

# Restoring Your Annual-Dominated Field to Utility Prairie



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



# Restoring Your Annual-Dominated Field to “Utility Prairie”

In this guide, you will learn the basic steps to restore a field dominated by annual weeds 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 that you consult with restoration professionals to evaluate your site’s unique characteristics. Please visit [nature.org/MNPrairieRestorationGuides](http://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 annual-dominated fields?

Annual-dominated fields (>75% coverage by annual weeds) are often previously cropped fields that have been left fallow. They have been colonized by annual weeds, such as foxtail, barnyard grass and lambs-quarters. Native weedy annuals such as ragweed may also be present, but desirable native prairie species are either absent or very minimal.

Controlling annual weeds and their seed bank will be an important step in restoration, and seedbed preparation is typically required prior to seeding. These fields are relatively straightforward to restore to prairie, and they require less investment in weed control than sites that have become invaded by aggressive perennial weeds.

This guide assumes that your site has moderate to dry soil moisture and has not been drained. Relatively wet fields 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<sup>1</sup>.



<sup>1</sup> 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<sup>2</sup>.
- **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 an annual weed-dominated 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.

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<sup>2</sup>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.



## Annual-Dominated Field 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 herbicides 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?
- What types of vegetation are currently present on the site?

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

Annual weeds are common in disturbed sites, such as fallow crop fields. If not properly managed, annual weeds can overtop and shade newly planted prairie seedlings, resulting in reduced survival and growth. Controlling annual weeds and reducing their seed bank prior to seeding and in the early establishment phase will typically result in faster and more complete establishment of planted natives. Annual weeds are commonly controlled with combinations of mowing/burning and herbicide applications.

#### **Recommended protocol:**

- Burn site to remove thatch. Or, if fuel load cannot carry a fire, mow site instead.
- When weed regrowth reaches 4-6 inches (2-4 weeks), apply appropriate herbicide, such as glyphosate.

- See Smith 2010 (Chapter 4) and Packard and Mutel 2007 (Chapter 16) for lists of recommended herbicides.
- Reapply herbicide (broadcast or spot-treatment) to remaining green vegetation after 2 weeks.
- Wait at least another 2 weeks following herbicide application to seed.
- An alternate option is to harrow or disk the site to bring seeds to soil surface and then apply repeated herbicide applications to emerging vegetation and regrowth.
  - This risks bringing the seeds of additional undesired species such as invasive perennial weeds to the soil as well.
  - Not recommended for highly erodible sites.

- If the site was not burned to remove thatch (e.g. due to insufficient fuel), tilling, disking and harrowing can be used to clear and smooth the seedbed.



## Seedbed preparations

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:

- No seedbed preparation is needed if seeding with no-till drill, unless:
  - If soil surface is uneven with numerous soil clods, lightly harrow to create a smoother surface for drilling.
  - 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. Additional 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 drills 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 into 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<sup>3</sup>. Spring/early summer seeding promotes warm season grasses.

<sup>3</sup> Summer seeding after July 1 leads to poor seedling survival and is not recommended for prairies.



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

- Dormant seeding should occur Dec. 1 to April 30 OR after soil temperatures fall below 50 degrees F for a consistent period of time<sup>4</sup>. When possible, timing the seeding before a snowfall may help prevent loss of seed that is consumed by wildlife over 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 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<sup>5</sup>.
- 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, for example in select a separate seed mix for wet conditions for these seeding zones<sup>6</sup>.
- 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.

<sup>4</sup> Early fall seeding is not recommended for prairies, because seed may germinate too early and not survive over winter.

<sup>5</sup> See [nature.org/MNPrairieRestorationGuides](https://www.nature.org/MNPrairieRestorationGuides)] for more information on seed mix design and an example utility prairie seed mix.

<sup>6</sup> See [nature.org/MNPrairieRestorationGuides](https://www.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 prevent re-invading weeds and woody species from out-competing and displacing establishing natives.

Reinvading annual weeds are the biggest management problem in the early stages of restoration from annual-dominated 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 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.



### 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 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; e.g. an alternating biennial rotation of grazing and haying within 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.



## Cost estimate

The estimated cost to restore an annual-dominated field to utility prairie in Minnesota is \$983 per acre, based on 2013 prices. Costs associated with site assessment and project planning are excluded from this estimate. This cost estimate assumes vegetation removal includes two broadcast herbicide applications and one mowing treatment, and the site is seeded with a no-till drill.

Post-seeding management costs include aftercare activities through year 3, specifically: eight mowing treatments and two controlled burns (one half of the site per burn). 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](http://www.bwsr.state.mn.us/native_vegetation)

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