

NATURAL RESOURCES CONSERVATION SERVICE

**CRITICAL AREA PLANTING DESIGN PROCEDURES**

(342DP)

**A. STABILIZING CRITICAL AREAS BY SEEDING HERBACEOUS VEGETATION:** Overall guidance for site preparation and seeding and establishing herbaceous seedings is found in (550DP) Herbaceous Vegetation Design Procedures> In addition the following apply to seeding critical areas:

**1) Grading Shaping and Filling**

- a) Necessary grading, shaping and smoothing shall be made before seedbed preparations are started and to the degree necessary to establish cover and permit the intended use of the area. Slopes on dunes and blowouts will not exceed three horizontal to one vertical. For practices such as dams, grassed waterways, diversions, terraces or other structural practices grading and shaping shall be completed according to the appropriate practice standard(s).
- b) On steep banks, earth moving machinery should be used to shape the area in a manner that seedbed preparation and seeding operations can be carried out and permit the use of conventional equipment for seedbed preparation (Cabling of equipment may be necessary on slopes steeper than three horizontal to one vertical).

**2) Seedbed/Site Preparation**

- a) Refer to 550DP for guidance.

**3) Cover Crops/Mulching**

- a) On low fertility sites and sites prone to excessive erosion a cover crop/companion cover crop or mulching shall be used. (Refer to 550DP for requirements on cover crops/companion cover crops)

**4) Seeding Rates**

- a) When drilled, mixtures will provide a minimum of 60 P.L.S. seeds per square foot of grass. Companion crops and forbs/legumes are added to the mixture will be above and beyond grass seeding rates.
- b) Double the grass seeding rate when broadcasting or hydroseeding (120 P.L.S. seeds per square foot)

**5) Seed Mixtures**

- a) Will contain at least 60% sod-forming grass species and will contain a minimum of two grass species. Refer to Table 1 for species adapted to specific purposes and Table 3 for example mixtures.
- b) Emergency spillways or other critical areas that will have concentrated water flow must meet requirements in Section B for grassed waterways and other concentrated flow areas including use of at least 80% sod-forming grass species (refer to Part B for more information).
- c) All species must be adapted to the site per either the 512 Pasture Planting or 550 Range Planting Standards.
- d) Refer to 550 DP for additional guidance on species and variety selection.

**6) Seeding Method**

- a) Grass drills, interseeders, mechanical power drawn drills, hydraulic seeders or other types of seeders
  - i) Refer to 550DP for guidance on appropriate seeding equipment
  - ii) Grass Drill will be used unless the area is too steep for equipment operation.
- b) Broadcast seeding
  - i) Refer to 550DP for guidance
  - ii) Only on areas too steep for equipment operation

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- iii) Cover seed by dragging a harrow and then pack with a roller to provide good soil-seed contact whenever possible.
- iv) Shall be done as soon as possible after shaping (prior to the ground sealing).
- c) Hydroseeding
  - i) Refer to 550DP for guidance
  - ii) Only on areas too steep for equipment operation, seed mixtures may be broadcast along with a companion cover crop.
  - iii) Shall be done as soon as possible after shaping (prior to the ground sealing).

### **7) Seeding dates:**

- a) Refer to 550DP for guidance.

### **8) Fertilizing/Liming**

- a) Refer to 550DP for guidance
- b) On sites with at least 2 inches of topsoil no fertilizer should be used in the establishment year.
- c) On sites without topsoil and low in fertility Zinc/Sulfur fertilizer or manure should applied at agronomic rates
- d) Nitrogen, Phosphorus and other nutrients shall be applied to maintain a healthy stand of grasses per soil test results and according to standard Nutrient Management (590) after establishment.

### **9) Weed/Pest Control for Establishment Maintenance and Protection of Seeded Critical Areas.**

- a) Refer to 550DP for guidance.
- b) Critical areas need to be established as quickly as possible in order to have the maximum amount of protective vegetative cover as soon as possible to prevent erosion.

### **10) Irrigation**

- a) When an irrigation system is available or can be set-up temporarily it should be utilized to enhance establishment (especially in droughty periods or when quick establishment is needed).
- b) Application of water will be light, frequent and at a rate that no erosion occurs until plants are established.



**B. STABILIZING GRASSED WATERWAY, EMERGENCY SPILLWAYS, CHANNELS AND OTHER CONCENTRATED WATER FLOW CRITICAL AREAS** (All of the following apply and must be taken into account when developing specifications):

**1) Grass Mixtures**

- a) Grasses species selection
  - i) Refer to Table 1 for species best adapted for channels and grassed waterways.
  - ii) Species listed in Table 2 and other species not listed, and varieties must be adapted to the site (refer to Range Planting (550) practice standard, or Pasture Planting (512) and/or Section II Pastureland Interpretations, "Certified Perennial Varieties for Nebraska".
  - iii) Refer to Table 3 for example grassed waterway mixtures.
- b) Sod-forming grasses shall constitute at least 80 percent of the grass mixture.
- c) Grass species selected for mixtures shall be compatible with vegetation management practices (timing and height of mowing, haying, incidental grazing, fertilizer, etc.) and herbicides that may enter the waterway.
- d) Requirements for Selection of Grass Species to avoid herbicide damage
  - i) When grass species tolerant to herbicides are not available, or measures to avoid the potential of herbicides entering waterways, are not practical, grassed waterways shall not be installed/recommended.
  - ii) Grasses and cover crops utilized must be adapted to herbicides that are likely to be applied across waterways, and/or have the potential to drift or enter the waterway through runoff (herbicide use and application method shall be determined prior to recommending grass mixtures).
  - iii) Herbicide labels shall be checked to determine which grass species and/or cover crops are adapted to herbicides that are likely to enter the waterway.
  - iv) Where glyphosate or other burndown herbicides are applied during the growing season:
    - (1) Mixtures must contain both warm and cool season grasses with different growth patterns to reduce the potential of herbicide damage because both types of grasses are not actively growing at the same time.
    - (2) If spraying only occurs in the early spring or late fall when cool season grasses are actively growing and warm season grasses are dormant, cool season grasses shall not be included in the mixture.
    - (3) Once established grass species (established) listed below have demonstrated a wide range of tolerance to many corn, sorghum, soybean and small grain soil applied (residual) herbicides. Specific examples are listed below.
      - (a) Western wheatgrass (tolerant to triazine, imidazolinone and other ALS-AHAS inhibition herbicides)
      - (b) All wheatgrasses (tolerant to imidazolinone and other ALS-AHAS inhibition herbicides)
      - (c) All native warm season grasses (tolerant to triazine, imidazolinone and other ALS-AHAS inhibition herbicides)
    - (4) Refer to the current "Guide for Weed Management" in Nebraska (<http://www.ianrpubs.unl.edu/>) for information on herbicide classifications.

**2) Avoiding Herbicide Damage To Grassed Waterways**

- a) Use proper operation and maintenance measures when applying herbicides
  - i) Shut off sprayers when crossing waterway
  - ii) Spray along the side of the waterway rather than across it

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- iii) Utilize soil applied herbicides that will not harm established grass.
- iv) Spray burn down herbicides only when grasses are dormant
- b) If absolutely necessary to spray a burndown herbicide across a waterways utilize the following measures to reduce the potential for injury:
  - i) Spray directly after close-mowing/haying in order to reduce leaf area prior to spraying, which will reduce the risk of glyphosate damage by limiting translocation of the herbicide.
  - ii) Spray very early in the growing season when very little leaf area or active growth is minimal.
  - iii) Avoid spraying during the time of the year when grasses are translocating carbohydrates to their root system.

### 3) **Additional Measures Required for Grass Establishment.**

- a) Mulching, cover crops, companion crops, side dikes, fabric/rock checks or a combination of these measures **will be employed on all grassed waterways and other concentrated flow channels** to facilitate vegetation establishment.
  - i) Mulching will be applied in accordance with the Mulching standard (484) after seeding has been completed.
    - (1) Mulching is the preferred method of temporary protection in most situations and may be used in combination with the other temporary protection measures
  - ii) Companion cover crops seeded along with the grass must be fast germinating and short-lived.
    - (1) Refer to 550DP for requirements on companion cover crops
  - iii) Cover crops seeded prior to grass planting
    - (1) Refer to 550DP and 340 Cover Crop standard for appropriate cover crops to use prior to planting grass.
  - iv) Sidedikes
    - (1) Refer to 412 Grassed Waterway Standard for guidance.

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**Table 2 Grass species for waterway mixtures**

X = Best suited, 0 = Fair, - = Poor or not suited, B = Bunchgrass, HR = Highly Rhizomonous (strong sodforming), S = Sodforming (not aggressive), SB = Sodforming that grows in bunches, SL = Short lived				
1/ Species	Non-sandy soils	Sandy soils	Poorly drained soils	Notes
<b>Native Cool Season Grasses:</b>				
<i>Canada wildrye</i>	0	0	X	S
<i>Virginia wildrye</i>	-	-	X	S
Western wheatgrass	X	X	X	HR
Thickspike wheatgrass	X	X	-	HR
<b>Warm season grasses</b>				
<b>Non-sandy soils</b>				
<b>Sandy soils</b>				
<b>Poorly drained soils</b>				
<b>Notes</b>				
Big bluestem	X	0	-	S
2/ <i>Blue grama</i>	0	0	-	B
<i>Buffalograss</i>	0	0	-	HR
Sand bluestem	-	X	-	S
Indiangrass	X	-	-	S
Sideoats grama	X	X	-	S
2/ <i>Sand lovegrass</i>	-	X	0	B
Switchgrass	X	X	X	SB
Prairie cordgrass	-	-	X	HR
<b>Introduced Cool Season Grasses:</b>				
<b>Non-sandy soils</b>				
<b>Sandy soils</b>				
<b>Poorly drained soils</b>				
<b>Notes</b>				
Intermediate wheatgrass	X	0	-	S
Pubescent wheatgrass	X	X	-	S
Creeping foxtail	X	-	X	HR
3/ Perennial ryegrass	X	0	0	SL, B
Smooth brome grass	X	-	-	HR
2/ <i>Tall fescue</i>	X	-	0	B
Reed canarygrass (improved varieties may aggressively invade wetland/riparian habitat)	-	-	X	HR

1/ Species in italics/underlined can make up no more than 25% individually and no more than 40% in total (in aggregate) of a mixture.

2/ Bunchgrass species can make up no more than 20% of a mixture (including other bunchgrass species not listed in this table). Avoid use of species that grow in bunches if sheet flow is desired i.e. Little Bluestem.

3/ Perennial ryegrass may be used as a companion crop with grass planting for short-term cover for erosion control. When using this grass species it shall be above and beyond the recommended seeding rate.

**C. STABILIZING CRITICAL AREAS WITH SOD, SPRIGS OR CUTTINGS** (for shaping, fertilizing, irrigation, maintenance, protection and other additional specifics refer to Section A “Stabilizing Critical Areas by Seeding Perennial Vegetation”).

**1) Plant materials**

- a) Obtain seedlings, plants, crowns, or sod plugs that are healthy and have received proper care in lifting from the nursery and during transport to the planting site.
- b) Plant material should never be allowed to become dry or overheated due to improper packing and hauling. Keep plant materials moist and as cool as possible after delivery to the site until they are set.

**2) Site Preparation**

- a) The surface to be sodded or sprigged shall be reasonably smooth, even, and free from debris. The surface shall be brought to the correct alignment, grade, and cross section.
- b) Refer to Section A “Stabilizing Critical Areas by Seeding Perennial Vegetation” for more information on grading, shaping and filling.

**3) Sodding**

- a) The site must have the ability to irrigate in order to keep soil moisture at or near field capacity during establishment.
- b) The sod should be in strips or blocks of a native grass mixture, Switchgrass, Prairie cordgrass, Reed canarygrass, or other suitable grasses (avoid using Reed canarygrass where it may invade and be undesirable). Bluegrass sod is used only when the area is irrigated. Sod materials are to be taken from good, solid, thick-growing stands.
- c) Sod shall be cut in strips of uniform width and to a uniform thickness of at least 3 inches for tall grass and ½ to 1-½ inches for short grasses. Lay sod within 24 hours from the time it is cut.
- d) Sod strips shall be carefully placed in rows across (perpendicular or at right angles to) the direction of slope. The sod strips shall be placed together tightly so that no open joints are left between strips or between the ends of strips. Joints between the ends of strips shall be staggered. Any spaces between joints shall be filled with topsoil and all edges of sod covered with topsoil at least 2 inches in depth. The edge of the sod at the top of slopes shall be turned slightly under and a layer of the soil compacted over the edge so as to conduct surface water over and onto the top of the sod. The sod shall be well tamped to help it remain firmly in place.
- e) On slopes steeper than three horizontal to one vertical or where high velocity flows are likely to occur over newly sodded areas, the strips should be held in place by wooden pegs or anchored with jute netting or other commercial netting over the sod (refer to 484 Mulching standard).

**4) Sprigs/Cuttings (use on wet sites only)**

- a) Prairie cordgrass or Reed canarygrass sprigs or cuttings will be planted at 1-foot intervals along the water edge for shorelines, in front of impoundment structures, areas that are subject wave action, edge of concrete or metal structures, or on any site where there is danger from rodent damage. This will include the areas in front of the weirs and along the side of the wingwalls of concrete, or sheet-metal weir structures. Sprigs will be planted in the strip from 6 to 12-inches from the structure. Reed canarygrass should be avoided where it has the potential to spread into areas where it is not desired.
- b) Parallel strips of Prairie cordgrass or Reed canarygrass may be placed across spillways, flumes, waterways, roadside ditches, areas that are subject to concentrated flow erosion, or other appropriate areas.
- c) Sprigs/cuttings should be at least 6-inches long, consist of a growing point, and should be at least 3-inches deep at 1-foot intervals. Sprigs should not be permitted to dry out and should not be exposed to direct sunlight. Plant sprigs within 24 hours of the time they are dug.

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### 5) Sprigging or Sodding Dates

- a) Cool-season vegetation:
  - i) August 1 to October 10 (optimum August 1 to September 15)
  - ii) March 1 to May 30 (optimum March 1 to May 1),
- b) Warm-season vegetation:
  - i) March 1 to May 31 (optimum March 1 to May 20),

## D. STABILIZING CRITICAL AREAS BY PLANTING SHRUBS AND TREES

### 1) Tree and shrub establishment requirements/procedures

- a) For overall guidance on designing tree/shrub plantings for Critical Areas refer to Tree Planting (612) practice standard and Tree Planting Design Procedures (612 DP).
- b) Shrubs and deciduous trees must establish quickly, and sucker from the root or otherwise spread in order to provide effective vegetative cover (Refer to Section II Windbreak Interpretations, Conservation Tree/Shrub groups Table 11 Species Attributes).
- c) Refer to Tree Planting Procedures TPP 380 for detailed planting, site preparation, care and maintenance guidelines, control of competitive vegetation, care and maintenance procedures and all other tree planting procedures.
- d) Livestock will be excluded from planting. Fencing will be installed when necessary.
- e) The planting will be protected from fire, rodents and other damaging activity.

## E. STABILIZING DUNES AND BLOWOUTS WITH MANAGEMENT METHODS (refer to Section A "Stabilizing Critical Areas by Seeding Perennial Vegetation" for requirements when shaping and seeding to grass)

### 1) Natural recovery by protection and through use of Prescribed Grazing (528A) standard

- a) This method is effective where desirable native grass species are present in sufficient amounts and the character of the blowout will permit stabilization in the desired time.
- b) Limited livestock traffic (hoof action) especially during the dormant season may be desirable, but do not permit overuse or destruction of vegetative cover.
- c) Temporary fencing can be utilized to manage grazing on critical areas as needed.
- d) Refer to Prescribed Grazing (528) standard for detailed information on grazing systems.

### 2) Native Hay Mulch With Viable Seed

- a) Slope steep banks to not to exceed a slope of three horizontal to one vertical.
- b) Mulch the area with 2 to 3 tons per acre of native hay containing mature seed of desired grass species or bulrushes.
- c) Anchor hay mulch according to the method described Mulching (484) practice standard or by feeding livestock on the mulched area for a short period of time.
- d) Manage grazing to the extent necessary to maintain/improve the vegetative cover so it does not jeopardize the critical area planting.

### 3) Feeding Hay on Critical Area

- a) Seed a mixture of adapted native grass species/varieties at a minimum seeding rate of 30 PLS/sq. ft. in accordance with seed mixtures and rates shown in establishing grass cover for critical areas after November 1. Feed hay on the area according to standard Mulching (484). Feeding livestock hay should be discontinued by April 30 and so that the site is left in good condition for establishing grasses (no excessive clumps of hay, manure, etc.).

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- b) In lieu of seeding, feed hay containing viable native grass seed per item 2 above.
- c) Manage grazing to the extent necessary to maintain/improve the vegetative cover so it does not jeopardize the critical area planting.

### **F. TEMPORARY STABILIZATION OF CRITICAL Areas** (for one growing season or < 1 year's time).

#### 1) **Cover Crops**

- a) Refer to Cover Crop 340 practice standard for selecting the appropriate cover crop for temporary stabilization of critical areas.
- b) Utilize the highest recommended cover crop seeding rate in standard Cover Crop (340) when establishing temporary cover on critical areas.
- c) The cover crop must be compatible for establishing the planned cover.

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Table 3 Example seed mixtures for critical area plantings

Mixture	Lbs/ac to provide 60 pl/sq. ft.	Lbs/ac to provide 120 pl/sq. ft. <sup>1</sup>	Remarks
<b>Dams and Other Structures</b>			
Western wheatgrass	6.5	13.0	Cool/warm season native mixture for structures. Mixture meets Corp of Engineers (COE) permit requirements.
Sideoats grama	4.1	8.2	
Canada wildrye	2.5	5.0	
Big bluestem	5.0	10.0	
Intermediate wheatgrass	8.0	16.0	Cool/warm season mixture for structures. Mixture meets Corp of Engineers (COE) permit requirements.
Sideoats grama	1.9	3.8	
Canada wildrye	3.0	6.0	
Big bluestem	1.0	2.0	
Switchgrass	1.6	3.2	
Blue grama	0.5	1.0	
Western wheatgrass	8.3	16.6	Structure mixture for sites requiring mowing also good for sandy sites. Mixture meets Corp of Engineers (COE) permit requirements.
Sideoats grama	3.3	6.6	
Blue grama	1.3	2.6	
Western wheatgrass	6.3	12.6	Structure mixture for sites with sandy soils. Mixture meets Corp of Engineers (COE) permit requirements.
Sand bluestem	4.0	8.0	
Canada wildrye	2.0	4.0	
Sideoats grama	2.6	5.2	
Blue grama	0.9	1.8	
Smooth bromegrass <sup>2</sup>	9.5	19.0	Introduced/native structure mixture for sandy soils.
Prairie sandreed	4.0	8.0	
Sand bluestem	2.0	4.0	
Smooth bromegrass <sup>2</sup>	12.0	24.0	Cool season mixture for structures with sandy soils.
Pubescent wheatgrass	9.8	19.6	
Smooth bromegrass <sup>2</sup>	8.0	16.0	Cool/warm season structure mixture.
Intermediate wheatgrass	8.0	16.0	
Big bluestem	5.0	10.0	
Smooth bromegrass <sup>2</sup>	9.8	19.6	Cool/warm season structure mixture.
Big bluestem	5.0	10.0	
Sideoats grama	2.0	4.0	
<b>Ag Waste Structures and Sites With Heavy Traffic</b>			
Smooth bromegrass <sup>2</sup>	15.0	30.0	For ag-waste structures.
Tall fescue	2.5	5.0	
Smooth bromegrass <sup>2</sup>	14.4	30.0	For ag-waste structures.
Intermediate whatgrass	7.5	13.0	

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- continued - Table 3 Example seed mixtures for critical area plantings

Mixture	Lbs/ac to provide 60 pls/sq. ft.	Lbs/ac to provide 120 pls/sq. ft. <sup>1</sup>	Remarks
<b>Grassed Waterways</b>			
Western wheatgrass	12.0	24.0	Grassed waterway mixture for triazine herbicide resistance.
Big bluestem	3.0	6.0	
Sideoats grama	4.2	8.4	
<b>Grassed Waterways</b>			
Western wheatgrass	6.0	12.0	Grassed waterway mixture for imidazolinone herbicide resistance.
Intermediate wheatgrass	8.0	16.0	
Sideoats grama	4.0	8.0	
Big bluestem	3.0	6.0	
<b>Grassed Waterways</b>			
Intermediate wheatgrass	9.2	18.4	Alternate (economical) grassed waterway mixture for imidazolinone herbicide resistance.
Tall fescue	2.4	4.8	
Sideoats grama	4.0	8.0	
Big bluestem	3.0	6.0	
<b>Grassed Waterways</b>			
Intermediate wheatgrass	8.0	16.0	Grassed waterway mixture with warm-season and cool-season grasses to reduce risk of damage by glyphosate.
Creeping foxtail	0.8	1.6	
Big bluestem	8.0	16.0	
<b>Grassed Waterways</b>			
Smooth bromegrass <sup>2</sup>	9.5	19.0	Alternate (economical) grassed waterway mixture to reduce risk of damage by glyphosate.
Switchgrass	3.5	7.0	
<b>Carcass Disposal Sites</b>			
Blue Grama	0.85	1.7	Native grass mixture for use in MLRA 60A and 64 on Sandy, Sands or Sandy Lowland sites.
Prairie Sandreed	3.0	6.0	
Sand Bluestem	5.5	11.0	
Western Wheatgrass	4.5	9.0	
<b>Carcass Disposal Sites</b>			
Big Bluestem	6.0	12.0	Native grass mixture for use in MLRA 60A and 64 on Loamy Overflow, Clayey Overflow, and Loamy Terrace sites.
Blue Grama	0.9	1.8	
Green Needlegrass	5.0	10.0	
<b>Carcass Disposal Sites</b>			
Blue Grama	0.7	1.4	Native grass mixture for use in MLRA 60A and 64 on Clayey, Dense Clay, Claypan, Thin Claypan, Thin Upland and Loamy sites.
Green Needlegrass	4.0	8.0	
Sideoats Grama	3.0	6.0	
Western Wheatgrass	8.0	16.0	
<b>Example Forb/Legume Mixtures (add to mixtures above when diversity to enhance wildlife habitat is a secondary objective, do not reduce seeding rates of other grasses)</b>			
Alfalfa – (rhizomatous variety preferred)	0.4	0.8	Introduced legume mix adapted to a variety of sites except for those with prolonged saturation and high water table. Seeding rate set at 10% of grass mix.
Red clover	0.5	1.0	

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- *continued* - Table 3 Example seed mixtures for critical area plantings

Mixture	Lbs/ac to provide 60 pls/sq. ft.	Lbs/ac to provide 120 pls/sq. ft. <sup>1</sup>	Remarks
Red clover	0.5	1.0	Introduced legume mix adapted to eastern half of Nebraska and/or wet sites. Seeding rate set at 10% of grass mix
White clover (or Ladino)	0.2	0.4	
Blackeyed Susan	0.06	0.12	Native forb mix to be used only with native grass seedings and adapted to a variety of sites. Seeding rate set at 10% of grass mix.
Purple prairieclover	0.32	0.64	
Upright coneflower	0.12	0.24	
Plains coreopsis	0.08	0.15	Native forb mix to be used only with native grass seedings adapted to eastern Nebraska and/or wet sites. Seeding rate set at 10% of grass mix.
Illinois bundleflower	0.73	1.45	
New England aster	0.07	0.14	
<b>Companion Crops (add to mixtures above when rapid cover for erosion control is necessary, do not reduce seeding rates of other grasses)</b>			
Perennial ryegrass	Use "Linn" variety where rapid cover is desirable for erosion control, short lived use, seed 2.0 pounds per acre (10 PLS) with 60 PLS seedings and 4.0 pounds per acre (20 PLS) with 120 PLS seedings.		
Oats	Best with cool-season mixtures only refer to NE-CPA-7 for guidance.		

<sup>1</sup> Use seeding rate of 120 pls/sq.ft when seed is broadcast or hydroseeded.

<sup>2</sup> Smooth brome grass shall not be used on native rangeland or other sites where invasion of the plant is not desired.