

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

RESTORATION AND MANAGEMENT OF DECLINING HABITATS

(acre)
Code 643

DEFINITION

Restoring and conserving rare or declining native vegetative communities and associated wildlife species.

PURPOSES

- Restore land or aquatic habitats degraded by human activity.
- Provide habitat for rare and declining wildlife species by restoring and conserving native plant communities.
- Increase native plant community diversity.
- Management of unique or declining native habitats.

NOTE: NRCS uses the term "wildlife" to include all animals, terrestrial and aquatic.

CONDITIONS WHERE PRACTICE APPLIES

On any landscape which once supported or currently supports the habitat to be restored or managed.

Declining habitats identified herein are those referenced for Minnesota as critically endangered, endangered or threatened ecosystems (Figure 1). The MN DNR Field Guides to Native Plant Communities should be used to further refine where it is appropriate to apply these practices. These declining habitats and the locations where they can be restored are:

Tallgrass Prairie - In the tallgrass prairie region of the state.

Oak Savanna – On areas that once supported savannas. Savannas typically occurred on prairie and transition soils.

Red Pine, Jack Pine and White Pine Forests – On areas that once supported native stands of Red, Jack and White pine.

Aspen Parkland – In the aspen parkland region of the state.

Wetlands of all types – Statewide.

Jack Pine Woodlands – On areas that once supported jack pine woodlands.

CRITERIA

General Criteria Applicable to All Purposes

- Methods used will be designed to protect the soil resource from erosion.
- Vegetative manipulations to restore plant and/or animal diversity can be accomplished by prescribed burning or mechanical, biological or chemical methods, or a combination of the four.
- Management measures must be provided to control invasive species and noxious weeds in order to comply with state noxious weed laws.
- To benefit insect food sources for grassland nesting birds, spraying or other control of noxious weeds will be done on a "spot treatment" basis to protect forbs and legumes that benefit native pollinators and other wildlife.
- Management practices and activities are generally not to disturb cover during the primary nesting period of May 1 – August 1. Management and maintenance activities will generally be restricted to August 1 - September 30 and prior to the primary nesting season. Exceptions could be granted when necessary to maintain the health of a plant community.
- Mowing may be needed during the establishment period to control weeds.
- Rotate periodic planned management or other treatments throughout the managed area.
- Where feasible, prescribed burning will be utilized instead of mowing. Refer to practice standard 338-Prescribed Burning.
- Native species seeded or planted will be adapted to the soil-site conditions.
- Seeding and planting rates will be adequate to accomplish the planned purpose.
- Only high quality and ecologically adapted native plant materials will be used.
- Planting dates, and care in handling and planting of the plant material will ensure that the established vegetation will have an acceptable rate of survival.

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Conservation practice standards are reviewed periodically and updated if needed. To obtain the current version of this standard, contact the MN NRCS in your area, or download it from the eFOTG for MN.

- Site preparation shall be sufficient for establishment and growth of selected species. Consider appropriate deprecation protection practices.
- Timing and use of equipment will be appropriate for the site and soil conditions.

Criteria for Enhancement of Existing Degraded Habitats

For sites that are not currently cultivated and still exhibit remnant characteristics of the pre-settlement habitat type, it is often best to attempt restoration and enhancement through management techniques such as prescribed burning, silvicultural techniques, brush and weed control, and interplanting with desired species. Refer to the maintenance recommendations section of each habitat type.

Criteria for Tallgrass Prairie Restoration

High species diversity is recommended to promote native community stability and function, to provide benefits to multiple wildlife species and to prevent establishment of invasive species.

Native prairie plant communities will be established utilizing seed harvested from existing Minnesota native prairies, or utilizing seed mixes comprised of Minnesota ecotype grasses, legumes and forbs, developed to reflect "native prairie" communities as determined suitable for specific site conditions.

All seed, including native harvest, shall be supplied as pure-live seed (PLS) and conform to Minnesota Seed Law including limits on noxious weed content and State labeling requirements. Documentation must be provided by the grower, and responsibility for obtaining documentation rests with the producer.

Protection of Existing Native Prairies

DNR identified remnant prairie communities will be protected from non-local sources of seed.

Varieties/cultivars (selected germplasms) of native species will not be used adjacent to existing remnant prairies in an effort to limit genetic influences. A minimum isolation distance of ¼ mile is required.

Seed Origin:

Seed must come from local sources when planting buffers adjacent to identified remnant prairies. The following is a recommended sequence for obtaining seed/plants:

- Collected directly from the adjacent remnant prairie.

- Collected from a local remnant prairie within the same ecological sub-section.
- Collected from a remnant prairie within the same ecological section.

Restoration on Agricultural Fields and Other Disturbed Sites

Seed Origin:

It is desirable for seed sources of native grass, forbs and legumes to originate from as close to the planting site as possible. When available, "Yellow Tag" or source identified materials are preferred.

The following sequence defines the preferred wild/native harvest seed source for the project. Areas with similar site conditions and located as close to the project site as possible

- Ecological Sub-sections
- Ecological Section
- Maximum distance of 175 miles of project
- Field tested native grass varieties and natural germplasm materials of known origin and adaptability. Refer to Table 1 and Figure 2 for a listing of grass varieties/natural germplasm materials and their zone of adaptability.

Seeding Requirements:

Seed mixes will consist of a minimum 15 native species. The mixture will be comprised of a minimum 5 grasses, and a minimum 5 forbs. At least one forb shall be a legume.

The mixture will result in a minimum 35 PLS seeds per square foot total, with a maximum 70% grass component based on seeds per square foot.

- No more than 20% of the grass component will be comprised of cool season grasses based on seeds per square foot. The exception is for wetland sites where cool season grasses may exceed 20% to reflect historic plant communities.
- Minimum grass seeding rate will be 7.0 lb/ac PLS.
- Minimum forb seeding rate will be 16.0 oz/ac PLS, with no individual forb comprising more than 20% of the forb mixture based on seeds per square foot.

Wild or native harvest mixtures meeting the minimum species diversity requirements above will be considered adequate.

Constructed mixtures may be developed using Table 2.

Seeding Dates:

Seeding will favor warm season grasses over forbs, unless forbs have already been stratified.

- Spring seeding dates shall be May 15 (or a consistent soil temperature of 50° F) - June 30 statewide.
- Fall Dormant Seeding offers an excellent opportunity to establish a diverse stand. Fall seeding tends to favor forbs and there is less competition with other planting activities. Dormant seeding shall be completed after November 1 to insure seed will not germinate.

Temporary Cover:

Temporary cover crops, when determined necessary, shall be spring seeded small grains, sudangrass, or millet. Seeding rates are as follows:

SPECIES	RATE	DATE
Oats	2.5 bu/ac	4/1 – 6/1
Barley	1.5 bu/ac	4/1 – 6/1
Sudangrass/Millet	12.0 lb/ac	5/15 – 6/10
Annual Ryegrass	8.0 bu/ac	8/1 – 9/1

Companion Crops:

Companion crops can be used to reduce the amount of erosion on critical sites by including Canada Wild rye, Slender Wheatgrass and/or Sideoats Grama in the mixtures at rates specified in Table 2.

Seedbed Preparation and Seeding:

Prepare a firm seedbed for all planting methods.

Conventional Tillage - Prepare a fine firm seedbed to a minimum of 3 inches. The seedbed should contain enough fine soil particles for uniform shallow coverage of the seed as well as contact with moisture and nutrients. If possible, use specialized native grass drills with depth bands designed to handle a wide variety of seed. For conventional drills, as a minimum, cultipack before seeding. Cultipack after seeding if possible.

Do not use heavy drills on conventionally prepared seedbeds as heavy drills tend to sink in the soil and depth control is difficult. Plant seed between one-quarter and one-half inch deep. Some seed may be seen on the surface of the ground after seeding. Tillage should only be used on flatter slopes or in conjunction with erosion control measures.

No-Till - No-till drilling reduces the exposure of the newly seeded site to erosion. A no-till drill must be used to seed these sites. A drill should be selected that can handle a wide variety of seed (fluffy, smooth, large, and small) and low seeding rates. Plant seed to a depth of one-quarter to one-half inch deep.

Use of a herbicide is essential in order to kill existing vegetation. Land that has been in grass for many years usually has a thick residue layer on the soil surface.

To allow for the best no-till seedbed this residue must be removed. Three options are: (1) grazing; (2) mowing with residue removed; and (3) prescribed burn. In the fall a burndown herbicide can be applied to prepare for a spring no-till seeding. An additional spring herbicide application may be required, depending on plant growth.

Broadcast - Prepare a fine firm seedbed to a minimum of 3 inches. Use a roller, cultipacker or similar implement prior to seeding. The seedbed should contain enough fine soil particles for uniform shallow coverage of the seed as well as contact with moisture and nutrients.

Broadcast seed at a rate of 1.5 times the normal seeding rate and roll or cultipack again after seeding. Do not harrow in the seed.

Weed Control:

It is important to mow for weed control during the first summer, especially on silt loam or heavier soils. During the establishment year, mow weeds after they have reached a 12" height. Mow 2–3 times, generally on 30 day intervals from the date of seeding. Mow to a height of 6" to 8". Use a rotary mower or remove the clippings so as not to smother the seedlings. This will slow the weeds but won't harm the prairie plants.

The second year, evaluate the stand to determine if weed control is necessary. If it is, spot mow the planting at a height of six inches. If there is enough material for a prescribed burn, this may be an effective method to control weeds.

Maintenance:

Prairie communities are best managed by the use of prescribed grazing or prescribed fire. Other management techniques include mowing/haying and prescribed grazing. Periodic management will normally be required to maintain stand vigor and persistence of desired plant species.

Fall burns and early spring burns tend to favor forbs. Late spring burns provide maximum stimulus to warm season plants and work well to control cool season grasses. Burn when cool season grasses are growing and warm season plants are just beginning to grow.

Woody vegetation control becomes critical in maintaining areas in prairie. Undesirable woody vegetation may be controlled by early spring or fall burning, or cutting/girdling with spot chemical treatment to remove the plant or prevent sprouting.

Chemicals used in performing this practice must be Federally, State, and locally registered and must be applied in accordance with label directions.

Criteria for Oak Savanna Restoration

Prior to European settlement, oak savanna was common in a long narrow diagonal zone northwest to southeast across Minnesota.

This community is characterized by widely spaced, open grown trees/shrubs and greater than 30% prairie grassland understory. The canopy cover is broken to scattered and ranges from 10% to as high as 70%.

Apply this practice to lands suited to the appropriate planned oak savanna community restoration (Mesic or Dry) as identified in Figure 1.

Restoration Design:

- 50%-75% of the site shall be established to native prairie according to the practice specifications for "Tallgrass Prairie Restoration". 25%-50% of the site shall be established to native oak trees and native shrubs.
- Planting stock for oak savanna establishment shall consist of Minnesota ecotype species: Bur Oak (*Quercus macrocarpa*), White Oak (*Quercus alba*), Black Oak (*Quercus velutina*), Swamp White Oak (*Quercus bicolor*) or Northern Pin Oak (*Quercus ellipsoidalis*) adapted to the site conditions and savanna type planned.
- Select native shrubs adapted to the site conditions. Refer to practice standard 645-Upland Wildlife Habitat Management. Predominant savanna shrub species include: Plum (*Prunus spp.*), Dogwood (*Cornus spp.*), Rose (*Rosa spp.*) and American Hazel (*Corylus americana*).
- Minnesota ecotype seedlings developed to reflect native communities and obtained through commercial vendors and determined suitable for specific site conditions may also be used.

Planting Rate:

- Trees and shrubs will be planted at a rate of 100-125 trees/shrubs per acre. On wetter sites, up to 250 trees/shrubs per acre may be planted if recommended by the MDNR Forester.
- Woody plantings shall consist of 80%-100% oaks with the balance comprising native shrubs.

Planting:

- For restorations less than 10.0 acres in size, the tree/shrub planting shall be in the form of clumps, not plantations, and shall be planted at a rate of 25 trees/shrubs per clump. Distribute the clumps throughout the project area.
- For restorations greater than 10.0 acres in size, the tree/shrub planting shall be in the form of blocks. Each block will not exceed 5.0 acres, and will be distributed throughout the project area.

Shrubs as applicable shall be randomly intermixed with the oaks.

Site Preparation and weed control:

Refer to practice standard 380-Windbreak. Cover crop seeding mixtures shall be selected from one of the following individual species, or a 50:50 mixture each at ½ the full seeding rate:

	FULL RATE - SEEDED ALONE	
	Drilled Rate PLS lb/ac	Broadcast Rate PLS lb/ac
Blue Grama	5.0	10.0
Sideoats Grama	15.0	30.0

Planting Dates:

Planting will be done in the spring, prior to June 1.

Maintenance:

Oak savannas are plant communities that developed and are maintained by fire. General guidance for management of the understory component is as follows:

- To produce barrens understory structure of grasses without brush, utilize late spring and summer burns. Frequent "low intensity" burning techniques are necessary such as the "backfire" method on a 1-3 year interval.
- To produce scrub barrens with a sparse brush and grass understory, high intensity fires at intervals of 5 years or greater are necessary.

Avoid burning the savanna portion that contains trees and shrubs until they reach a size resistant to fire, usually a minimum of 5 years following establishment.

Criteria for Red and White Pine Restoration

Apply this practice to sites where the soils and climate are suitable for growing red pine (*Pinus resinosa*), jack pine (*Pinus banksiana*) and white pine (*Pinus strobus*).

Do not apply this practice to convert native jack pine stands to red or white pine stands. Sites will be located within the historic range as identified in figure 1.

Restoration Design:

Consult with MDNR for design recommendations.

- Each planting site shall contain a mixture of primary and secondary species as follows:
 1. Primary Species: red pine, jack pine and white pine.
 2. Secondary Species: three native hardwood tree species and one native shrub species suited to the eco-region and site conditions.

Note: where desired, an understory native conifer may be substituted for one of the hardwood species.

- Where practical, the planting patterns should be altered to reflect the random nature of a natural forest stand. Rows of single species should be avoided.
- Retain any appropriate existing native vegetation.
- Planting stock shall consist of Minnesota ecotype red pine, jack pine and white pine, from known and documented seed sources.
- Planting stock for native hardwood trees and shrubs will be adapted to the site conditions.
- The potential for animal depredation of planted trees and shrubs should be considered, and appropriate steps taken to protector manage damage (e.g. bud caps, tree shelters etc.)

Planting Rate:

Plantings should establish 300 to 500 red and white pines per acre, up to 800 jack pines, and 100 to 300 hardwood trees and shrubs per acre.

Planting Dates:

Planting of all bare root stock will be done in the spring, as soon as site conditions allow, but prior to June 1. Planting of container stock may occur after June 1, provided soil moisture conditions are adequate.

Site Preparation and Maintenance:

Refer to practice standard 612–Tree/Shrub Establishment.

Criteria for Aspen Parkland Restoration

The tallgrass aspen parkland occupies a broad zone of gradual transition between the prairie, forest and peat lands as identified in Figure 1.

Historically, this community was characterized by a dominance of tallgrass and wet prairie, and a sub-dominance of scattered shrub thicket, bur oak and aspen groves. Floodplains were comprised of Elm and Ash.

Apply this practice to sites where the soils and climate are suitable to the appropriate habitat components.

Restoration Design:

Parkland restoration must take into consideration a number of planning issues including; landscape considerations, species selection and composition, and the effects on “at risk species”. Therefore, it is recommended that the MN DNR be involved in the project design and restoration plan.

Prairie Component - Follow the specifications for “tallgrass prairie” restoration. Additional wet/brush

prairie species may include sedges (*Carex spp.*), willow (*Salix spp.*), bog birch (*Betula glandulifera*), and shrubby cinquefoil (*Potentilla fruticosa*).

Wetland Component - Wetlands will be restored based on practice standard 657–Wetland Restoration.

Woodland Component - The aspen component will be comprised primarily of trembling aspen (*Populus tremuloides*), balsam poplar (*Populus balsamifera*) and bur oak (*Quercus macrocarpa*) may be included as a secondary component.

Aspen will be established by one or a combination of the following methods:

- Natural regeneration – due to the suckering characteristic of aspen, sites with minimal disturbance may best be established through discontinuing the disturbance activity and allow passive regeneration.
- Planting – on sites where passive regeneration will not meet restoration objectives planting may be necessary.
 1. Plant materials shall consist of Minnesota ecotype species.
 2. Planting shall be in the form clumps, not plantations.
 3. Trees shall be planted at a rate of 25 trees per clump, with 100-125 trees per acre.

Additional tree and shrub species may include; American hazel (*Corylus americana*), chokecherry (*Prunus virginiana*), plum (*Prunus americana*), erviceberry (*Amelanchier spp.*), and bur oak (*Quercus macrocarpa*).

Site preparation and planting:

Follow practice standard 612–Tree/Shrub Establishment. The potential for animal depredation of planted trees and shrubs should be considered, and appropriate steps taken to protector manage damage (e.g. bud caps, tree shelters etc.)

Maintenance:

Management of parkland restorations are best accomplished through the introduction of controlled fire to restore the natural dynamics of the parkland.

For more information on prescribed burning see practice standard 338–Prescribed Burning. Additional guidance may be found in the tallgrass prairie and oak savanna sections of this standard.

Criteria for Wetland Restoration

Refer to practice standards 657–Wetland Restoration and 659–Wetland Enhancement.

Criteria for Jack Pine Woodland Restoration

Consult with MN DNR for design recommendations.

Jack pine woodlands are a declining plant community that occurs in central and northern Minnesota. They typically occur on sandy soils where crown and surface fires were historically common. Their canopies are patchy to continuous (25-100% cover), dominated by jack pine with minor amounts of paper birch, red pine, quaking aspen and bur oak. Hazel and juneberry are common shrubs.

Planting Rate:

Plantings should establish 100 to 400 jack pines per acre, and up to 100-300 hardwood trees and shrubs per acre.

A sparse planting of native grasses and forbs may be included in the restoration site. Consult MN DNR for appropriate species mix.

CONSIDERATIONS

Confer with other agencies and organizations to develop guidelines and specifications for conserving declining habitats.

In many cases threatened and endangered species or species of concern will benefit from conservation of declining habitats.

Haying, grazing and tree harvest will be planned and managed as necessary to achieve and maintain the intended purpose of managing wildlife habitat.

All habitat manipulations will be planned and managed according to soil capabilities and recommendations for management will avoid excessive soil loss.

PLANS AND SPECIFICATIONS

Plans and specifications for establishment and maintenance of this practice shall be prepared for each habitat type. Plans and specifications shall be recorded using approved specification sheets, job sheets, and narrative statements in the conservation plan or other acceptable documents.

For wetland restorations, prepare site specific plans and specifications following practice standard 657—Wetland Restoration.

For prairie, parkland and oak savanna restoration, site specific plans and specifications shall be developed based on this standard.

For red and white pine restoration, site specific plans and specifications shall be developed based on practice standard 612—Tree/Shrub Establishment.

OPERATION AND MAINTENANCE

A restoration project may require many years to achieve the biological diversity that approximates a native habitat. Proper management of the restored area is essential for the restoration to achieve and maintain the full potential of the site for the desired habitat type. As vegetation matures and goes through successional stages, changes in management practices including introduction of new species may be required to maintain and enhance the desired habitat type.

Any use of fertilizers, pesticides and other chemicals shall not compromise the intended purpose of this practice.

Follow-up habitat assessments shall be performed on a regular basis to evaluate the progress of planned activities.

REFERENCES

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United States Department of Agriculture. 1995. Revegetating with Native Grasses

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Table 1: Adapted Native Grass Variety/Natural Germplasm Materials Suitable for Agricultural Fields and Other Disturbed Sites.

Warm Season Species	Variety	Source Origin	Adaptability Zone
Switchgrass	Sunburst <u>1/</u> Forestburg <u>2/</u> Dacotah <u>1/</u>	South Dakota SD Composite North Dakota	A,B,C,D A,B,C,D B,C,D,E
Indiangrass	Tomahawk <u>2/</u>	ND Composite	Statewide
Sideoats Grama	Pierre <u>1/</u> Killdeer <u>1/</u>	South Dakota North Dakota	A,B,C,D C,D,E
Blue Grama	Bad River <u>1/</u>	South Dakota	Statewide
Little Bluestem	Bad Lands <u>2/</u> Itasca <u>2/</u>	ND-SD Comp. MN-ND-SD Composite	Statewide
Prairie Cordgrass	Red River <u>2/</u>	MN-ND-SD Composite	Statewide
Big Bluestem	Bounty <u>2/</u> Bonilla <u>1/</u> Bison <u>1/</u>	MN-SD Composite South Dakota North Dakota	A,B,C,D A,B,C,D B,C,D,E
Cool Season Species	Variety	Source Origin	Adaptability Zone
Slender Wheatgrass	Revenue <u>1/</u>	Saskatchewan	Statewide
Western Wheatgrass	Rodan <u>1/</u>	North Dakota	Statewide
Canada Wildrye	Mandan <u>1/</u>	North Dakota	Statewide
Green Needlegrass	Lodorm <u>1/</u>	North Dakota	Statewide

1/ Variety2/ Natural Germplasm – Source Identified

Table 2: Recommended Seeding Mixtures for Native Prairie Restoration

The following list identifies native grasses commonly found in native grasslands. The list is not inclusive and identifies those species which are readily available through private vendor seed supplies. Other native species may be used provided they are adapted to the site conditions. Seeding rates are listed in pounds pure live seed (PLS) per acre.

Grasses

Species	% of Mix	Full Seeding Rate (PLS)	Seeds per Square Ft. (1 lb/ac)	pH Min.	Wet Soils <u>1/</u>	Drought Tolerance <u>2/</u>	Flood Tolerance
Big Bluestem (<i>Andropogon gerardii</i>)	0-50	8.0	3.8	>5.5	Yes	Moderate	Good
Indiangrass (<i>Sorghastrum nutans</i>)	0-50	8.0	4.0	>5.5	No	Moderate	Moderate
*Green Needlegrass (<i>Stipa viridula</i>)	0-10	8.0	4.0	>5.5	No	Moderate	Fair
Little Bluestem (<i>Schizachyrium scoparium</i>)	0-30	8.0	6.0	>5.5	No	Good	Poor
Sideoats Grama (<i>Bouteloua curtipendula</i>)	0-30	8.0	4.4	>5.5	No	Good	Poor
Prairie Sandreed (<i>Calamovilfa longifolia</i>)	0-30	5.0	6.6	>5.5	No	Excellent	Poor
*Canada Wildrye (<i>Elymus canadensis</i>)	0-10	12.0	2.6	>5.5	Yes	Moderate	Moderate
*Slender Wheatgrass (<i>Agropyron caninum</i>)	0-10	8.0	3.7	>5.0	Yes	Moderate	Moderate
*Western Wheatgrass (<i>Agropyron smithii</i>)	0-10	12.0	2.6	>6.5	Yes	Good	Good
Blue Grama (<i>Bouteloua gracilis</i>)	0-20	2.0	17.5	>5.5	No	Excellent	Poor
Switchgrass (<i>Panicum virgatum</i>)	0-5	5.0	9.0	>5.5	Yes	Poor	Good
*Canada Bluejoint (<i>Calamagrostis canadensis</i>)	0-5	10.0	91.0	>5.5	Yes	Poor	Excellent
Prairie Cordgrass (<i>Spartina pectinata</i>)	0-5	8.0	3.8	>5.5	Yes	Fair	Excellent
*Virginia Wildrye (<i>Elymus virginicus</i>)	0-10	15.0	2.2	>5.0	Yes	Moderate	Good
*Kalm's Brome (<i>Bromus kalmii</i>)	0-10	8.0	3.0	>5.5	No	Moderate	Fair

* Cool Season Grasses

1/ Wet soils are those classified as somewhat poorly drained to very poorly drained.

2/ Droughty soils are those classified as excessively drained.

Table 2 (cont'): FORBS AND LEGUMES

The following list identifies native forbs and wildflowers commonly found in native grasslands. The list is not inclusive, and identifies those species, which are readily available through private vendor seed supplies. Other native species may be used provided they are adapted to the site conditions.

Species		Value to Wildlife	Seeds Per Square Ft <u>1/</u>
DRY			
Bush Clover <u>2/</u>	(Lespedeza capitata)	G	0.18
Dotted Blazingstar	(Liatris punctata)	EX	0.16
Purple Coneflower	(Echinacea angustifolia)	EX	0.16
Showy Penstemon	(Penstemon grandifloris)	G	0.32
Silky Aster	(Aster sericeus)	EX	0.60
DRY to MESIC			
Butterfly Weed	(Asclepias tuberosa)	EX	0.10
Canada Milkvetch <u>2/</u>	(Astragalus canadensis)	EX	0.39
Compass Plant	(Silphum laciniatum)	G	0.02
Hoary Vervain	(Verbena stricta)	G	0.64
Leadplant <u>2/</u>	(Amorpha canescens)	EX	0.37
Prairie Smoke	(Geum triflorum)	G	0.62
Rough Blazingstar	(Liatris aspera)	EX	0.37
Showy Goldenrod	(Solidago speciosa)	G	2.18
Smooth Aster	(Aster laevis)	EX	1.26
Stiff Tickseed	(Coreopsis palmata)	EX	0.23
MESIC to WET			
Canada Tick Trefoil <u>2/</u>	(Desmodium canadense)	G	0.13
Common Ox-eye	(Heliopsis helianthoides)	EX	0.14
Giant Sunflower	(Helianthus giganteus)	EX	0.23
Golden Alexanders	(Zizia aurea)	G	0.25
Partridge Pea <u>2/</u>	(Chamaecrista fasciculata)	EX	0.06
Rattlesnake Master	(Eryngium yuccifolium)	EX	0.17
Tall Blazingstar	(Liatris pycnostachya)	EX	0.25
Wild Bergamot	(Monarda fistulosa)	EX	1.61
Yellow Coneflower	(Ratibida pinnata)	EX	0.69
WET			
Blue Vervain	(Verbena hastata)	G	2.13
Boneset	(Eupatorium perfoliatum)	EX	3.67
Joe-pye Weed	(Eupatorium maculatum)	G	2.18
New England Aster	(Aster novae-angliae)	G	1.52
Panicled Aster	(Aster lanceolatus)	EX	3.58
Swamp Milkweed	(Asclepias incarnata)	EX	0.11
DRY to WET			
Black-eyed Susan	(Rudbeckia hirta)	EX	2.11
Illinois Bundleflower <u>2/</u>	(Desmanthus illinoensis)	G	0.10
Purple Prairie Clover <u>2/</u>	(Dalea purpurea)	EX	0.41
Maximillian Sunflower	(Helianthus maximiliani)	EX	0.30
Stiff Goldenrod	(Solidago rigida)	EX	0.94
White Prairie Clover <u>2/</u>	(Dalea candidum)	EX	0.44
Yarrow	(Achillea millefolium)	EX	4.13

1/ Seeds per square foot based on 1.0 oz/ac seeding rate

2/ Legumes

EXAMPLE NATIVE GRASS AND FORB MIXTURE

<i>SPECIES</i>	<i>RATE/ACRE</i>	<i>SEEDS/Sq. Ft</i>	<i>% OF MIXTURE SEEDS/Sq. Ft.</i>	
Big Bluestem	2.0 lb	8.0	25.0	
<i>Indiangrass</i>	2.0 lb	7.6	26.3	
<i>Switchgrass</i>	0.2 lb	1.8	5.9	
<i>Canada Wildrye</i>	1.0 lb	2.6	8.6	
<i>Little Bluestem</i>	1.3 lb	7.8	25.7	
<i>Western Wheatgrass</i>	1.0 lb	2.6	5.6	
	7.5 lb	30.4	100%	Grass – 68%
<i>Maximillian Sunflower</i>	1.5 oz	0.5	3.1	
<i>Wild Bergamot</i>	1.5 oz	2.4	16.8	
<i>Purple Prairie Clover</i>	2.0 oz	0.8	5.8	
<i>Black Eyed Susan</i>	1.0 oz	2.1	14.7	
<i>Yellow Coneflower</i>	1.5 oz	1.0	7.2	
<i>Tall Blazingstar</i>	1.5 oz	0.4	2.6	
<i>Stiff Goldenrod</i>	1.5 oz	1.4	9.8	
<i>Yarrow</i>	0.5 oz	2.1	14.4	
<i>Smooth Aster</i>	1.5 oz	1.9	13.2	
<i>White Prairie Clover</i>	2.0 oz	0.9	6.1	
<i>Silky Aster</i>	1.5 oz	0.9	6.2	
	16.0 oz	14.3	100%	Forbs – 32%
TOTAL	8.5 lbs	44.7 seeds/sq. ft.		

Figure 1: Declining Habitats of Significant Extent.

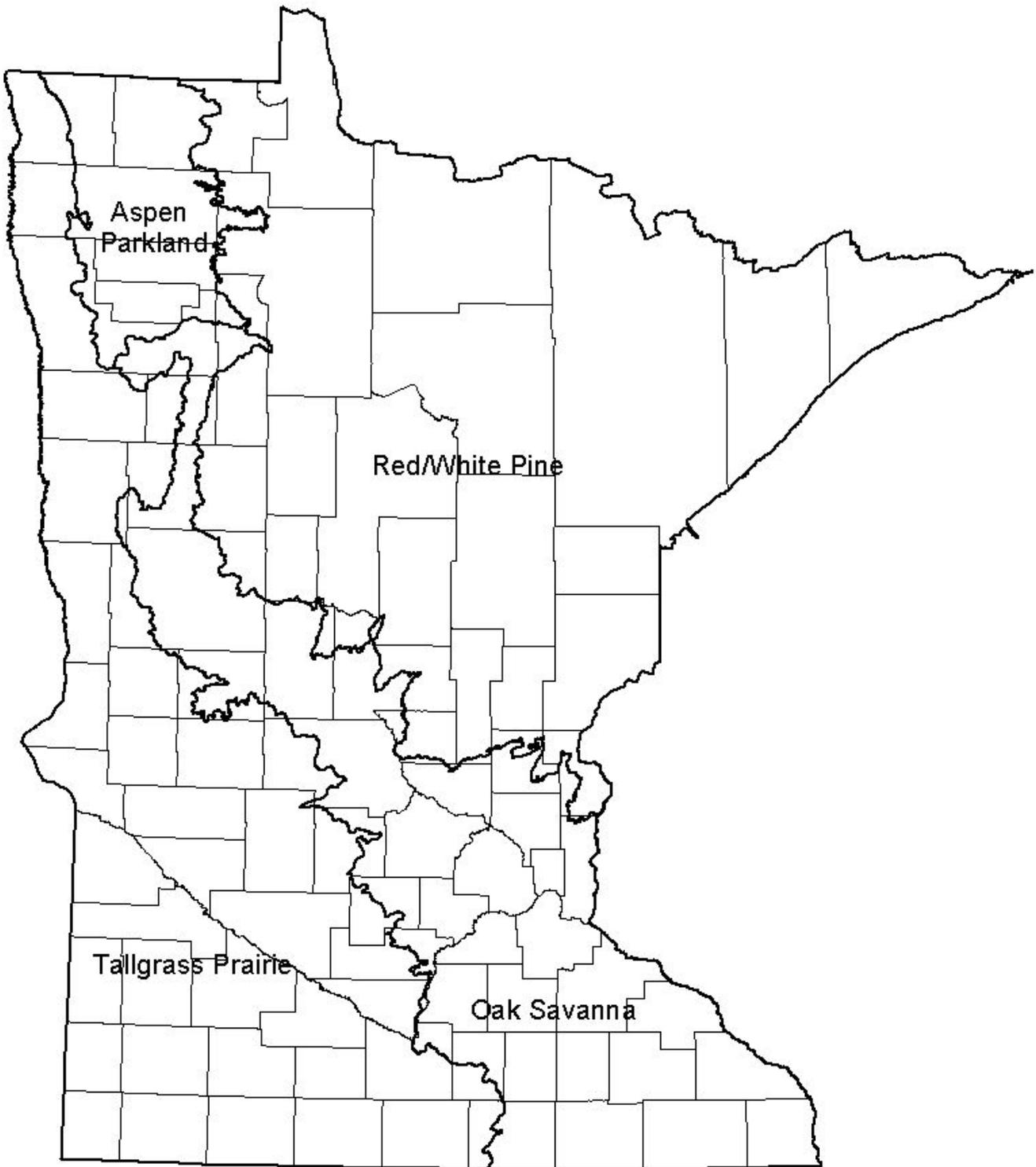


Figure 2: Native Grass Variety/Natural Germplasm Adaptability Zones

