Observations on Recreating Prairie

Attempts at restoration of Eastern Tallgrass Prairie are relatively recent undertakings. In the 1930s, the Curtis Prairie was established near Madison, Wisconsin, with the assistance of Civilian Conservation Corps workers. There were other infrequent restoration projects, and in the 1960s, a restoration, later designated the Schulenberg Prairie, was started at the Morton Arboretum in Lisle, Illinois. Since then, there have been increasing numbers of restoration and reconstruction projects by organizations, government agencies, schools, and individuals.

Due to the enduring nature of these efforts, various approaches and techniques have been tried and recommended. Variations include a matrix-type approach, recommended by Robert Beitz and others, in which pioneering native species are predominant in the initial seed application, with more conservative species added in later enrichment plantings, in an attempt to copy the observed successional changes occurring on disturbed native remnants. Another approach, suggested by Scott Weber, is to include few if any early successional native species such as wild bergamot, black-eyed Susan, and gray-headed coneflower in the seed mix and to proceed directly to plantings of conservative species, which could hasten the establishment of a high-quality prairie. Omitting early successional species may permit certain alien species to remain longer before being displaced, but this method is intriguing. What is interesting is that different people have used varying methods, yet all indicate some degree of success in achieving reasonably diverse prairies. It may imply either that prairie is very forgiving or that prairie restoration continues to be more art than science.

Conservative species such as prairie dropseed, shooting star, and hoary puccoon can be established with the help of a prairie nursery. Such a "garden," where these hard-to-establish plants are grown for the principle purpose of seed production, can greatly increase the amount of seed available to plant in the restoration proper. Once established, the nursery can also have the added benefit of providing root divisions or transplants.

Although individuals working in the field, including myself, use the terms restoration and reconstruction freely, it should be understood that they are not quite accurately descriptive. Prairie restoration usually refers to the recovery and enrichment of prairie on a field where some prairie species continue to exist. Reconstruction refers to introducing prairie into an area where prairie species have been extirpated, such as a tilled field that has been growing corn or soybeans. Sometimes, as here, the terms are used interchangeably.

The problem with both terms is they imply that pre-settlement prairie will be recreated, which is unlikely for several reasons—including changes in soil hydrology, possible climate change, and the introduction of vast numbers of alien species. The last is especially daunting for prairie work on restorations and also on native remnants. These aliens are species that were introduced intentionally or inadvertently from such regions as Europe, Asia, or other parts of this continent. Originally, the native prairie did not have to contend with these species. Fortunately, a healthy prairie can displace, at least to a major extent, most of these. However, a few thrive in prairie conditions and present long-term challenges for prairie management. More accurately, what we are attempting to achieve with prairie plantings is to establish a healthy, reproducing mix of species that were likely present in a designated region in pre-settlement times.

My first prairie restoration work began on a 7-acre, clay loam mesic soil permanent pasture in 1974 (at the Illinois Steward, Summer 2005). From then until 1990, I used various methods to establish prairie plantings on plots, working progressively across the field. Now, over 30 years later, that field has more than 150 native species established, with a mix of spring, mid-summer, and late-summer flowering species. Also, the field has been expanded to 15 acres. However, in 1993, I conducted a vegetation analysis on the core field that combined relative frequency and relative density numbers to assign an importance value (IV) to species encountered on the survey. At that time, five of the species with highest IV rankings were nonnatives. In 2004, the analysis was repeated. After that 12-year period, three nonnatives continued to rank among the top ten. Although this is an improvement, it also indicates the slowness of development of a prairie project, at least by the methods I have used. What follows is a summary of some of these experiences.

Soil Preparation

One method to prepare for seeding was to use a moldboard plow in the fall, turning the soil 7 to 10 inches deep. The following spring, that area was disked and harrowed, thus producing a fine-particle seedbed. The seed was broadcast, as it was on all of these restoration

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plots, and then the area was rolled in order to gain better seed-soil contact. At times, the site was lightly harrowed after seeding, but this introduced the possibility of burying some seed too deeply.

The advantage of this approach was that it probably achieved the best seed-soil contact of any of the methods tried. However, by inverting a soil layer, it created more soil disturbance than was desired on a field that did not have a history of tillage. It also left the soil exposed over winter to possible erosion. Because weed seeds were brought to the surface, annual weeds may have increased the first year, but these appeared regardless of the method used. Given time, prairie species became well-established.

An alternative soil-preparation method was to use only a disk or a disk-chisel plow combination in the fall. This approach thoroughly agitated the soil and had the advantage of not inverting soil layers. Also, by leaving vegetative material on the surface, erosion was reduced. The area was harrowed in the spring, followed by hand-seeding and rolling. Seed-soil contact may have been somewhat poorer than with the prior method, due to more mulchlike surface material. However, prairie seed germinated and grew well with this method.

Yet another method was to use almost no tillage. In early May, a 2% glyphosate herbicide was sprayed on the designated area, which had been burned previously in late winter. Spraying was repeated 2 weeks later. The area was lightly harrowed, hand-seeded, and rolled. This method had the advantage of almost eliminating soil disturbance and possible erosion. It had the disadvantages of likely preventing optimum seed-soil contact and involved the use of a herbicide, although one that is considered relatively benign. This method also proved effective over time in establishing a prairie planting.

Techniques that proved unsuccessful included leaving an area fallow for an extra year in order to periodically till and destroy more weed seedlings. However, a large population of annual weeds continued following planting the second year, and the soil was left exposed to erosion for an extended time. This method was not repeated.

There was an attempt to start prairie by incorporating seed into individual 3-foot, handspaded quadrats. This proved unsuccessful on the pasture field because the cool-season native pasture grasses rapidly encroached onto the quadrats, displacing most prairie seedlings.

Following these experiences, I now feel that—if a prairie planting is to be conducted on a field that has been in row crops—the better choice would be to till the soil and create a good seedbed. If following soybeans, minimal tillage is required, as existing surface vegetative material would not be great, and the soil has a relatively loose texture. Following corn, more tillage, such as with a disk-chisel plow combination, would be required to partially incorporate the often heavy accumulation of leaf and stem material, which if left on the surface could prevent adequate seed-soil contact or inhibit the emergence of germinating plants.

If the area to be seeded is currently in sod or a hay crop such as alfalfa, two sprayings with 2% glyphosate should be effective. In the case of alfalfa, the first spraying should be done in the fall. The field can be lightly disked or harrowed before seeding. As always following seeding, the site should be rolled.

An alternative to hand-broadcasting seed is to use a specialized no-till drill such as a Truax or Nishit drill. These implements are used routinely and are effective, but I have not had experience with them.

Timing of Seeding
Most of my seeding has been during late May or early June—to permit elimination of the first flush of spring weeds either through tillage or herbicide treatment. However, the later the seeding date, the greater the possibility of encountering an extended period of dry, hot weather that could adversely affect seedlings or prevent germination of seed that first year.

It should be understood that the rapid growth of annual weeds is a natural response to soil disturbance and to the removal of existing vegetation. Providing the initial stage in healing the unstable site, the annual weeds stabilize the soil and create cover for the small, slower-growing perennials that are attempting to become established. These weeds compete for existing soil moisture, a problem that can be partially negated by moving a couple of times during the growing season with the mower set 6- to 8-inches high to avoid small, emerging prairie species. The shorter weeds continue to provide a degree of cover. Fall or winter seeding has proved effective, thus timing of seeding may be of less concern.

After a prairie planting is becoming established, additional seed may be applied through enrichment seeding. Seed of most spring-flowering species ripens in late spring or early summer. This fresh seed may be applied in late summer by scratching it into small areas of exposed soil often found between tussocks of the tall grasses. For most species, an easier time to introduce the seed is in late winter or early spring following burning of the site. The absence of aboveground growth of plant material gives easier access to suitable areas where the seed can be incorporated into the soil. Another method of enrichment is to broadcast larger quantities of seed over the burned site and allow spring rains to mix the seed into the soil.

Seed Mixes
My seed was hand-collected and not fully cleaned. There was no deheading or removing of coverings on one-seeded fruits. Thus it was not possible to determine exact weights. More importantly, seed was applied generously, and as many species as possible were included.

Although difficult to quantify, an expansion of native prairie on mesic soil, likely 200 or more vascular plant species were present. These species were part of a complex dynamic ecosystem of interactions and interdependencies, some of which enhanced the growth of other species, while others restricted population expansion. Factors involved included allelopathy, hemiparasitism, interactions with soil microorganisms, and different moisture and nutrient requirements. Many of these effects are poorly understood, so—to take advantage of them—it is important to introduce the greatest possible diversity of species that are ecologically compatible to the selected site.

One problem with some restorations has been the perceived overpopulation of native grasses. Thus the recommendation is to plant less grass seed. Although this is possibly true, the emphasis should be reversed. Plant a larger quantity and greater diversity of forb seed. Some prairie plantings may include 40 or 50 species, which seems to be a good diversity. However, it does not approach the diversity that likely existed on native prairie and thus may not benefit from the interactive characteristics that prevented overpopulation of certain species.

In my restoration work, seeding patterns varied. Sometimes, I applied more grass seed...