

The History of the Tallgrass Prairie at the Litzsinger Road Ecology Center

In a publication of the Missouri Department of Conservation, *Pre-settlement Prairie of Missouri*, 1982 Walter Schroeder writes: Deer Creek Valley, from Brentwood Boulevard west to I-244, was prairie. This part of Deer Creek Valley includes the field where the Litzsinger Road Ecology Center is located and therefore we can state, with a great degree of assurance, that the Litzsinger Road Ecology Center prairie was part of a larger prairie in pre-settlement times.

The field was used for agriculture for many years but no written records of the crops grown or for how long, are known to exist.

For some years the field was occupied mostly by non-native plants including tall fescue (*Festuca arundinacea*), hairy vetch (*Vicia villosa*), sour dock (*Rumex crispus*), bitter dock (*Rumex obtusifolius*) and japanese hops (*Humulus japonicus*).

In 1988, the owners of the field, who had been discussing planting prairie grasses with Floyd Ficken, a Missouri Department of Conservation field agent, visited Shaw Arboretum to see the Experimental Prairie there. After a tour of that prairie, they decided to include the forbs as well, to attempt to recreate a tallgrass prairie ecosystem.

Because of the weedy nature of the field, the field was plowed and planted with Sudex - a hybrid cross of Sudan grass and Sorghum. The plowing killed many of the existing plants and the Sudex grew to a height of 12 feet and shaded out most of the weeds that grew from the seed bank. The plowing and planting of the Sudex was done by Schlegel Landscaping Co. on June 8, 1988. The Sudex was mowed on August 8, before its seeds matured and it regrew another 6 feet.

The field is part of the flood plain of Deer Creek and is approximately 10 acres divided by a straight row of trees along a shallow drainage ditch. About 6 acres are northeast of this row of trees and 4 acres are southwest. There is a swale in the northeast portion that trends from SW to NE and was probably constructed for drainage when the field was cropland.

Of the fourteen prairie natural communities described by Paul Nelson in *The Terrestrial Natural Communities of Missouri* (1985), mesic prairie and wet-mesic prairie best describe the type of prairie one would have expected to find on this site in pre-settlement times. As described by Nelson a mesic prairie has deep soil (40 inches or more) and is moderately well drained, whereas a wet-mesic prairie has deep soil and is somewhat poorly drained with surface water present after heavy rains. Judging from the way water drains from the site and the mostly level aspect, it is believed a wet-mesic prairie is closer to the best description of this site. This characterization was important in deciding what species to plant when collecting seeds for this project.

On May 31, 1989 the dead Sudex was burned. Since there was so much dry fuel the fire was very hot and the field burned completely. Besides preparing the field for planting, the burn also killed many weeds that had emerged from the seed bank.

Just before planting, the field was harrowed shallowly to obtain good seed to soil contact and

allow the use of a seed drill for planting. The field was divided into six areas and a separate mix of seeds was prepared for each area to facilitate planting and to take advantage of slight variations in elevation in the field. These seeds are listed for each area in appendix 1. The seeds were collected mostly from the Experimental Prairie at Shaw Arboretum, 35 miles from the Litzsinger Road Ecology Center, except for most of the prairie grass seed that was purchased from Bluestem Seed Co. whose seed nurseries were in northwest Missouri and eastern Kansas. Locally collected seed of the grasses would have been used if they were obtainable in the quantity required.

The area along the southwestern edge of the field (adjacent to the lawn) and 50 feet into the field, designated Area 1, was planted by hand, broadcasting and raking the seeds in on June 11, 1989. Big bluestem and indian grass were not planted in Area 1 in order to provide a transition between the lawn and the taller grasses. The purchased prairie grass seed and some of the forb seed were planted on June 16, 1989 in Areas 2 through 6 using a Truax seed drill brought to the site by the Missouri Department of Conservation as part of their Native Warm Season Grass Program. The species and amount of prairie grass seed planted are listed in appendix 2.

The majority of the forb seed was planted on June 16 and 17, 1989 using a Vicon seeder pulled by an all-terrain vehicle with a power take-off. After planting, the field was dragged lightly with sections of chain-link fence to set the seed in.

In late June, 1989, 154 wildflower (forb) and 538 prairie grass seedlings were planted on a gentle slope adjacent to the lawn. This area, having better drainage, allowed the planting of species that would not be able to compete in the level area below where the soil is more moist, thus increasing the diversity. This planting (see list in appendix 3) provided the means of testing the survival over the years of individual species, serving as a guide for future plantings.

As usual with prairie plantings, the prairie seedlings grew slowly above ground and were commingled with the faster growing weeds that sprouted from the seed bank. The most common weed at this stage was wild mustard, which being an annual, does not usually pose a problem in prairie restoration. The total vegetative growth was not enough to conduct a prescribed burn in the spring of 1990.

However, in 1990 from May through August weed growth was of a height and extent to require control. Some areas were sprayed with the herbicide, *Roundup* and larger areas were mowed high with a tractor to prevent the weeds from shading out the slower growing prairie plants and to prevent more weed seeds. The most numerous weeds were those observed before work began, namely hairy vetch, sour dock, bitter dock and Japanese hops. Very little fescue survived the cultivation, the shading from the Sudex, and the burn of Sudex residue in 1989.

Two species of plants covered the greatest area of the prairie in 1990: black-eyed Susan, which was planted, and daisy fleabane, which sprouted from the seed bank.

Less mowing for weed control was required in 1991 but application of *Roundup* to control japanese hops continued until 1997. Japanese hops is no longer a major problem but is hand-weeded in certain areas.

The prairie is burned every year since bio-mass accumulation is so great with such moist fertile soil. The prescribed burn is conducted in mid-March to help control japanese hops seedlings that sprout in early March. The annual burn is very helpful in controlling invasive trees that also grow well in this soil. Each year, after the burn, prairie forb and grass seeds are sown in open areas and especially where small mammals have created bare areas by digging and mound building. Some seed is also sown in winter to obtain natural stratification resulting from cold moist weather. The freezing and thawing of the soil also helps work the seeds into the soil.

In the Spring of each year from 1990 through 1995 approximately 900 forb and grass seedlings have been planted on the edges of the prairie. In the fall of 1994, 130 seedlings were planted in the prairie at an intersection of the trail through the prairie, and 200 seedlings were planted just west of the entrance to the prairie trail.

In May, 1997, students from Mary Institute/Country Day high school planted 1000 forb and grass seedlings on the west edge of the prairie below the defunct dam. The students grew half of these plants at their school.

Since 1996, participants in the four-week Ecological Restoration Corp program held at L.R.E.C. each summer have planted approximately 1000 plants on the edge of the prairie.

The planting of seedlings has been successful in increasing diversity of the prairie and is very useful during the educational programs since they are so accessible to students.

Two species of plants that are important components of wet-mesic prairies were not introduced in the L.R.E.C. prairie until it was somewhat established because they are very aggressive: cordgrass and sawtooth sunflower. Cordgrass, (*Spartina pectinata*), could easily become the dominant plant in the L.R.E.C. prairie if planted in appreciable numbers. It spreads quickly by vegetative reproduction forming dense colonies that exclude other species. 20 or 25 small clumps or plugs of cordgrass were planted in the prairie in five locations from 1995 through 1998. The first planting (1995) has become a large colony that is nearly a monoculture. Once established, cordgrass is very difficult to eradicate. In 1997, ten clumps of sawtooth sunflowers were planted in the south portion of the prairie where they have become well established, spreading by seed and rhizomes, and growing as tall as 14 feet.

The Present State of the L.R.E.C. Tallgrass Prairie

The species and areal extent of the plants in a re-created prairie are determined by many factors:

1. the soil and soil profile, including available nutrients.
2. the topography of the site.
3. the species (and the number of seeds or plants of each species) introduced including how well the ecotypes of the introduced species are suited to the site.
4. the species and numbers of plants that have appeared spontaneously from the seed bank or remnant perennials.
5. all the management activities (and the timing of these activities) that have taken place since the prairie was planted.
6. the weather, which has occurred since planting, including precipitation, temperature, humidity, wind and amount of sunlight.
7. activities of fauna, including micro-organisms, insects, mammals, birds and reptiles.
8. activities of fungi, especially mycorrhizal fungi.

Plant surveys to determine the areal extent of the most common species in the L.R.E.C. prairie have not been conducted. However, visual observation on a regular basis since the prairie was planted can give us a plausible estimate of trends in the population of these species.

The following observations and speculations are made in an attempt to describe the present state of the L.R.E.C. prairie:

1. Considering that 18 lbs p.l.s. (pure live seed) of big bluestem, which tested at 81% germination, was planted in 1989, one would expect the population of big bluestem to be greater than it is. It has been increasing slowly in the north portion of the prairie since being planted and more recently in the south portion that still has a very low number of plants. One could speculate that the trax seed drill planted the seed too deep or that a dry spell after germination killed many of the seedlings or that many of the young seedlings were shaded out by faster growing plants. Another possibility is that the big bluestem seed purchased, being a more western ecotype, was not well suited to the site. The quick establishment of big bluestem planted in 1998 in a small prairie by the barn at L.R.E.C. in similar soil, using seeds collected from a prairie remnant in Calvary Cemetery in St. Louis (9 miles from L.R.E.C.) lends credence to this theory.
2. Although 18 lbs p.l.s. of indiagrass seed were also planted in 1989 very little appeared and its population has been fairly constant for the past several years. Since this species is usually found in somewhat drier soils it may not compete as well in a wet-mesic site.
3. Switchgrass, (*Panicum virgatum*), should be a larger component of the L.R.E.C. prairie than it is now. It was not planted in 1989 because the seed sold in the quantity required was not available. The seed sold commercially are varieties selected for vigor and forage production and are much taller and coarser than the more local switchgrass. Some plants of these more vigorous varieties are now growing in the L.R.E.C. prairie, having arrived there likely as adulterants in the purchased grass seed.

4. Although only 6 ounces of seed of Eastern gama grass, (*Tripsacum dactyloides*), was planted in 1989 in two widely separated areas along the northeast edge of the prairie, gama grass is now the dominant species in these two areas, each of which is approximately 2000 square feet. Eastern gama grass spreads vegetatively and by seed. It seems to be especially suited to this site, producing monocultures in these two areas.
5. The area covered by cordgrass, (*Spartina pectinata*), is small but steadily increasing in five locations where it was planted beginning in 1995.
6. Indian hemp, (*Apocynum sibiricum*), was increasing in areal extent to such a degree that it was thought it might become too dominant. This species spreads by rhizomes and by wind-borne seeds. In 1996 a patch of indian hemp of approximately 120 square feet was sprayed with **Roundup** which provided excellent control. In 1998 and 1999 the areal extent of indian hemp declined considerably for unknown reasons. A large colony is still growing in the south portion of the prairie. It is not believed that indian hemp requires further control at this time.
7. New England aster, (*Aster novae-angliae*), a moisture-loving plant with beautiful flowers in the fall, occurs in many locations in the prairie and is increasing in numbers slightly. Being a late bloomer, New England aster is an important nectar source for the monarch butterfly during its fall migration.
8. Purple coneflower, (*Echinacea purpurea*), is found in a large patch adjacent to the lawn at the southwest end of a row of trees through the prairie. This species likes drier soil than is found in most of the prairie and does well on the gentle slope there. It also does better in the partial shade it receives from nearby trees. This is a good species for observation of many kinds of insects that visit during its long growing season. The purple coneflower patch has increased in size slowly but required hand-weeding of tall goldenrod for four or five years.
9. Purple bergamot, (*Monarda fistulosa*), is found throughout the prairie and is increasing slowly. It is found in greater numbers where it receives partial shade. This species is visited by many species of bees, hence its other common name - bee balm.
10. Biennial evening primrose, (*Oenothera biennis*), appeared in great numbers in the first three years after the prairie was planted and then declined rapidly, as one would expect of a biennial, especially in a prairie burned annually. This species, which grew spontaneously from the seed bank, is still found scattered throughout the prairie.
11. Smooth penstemon, also called foxglove, beardtongue, Penstemon digitalis is scattered throughout the prairie and increasing slowly in numbers. This species blooms in June. Its white tubular flowers are nectar sources for many species of bumblebees and other insects.
12. Hairy mountain mint, (*Pyenanthemum pilosum*) is present mostly in the small transplant plots and the number of plants is fairly constant in those plots. This species is a member of the mint family, an important member of the prairie ecosystem. Its leaves have a very powerful aroma, making it a noteworthy plant for student activities.
13. Gray-headed coneflower, (*Ratibida pinnata*) is scattered throughout the prairie. It is easily established and once covered large areas soon after the prairie was planted. Not being a long-lived perennial, it has diminished in numbers.
14. Black-eyed Susan, (*Rudbeckia hirta*) is easily established and was a co-dominant plant throughout the prairie in 1990. It is a short-lived plant and has mostly disappeared

from the prairie. This species is usually included in prairie plantings because it provides a show of color quickly, acts as a nurse crop for the other prairie seedlings, and helps prevent weeds from getting established. Black-eyed Susan was planted at the rate of 3 2 oz., of seed per acre in 1989. Because of the high fertility of the site, the amount of foliage produced was greater than anticipated and may have shaded out newly emerged seedlings of other species planted in 1989. Based on this outcome, it would probably be better to plant Black-eyed Susan at a lower rate (perhaps 1 2 oz per acre) when planting in fertile moist soil.

15. Sweet coneflower, (*Rudbeckia subtomentosa*) is a tall (up to 6 feet) plant with profuse yellow flowers that bloom in late August and September. When one looks down on the prairie, the sweet coneflowers produce a colorful display sweeping across the prairie, (especially in the northeast portion of the prairie), and scattered throughout the whole prairie. Sweet coneflower is a prolific seed producer and also spreads by rhizomes, forming multi-stemmed clumps. It seems to be especially suited to this prairie's conditions and is now the most numerous plant on the L.R.E.C. prairie.
16. Wild senna, (*Senna marilandica*) is a favorite plant for the L.R.E.C. instructors to show students because of the small round extra-floral nectaries growing near the main stem on the leaf petioles. These nectaries produced food that attracts insects, especially ants that parade up and down the stalks, stopping long enough to obtain the reward of nectar. This phenomenon may be a symbiotic relationship in which the ants, by their presence (and/or active defense) may provide protection to the plant from insectivory.