

# **Mead's Milkweed Reintroduction Plan for Marais des Cygnes National Wildlife Refuge**



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## **Abstract**

This plan has been developed to increase the number and size of the federally-threatened Mead's milkweed (*Asclepias meadii* Torr.) populations at the Marais des Cygnes National Wildlife Refuge. This will be accomplished by planting small greenhouse-grown plants in at least three locations and with seeds planted at other sites. These transplants and seeded areas will be watered the first year and the sites where these populations are located will be managed as native prairie in subsequent years. Best management practices for tallgrass prairie in eastern Kansas are discussed for both native prairie and Mead's milkweed populations.

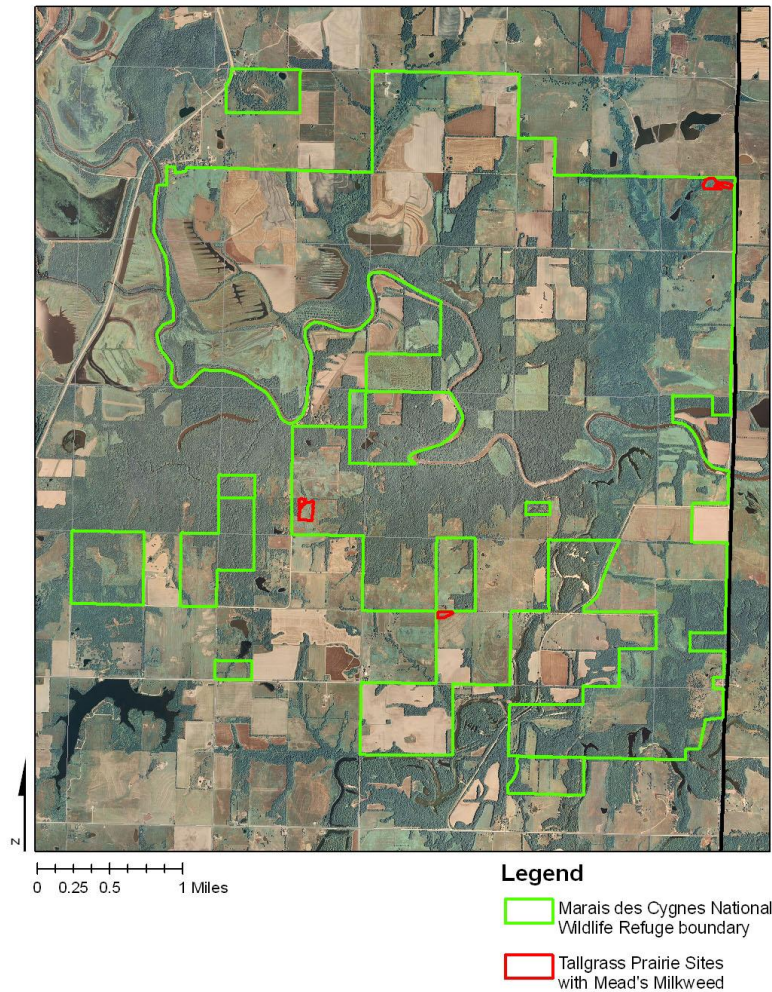
## **Introduction**

There is considerable opportunity to expand both the number and size of Mead's milkweed populations at the Marais des Cygnes National Wildlife Refuge through introduction of local ecotype plants and seeds. The National Wildlife Refuge system is an excellent location for reintroduction and increasing populations of rare species because these activities are encouraged on these federal lands. The Marais des Cygnes National Wildlife Refuge is in a landscape that is primarily agricultural. Because the Refuge is adjacent to the Marais des Cygnes River, there is a considerable acreage of forest. In the 1850s, about one-third of the Refuge was forest and the rest was tallgrass prairie (Kettle et al. 2002). The Marais des Cygnes National Wildlife Refuge still has several small areas of native tallgrass prairie in its holdings. Three of these areas contain the federally-threatened Mead's milkweed, including one new site that we discovered through field work in June 2008. (Figure 1.)

## **Mead's Milkweed (*Asclepias meadii*) Description and Location**

Mead's milkweed occurs in the Midwest and eastern Great Plains (Figure 2, U.S. Fish & Wildlife Service 2003). It is a smooth, rhizomatous, perennial herb with a distinctive single nodding head of greenish-cream-colored, fragrant flowers produced at the end of each flowering stem. Flowers are produced from mid-May to early June. Slender, hairy, erect pods mature from mid-June to late September. Vegetative plants often arise from the rhizomes in the vicinity of flowering/fruitleting stems.

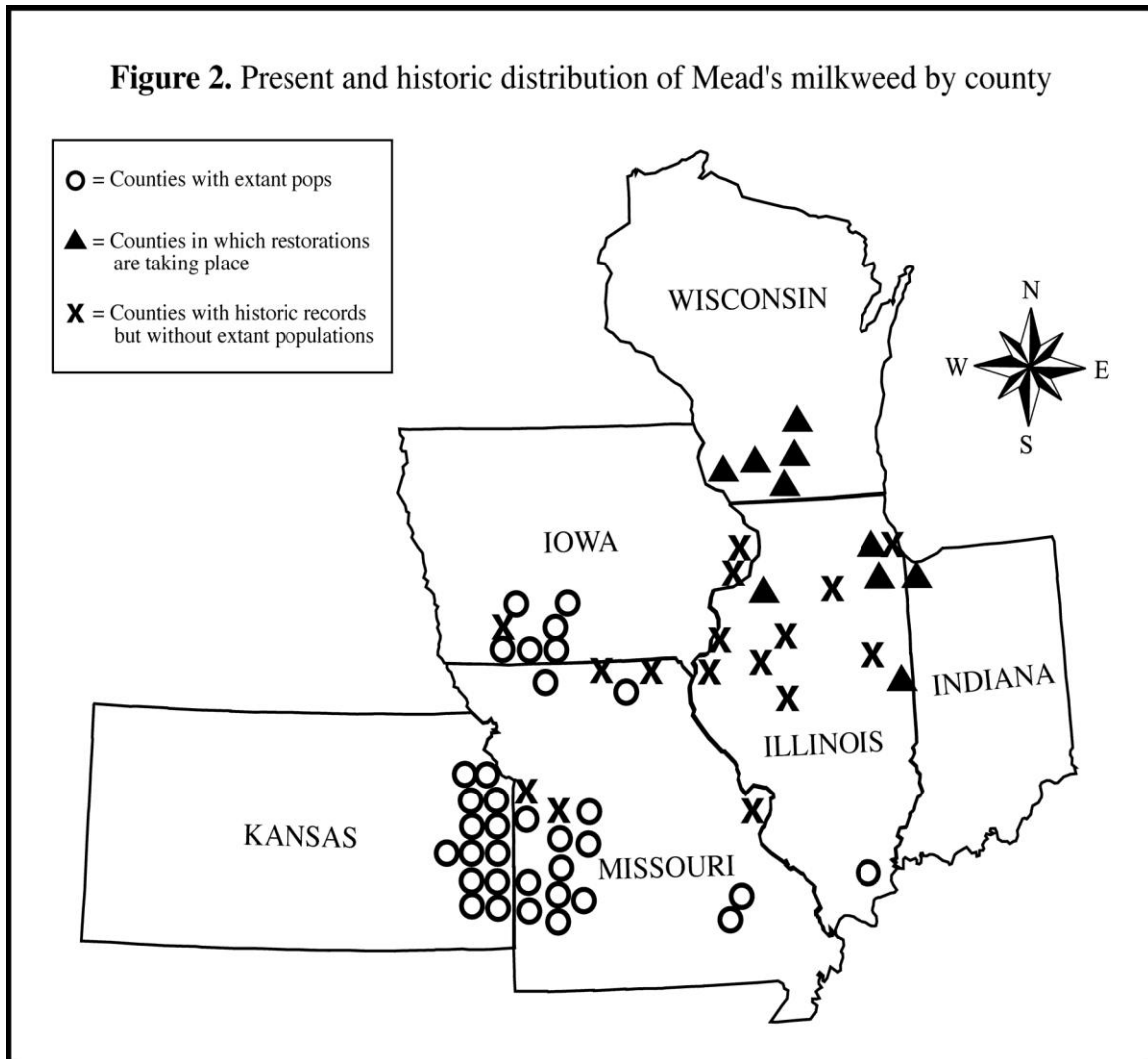
## Tallgrass Prairie Sites with Mead's Milkweed at Marais des Cygnes National Wildlife Refuge



**Figure 1.** Existing Mead's milkweed sites at Marais des Cygnes National Wildlife Refuge, 2008.

Most of the remaining species locations occur in Kansas, where more than 200 populations have been documented in the eastern two tiers of counties in the Osage Cuestas and in the southern Glaciated Region (Kansas Natural Heritage Inventory data for 2008). Fifty-two of these locations are in Linn County, where Marais des Cygnes National Wildlife Refuge is located. The number of stems fluctuates annually in a population. The largest population identified in Kansas was in Anderson County in 1988 with more than 2,200 stems. However, only four stands identified in Kansas had more than 200 stems (Kansas Natural Heritage Inventory 2008). Most populations occur on dry-mesic to mesic tallgrass prairies that are hayed annually, but a few occur on sites that

are known to be grazed lightly. Most grazing practices are not compatible with the long-term viability of Mead's milkweed. Plants grow most frequently on the middle and upper slopes of ridges and hills that have shallow, well-drained, limestone or (infrequently) sandstone soils.



Mead's milkweed has declined because of habitat destruction and alteration by humans. Because of its rhizomes, plants can survive annual mowing, a common practice on native prairie in eastern Kansas. Unfortunately, haying removes fruits before they can mature and release seeds, which prevents the establishment of new plants in most populations. Consequently, populations on most prairies with a long history of haying show less genetic variability than do populations on sites managed by fire (Freeman and Hall 1991; Bowles et al. 1998).

### Availability of Seeds and Plants

The USDA Plant Material Center has grown about 100 plants from local ecotype seed (from Miami County, Kansas) in the greenhouse in Manhattan, Kansas. In spring 2009, the seedlings will be one year old and ready to plant. We plan to collect more seeds in the future, so that this plan incorporates multiple years of introducing both plants and seeds beginning in 2009. (Figure 3.)



**Figure 3.** Mead's milkweed seeds can be collected from the distinctive seedpods after they open.

Target areas that would be suitable for initial introduction would include sites nearer to the refuge headquarters and those that are easier to water or manage. Another important factor is that we will want to expand the number of existing stands. Prairies and adjacent buffer areas, especially those that have been planted to native grass species, can be key locations for introducing Mead's milkweed plants and seeds.

## Care and Management of New Plantings and Seedlings

Mead's milkweed plants can be planted in the spring of 2009. Success of young plants is much higher than from seeds sown in the field. In a three-year experiment in Illinois, Bowles et al. (1998) found 60-80% establishment success of plants compared to 5 - 40% success for seeds when both were planted in native prairie remnants. The highest rates of success for both plants and seeds occurred in 1996 when precipitation was 200% of normal. These data indicate that transplanted plants will have higher success and that all types of plantings will be more successful when the plant materials are well-watered. Watering is likely to be even more important in Kansas than Illinois because of the prevalence of drought in these further southwest locations.

Mead's milkweed plants are usually found on upland prairies along side slopes or other well-drained sites. They are not found in wet or shaded areas. Techniques for establishing plants by transplanted seedlings and by seeds are discussed below:

### Transplanting one-year-old seedlings

The planting area can be prepared in April. The ideal location is in a prairie area where the plants can be found after planting so that they can be watered and monitored. We suggest that a line transect be laid out along an upland portion of the prairie area and that holes be dug at either 5 or 10 m intervals. Although straight lines and equal distances may not be aesthetically pleasing, they will help greatly in locating the plants in the future. Also, Mead's milkweed plants will move up to a meter or more over time because of their spreading rhizomes (US Fish and Wildlife Service 2003), especially when management includes mowing and/or the use of fire.

Once the planting location has been determined and marked, we recommend the following procedure:

1. Dig planting holes with a shovel. The soil should be moist but not saturated. The seedlings should be planted between bunches of grass to increase light availability. If it is possible, some grasses adjacent to the planting holes can be removed to reduce competition further. Soil should be dug out from an area at least two to three times the width and depth of the plant container. Clumps should be broken up, and the soil replaced in the hole.

2. Transplant the young plants into the holes. If the growing medium is dry, water the pots thoroughly a few hours before planting to ensure that the entire soil block is moistened. The plants will likely be dormant, but buds beneath the soil may be sprouting, so the plants should be handled carefully. Gently squeeze the container to loosen the growing medium, and tip the soil block into one hand. Open a space in the loosened soil with a trowel, and slip the plant into the hole. It should be slightly deeper than it was grown in the greenhouse. Push soil around the plant to eliminate air pockets and tamp it down lightly.

3. Mark each plant with a flag so that it can be located for maintenance. We also recommend that each plant be marked more permanently so that it can be located in the future if the wire and plastic flag gets lost. We suggest using 10-inch nails or 10-inch-long sections of metal rebar, both of which should be almost entirely buried. These metal sections can be found later with a metal detector.

4. Water the new plants immediately after planting. Even if the soil is moist, they still need a thorough watering to settle the soil around the roots. Use a hose wand that delivers water gently, and circle it around the plant for 30 to 60 seconds to be sure enough water is delivered to moisten the entire root zone.

5. If possible, set up an irrigation system. If the weather is warm and windy, and the soil is dry, the young plants may need to be watered every few days for two or three weeks. Once the leaves emerge, it will be easier to judge when the plants need to be watered. In general, they should be watered thoroughly every week unless there have been heavy rains. This can be done with a hose from a truck, or a drip irrigation system could be established.

6. Monitor the plants during establishment. Weeds will be few in a prairie, but if there are some annual weeds that come up in the disturbed soil, they should be carefully removed by pulling them. No herbicides should be used for weed control because of the risk to the Mead's plants. The plants should be monitored for damage by deer or rabbits. If it occurs, poultry fencing or metal cages may be needed to protect the young plants.

#### Planting Mead's milkweed by seed

A similar procedure should be used for planting Mead's milkweed by seed.

A long transect should be established and seeds should be planted an equal distance apart. Since the success of planting seeds is low, a distance of two meters between seeds would be adequate. Seeds that have been cold stratified should be planted between clumps of native grass or other plants in soil loosened with a hoe or trowel. Additional clumps of grass adjacent to where the seeds are planted also can be removed. The locations of planted seeds should be flagged and ideally marked with steel as described above. Again, they should be watered once per week, unless it rains heavily at the restoration site.

#### Management of Mead's milkweed plantings after the first year

Mead's milkweed plantings are slow to mature in the field. Observations in Illinois (Bowles et al., 1998) indicated that even after three years, seedlings were small and still not flowering (Figure 4). After the first year, watering should be considered during times of drought, especially between mid-May, when Mead's milkweed emerges, and early July, when it likely will go dormant. When plants do not flower, they often turn yellow and go dormant. Fire also appears to help Mead's milkweed grow better, as does haying (Bowles et al 1998), so these management options should be considered in following years. If the prairie is going to be hayed, the strips where the Mead's milkweed plants are growing should usually be left unmowed to prevent cutting plants before they set seed. Different types of management are discussed below.



**Figure 4.** The slender stems of young Mead’s milkweed plants are difficult to spot among the prairie grasses. They should be planted in rows and flagged so they can be located and watered.

### **Ideal Management of Native Prairie Remnants and Restoration Areas**

The remnant prairies of eastern Kansas and around the Marais des Cygnes National Wildlife Refuge are unique habitats that require specific management strategies. In general, hay meadow management simulates conditions before European settlement, when tallgrass prairie covered most of the mid-section of North America. Fire and grazing were the two most important influences on native prairies because they prevented the establishment of woody species and eventual succession to woodlands. Fires sparked by lightning and deliberately set by Native Americans raged sporadically across prairies, killing young woody plants and adding nutrients to the soil, benefiting the prairie grasses and forbs. Bison and other herbivores damaged trees and shrubs by trampling, gnawing, browsing and rubbing. Today, fire and mowing/haying are the primary management tools for hay meadows. Haying is a substitute for both the clipping by grazers and the thatch removal of fires. Grazing is generally not recommended for hay meadows except in a few carefully controlled and monitored situations.

A general rule of thumb for any situation is to apply the management practice, whether it’s haying, fire or grazing, to only a portion of the land in any given year. That’s because any treatment will affect some species positively and some negatively. By withholding treatment from some portion of the land, a refuge is created for the species that would be negatively affected by the practice.



## **Typical Management of a Healthy Prairie**

The best economic use for eastern Kansas native prairies is for hay. Almost all hay meadows are located on private property. Fortunately, managing a prairie for hay is also one of the best ways to maintain its biodiversity and ecological value. By cutting a prairie each year at the peak of grass growth, the grasses tend to be subdued and the spring and fall flowering forbs are released from competition with the grasses.

### When to mow

Harvest date is the most important factor in hay meadow management. Timing of the hay cutting will affect protein content, yield, and re-growth. Hay quality peaks early in the growing season and then drops off rapidly after the first week of July. However, at the time of peak nutritional quality, yield is lowest. It then increases as the warm-season grasses put on their maximum growth in June and July. The best compromise between nutritional quality and yield is to harvest in mid July in east-central Kansas. Delaying harvest into August or September does increase yield, but the forage quality is much lower and the plants are weakened going into winter, reducing yields as much as 50% the following year. If a meadow can't be harvested by the end of August, it shouldn't be cut at all. Over time, haying after August could change species composition, weakening the desirable warm-season grasses and favoring undesirable invaders. Native prairies should not be cut twice in one growing season, no matter how much regrowth occurs after the first cutting, because a second cutting decreases root reserves and reduces yield the following year. Straying from recommended haying dates occasionally does no harm, but late haying should not be done every year.

### Mowing height

Cutting height is also important to long-term hay yields. In a normal year, prairies should be cut at a height of three to four inches, which leaves sufficient stubble for re-growth and soil cover. In a dry year, five to seven inches is more appropriate. The goal is to leave enough for the plants to rebuild carbohydrate root reserves before frost. Litter on the ground also conserves soil moisture and protects against erosion.

### Fertilizers

Fertilizing is generally not recommended for native hay meadows. Nitrogen fertilizers may increase hay growth slightly during the current year but cause long-term problems. Nitrogen causes rapid growth of undesirable cool-season grasses, which can become invasive. Other weedy species can proliferate with fertilization. The desirable native grasses and forbs don't respond well to fertilization. Overall, most hay meadow managers agree that the meager benefits of fertilization do not justify the expense.

### Herbicides

Do not use herbicides on native hay meadows to attempt to reduce plants that appear "weedy." Many of these plants are native forbs and will be affected negatively. Some of the plants are very nutritious or have medicinal compounds that may be beneficial to livestock.

### Bale storage

After a prairie is mowed and baled, the bales should be removed from the field as soon as possible. However, they should not be lined up along the edge of the meadow and left there. They often kill the plants underneath, opening the soil to seeds of invasive species from adjacent land.

### Wildlife

Some landowners manage their prairie for the benefit of wildlife, especially ground-nesting birds such as the Bobwhite Quail, Eastern Meadowlark, Grasshopper Sparrow, and Dickcissel. A management plan to benefit these species employs all of the strategies above, except that haying is postponed until after July 15, when the majority of ground-nesting birds will have fledged. Several federal and state programs compensate landowners for deferred haying to benefit grassland nesting birds.

### Burning

Healthy hay meadows should not be burned annually, but fire can be an occasional tool for controlling cool-season grasses and other undesirable species. A prairie should be assessed each year to determine whether burning should be part of the management plan the following year. A prairie can be burned only if it has been rested the previous summer, so that it has enough fuel to carry a fire. A prairie will often carry a spring fire if sufficient late summer regrowth occurred the previous season, but the fire may not be hot enough to control woody species.

### Resting

Ecologists recommend that to encourage long-term biological diversity at least 10% and, if possible, up to 30% of a prairie be left untouched each year. Rested areas can serve as refuges for wildlife. They also allow for continued seed production of native plants, which will then be carried or blown onto the treated portions of the prairie, where they can re-establish. Ideally, if the prairie consists of more than one type of plant community, such as wet prairie and upland prairie, each type should be treated separately, with refuges on each. This is also known as rotational haying, with some portion of the meadow rested for a year, shifting across the prairie in a three- to four-year rotation. For small prairies or those where haying is contracted out, the entire tract can be rested occasionally.

### **Managing a slightly degraded prairie**

Even the best-tended hay meadows can be degraded by cool-season grasses, noxious weeds, and trees and shrubs. Ravines, wet areas, and prairie edges are where most problems begin. Landowners should watch for invasive species and take action early before they threaten a prairie's viability.

### Mechanical control of woody plants

Most woody species can be controlled just by annual mowing for hay. Ravines and adjacent areas may need to be rotary mowed a couple of times before they can be hayed.

### Herbicides

Never broadcast spray herbicides on a hay meadow, even if it has invasive species. The herbicides will harm non-target broadleaf plants, including all the showy wildflowers, and it can take decades for them to recover. Instead, spot spray noxious weeds such as sericea lespedeza. Be sure you really have the invasive species; some native, non-invasive plants easily can be mistaken for the invasive species.

If you do use herbicides, apply only those labeled for the target species and for use in hay meadows. Pay particular attention to the waiting period between spraying and hay harvest. For more information about herbicides, contact your county extension agent.

### Burning

Fire can control many unwanted species on a prairie if there is enough fuel to carry a fire. Cool-season grasses such as fescue and brome will be suppressed if the prairie is burned early in the season when they are growing most rapidly. The best time to burn is in mid- to late April, when big bluestem and Indian grass are one to two inches tall; the fire will not affect the native warm-season grasses. Prairies should not be burned later in spring because fire then will harm the native plants during their most active growth period.

### Grazing

For long-term hay production and biodiversity, grazing is generally not recommended. Although native herbivores such as bison were essential to maintaining the tallgrass prairie on large landscapes, the situation is different on small remnant prairies. Grazing cattle will change the species composition and diversity over time. Overgrazing presents the biggest threat to the health of a prairie. Excessive stocking rates and/or grazing over too long a season will degrade a hay meadow quickly, and it may never recover due to the elimination of many plant species. Even moderate stocking rates can damage prairie diversity.

### **Restoring a degraded prairie**

A ravine, prairie edge or abandoned hay meadow that has not been hayed or burned in many years may have become overrun with cool-season grasses, cedars, and other woody plants. It usually can be saved, but it will take significant effort. The first order of business is to remove the invasive species; the second is to employ practices that encourage the reestablishment of native species.

The words “restoration” and “reconstruction” are often used interchangeably, but there is a distinction. Restoration refers to an existing native prairie remnant that is now being managed to control exotic species and bring back native species. The recommendations in this section refer to this definition of restoration. Reconstruction involves planting native species on land that has been cropland, woods, or lawn, though it may have been prairie in the distant past. Reconstruction is beyond the scope of this report.

### Cutting, Mowing, and Burning

When cool-season grasses, trees, and shrubs have encroached on native prairie, the first step toward restoration is to cut down any woody plants that are too big to mow. Then the land can be mowed to remove smaller shrubs. Once the big invaders have been removed, the grasses should be allowed to grow all season in order to create enough fuel to carry a fire the following spring. If the fire is hot enough, it will kill woody plants and prevent them from resprouting. The prescribed burns should be scheduled for April, when the invasive plants are actively growing and most susceptible to damage by fire.

If a spring burn doesn't set back the woody plants sufficiently, they can be clipped or mowed during the summer. The rest of the meadow should be left unhayed again to prepare for a second burn the following April.

### Seeding

When a prairie has been degraded by overgrazing or physical disturbance, it likely will result in low species richness. Spreading seeds of native plants may help with the restoration. Seeds from healthy plants on nearby prairies have the best chance of succeeding on a restoration. They are known as "local ecotypes" - plants that have adapted to the specific local geographic environment.

Seed should be collected at least twice a year, in June after the spring-flowering plants have set seed, and again in September when summer-flowering plants have set seed. If possible, collecting seeds even more frequently throughout the growing season will result in a more diverse prairie seed mix by including species whose seed matures during other times in the growing season. In general, seeds can be harvested when they have a hard seed coat. To keep the seeds separated, they can be mixed 50-50 with perlite, a spongy, white natural substance that is used in garden planting mixes and is available from nursery supply companies.

Interseeding is a restoration practice where local ecotype seed is spread on existing prairie. In dense native grass, which is likely to shadow the ground at some point in the season, the prairie should be burned or mowed before seeding. Although there are no hard-and-fast rules about seeding rates, *The Tallgrass Restoration Handbook* recommends that the seed/perlite mixture be spread at the rate of one kitchen garbage bag full per half-acre. In other words, due to competition for moisture, one needs a lot of seed!

Prairie species may establish best when interseeded after an area has been rested for a year, followed by a fall or early winter burn. Then the burned area can be directly seeded, in the early winter so that the seeds get stratified naturally. The area can then be mowed during subsequent growing seasons to give the seedlings a chance to establish without being shaded by tall grasses.

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