

## Critical Area Planting (Acre) 342

## CRITERIA

### DEFINITION

Establishing permanent vegetation on sites that have physical, chemical, or biological conditions that prevent the establishment of vegetation with normal practices.

### PURPOSES

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

- 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.
- Restore degraded sites (for example, brown field areas) that cannot be stabilized through normal methods.
- Stabilize sand dunes, shifting sands, or sand areas subject to blowing.

### CONDITIONS WHERE PRACTICE APPLIES

On areas with existing or expected high rates of erosion or degraded sites that usually cannot be stabilized by ordinary conservation treatment and/or management, and if left untreated, could be severely damaged by erosion or sedimentation or could cause significant off-site damage.

Examples of applicable areas are: dams, dike cuts, fills, surface-mined areas, sand blown areas, denuded gullied areas, grass waterways, or heavy use areas where vegetation is difficult to establish with usual seeding or planting methods.

This also applies to small concentrated flow areas where the drainage area is 5 acres or less; and where adequate capacity exists without earth moving.

### General Criteria Applicable To All Purposes

Species selected for seeding or planting shall be suited to current site conditions and intended uses. Selected species will have the capacity to achieve adequate density and vigor within an appropriate time frame to stabilize the site sufficiently to permit suited uses with ordinary management activities.

Use grasses or grass-legume mixtures on all earth fill and actively eroding areas (see Tables 1 and 2). Woody vegetation may be used on less erosive sites where canopy and leaf litter will provide adequate erosion control (see Table 3). Temporary vegetative cover may be used only until long-term protection can be established (see Table 4).

### Seed

Seed will be clean and at an acceptable level of weed seed and other contaminants. Bags will be labeled with a germination and purity test completed within the past 9 months. Certified seed is preferred. Seed that has become wet, moldy, or otherwise damaged in transit or storage is not acceptable. Seed will meet Michigan Certified Seed law standards.

### Inoculation

Inoculate all legume seed in accordance with the manufacturer's recommendations. The inoculate for treating legume seeds shall be a pure culture of nitrogen-fixing bacteria specific for the species and shall not be used later than the date indicated on the container or as otherwise specified. A mixing medium, as recommended by the manufacturer, shall be used to bond inoculate to the seed. All legumes not inoculated will be inoculated within 12 hours of seeding with inoculate specific to the species being seeded. If seed was inoculated more than 60 days prior to seeding, add new inoculation. When the area is seeded with a hydro-seeder or a site where a new legume is seeded for the first time ever, use 5 times the recommended rate of inoculate.

### Fertilizer

Lime and fertilizer are needed for the proper establishment and maintenance of critical area seeding. Fertilize according to the soil test results; soil test is recommended, but not necessary. Nutrient management recommendations will follow NRCS-MI Conservation Practice Standard Nutrient Management (590). If no soil test, see Table 5.

Apply fertilizer prior to tillage for the seedbed.

When a hydro seeder is used, the fertilizer may be applied at the time of seeding.

#### Seedbed Preparation

Seed may be sown by hand, frost seeding, cyclone seeder, mechanical seeders, drills, cultipacker-seeders, hydro-seeder, broadcast seeder, airflow seeder, or other suitable equipment. Seed according to Critical Area Planting job sheet or engineering construction specifications provided with the approved Critical Area Planting or Engineering Plan Specifications.

Where broadcast seeding, the seed will be covered by use of hand rake or by dragging harrows, chains, or other suitable equipment over the surface or mulch to cover the seed.

Plant seed in a moist, firm seedbed unless the area will be mulched. Place seed from 1/4 inch to not more than 1/2 inch deep or per specifications. Use a cultipacker to make a firm seedbed. On slopes too steep for farm equipment, tracking type equipment may be used to firm the seedbed.

Where practical, grade to permit use of conventional equipment for seedbed preparation, seeding, mulch application, anchoring, and maintenance.

The seedbed, immediately before seeding, shall be firm but not so compact as to prohibit covering seed or securing adequate germination or root penetration. Tillage implements shall be used as necessary to provide at least a 3 inch depth of firm but friable soil, free of large clods and stones. On slopes steeper than 3:1, the 3 inch minimum depth of seedbed preparation is not required, but the soil shall be worked enough to ensure sufficient loose soil to provide an adequate seed cover. No till seeding methods will require that existing vegetation be killed prior to planting. Follow herbicide recommendations according to the label and NRCS-MI Conservation Practice Standard Pest Management (595) specifications.

#### Mulching

Mulch is extremely important on new seedlings on slopes, droughty sand, clay, areas without topsoil, and areas subject to erosion.

Anchor mulch with one of the following methods: strawy manure, emulsified asphalt, mulch netting, excelsior blanket, and other similar approved

products. See NRCS-MI Conservation Practice Standard Mulching (484). Anchoring may also be completed by track equipment. This practice is commonly known as cleating.

#### Planting Dates

To improve chances for success of seeding, follow the prescribed planting dates (see Table 6).

#### Sod Site Preparation

Before laying sod, kill weedy perennial grasses such as: quackgrass, tall fescue, Smooth brome grass, and bent grass with approved herbicides.

A 3-6 inch depth of porous, well drained topsoil with good water holding capacity is desired.

Avoid use of muck soil (MSU Soil Management Group M soils) as a soil amendment because it breaks down too quickly via oxidation.

Before applying topsoil and sod, till the subsoil 2-3 inches deep to improve sod health via deeper rooting. Avoid compacting by tilling too wet. See NRCS-MI Conservation Sheet, Soil Compaction Symptoms, Causes, Correction, Prevention for guidance.

Improve water holding capacity of sandy soils by tilling in 2-3 inches of loamy topsoil or fibrous peat into the soil to a 6 inch depth.

Reduce compaction and improve rooting depth on compacted fine textured soils or subsoil by applying 2-3 inches of sandy topsoil or 2 inches each of coarse sand and fibrous peat. Mix into the existing soil to a 4-6 inch depth.

Where applicable, sod may be used. Before laying sod, control excessive water runoff, grade to a stable slope, prepare site, and apply lime and fertilizer according to specifications or soil test results. Fill areas must be compacted to resist uneven settling. Cut areas must be loosened to permit grass root penetration. The surface shall be free from large clods, stones, or other debris. For best results, lime and fertilizer should be uniformly applied and incorporated into the soil. Immediately before placing sod, the soil surface shall be loosened to a depth of 1 inch and thoroughly dampened if not already moist. The staking of sod is needed in areas of concentrated flow.

If existing topsoil or amendments (sand Peat) are not used, the existing subsoil should be loosened to a 4-6 inch depth.

### Sod Timing of Installation

Sod can be laid any time of the year if the soil is dry enough to allow site preparation. For best results, sod may be laid any time from May 1 until October 20 if it can be irrigated as needed. Sod shall not be laid between June 10 and September 20 without irrigation.

### Sod Selection and Installation

Sod should be weed free and contain cultivars recommended for the location. Sod strips shall be cut with clean edges and square ends to facilitate laying and fitting. Cultured sod should be a minimum of 1 inch thick. Other grass sod should be at least a minimum of 2 inches thick.

Select sod adapted to site conditions; i.e., shady vs. sunny; resistant to diseases or high traffic area, erosion control or lawns. Use bluegrass sod on areas where attractive appearance is desired and maintenance will include regular mowing and intensive care.

Lay sod within 24-48 hours of harvest to prevent death of sod from heat damage.

Sod should not be laid during dry periods unless water is available to irrigate it.

Do not lay sod on powdery, dry soil. Soil should be moist but not saturated to a depth of 6 inches.

Sod pieces should be staggered at the ends to prevent erosion and lines across the turf. Sod strips shall be placed in rows across (at right angles to) the direction of slope. Sod ends should be touching but not overlapping. Roll sod after laying to remove air pockets and improve good contact with the soil. Water the sod after rolling. This will be needed daily until the roots have grown into the soil. Water daily for 2 to 3 weeks until rooted, then gradually reduce watering as needed each week to prevent wilting.

To prevent slippage on sloping soil (slopes steeper than 3 horizontal to 1 vertical), peg the sod with wooden stakes.

### Tree and Shrub Planting

For planting instructions, refer to NRCS-MI Conservation Practice Standard Tree/Shrub Establishment (612). Follow recommendations per the 612 job sheet or equivalent. See Table 3 for trees and shrubs to plant on critical areas.

### Other Ground Covers

Where applicable, other ground covers may be used (see Table 8) on erosive sites where low growing plants are desirable. These plants are typically planted in an urban setting. Most of these plants are not considered to be native to Michigan. See Table 9 for pH adaptation of various plant species.

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

Site preparation and seeding or planting shall be done at a time and in a manner that best ensures survival and growth of the selected species. What constitutes successful establishment; e.g., minimum percent ground/canopy cover, percent survival, stand density, etc.; shall be specified before application.

Fertilization, mulching, or other facilitating practices for plant growth shall be timed and applied to accelerate establishment of selected species. If the recommended fertilizer rate exceeds the criteria in NRCS-MI Conservation Practice Standard Nutrient Management (590), appropriate mitigating practices will be installed to reduce the risk of nutrient losses from the site.

Comply with all applicable federal, state, and local laws, rules, and regulations.

All urban sites where Critical Area Plantings are planned must follow Michigan Soil Erosion and Sedimentation (Act 347) requirements.

### Additional Criteria To Restore Degraded Sites

If gullies or deep rills are present, they will be treated, if feasible, to allow equipment operation and ensure proper site and seedbed preparation.

Soil amendments will be added as necessary to ameliorate or eliminate physical or chemical conditions that inhibit plant establishment and growth. Required amendments, such as compost or manure to add organic matter and improve soil structure and water holding capacity; agricultural limestone to increase the pH of acid soils; or elemental sulfur to lower the pH of calcareous soils, or the addition of 6 inches of topsoil, shall be included in the site specification with amounts, timing, and method of application. (see Tables 2, 4, and 8).

## CONSIDERATIONS

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

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

Critical areas of grassed waterways (see NRCS-MI Conservation Practice Standard Grass Waterway (412)), such as an increase in channel grade, a change to a more erosive soil type, or other erosion problems, will require special attention. The use of jute netting, excelsior blanket, mulch net, or sod (staked down) should be considered (see NRCS-MI Conservation Practice Standard Mulching (484)).

Where slopes must be steeper than 2 horizontal to 1 vertical or on slopes with soil slippage problems, vegetation alone cannot be expected to fully stabilize the slope. Consider mechanical retaining walls or rock riprap rather than vegetative cover.

Where slopes are flatter than 2:1, consider a combination of structural practices and soil bio-engineering. When considering soil bio-engineering techniques for protecting critical areas, refer to Engineering Field Handbook, Chapter 18.

Where internal water movement may cause seeps or soil slippage or poor drainage, consider installing subsurface drainage (see NRCS-MI Conservation Practice Standard Subsurface Drain (606)) before establishing vegetation.

Divert runoff water away from the area being stabilized whenever possible. Control excessive water runoff by grassed waterways, diversions, terraces, street and storm sewers, closed outlets, or other mechanical means.

Provide the best possible soil conditions for seeding. Wherever possible, stockpile and replace topsoil after grading. Desirable soil textures are sandy loam, loam, or silt loam. Where sands or clayey soils are encountered, consider modifying them with additions of hauled-in materials, add 2-4 inches of topsoil, then apply the fertilizer, and prepare a 5 inch deep seedbed.

When considering seeding and fertilization rates, be aware that severely eroded or disturbed sites may have low fertility and few, if any, resident seeds. Higher seeding and fertilizer rates may be needed to ensure adequate vegetative cover.

When the fertilized area is immediately above a water body, the phosphorus may be reduced to avoid nutrient loading.

Consider permanent exclusion of people, ORV, domestic livestock, and other avoidable disturbances.

This practice is not to be used for general cover plantings such as the Conservation Reserve Program (see NRCS-MI Conservation Practice Standard Conservation Cover (327)).

If the primary purpose for the activity is for wildlife, refer to NRCS-MI Conservation Practice Standards Wildlife Upland Habitat Management (645) and Wildlife Wetland Habitat Management (644).

## PLANS AND SPECIFICATIONS

Plans and specifications are to be prepared for each treatment area and include:

Location data: county, township, section, site, or field map symbol for location.

1. Planting dates
2. Seedbed preparation
3. Species to be planted
4. Methods and rates of planting
5. Planting depth
6. Time of planting
7. Fertilizer requirements
8. Management or/and establishment requirements (soil amendments required)
9. Type and amount of mulch required
10. Inoculation

## 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 ensure that this practice functions as intended throughout its expected life.

An O&M plan for this practice includes:

- Periodic inspection and evaluation of vegetation to determine maintenance needs.

- Replanting due to drought, insects, or other events which prevented adequate stand establishment should be addressed within 1-3 years of planting. Recommendations may vary from complete re-establishment to overseeing or spot planting.
- Maintain all necessary fencing (see NRCS-MI Conservation Practice Standard Fence (382)), if applicable. Protect the area from grazing by livestock or other uses until the vegetative cover is established.

If possible, as a temporary measure on grassed waterways, divert water out of the channel by a temporary diversion above the waterway and by spoil ridges along the sides of the waterway until the seeding is established.

#### Maintenance of Planting

Fertilize annually according to the soil test or use Table 5. Fertilization in the fall will aid in controlling annual grasses.

Weeds should be controlled by mowing or herbicides. When spraying, use herbicides according to Michigan State University recommendations and herbicide label. Mowing is encouraged during establishment to encourage a dense sod. See NRCS-MI Conservation Practice Standard Upland Wildlife Habitat Management (645) for Operation and Maintenance mowing specifications after the stand is adequately established.

Vehicular traffic must be controlled so as not to leave depressions or deposits of soil which can result in concentrations of water and formation of gullies. Overgrazing by livestock or grazing when wet should not be permitted. If washouts occur, repair by laying sod or reseeding.

Avoid removing more than 1/3 of the leaf surface at any one mowing.

#### **REFERENCES**

- USDA-NRCS Technical Note 4b.
- USDA-NRCS Plants Projects Internet Sites:  
<http://plants.usda.gov>.
- Michigan State University Extension Bulletins E2107 and E1490.

**TABLE 1 - Agronomic Adaptation and Characteristics of Perennial Vegetation - Michigan**

Perennial Species <sup>4</sup> (seeds/lbs in 1000)	Minimum Adequate Drainage <sup>1</sup>	Tolerance to pH < 6.0	Minimum Adequate Fertility	Drought Tolerance	Persistence	Seedling Aggressiveness	Growth Habit
<b>LEGUMES</b>							
Alfalfa (200)	WD	Low	High to Med	High	High	High	Bunch
Alsike Clover (680)	PD	High	Medium	Low	Low	Low	Spreading
Birdsfoot Trefoil (375)	SPD	High	Medium	Medium	Medium	Low	Bunch
Ladino Clover (871)	PD	Medium	High to Med	Low	High	Low	Spreading
Lancer' Perennial Pea (8)	MWD	Low	High to Med	Low	High	Low	Spreading
Lathco' Flatpea (8)	MWD	High	Low	High	High	Low	Spreading
Red Clover (272)	SPD	Medium	Medium	Medium	Low	High	Bunch
Sweetclover (260)	MWD	High	Medium	High	Medium	High	Bunch
White Dutch Clover (802)	PD	Medium	Medium	Low	High	Low	Spreading
<b>COOL SEASON GRASSES</b>							
American Beachgrass <sup>3</sup>	MWD	High	Medium	High	High	Medium	Spreading
Canada Wild Rye <sup>5</sup> (115)	SPD	High	Medium	Medium	Medium	Low	Bunch
Creeping Red Fescue (615)	MWD	Medium	Medium	High	High	Medium	Dense Sod
Kentucky Bluegrass (2,177)	SPD	Medium	Medium	Low	High	Low	Dense Sod
Orchardgrass (550)	SPD	Medium	Medium	Medium	Medium	High	Bunch
Perennial Ryegrass (227)	SPD	Medium	Med to High	Low	Low	Very High	Bunch
Redtop (4,990)	VPD	High	High	Medium	Medium	High	Bunch
Reed Canarygrass (533)	VPD	High	Med to High	High	High	Low	Open Sod
Smooth Brome (136)	MWD	Medium	High	High	High	Medium	Open Sod
Tall Fescue (227)	SPD	High	Medium	Medium	High	High	Variable <sup>2</sup>
Timothy (1,230)	MWD	Medium	Medium	Low	High	Low	Bunch
Virginia Wild Rye <sup>6</sup> (115)	SPD	High	Medium	Medium	Medium	Low	Bunch
<b>WARM SEASON GRASSES</b>							
Big Bluestem (130)	MWD	High	Low to Med	Excellent	High	Very Low	Bunch
Indiangrass (170)	MWD	High	Low to Med	Excellent	High	Very Low	Bunch
Prairie Sand Reed (274)	MWD	Medium	Low	High	Medium	Medium	Bunch
Switchgrass (275)	SPD	High	Low to Med	Excellent	High	Very Low	Bunch
Tioga' Deertongue (400)	MWD	Very High	Very High	High	High	Medium	Bunch

1. Minimum drainage required for acceptable growth: WD=Well Drained; MWD=Moderately Well Drained; SPD=Somewhat Poorly Drained; PD=Poorly Drained; and VPD=Very Poorly Drained.
2. If not cut often, tall fescue has a bunch growth; under frequent cutting or grazing, it forms a sod.
3. Beachgrass is planted vegetatively.
4. These plant materials are considered to be invasive: Crownvetch, Reed Canarygrass, Smooth Brome, and Birdsfoot trefoil.
5. Native Cool Season Grass; pH range tolerance 5.0 - 8.0.
6. Native Cool Season Grass; pH range tolerance 5.0 - 7.4.

**TABLE 2 - Permanent Critical Area Seedings  
(Waterway-Type Areas, Critical Areas, and Construction Areas)**

Seeding Mixture <sup>1,3,4</sup>	lbs/acre (/1000 ft <sup>2</sup> )	Suitable Uses	Wildlife Value	Drainage	Remarks
Creeping Red Fescue	40 (1.0)	WW,CA,HU,CO	LOW	MWD	
Creeping Red Fescue Kentucky Bluegrass	20 (.5) 20 (.5)	CA, HU, CO	LOW	MWD	For waterways, if management as a lawn.
Creeping Red Fescue Tall Fescue Kentucky Bluegrass Perennial Ryegrass	25 (.6) 20 (.6) 5 (.2) 5 (.2)	CA, HU, CO, FR, WW	LOW	SPD	On soils which have higher clay content, increase Tall Fescue and reduce Creeping Red Fescue.
Creeping Red Fescue Kentucky Bluegrass Redtop Smooth Bromegrass Timothy Birdsfoot Trefoil	20 (.5) 5 (.2) 1 (.03) 20 (.5) 2 (.05) 10 (.3)	CA, HU, CO	LOW	SPD	
Creeping Red Fescue Redtop Smooth Bromegrass Perennial Ryegrass	20 (.5) 1 (.03) 20 (.3) 5 (.2)	CA, HU, CO	LOW	PD	
Tall Fescue Smooth Bromegrass	15 (.4) 15 (.4)	WW, CA, HU, CO	LOW	SPD	Add 6# of Birdsfoot Trefoil if desired.
Tall Fescue Redtop Perennial Ryegrass	30 (.7) 2 (.05) 5 (.2)	WW, CA	LOW	SPD,MK	For close mowing and for waterways with < 2.0 ft/sec velocity. Add 6# of Birdsfoot Trefoil if desired.
Smooth Bromegrass Birdsfoot Trefoil	15 (.4) 10 (.3)	CA	LOW	SPD	
Tall Fescue Smooth Bromegrass	20 (.5) 20 (.5)	WW	LOW	SPD	
Tall Fescue Crownvetch	10 (.3) 15 (.4)	CA, HU, CO	LOW	MWD	
Reed Canarygrass	10 (.3)	CA, HU, CO	LOW	VPD, MK	
Reed Canarygrass Timothy Redtop	10 (.3) 4 (.1) 1 (.03)	CA, HU, CO	MED	MK	
Smooth Bromegrass	30 (.7)	WW, CA	LOW	MWD	Add 6# of Birdsfoot Trefoil if desired.
Smooth Bromegrass Red Top Perennial Ryegrass	25 (.6) 2 (.05) 5 (.2)	WW	LOW	SPD	Add 6# of Birdsfoot Trefoil if desired.
Timothy Birdsfoot Trefoil	3 (.1) 10 (.3)	CA, HU, CO	MED	MWD	

- One (1) bushel/acre of rye or wheat or oats; or 5 lbs/acre of annual or perennial rye is highly recommended for adding to the mix for quicker green-up or stabilization. See Table 4 for further details.
- WW=Waterway Type Areas; CA=Critical Areas; HU=Heavy Use Areas; CO=Construction Areas; and FR=Harvest Trails and Landing Sites.
- See Table 6 for seeding dates.
- Use the higher seeding rates for steeper slopes, reclamation areas, or poorer site conditions.
- Minimum drainage or better required for acceptable growth: WD=Well Drained; MWD=Moderately Well Drained; SPD=Somewhat Poorly Drained; PD=Poorly Drained; and MK=Muck Soils.
- All warm-season grass seeding rates are listed as pure live seed (PLS).

**TABLE 2 - Permanent Critical Area Seedings - Continued  
(Waterway-Type Areas, Critical Areas, and Construction Areas)**

Seeding Mixture <sup>1,3,4</sup>	lbs/acre (/1000 ft <sup>2</sup> )	Suitable Uses	Wildlife Value	Drainage	Remarks
Big bluestem Prairie Sandreed Little Bluestem	5 (.2) 5 (.2) 5 (.2)	Sand Dune area	HIGH	MWD	Plant after sand is stabilized with beach grass (2 yrs).
American Beachgrass	Planted Vegeta- tively	Sandy areas subject to blowing	MED	WD	To stabilize sand areas subject to blowing refer to Additional Criteria on page 3 for planting information.
Red Top Perennial Ryegrass Orchard Grass Birdsfoot Trefoil	2 (.05) 5 (.2) 1 (.03) 3 (.1)	CA, CU	HIGH	SPD	
Switch Grass Perennial Ryegrass Ladino Clover Orchard Grass	2 (.05) 5 (.2) 3 (.1) 1 (.03)	CA, HU, CO	HIGH	SPD	
Big Bluestem Little Bluestem Switchgrass	2 (.05) 2 (.05) 2 (.05)	CA, CO	HIGH	MWD	
Orchard Grass Ladino Clover Red Top	8 (.25) 2 (.05) 3 (.1)	FR	HIGH	MWD	
Creeping Red Fescue Perennial Ryegrass Red Clover	20 (.5) 6 (.2) 3 (.1)	CO, CA, FR	LOW	MWD	
Lathco' Flatpea Perennial Ryegrass	30 (.7) 20 (.5)	FR	MED	MWD	For shaded Woodland.
Lathco' Flatpea Tall Fescue	20 (.5) 20 (.5)	FR	LOW	MWD	For shaded Woodland.
Crownvetch Tall Fescue Redtop	15 (.4) 20 (.5) 2 (.05)	FR	LOW	MWD	For shaded Woodland.
Birdsfoot Trefoil Timothy	8 (.3) 4 (.1)	FR	HIGH	MWD	For Wooded Edges and Openings.
White Clover Kentucky Bluegrass Timothy	1 (.03) 6 (.2) 2 (.05)	FR	MED	MWD	For Wooded Edges and Openings.
Orchardgrass Ladino Clover Redtop	10 (.3) 2 (.05) 3 (.1)	FR	HIGH	MWD	For Wooded Edges and Openings.
Tioga' Deertongue Birdsfoot Trefoil	8 (.3) 6 (.2)	FR	MED	MWD	For Wooded Edges and Openings.

- One (1) bushel/acre of rye or wheat or oats; or 5 lbs/acre of annual or perennial rye may be added to the mix for quicker green-up or stabilization.
- WW=Waterway Type Areas; CA=Critical Areas; HU=Heavy Use Areas; CO=Construction Areas; and FR=Forest Roads and Landing Sites
- See Table 6 for seeding dates.
- Use the higher seeding rates for steeper slopes, reclamation areas, or poorer site conditions.
- Minimum drainage or better required for acceptable growth: WD=Well Drained; MWD=Moderately Well Drained; SPD=Somewhat Poorly Drained; PD=Poorly Drained; and MK=Muck Soils.
- All warm-season grass seeding rates are listed as pure live seed (PLS).

**TABLE 3 - Trees and Shrubs for Critical Areas (for areas less subject to erosion)**

In areas less subject to erosion plant trees where the plant canopy and leaf litter will provide adequate erosion control. Space trees 6' x 6' and shrubs 3' x 3'. Stagger seedlings in adjacent rows.

Soil Conditions	Trees	Shrubs
Well and moderately well drained sand and loamy sand (coarse textured soils)	Jack Pine <sub>1</sub> , Red Pine, White Pine <sub>1</sub> , Black Locust <sub>2</sub> , Imperial Carolina Poplar	Hawthorn <sub>1</sub> , Crabapple <sub>1</sub> , Serviceberry <sub>1</sub> , Arnot' Bristly Locust <sub>2</sub> , Autumn Olive <sub>1,2</sub>
Well and moderately well drained, moderately coarse to moderately fine textured soils (sandy loam, loam silt loam, and clay loam textured soils)	Jack Pine <sub>1</sub> , Red Pine, White Pine <sub>1</sub> , Norway Spruce <sub>1</sub> , White Spruce <sub>1</sub> , Black Locust <sub>2</sub>	Gray Dogwood <sub>1</sub> , Crabapple <sub>1</sub> , Nannyberry <sub>1</sub> , Autumn Olive <sub>1,2</sub>
Well and moderately well drained clay and silty clay (fine textured soils)	White Pine <sub>1</sub> , Norway Spruce <sub>1</sub> , Black Locust <sub>2</sub> , White Spruce <sub>1</sub>	Silky Dogwood <sub>1</sub> , Crabapple <sub>1</sub> , Nannyberry <sub>1</sub> , American Cranberrybush <sub>1</sub>

1. Indicates species best suited for wildlife food or cover.
2. Indicates species that may be invasive in some areas.

**TABLE 4 - "Temporary Seedings" for Fields or Critical Areas**

Seed Mixture	lbs/acre or lbs/1000 ft <sup>2</sup>	Planting Zone 1 <sub>1</sub>	Planting Zone 2 <sub>1</sub>	Planting Zone 3 <sub>1</sub>
Oats	96 or 2	4/1 to 9/15	4/15 to 8/1	5/1 to 8/1
Perennial Ryegrass	20 or .5	8/1 to 10/15	6/1 to 8/1	8/1 - 10/1
Sudangrass	40 or 1	6/1 to 7/15	6/1 to 7/15	Not Rec.
Wheat	120 or 3	9/20 to 10/15	9/10 to 10/1	9/10 to 10/1
Cereal Rye	120 or 3	8/1 to 10/15	8/1 to 10/10	8/1 to 11/1
Buckwheat	75 or 2	6/1 to 7/15	6/1 to 7/15	6/15 to 7/15

1. Planting Zones:
  - 1 - Lower Peninsula, South of US 10
  - 2 - Lower Peninsula North of US 10
  - 3 - Upper Peninsula

**TABLE 5 - Fertility for Critical Area Type Seedings<sub>1</sub>**

Lime	Nitrogen <sub>2</sub>	Phosphorous (P <sub>2</sub> O <sub>5</sub> )	Potash (K <sub>2</sub> O)
As needed per site condition <sub>3</sub>	50- 60 Lbs/Acre 1.25 Lbs/1000 ft sq	50- 60 Lbs/Acre 1.25 Lbs/1000 ft sq	50- 60 Lbs/Acre 1.25 Lbs/1000 ft sq

1. Fertilize according to the soil test results; a soil test is recommended, but not necessary. If no soil test is available use the fertilization recommendations in Table 5
2. For Warm Season Mixes, do not apply Nitrogen until the second year.
3. For seedings containing legumes, soils should be limed, if needed, to a pH of 6.5 to 7.0. Without a legume in the seeding mixture, a pH of 5.5 is adequate.

**TABLE 6 - Seeding Dates for Long-Term Vegetative Cover**

Zones	With Irrigation and/or Mulch <sub>1</sub>	Without Irrigation or Mulch	Dormant Seeding with Mulch <sub>2</sub>
Lower Peninsula, South of US 10 MLRA 97, 98, 99, and 111	4/1 to 8/1	4/1 to 5/20 or 8/10 to 10/1	11/1 to freeze-up
Lower Peninsula, North of US 10 MLRA 94-S, 95, and 96	5/1 to 9/20	5/1 to 6/10 or 8/1 to 9/20	10/25 to freeze-up
Upper Peninsula MLRA 92, 93, and 94-N	5/1 to 9/10	5/1 to 6/15 or 8/1 to 9/20	10/25 to freeze-up

1. Grassed waterways shall be seeded and mulched by September 15.
2. A dormant seeding may be made in late fall to germinate in spring. Dormant seedings must be mulched. Do not seed when ground is frozen or snow covered. Do not use a dormant seeding on grassed waterways.

**TABLE 7 - Trees, Shrubs, and Grasses to Plant on Wind Blown Areas<sub>1</sub>**

Site Condition	Vegetation to Plant
Grasses to plant on sand dunes, once sand is stable	Prairie Sand Reed <sub>2</sub> at 5 lbs per acre Big Bluestem <sub>2</sub> at 5 lbs per acre Little Bluestem <sub>2</sub> at 5 lbs per acre
Trees to stabilize blowing loamy sands	Red Pine, White Pine <sub>2</sub> , Jack Pine <sub>2</sub>
Trees to stabilize blowing sands	Jack Pine <sub>2</sub> , Red Pine, "Imperial Carolina" poplar
Trees and shrubs to plant on wet spots of shifting sands	Cottonwood, Shrub Willow <sub>2</sub> , American Cranberrybush <sub>2</sub> , Nannyberry <sub>2</sub> , Red Osier Dogwoods <sub>2</sub>
Trees to plant on sand dunes adjacent to large lakes	White Pine <sub>2</sub> , "Imperial Carolina" Poplar, Red Pine, Jack Pine <sub>2</sub>

1. Where trees and other grasses are to be planted in beachgrass after it has controlled sand movement, but before the grass becomes too dense (about two years), space trees 6' x 6' to 8' x 8'. For planting instructions, refer to Tree/Shrub Establishment Standard, 612.
2. Indicates species best suited for wildlife food or cover.

**TABLE 8 - Alternative Urban Ground Covers and Shrubs for Critical Areas**

Small plants such as bugleweed should be set 4 to 6 inches apart; set larger plants like junipers about 3 to 4 feet apart. Spring is the best planting time. This list of plants is not all inclusive, there are other plants, both native and ornamental that can be considered.

Plant	Height (inch)	Sun	Partial Shade	Shade	Soil	Remarks
Bugleweed (carpet bugle) ( <i>Ajuga reptans</i> )	4 to 8	X	X	X	most soils	One of the best perennials; spreads rapidly. Parent plant has deep green foliage, blue flowers. Gaiety and Metallica Crispa varieties have bronze-purple leaves. Silver Beauty's foliage is cream and light green.
Japanese Spurge ( <i>Pachysandra terminalis</i> )	up to 6		X	X	fertile, moist	Universally popular evergreen herb. Some plants have small, spiked white flowers sometimes followed by white berries in the fall. Improved forms: Green Carpet, Silver Edge.
Juniper * ( <i>J. sabina tamariscifolia</i> )	up to 24	X	X		dry areas	Sometimes called Tamarix Savin juniper. Needlelike silver-green leaves. A good spreader for slopes; use as foreground for deciduous trees or complete ground cover.
Juniper * ( <i>Juniperus horizontalis</i> )	12 to 18	X	X		dry areas	Creeping, soft-textured plant; light green to steel blue needles frequently turn purple in winter.
Lily-of-the-Valley ( <i>Convallaria majalis</i> )	6 to 10	X	X		rich moist	Fragrant white bell-like flowers; Rosea variety has purplish-pink flowers.
<i>Sedum album</i>	up to 4	X	X		sandy, well drained	Forms mats of attractive dark-green to red foliage on creeping stems. Not as likely to invade grass areas as Stonecrop.
Stonecrop, Goldmoss ( <i>Sedum acre</i> )	up to 4	X	X		stoney, sandy, dry	Mats of tiny foliage, good between stepping stones and in crevices. Spreads rapidly and can become a weed in grass. The sedum variety, Dragon's Blood, is known for its reddish-brown inch high foliage and carmine flowers.
Virginia Creeper ( <i>Parthenocissus quinquefolia</i> )	Climbs to 20 ft	X	X		sand to loamy clay	Flowers inconspicuous, yellow-green to white. Leaves turn a beautiful scarlet in fall. Berries eaten by game birds and small mammals.

\* Indicates species best suited for wildlife food or cover.

**TABLE 9 - pH Range for Various Plant Species**

Field Crops			
Barley	6.5 - 7.8	Rape	6.0 - 7.5
Bean	6.0 - 7.5	Rice	6.8 - 5.8
Buckwheat	5.0 - 7.0	Rye	5.5 - 7.0
Corn, all kinds	5.5 - 7.5	Sorghum, all	5.5 - 7.0
Cowpeas	5.5 - 7.0	Soybeans	6.0 - 7.0
Millet	5.5 - 7.0	Tobacco	5.5 - 6.0
Oats	5.0 - 7.0	Wheat	5.5 - 7.0
Grasses			
Bent Grasses	5.5 - 7.5	Red fescue	5.5 - 6.5
Bluegrass, Kentucky	5.5 - 7.5	Reed Canarygrass	5.5 - 7.5
Bromegrass (smooth)	5.5 - 7.0	Sudan grass	5.5 - 7.5
Canada Wild Rye	5.0 - 8.0	Tall fescue	5.5 - 8.0
Orchard grass	5.5 - 7.5	Timothy	5.5 - 7.5
Redtop	5.5 - 7.5	Virginia Wild Rye	5.0 - 7.4
Legumes			
Alfalfa	6.3 - 7.8	Clover, Sweet	6.5 - 7.8
Birdsfoot Trefoil	5.5 - 7.0	Lespedeza, Annual	5.5 - 7.0
Clover, Alsike	5.5 - 7.5	Lespedeza, Serricca	6.0 - 6.5
Clover, Ladino & White	6.0 - 7.0	Vetch, common & Hairy	5.0 - 7.0
Clover, Mammoth	6.0 - 7.0	Vetch-crown	6.5 - 8.0
Clover, Red	6.0 - 7.5		
Trees			
Ash, Basswood & Hickory	6.0 - 7.5	Oak, Black	6.0 - 7.0
Beech	5.0 - 6.7	Oak, Red	4.5 - 6.0
Cedar, Red	5.5 - 7.0	Oak, White	5.0 - 6.5
Cedar, White	4.5 - 5.0	Pine, Jack	4.5 - 5.0
Chestnuts	5.0 - 6.5	Pine, Red	5.0 - 6.0
Elder, Box	6.0 - 8.0	Pine, Scotch	5.0 - 6.5
Elm, American	6.0 - 7.5	Pine, Yellow	5.0 - 6.0
Fir, Balsam & Hemlock	5.0 - 6.0	Pine, White	4.5 - 6.0
Fir, Douglas	6.0 - 7.0	Spruce, Norway/White	5.0 - 6.0
Maple	6.0 - 7.5	Willow, Pussy	6.5 - 8.0
Truck Crops			
Asparagus	6.0 - 8.0	Okra & Onions	6.0 - 6.5
Bean, garden & field	5.5 - 6.5	Parsley	5.5 - 6.0
Beets, garden	6.0 - 7.0	Parsnips	5.5 - 6.7
Beets, sugar	6.0 - 7.5	Peas	6.0 - 7.5
Brussel Sprouts	5.7 - 7.0	Peppers	5.5 - 6.5
Cabbage	5.7 - 7.0	Potato, Irish	5.2 - 6.5
Cantaloupe	6.0 - 6.5	Potato, Sweet	5.0 - 5.7
Carrot	5.7 - 7.0	Pumpkin	5.5 - 6.5
Cauliflower	6.0 - 7.0	Radish	5.5 - 6.5
Cucumber	5.5 - 6.7	Rape	6.0 - 7.5
Celery	6.0 - 7.0	Salsify	6.0 - 6.5
Eggplant	5.5 - 6.0	Squash	5.5 - 6.5
Kale, Spinach, Swiss Chard	5.7 - 7.0	Strawberries	5.3 - 6.5
Kohlrabi	5.5 - 6.5	Tomato	5.5 - 6.7
Lettuce	6.0 - 7.0	Turnip	5.5 - 6.5
Mustard	5.5 - 6.5	Watermelons	5.0 - 5.5
Miscellaneous			
Apples	5.7 - 7.5	Holly	5.0 - 5.5
Azalea	5.0 - 5.5	Raspberries	5.0 - 7.0
Blueberries	5.0 - 5.5	Rhododendron	5.0 - 5.5
Cranberries	5.0 - 5.5		