

10TH BOULDER COUNTY ECOSYSTEM SYMPOSIUM

Saving our Native Grasslands

This year BCNA's Ecosystem Symposium focused on our fascinating but often overlooked grasslands. The symposium was held April 4th at the Boulder Public Library auditorium and was, once again, well attended. Research results were presented by a variety of excellent speakers. The abstracts from the talks are presented below.

An Overview of Boulder Valley Grasslands

Carl Bock (University of Colorado, Boulder)

Drought, fire, and grazing are major factors determining the distribution and character of nearly all of the world's grasslands, including those in the Boulder Valley. The distinctive position of these grasslands at the foothills of the Rocky Mountains created climatic and soil circumstances where all three of the major Great Plains grassland types are represented: shortgrass, mixed grass and tallgrass prairie. Fires kept the pine forests at bay, while bison grazed at least episodically, creating opportunities for short grasses and for prairie dogs. City and County open space programs are remarkable for the amount of grassland they have protected in the midst of one of the largest urban explosions on the continent. However, the integrity of these ecosystems is being challenged by anthropogenic forces, including agriculture, introduction and spread of exotic species, and landscape alterations resulting from urban and suburban growth. How have Boulder Valley grassland ecosystems fared in recent times? Historical evidence, especially information about birds, suggests that shortgrass prairies and associated fauna, such as the Lark Bunting and Burrowing Owl, are far less common than they were a century ago, perhaps because of their relative intolerance for urbanizing landscapes. By contrast, species associated with tall and mixed grass prairies, such as Bobolink and Grasshopper Sparrow, remain relatively common. Regardless of their habitat associations, a variety of Boulder Valley birds and mammals tend to avoid grasslands at urban and suburban edges, and it remains to be determined how they will fare as regional development continues.

Big bluestem, *Andropogon gerardii* populations in Open Space and Mountain Parks

Kathleen H. Keeler (University of Nebraska, Lincoln)

Andropogon gerardii, big bluestem, the dominant grass of the tallgrass prairie, is common in tallgrass areas of the Open Space and Mountain Parks. Across the western part of the Great Plains, *A. gerardii* has two common chromosome morphs (cytotypes), one with 60 chromosomes (hexaploid) and one with 90 (enneaploid). The two cytotypes interbreed, producing plants with intermediate chromosome numbers.

In 1995-6 I mapped individual plants of *A. gerardii* in eight plots in Open Space and Mountain Parks. Chromosome numbers were determined using flow cytometry. Plants were remapped annually and changes in clone size calculated using ArcView GIS system. Flowering stalk and seed production were counted annually for all plants for 4

years. Hexaploid plants are 60% of the *A. gerardii* of the plots, enneaploids 35% and intermediate cytotypes 5%. Hexaploids had a mean clone area of 2910 cm² (SE = 693), enneaploids 3191 cm² (SE = 528) and intermediates 2450 cm² (SE = 1302); these numbers are not significantly different. Mean number of caryopses (single-seeded fruits) did not differ significantly between cytotypes but percent and number of good (filled, viable) seeds produced was significantly higher for hexaploids than enneaploids or intermediates. Thus in Open Space and Mountain Park populations enneaploids are large healthy plants and contribute to the next generation, but hexaploids have higher fitness and should replace enneaploids eventually, but there is little change in any one year.

Observations on the Effects of Grazing on Tallgrass Natural Areas in City of Boulder Open Space and Mountain Parks

David L. Buckner (ESCO Associates) and Lynn Riedel (City of Boulder OS&MP Dept.)

Experimental partial exclusion of grazing has been integral to management of the Colorado Tallgrass Prairie State Natural Area, established in 1984 on City of Boulder Open Space and Mountain Parks (OSMP) cooperatively with the Colorado Natural Areas Program. Exclosures were designed for the purpose of evaluating the effects of grazing on these special interest native grassland communities. Three parcels within the Boulder Tallgrass Natural Area have been monitored since 1986.

Results show that the effects grazing vary with the degree of moistness of the particular tallgrass stand. Following exclusion of winter grazing, a very wet example (Area 6) experienced a rapid and thus far permanent decline in the target warm season tallgrasses, with coincident increases in the abundance of cool season grasses, forbs, and shrubs including the appearance and proliferation of Canada thistle (*Breca arvensis*). As of 2002, the ungrazed portion of the Area 6 tallgrass stand supported 6 percent cover by the tallgrasses big bluestem (*Andropogon gerardii*) and switchgrass (*Panicum virgatum*), while the grazed portion had 32 percent cover by these species. Under drier (but still mesic) moisture conditions, warm season grasses in general have experienced no decline in the absence of grazing, but cool season native grasses have had higher abundance in the absence of grazing. Conversely, native perennial forbs in general have lower abundance in ungrazed sites. Overall native species density on grazed sites tends to be greater than ungrazed sites of similar ecological site characteristics. Litter cover tends, especially in and following moist years, to be higher in ungrazed tallgrass stands.

Revegetation Experiment in an Active Prairie Dog Town: Second Year Monitoring *Patrick Murphy (Ecological Consultant)*

This experiment was conducted to address the issue of prairie dog survival in the highly disturbed urban and rural environments of Boulder County. Prairie dog populations in these urban/agricultural "islands" are artificially isolated from both resources and predators that would naturally keep the populations in balance. This experiment tests the possibility of using direct seeding in order to reestablish native species in an active

prairie dog town in an area that is heavily disturbed and dominated by introduced weeds. This experiment addresses only the resource aspects of the food pyramid in which the prairie dog plays such an important role.

This is the second data report for this project. It includes a single vegetation cover sampling, and the first sampling for seedling density. The planted grass species have not achieved a total percent cover that is easily measurable by the point-intercept methodology using 100 points on a 50 meter transect. The presence of seedlings under the short canopy (3-10 cm) of the bindweed (*Convolvulus arvensis*) and burning bush (*Bassia sieversiana*) indicates that the native species are present, but not well established. The canopy of weeds is kept short by the prairie dog grazing and seems to benefit the planted seedlings by providing shade and mulch. Although there are places that are pitted by prairie dog digging for what might be underground plant resources, most of the area is not pitted and some of the planted seedlings are adjacent to prairie dog mounds. A systematic plot sampling technique using twenty 0.25-meter² plots per transect was used to estimate the abundance of these seedlings.

This project examined the response of vegetation and a prairie dog population to interseeding (overseeding) native shortgrass and mid-grass species in an active colony that occurs at a highly disturbed site (Figure 1) dominated by introduced weeds. Native grasses were seeded on April 6, 2000 using a low-till seed drill. Vegetation was sampled immediately before treatment and on June 3, June 30, August 4, and September 6, 2000. Prairie dog population characteristics were also assessed before and after treatment by means of above-ground prairie dog counts, active burrow counts (relative density), spatial dispersion, and burrow utilization. The results from the year 2000 were previously reported (Ecotone, 2000). This years report presents a single vegetation cover sampling in June, and an additional sampling for seedling densities of the planted grass species. The prairie dog population studies from year 2000 were not repeated in 2001.

Last year (2000) had an extremely dry period of April-May-June (the 5th driest in 105 years of record) that greatly reduced the germination and establishment of the native grasses. This year was much closer to average with a slightly wetter than average spring, and a slightly drier June.

A Butterfly Monitoring Program for Assessing the Composition and Distribution of Butterfly Communities in the City of Boulder Open Space and Mountain Parks **Steve Armstead (City of Boulder Open Space & Mountain Parks Dept., and CU)**

The Colorado Front Range, including the foothills, is well known and documented for its biological diversity including that of numerous species of butterflies (Opler 1994). Approximately 176 resident or regular colonist skippers and butterflies have been documented in this region representing the fourth richest butterfly region in the United States (CNHP 1998, Opler 1994). Butterflies are excellent invertebrates to include in grassland monitoring programs. They are well studied, easily observed, and can be sensitive to changes in vegetation and management practices (Murphy and Wilcox

1986, New 1997). Many of the butterflies of special interest on OSMP include grassland specialist butterflies such as the Ottoe skipper (*Hesperia ottoe*), Arogos skipper (*Atrytone arogos*), and the Regal fritillary (*Speyeria idalia*).

This study developed monitoring protocols and butterfly community composition and abundance results for six vegetation types across the City of Boulder Open Space and Mountain Parks of which half the sites were established to monitor grassland butterflies. Initially 1,000 meter walking transects were used that were modified the following year to 500 meter transects. Patterns in butterfly species composition, richness, abundance, uniqueness, and diversity are compared across sites and contribute to the development of a butterfly species list and phenology for the Boulder Valley. The continuation of this study will provide an ongoing view of Open Space and Mountain Parks butterfly diversity and provide guidance for the long-term conservation needs of local butterfly populations.

References:

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Rodent Communities Associated with Black-Tailed Prairie Dog Colonies, and the Effect of Landscape Context on Density of Black-Tailed Prairie Dogs in Boulder County, Colorado

Whit Johnson (University of Colorado, Boulder)

I studied two aspects of black-tailed prairie dog communities in Boulder County, Colorado: (1) small mammal communities on grasslands with and without prairie dogs to determine the effect prairie dogs have on other rodent species, and (2) the effect that increasing urbanization and road density have on black-tailed prairie dog density. In fall 2001 and spring 2002, I captured, marked, and released small mammals on 6 grassland sites with prairie dog colonies and on 6 adjacent grassland sites without prairie dogs using large Sherman live-traps to determine the extent to which prairie dog colonies influence small mammal communities. Sites with and without prairie dogs had similar small mammal densities; however, sites with prairie dog colonies were dominated by

deer mice (*Peromyscus maniculatus*) and had lower small mammal species diversity and richness.

In the second part of the study, I used remotely-sensed data and a GIS to quantify percent urbanization, road density, and the percentage of other prairie dog colonies in the surrounding landscape at 200-, 1000-, and 2000-m from the perimeter of 22 prairie dog colonies, and compared burrow density with each landscape variable at each scale. Within Boulder County, burrow density was significantly higher in colonies surrounded by greater density of roads.

The degree to which prairie dog colonies were immediately surrounded by unsuitable habitat, i.e., the "boundedness" of the colony, was negatively correlated with colony area and positively correlated with burrow density. A model based on boundedness, the density of roads at the 2000-m scale, and the amount of prairie dog colonies at the 200-m scale explained 73% of the variance in prairie dog burrow density. However, a non-linear model including boundedness and the squared term of road density at the 2000-m scale had the lowest AIC value of all linear and non-linear models, indicating a possible threshold effect of urbanization on prairie dog density.

Biological Control of Diffuse Knapweed on Boulder Open Space and Mountain Parks: A status report

Tim Seastedt (University of Colorado, Boulder)

Small releases of three species of biocontrol insects on Boulder County Open Space in 1997 have been monitored through 2002. Knapweed at the release site has declined from 30% of vegetation cover in 2000 to well under 1% of cover in 2002. Insects have spread to City Open Space properties and appear to be repeating the destruction of knapweed observed on county property. Populations are also being monitored at higher elevation sites and in adjacent counties. The insects appear to feed solely on diffuse and spotted knapweed. One of the biocontrol insects appears to be dispersing unaided across the Front Range, and populations of this species are hypothesized to be sufficient to reduce seed production of diffuse knapweed in south Boulder County in 2003 to levels where knapweed is no longer an invasive threat in this area.