

Biocore Prairie Restoration Project

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Permit 2005-2

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Primary aims of project

Ecological education and environmental stewardship

To teach research design and analysis as well as ecological principles and procedures to Biocore students through the process of restoring an abandoned agricultural field to tallgrass prairie

Background and history

In 1997, Biocore began a long-term prairie restoration in the Picnic Point Base Orchard Field. Between 1998-2002, Biocore staff and students completed the first set of experiments on site preparation techniques which showed equal success between mulching, repeated mowing, and rototilling for controlling weeds. In 2001, CNA committee approved an additional 3 acres for the Biocore prairie project (west of the current area) now referred to as Area III, making a total of 5 acres, and designated the rest of the Picnic Point Base Orchard Field (excluding the Eagle Heights Gardens) as future prairie/savanna. With an extended area for management, we continued to focus on weed control and establishment of prairie species as the main objective of our work. In 1999 and 2000 we set up two demonstration gardens as points of interest for visitors, as a reminder of our goal, and as a source of seed in the new planting areas. Areas Ia and II now have many thriving prairie species that are producing seed and expanding their vegetative growth. They also attract many seed eating birds, butterflies and other insects. This year (2005) the Biocore Prairie was expanded once again, including 2 acres in Area III directly south of the existing nursery area, west of the old orchard and east of the Eagle Heights Community Gardens. This area has been included in the soybean field for the last two years but is now included officially in a total of 7 acres that has been seeded and managed as Biocore Prairie.

Results/accomplishments Jan-Dec 2005

Mapping

Following the detailed survey of the entire 7 acres in summer 2004 by Dan Rodman (Civil and Environmental Engineering) and his students enrolled in CEE450, brass monument stakes were

installed in Fall 2005 at the corners of each 20 x 20 m grid square in Area III. (see 2004 Annual Report for details) When doing vegetation surveys in the field, Biocore students orient themselves to a specific monument point on the grid and then locate their sampling quadrats with measure tape using X (eastern) and Y (northern) direction. We are moving forward in developing a web-based computer interface that would allow students to enter vegetation data taken in the field based on our grid reference system and then convert that data directly to a format that is easily mapped in ArcExplorer GIS software. Using a systematic mapping protocol, we anticipate we will be able to generate a valuable database that will allow us to explore questions with a spatial component and investigate changes as the restoration develops over time.

Fire management:

Areas Ia, II, and demo gardens were burned on April 18, 2005

Fire team was led by Bill Muehl and started at approximately 9:30AM and finished the job in ~ 2h. This was not a particularly successful burn given that all of the areas had a significant amount of new, green plant cover which inhibited a hot fire from moving at the ground level. Although there appeared to be enough 'fuel' or dried biomass in Area II and the demo gardens to carry a hot fire, the burn was very spotty and had to be restarted many times. Although the vegetation was very short in Area 1b from repeated mowing through the 2004 growing season, fire did creep slowly across the entire area. The burn was particularly poor in Area Ia where red clover had already put on some early season growth. This area is still lacking a significant grass component and therefore has not generated much standing biomass to burn as fuel.

Planting, Watering, Weeding, Mowing and other Management Efforts:

During the winter of 2004-05 Seth McGee raised over 2000 prairie plant seedlings indoors in the Biocore lab space. Three-month old seedlings were planted out in Areas Ia and II through the month of June and early July. Our summer student management team led by Seth included 5 undergraduate student hourlies and 2 graduate student hourlies that helped in hand planting, hand weeding, mowing and general maintenance. In addition, summer 2005 was exceedingly dry, making it absolutely essential that newly planted seedlings get water on a regular basis. To facilitate access to water, hoses were extended over 50 meters from the EHCG easternmost stand pipe across the soybean field to the Biocore Prairie seed nursery. Our team then filled watering cans and hand watered nearly all the newly planted seedlings throughout the growing season.

We installed a new HOBO weather station between Areas 1b and II. This system will allow more accurate measurement of daily precipitation, temperature, humidity, wind speed than we can get from local/state weather stations.

Area I: Original 1 acre used for site preparation experiments and seeded in Nov. 1998 and Nov. 2000

Area 1b (~0.32 acres) This area was mowed twice- in early and mid summer to control annual weeds. Very few prairie seedlings were observed growing in this area, following several walk-through surveys done during the growing season. This area has been disappointing, proving very difficult for establishment of prairie plants. We plan to continue to discuss ideas for weed control and plant establishment for this area in particular during summer 2006.

Area Ia:

Biocore staff, volunteers and student helpers transplanted upwards of 1500 prairie seedlings throughout Area 1a and watered them during dry periods. To avoid excessive soil disturbance during planting, we planted each new seedling in a hole created by the removal of a problematic weed. We hope that this planting will give a competitive advantage to the prairie plants that are starting to establish in patches. In addition to seedlings, our team moved large transplants of big blue stem, Indian grass and little blue stem to the area hoping to improve the grass diversity and biomass. Ox-eye sunflower (*Helianthus helianthoides*) is a prairie species that was seeded in the original 1998 planting and has grown readily on the site. This species, in fact, has established so well and so aggressively that it may now be inhibiting colonization of other prairie species including grasses that have proven difficult to establish in this area. We will be discussing ways to keep this species under control this coming summer.

Area II: Site formerly under the dirt pile seeded in June 2001; seeded in summers 2001 and 2002
 Biocore staff and student helpers transplanted hundreds of young prairie plants into this area during the summer of 2005 and watered them during dry periods. Area II continues to develop and improve each year. The team continued to hand weed problematic weeds such as garlic mustard, thistles, Queen Anne's lace, sweet clover, and curly dock. This area currently supports 31 of 57 prairie species planted as surveyed by Biocore 302 students in fall 2005. Although the species richness of the prairie vegetation remained similar to the fall 2004, 2003 surveys, it was clear that the prairie plants are much more robust and established than in previous years. We continue to see an increase in abundance of little blue stem, Indian grass, and big blue stem, while Canada wild rye seems to be falling out. Weeds in this area are by no means under control, however, as prairie plants continue to establish, we anticipate the need for hand weeding will decrease significantly.

Area III: 3 acres to the west of Areas I and II

Area III was planted in Round-up Ready soybeans for the third season during summer 2005 and treated two times with Roundup (one pre-emergence and one post emergence spray). The field, unfortunately, was not sprayed entirely a third time because some areas had been spot sprayed three times (to the limit) but not recorded. This was very disappointing/frustrating and resulted in an overgrowth of redroot pigweed and lambsquarters that overtopped the soybeans and went to seed by mid- to late- August. The lack of weed control in Area III essentially put us back a year in our efforts to prepare the site for planting. Nevertheless, Area III was seeded in fall 2005 (see below). We conducted vegetation survey of the small 20 x 20 meter area seeding experiment begun in October 2004 which showed 21 species of prairie plants germinating and growing in the area among 22 common weeds including horseweed, daisy fleabane, white campion. This study was very encouraging and allowed us to design a seed mixture for the larger planting area.

On November 11, 2005 Biocore students and staff led a planting party of the last 5 acres of the prairie to be planted. The seed mix included 5 species of grasses and 53 species of forbs. We plan to mow the area frequently in summer 2006 and monitor for prairie plant germination and establishment. This was a great event!!

Summer Student Research

Three Biocore students; Anne Drehfal, Neha Seghal, and Rebeccah Steffensen pursued projects under the Sophomore Honors Research Apprentice program during summer 2005. Anne's project was co-mentored by Chris Kucharik (IES-SAGE) and Janet Batzli and analyzed the potential for carbon sequestration through measurements of soil respiration in different areas of the prairie at different stages of restoration. Neha and Rebeccah initiated a research plot to study the effect of sawdust and cornstubble additions on soil C:N ratio. This experiment follows on a previous project that resulted in significant decrease in soil NO₃-N and increase of prairie plant establishment after two treatments of sawdust at 500 g/m². Neha studied above ground effects on plant growth, sub-canopy light levels and soil moisture. Although Neha's results did not show differences this year, she considered this study a pilot for additional work she plans to pursue in summer 2006. Rebeccah studied below ground effects on soil invertebrate communities in treated versus untreated control plots with results indicating an increase in springtails under treated plots.

In addition to Biocore students, Rebeccah Steffensen mentored two high school students participating in the Summer Science Institute led by Robert Bohanan in Center for Biology

Education. With Rebecca's guidance, these two students did vegetation surveys and light measurements that contributed to an ongoing data set in the original sawdust plots treated in summer 2003. This project turned out to be very synergistic for Rebecca as she was learning to do research herself, she was also mentoring others on a similar project.

Biocore Bird Banding Station

Biocore Prairie is host to many migratory bird species. Bird populations are monitored by a dedicated team of researchers led by Dr. Mara McDonald. Mara holds regular bird banding workshops together with Preserve volunteers, Madison Audobon among others. These workshops were held weekly at the Biocore Prairie during the summer and seasonally in spring and fall as the weather permitted.

Anticipated action during 2006*Area 1a*

We will continue to survey this area for the establishment of grasses. With greater grass growth, we hope to burn this area in 2006.

Area 1b

We plan to discuss options for this area given that all restoration attempts have failed. We likely will continue to mow the area in summer 2006 and monitor for prairie plants. Seth is growing prairie seedlings indoors this spring with the hope of targeting this area for planting.

Area II

We will continue hand weeding, especially targeting garlic mustard, thistles, Queen Anne's lace, sweet clover, red clover, and curly dock. This area is doing very well and serves as a model for restoration of other areas on site.

Area III

As this area has just been seeded, we plan to mow many times during summer 2006 to decrease the number of weeds that go to seed.

Web site

Further information can be found on the Biocore Prairie web site <http://polyglot.lss.wisc.edu/biocore/prairie.html>.