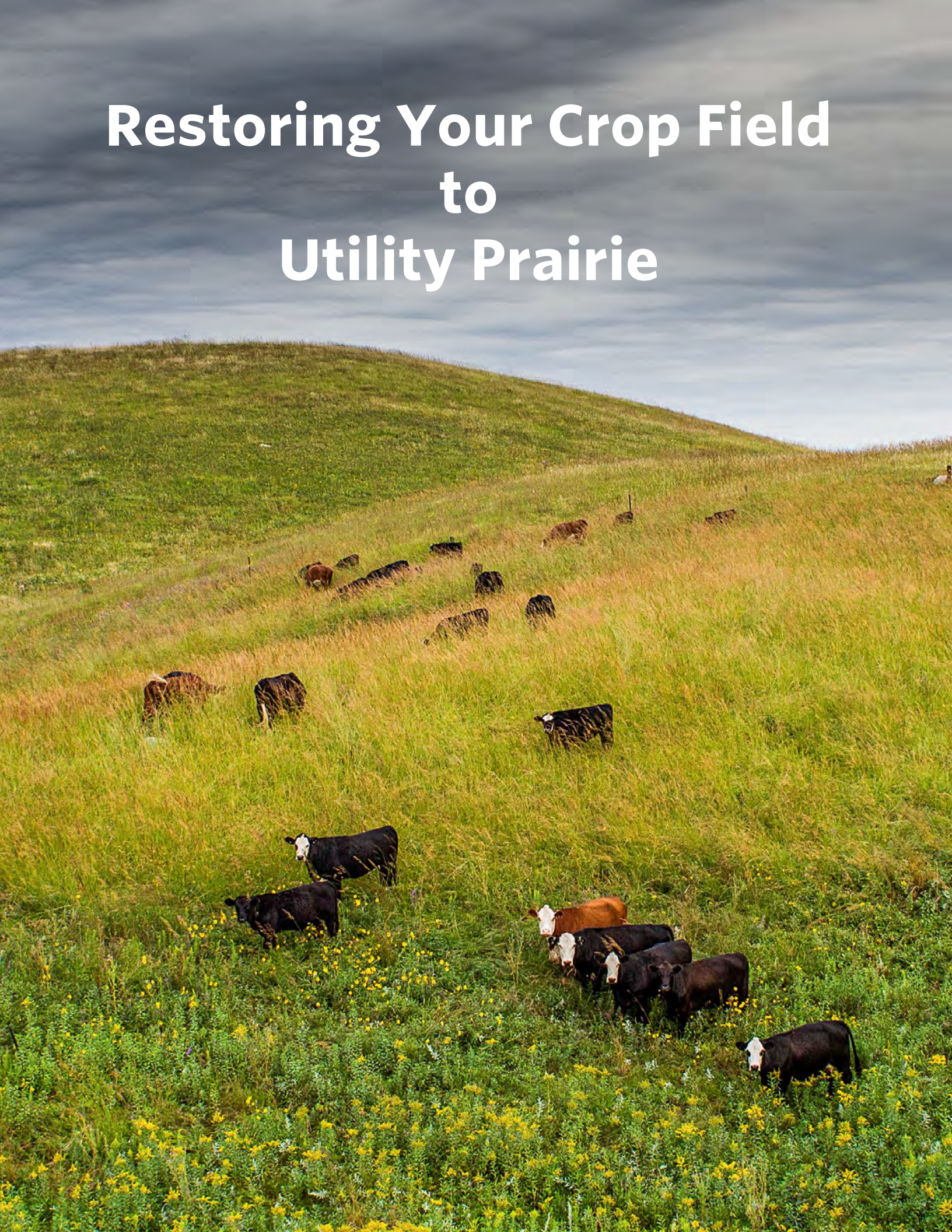
Restoring Your Crop Field to Utility Prairie



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Cover photo taken at Sheepberry Fen Preserve by Alison Mickelson, Greater Good Photography.

Restoring Your Crop Field to "Utility Prairie"

In this guide, you will learn the basic steps to restore a crop field to a utility prairie. The precise restoration actions will depend on the particular features of your site as well as your budget, preferences and project goals.

When planning your restoration, we recommend you consult with restoration professionals to evaluate your site's unique characteristics. Please visit nature.org/MNPrairieRestorationGuides for more information on who to contact or other publications that cover site assessment protocols.

What is utility prairie?

Utility prairie is designed to maximize production and palatability for forage, while still supporting basic conservation goals. It is distinguished from conventional hay fields and pasture by its emphasis on native species and greater diversity.

Compatible land uses include:

- Conservation grazing using cattle or bison
- Hay production
- Commercial seed harvest
- Recreational activities such as hunting

Conservation benefits include improved water quality, soil stabilization and habitat for birds, animals and insects. Utility prairie can also serve as a buffer for other high-quality native prairies and support threatened and endangered plants and animals that depend on large contiguous areas of grassland.

Why restore crop fields?

Crop fields are an excellent "blank slate" start point for restoring prairie. They offer a ready-to-seed seedbed, and the ground is essentially bare, with minimal weeds and no existing native species that need to be preserved. Restorations of crop fields are generally the most cost-effective, because they require relatively little labor to prepare the site for seeding.

The restoration steps in this guide assume that you are restoring a field that has been in corn-soybean rotations, but the steps may also apply to other common annual crops[1]. When possible, we recommend ending on a soybean rotation, because it is easier to drill into a field with minimal crop residue.

This guide also assumes that your site has moderate to dry soil moisture and has not been drained. Relatively wet crop sites that have been drained via drainage tiles or ditches are better suited for restoring to wet meadow. This may require additional steps to restore the hydrology[2].

Cattle on a utility prairie near Glacial Lakes State Park ©TNC/Steve Chaplin

[1] For perennial crops (e.g. alfalfa), refer to the restoration guide "Restoring your Invasive Perennial-Dominated Fields to Utility Prairie", which includes methods for controlling existing herbaceous vegetation.

[2] Refer to the restoration guide "Restoring your Crop Field to Utility Wet Meadow" for more information on hydrologic restoration.

What will it involve?

Prairie restoration typically includes these basic steps:

- **Site Assessment**— Identify the site characteristics and define goals for the restoration.
- **Vegetation Removal** – Remove existing weeds and undesired vegetation from the site to prevent aggressive weedy species from out-competing native prairie plants.
- **Seedbed Preparation** – Prepare a seedbed to ensure good seed-soil contact and promote germination of planted seeds.
- **Seeding/Planting** – Select seed mixes and seeding methods that are well suited to the site and project goals. Or, in the case of small sites of less than half an acre, consider hand-planting plugs for quicker results[3].
- **Establishment & Aftercare** – Control weeds and promote the establishment and growth of prairie plants through the first few years after seeding.
- **Long-term Management** – Maintain the health and diversity of native prairie into the future.

How long will it take?

On a crop field, the initial phases of site preparation and seeding can be completed within a single growing season. After the year it's seeded, expect to spend at least three years on aftercare to ensure good establishment of the utility prairie. This period is referred to as the establishment phase of restoration.

After establishment, often around year 4, the long-term management phase begins. Management actions are typically less frequent and intensive than during the establishment phase, but are critical for maintaining the health and diversity of the prairie into the future.

What will it cost?

The cost of the restoration will be influenced by:

- Management level required to control weeds
- Species and number of species selected for the seed mix
- Cost of seed, which fluctuates from year to year
- Labor and equipment available for the project

The cost estimate in this document will give you a baseline for what you can expect to spend through the initial establishment phase of your restoration (i.e. through three years after seeding). It may be tempting to cut costs by reducing the number of species planted or the frequency of weed control activities. Be aware that these investments on the front end can actually save costs in the long run. A healthy and diverse prairie will be more resilient to disturbance, invasion by exotic species, and extreme weather events such as drought.

Broadcast seeding at Grace Marshes WMA
©DNR\Cory Netland

[3] Plugs are young plants sold in 4- or 6-packs. Plugs cost substantially more than seed, but they establish rapidly and can produce a resilient and visually appealing prairie more quickly than seeding, so it is often a preferred option for smaller sites.

Young corn field north of Ordway Prairie
© TNC\Steve Chaplin

Crop to Utility Prairie Restoration Guidelines

Site assessment

A successful prairie restoration is highly dependent on specific characteristics of a site. Important considerations when planning a restoration include:

- Has the site had herbicide treatments that would prohibit seed from germinating?
- Is there a risk of herbicide drift from neighboring cropfields?
- Are the soils dry, moderate or wet?
- Are there steep slopes that may be vulnerable to erosion?

If you are new to prairie restoration, we strongly encourage enlisting someone who has restoration experience to help you assess the characteristics of the site and develop a restoration plan suited to your site's specific features and your project goals.

Vegetation removal

Vegetation removal is not necessary on annual crop fields, provided seed is planted in the winter following harvest. If the planting is planned for the spring following harvest, a round of herbicide is generally necessary to control annual weeds prior to planting.[4]

[4] If the crop field is left fallow for one or more growing seasons and has become dominated by annual weeds, refer to the "Restoring your Annual Dominated Field to Utility Prairie" guide for information on using herbicide to control annual weeds.

Seedbed preparations

Crop fields require little seedbed preparation, unless crop residue is heavy enough to interfere with seeding. Soybean fields are the preferred crop "start state" for restoration, because they are essentially ready to seed. The best method of seedbed preparation is influenced by the intended seeding method, as well as site conditions. For this utility prairie restoration plan, no-till drills are the recommended seeding method.

Recommended protocol:

- If light crop residue is present, such as with a soybean field:
    - No site preparation needed if no-till drilling.
    - If broadcast seeding, lightly harrow site prior to seeding, for example with a spike tooth harrow.
- If heavy crop residue is present, such as with a corn field:
    - Mow stalks.
    - Lightly disk site to incorporate residue into soil. Disking should be avoided if not necessary for the site conditions, as it can replant weed seeds and lead to greater weed problems during the prairie establishment phase.
    - Cultipack or roll the site to create a firm seedbed.
- If soils are severely compacted, till to 4-inch depth and harrow with something like a drag harrow or chain link fence to break up soil clods. Note that soil disturbance may bring weed seeds to the soil surface. Herbicide applications may be required prior to native seed establishment.

Seeding

The key to establishing a successful prairie is to maximize seed-to-soil contact during planting. If planting with a drill, use a seed drill designed specifically to plant prairie grasses and flowers. If broadcasting seed, native-seed broadcasters such as a Vicon seeder should be used. They are designed to spread mixes with different sized seeds.

Recommended protocol:

- How to seed:
    - Drill seeds directly into crop residue, or prepared seedbed, using a no-till drill such as a Truax.
    - Alternative seeding method: broadcast seeds, then cultipack or roll the site, if possible, to incorporate seeds into soil
- When to seed:
    - Planting dates will vary depending on the weather and location within the state. Consult with native seed suppliers or restoration specialists to determine the best planting dates for the year.
    - Growing season plantings should occur May 1 to July 1 OR when the soil temperature is at least 60 degrees F[5]. Spring/early summer seeding promotes warm season grasses.
    - Dormant seeding should occur Dec. 1 to April 30 OR after soil temperatures fall below 50 degrees F for a consistent period of time[6]. When possible, timing the seeding before a snowfall may help prevent loss of seed that is consumed by wildlife during the winter months. Dormant seeding in late fall, also known as frost seeding, can be done with a seed drill or until the ground is frozen. Seed can also be broadcast over snow in

[5] Summer seeding after July 1 leads to poor seedling survival and is not recommended for prairies.
[6] Early fall seeding is not recommended for prairies, because seed may germinate too early and not survive over winter.

Native seed mixes should be seeded with equipment designed to handle different sized seeds ©Justin Meissen.

winter/early spring, although results of snow seeding are more variable and dependent on weather conditions. Dormant seeding promotes cool season grasses and flowering plants.

Seed mixes will vary but should take into account:

- Consider soil moisture conditions of the site.
- Choose palatable species that can tolerate grazing or haying.
- Select a mix of both warm- and cool-season species to ensure availability of forage throughout the season[7].
- Cover/nurse crops such as oats are optional, but should be included with the seed mix when seeding steep slopes.

- Design:
  - Seed the mix evenly across the site unless soil moisture is highly variable.
  - If there are wet to wet-mesic soils on the site, select a separate seed mix for wet conditions for these seeding zones[8].

- Seed rate:
  - Plant at a minimum of 40 seeds/sq. foot to reduce risk of weed invasion.
  - If there is minimal weed pressure and excellent site preparation, the rate can be reduced to 30 seeds/sq. foot.
  - Increase rate to 50 seeds/sq. foot on steep slopes (3:1 grade).
  - Seeding rates may need to be increased by 25% for dormant seedings to account for lower germination rates and loss of seed to wildlife.

Drilling prairie plant seeds into a prepared seedbed © Matthew Traucht

[7] See nature.org/MNPrairieRestorationGuides for more information on seed mix design and an example utility prairie seed mix.

[8] See nature.org/MNPrairieRestorationGuides for examples of utility meadow seed mixes appropriate for wetter soils.

Post-seeding aftercare and long-term management

Utility prairie establishment generally takes 3 to 5 years, but will vary depending on soil moisture and climate conditions. Early management (aftercare) is critical to preventing re-invading weeds and woody species from out-competing and displacing establishing natives.

Annual weeds are the biggest management problem in the early stages of restoration from crop fields. They can quickly overtop and shade prairie seedlings, resulting in decreased growth and survival. Frequent mowing can prevent annuals from forming a dense canopy and building up thatch that can further suppress native seedlings.

Post-seeding aftercare goals include discouraging weeds and encouraging rapid and robust establishment of native species that can sustain grazing, haying and other uses. Management strategies during the establishment phase include:

- Mowing annual weeds
- Selective use of herbicide to control invasive perennials
- Prescribed fire to promote native prairie species and discourage further invasion
- Monitoring vegetation to evaluate establishment of prairie seedlings

Throughout the establishment phase and beyond, adjust management plans as necessary, including the option to reseed, to achieve the desired species composition and diversity.


Mowing weeds after prairie seeding ©BWSR

Recommended management protocol:

Year 1:

- Mow the field to a height of 4-6 inches when the annual weed canopy reaches a height of 12-18 inches. Most prairie plants will not reach this height in first year and will not be damaged by a mower. The frequency of mowing will depend on the height and density of weeds, and how much they are competing with the prairie seedlings for light and moisture.

Year 2:

- Mow the field to a 12-inch height as needed.
- If annual weeds are limited to individual patches, may spot-mow, perhaps even with a string trimmer, instead of mowing whole field.
- If there is flush of annual/biennial noxious weeds mow, pull, or spot-treat prior to flowering to prevent seed-set.

Year 3:

- Begin prescribed burns after three growing seasons or as soon as biomass accumulation is sufficient to carry a burn.
- Begin grazing or haying after three growing seasons, or when native grasses have achieved dominance.
- Mowing should no longer be needed. Spot-treat weeds as necessary using dormant season applications and/or back-pack sprayer/wick applicator to minimize damage to native species.
- Conduct a stand evaluation to assess seedling establishment outcomes. If native plant density is less than 1 plant per square foot, interseed to increase cover and diversity.

Prescribed fire is an important tool in maintaining a utility prairie ©Chris Helzer/TNC

Year 4 & beyond
(long-term management phase):

- Burn every 3-5 years to stimulate productivity of native prairie plants and prevent invasion of perennial weeds and woody trees and shrubs.
- Burn and hay in rotations, disturbing no more than one half of a field at a given time, to maintain diversity and a local refuge for wildlife. Suggested interval is to burn one-third of the field annually, so that each patch has a 3 year rotation.
- Graze at low to moderate intensities, or at stocking rates prescribed by a grazing management plan written to meet the objectives of the utility prairie. Avoid grazing in saturated conditions.
- Time burning, haying and grazing to allow sufficient biomass accumulation for each activity, for example: an alternating biennial rotation of grazing and haying with a 3-4 year burn rotation.
- Hay late July or August to promote diversity and avoid grassland bird nesting season. Leave 6-8 inch stubble and regrowth for winter cover/spring nesting habitat.
- Adjust timing and intensity of burning, grazing and haying to maximize diversity and adjust species composition.
    - Grazing in late spring or early summer will favor warm season grasses.
    - Mid-late summer grazing will favor cool season grasses.
- Every 1 to 3 years, monitor vegetation composition and diversity.
    - Interseed as needed to increase native cover and diversity if native species are declining.
    - Adjust management plan, such as frequency and intensity of burning, haying, or grazing, if:
        - cover of native species is declining
        - desired composition is not being maintained
        - cover of invasive species is increasing
    - Spot-treat weeds as needed by hand-pulling, back-pack sprayer, wick-applicator or dormant-season application.
- Temporarily increase burn frequency, such as annual burns for 2 years, if woody invasions increase in cover. Note that sustained burn intervals of less than 3 years will negatively impact cool-season natives and wildlife.

Restored prairie Eden Valley WPA
© USFWS Beverley Meyer

Cost estimate

The estimated cost to restore a crop field to utility prairie in Minnesota is $801 per acre (based on 2013 prices). Costs associated with site assessment and project planning are excluded from this estimate. This cost estimate assumes the site is seeded with a no-till drill.

Estimated post-seeding management costs include typical aftercare activities through year three, specifically: mowing the site eight times and conducting two prescribed burns (burning no more than one half of the site per season). Actual project costs will be lower if a less-frequent mowing schedule is required. Long-term management costs are not included in this cost estimate but can be quite variable depending on site needs. Costs assume services and seed are purchased from restoration contractors and native seed nurseries.

Useful references

Going Native: A prairie restoration handbook for MN Landowners – MN Dept. of Natural Resources
http://files.dnr.state.mn.us/assistance/backyard/prairierestoration/goingnative.pdf

Native Vegetation / Seed Mixes – MN Board of Water & Soil Resources
www.bwsr.state.mn.us/native_vegetation

Prairie Seedling and Seeding Evaluation. Bockenstedt, P. 2006. Bonestroo Rosene Anderlik & Associates.

The Tallgrass Prairie Center Guide to Prairie Restoration in the Upper Midwest. Smith, D. 2010. University of Iowa Press, Iowa City, IA.

The Tallgrass Restoration Handbook for Prairies, Savannas, and Woodlands. S. Packard and C. F. Mutel, editors. 2007. Island Press, Washington, D.C.