these heights after establishment will result in loss of vegetation.

***The seed mixtures included in the table above may also be used for grade stabilization structures constructed to provide a stable outlet to the grassed waterway(s).

Table 3. Site Groupings

Site Group	Description
1	dams, dikes, borrow areas, road cuts and other construction areas
2	steep eroding land, idled or formerly cropped land affected by severe erosion
3	blow outs in sandy soils
4	acidic mine refuse such as gob areas, slurry pit areas , and/or acid overburden material.
5	ditch bank side slopes
6	ditch bank spoil areas

1. Oats may be used for seedings in planted early spring to August 15.

2. Wheat or Cereal Rye must be used for seedings planted after August 15 but may be used for early spring seedings also.

Table 4. Seed Mixtures

Seed Mixture	Seeding Rate PLS lbs./acre	pH Suitability	Site Groups ³
Cool Season Mixtures			
Smooth Bromegrass and Alfalfa	24 and 8	6.0-7.5	1,2,5,6
Tall Fescue and Alfalfa	24 and 8	6.0-7.5	1,2,3,5,6
Tall Fescue or Smooth Bromegrass and Timothy or Redtop and Birdsfoot Trefoil	12 or 24 and 2.5 and 12	5.5-7.5	1,2,3,4,5,6
Tall Fescue or Smooth Bromegrass and Perennial Ryegrass and Alsike, or Red Clover	12 or 20 and 10 and 8	6.0-7.0	1,2,3,5,6,
Tall Fescue or Smooth Bromegrass and Redtop or Timothy and Alsike, or Red Clover	12 or 24 and 2.5 and 8	6.0-7.0	1,2,3,5,6
Tall Fescue and Smooth Bromegrass and Alfalfa	12 and 12 and 8	6.5-7.5	1,2,3,5,6
Smooth Bromegrass or Tall Fescue and Perennial Ryegrass and Alfalfa	20 or 10 and 10 and 8	6.0-7.5	1,2,3,5,6
Smooth Bromegrass or Tall Fescue and Perennial Ryegrass and Birdsfoot Trefoil	20 or 10 and 10 and 12	5.0-7.0	1,2,4,5,6
Redtop	8	4.5-8.0	Dikes constructed for wetland restoration

Seed Mixture	Seeding Rate PLS lbs./acre	pH Suitability	Site Groups³
Warm Season Mixtures			
Switchgrass 'Cave-in-Rock'	8	5.5-7.0	1,2,6
Switchgrass 'Cave-in-Rock' and Big Bluestem and Indiangrass	2 and 6 and 6	5.5-7.0	1,2,6
Canada Wildrye and Western Wheatgrass	10 and 10	5.0-8.0	1,2,4,5,6,
Canada Wildrye and Switchgrass 'Cave-in-Rock'	10 and 6	5.0-8.0	1,2,4,5,6,
3. Site Groups described in Table 3.			

Table 5. Fertilizer, Companion Crop and Mulch Requirements.

Site Grouping	Fertilizer (lbs./acre) N-P ₂ O ₅ -K ₂ O	Companion Crop		Mulch	Remarks
		Oats ¹	Cereal Rye or Wheat ²		
1	120-120-120	1 bu./acre	20 lbs./acre		The designer with engineering job approval authority is responsible for determining if mulching is required for the site specific engineering practice.
2,3,5	120-120-120	1 bu./acre	20 lbs./acre	Yes	For site groups 2 and 3, incorporate manure mixed with straw or sawdust bedding where available
4-Gob or Slurry	120-300-180	1 bu./acre	20 lbs./acre	Yes	
4-Acid overburden	60-120-120 at cover crop establishment 50-180-60 at permanent cover establishment	1 bu./acre	20 lbs./acre	Yes	
6	60-60-60	1 bu./acre	20 lbs./acre		The designer with engineering job approval authority is responsible for determining if mulching is required.
Grassed waterways	120-120-120	1 bu./acre	20 lbs./acre		The designer with engineering job approval authority is responsible for determining if mulching is required for specific grassed waterways.
Temporary Cover (45-365 days)	60-60-60 (Note: Fertilizer is not required for seedings planned to provide < 90 days of protection)	Temporary Cover		No	Only wheat or rye will be used where the temporary cover period includes the winter months. Sudangrass or sorghum-sudangrass can be used where the planting date is between May 1 – August 1.
		Oats, wheat, or cereal rye at 90 lbs/acre Sudangrass or sorghum-sudan hybrids at 20 lbs./acre			
Temporary Cover (>-365 days)	60-60-60	Annual or perennial ryegrass 20 lbs./acre		Yes	

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